A SERIES OF PROVINCIALLY DISTRIBUTED COMMUNITY ACCESS SATELLITE NODES SUPPORTED BY A CENTRAL EDUCATIONAL FACILITY.

Subtitled:
A demonstration of Place as an effector of education.

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April 23, 1999
Prepared in partial fulfilment of the requirements of the Royal Architectural Institute of Canada (RAIC) Syllabus Architectural Diploma Programme.

Regional Syllabus Coordinator: Mr. Garry D. Milton, B. Arch., MAAA, FRAIC

Key Words: place, genius loci, architecture, school, education, mediated education, technology, technology learning, distance learning, hyper-learning, life-long learning, Internet.

This Thesis Design Project, through its study of educational buildings and how they are impacted by evolving trends in electronic technology and education, examines the potential for the design of a hypothetical series of provincially distributed community access nodes which are supported by and are in affiliation with a central educational project facility. The thesis explores fashioning building forms and spaces to deliver current and anticipated educational courses in a manner which makes use of electronic technology and educational delivery trends.

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Final Thesis Submission
April 1999

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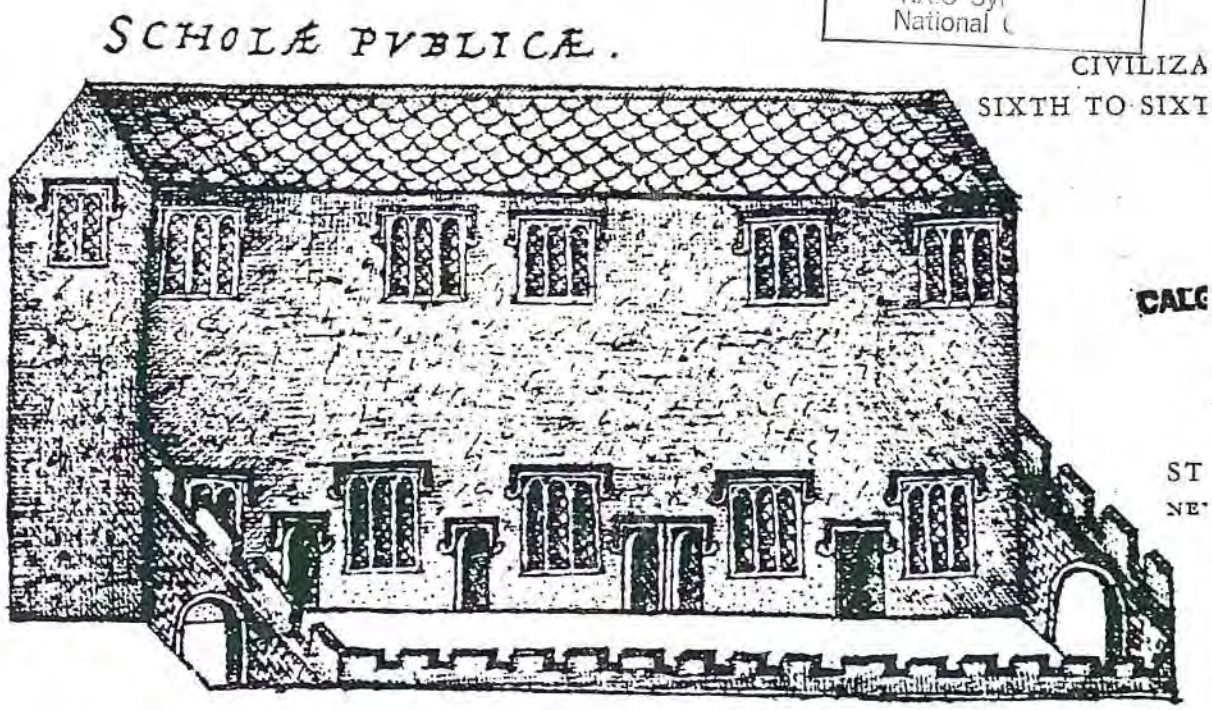

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Prepared in partial fulfilment of the requirements of the
Royal Architectural Institute of Canada (RAIC)
Architectural Syllabus Programme

I would like to thank a number of people for helping me along the way.

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INTRODUCTION

SECTION ONE

"Schools [are] *found to differ in the seriousness of the disjuncture as can be seen by examining two schools more closely. I shall do so not to contrast them, however, so much as to explore a thesis. This thesis, briefly stated, is that alike as schools may be in many ways, each school has an ambience (or culture) of its own and, further, that its ambience may suggest to the careful observer useful approaches to making it a better school."*

John I. Goodlad

1.1 INTRODUCTION

The purpose of this Thesis Design Project is to study the impact of trends of higher technologies and education on the architecture of our school buildings. Curiosity and concern over the effect from the combined influences of these two elements on our school buildings were the geneses for this hypothetical design problem and solution. This Thesis Design Project looks to establish the needs and criteria for new and future school buildings. It is also hoped that this Thesis Design Project will result in an awareness of the importance of Place in our school buildings and a recognition that we are evolving a new type of educational facility.

This Thesis Design Project will propose a design solution that satisfies the design and programme criteria that evolves from this study. This Thesis Design Project is not a rationale for keeping school buildings. This is an architectural Thesis and as such does not suggest the need for a building, merely the rationale for a design solution.

In keeping with the high technological nature of this Thesis Design Project, this Thesis was for a short time available on the Internet through the RAIC Syllabus North Bay student web site accessible through the national web site of SYLLABUS@INTERGATE.BC.CA. Any correspondence and direct E-mail regarding this thesis was received and is received at MURPHYL@COHOS-EVAMY.COM.

As the author of this report and as a student, I would like to offer a note about the level of detail for both the Historical and Current Endeavours sections for two of the topic areas of education and technology. Both education and technology are large topics and put together they are practically overwhelming. My experience and knowledge in both of these topic areas was minimal and because of this, I undertook a detailed look at not only what's happening now in each, but also a look at their history. Because the topics are so large, the amount of information reviewed became necessarily large. While a briefer report format may have been used, the reader is asked to view the volume of historical and current data not only as a vehicle for establishing and understanding trends, but also as a background into the topic and as a basis of general knowledge for me the student. The section on "Place" is similarly detailed however somewhat more specific to the architectural component of this Thesis. Should the reader wish to skip over the historical sections of the educational and technology topics, the summaries at the end of each section can be read instead.

1.2 BACKGROUND INFORMATION

Throughout history we have seen many great changes in our world and in the way we live. From our first shift away from a nomadic peoples of many thousands of years ago to community based societies[1] and up the present with our movement to live in space, we have changed, adapted and grown as a species. We have changed the way we communicate, the way we socialise, make food, grow our livestock, make a living, travel, view the world and fight wars. Virtually every aspect of our lives has changed since our first tentative steps to learn about ourselves and our environment.

These changes are traditionally marked by major epochs: The Stone Age; The Bronze Age; The Dark Ages; and others. Currently we are going through another epoch in our history - we are evolving from an "Information Age"[2] brought on by a "Computer World"[3], growing into a "Post Information Age"[4] - a world where electronics are ever present and mediate virtually every part of our lives.

Since the 1960's there has been prophesying about a "Global Village"[5] where we can communicate, visit (in a virtual sense) and work "virtually" anywhere in the world all while staying in the comfort of our homes. Now in the 1990's, we are seeing - viscerally and practically - the manifestation of this global ideal.

Along with these epoch changes we have seen great shifts in education. We see shifts in the way we educate ourselves, shifts in who we educate and indeed, shifts in why we educate. And now with the coming of the Internet and its impact on education we are seeing the next major shift - an individual, international and virtual education.[6]

Notwithstanding the omnipotent presence of the computer, an element of this Thesis Design Project is that the physical presence of a building is important in the overall delivery of education in our society today. While it is naive to think that higher technologies do not materially affect the way we learn[7], it is equally naive to think that society will immediately and irrevocably change to a paperless, internationally wired, educational system based on the "virtual classroom" [8]. Even though computers may seem to be everywhere and much of the technology for delivering educational material may seem to be already "old technology", this Thesis Design Project will assert that the need for access to computers coupled with the continuing growth of educational higher technologies, means that a new form of learning building is warranted.

1.3 RAIC SYLLABUS THESIS OBJECTIVES

The primary goal of any architectural thesis, as set forth by the RAIC Syllabus is:

> "*To develop and articulate a theoretical position in architectural design,*" and, "*to develop an integrated design in response to* [that] *stated theoretical position.*"

More general goals of a Thesis, again as put forth by the RAIC Syllabus, are:

> "*A need to advance knowledge*";
>
> "*A need to be an original body of work*"; and
>
> "*A need to be translatable into a built form.*"

Throughout this Thesis Design Project report, these goals are considered and addressed. Each of the specific research and study areas that are applicable to a particular goal is articulated and reviewed in the report summary. Through the proposition that "place" in architecture has a validity in our educational system, the first goal is satisfied. Through the study of the trends in both higher technologies and the delivery of education and, most importantly, their impact on our educational buildings, the second and third goals are satisfied, and through the hypothetical design solution of a series of community access satellite nodes (CASN's) and a Central Educational Facility (CEF), the fourth and final goal is satisfied.

I would like to note that wherever other people's ideas or concepts are included in the text, footnotes and references are made. As an example, the list of "Power Attributes" in Section Two - History of

Place" is footnoted and attributed to Ms. Kim Dovey from an article called Power / Place however the list of metaphorical and simulated computer Places from Section Three - Current Places, is not footnoted nor referenced and is therefore attributable to the me.

1.4 THESIS DESIGN PROJECT OBJECTIVES

With regards to this specific Thesis Design Project and its primary goal which is to study the impact of the trends in higher technology and educational delivery on the architecture of our schools this is achieved by the following objectives:

Develop an understanding of "place" in architecture and education;

Develop an understanding of educational delivery;

Develop an understanding of educational technology;

Develop an understanding of educational building design;

Develop design criteria against which the validity of a proposed design solution can be measured; and

Develop a design solution which satisfies the Thesis Design Project objectives.

1.5 METHODOLOGY

The methodology for this Thesis Design Project follows a sequence of: research and interviews; study of related case studies; analysis and evaluations of the findings; development of the programme from these findings; and finally design of the solution.

The scope and breadth of this design project meant that it was important to develop an understanding of three main focus areas directly related to the thesis topic:

Place in Architecture;
Education; and
Technology[9].

The primary area of study was around "Place" in architecture but was more specifically geared to educational architecture. This encompassed the greatest volume of research, however the two other primary focus areas - education and technology - were also studied in detail.

The research followed somewhat similar lines for each of the focus areas. This included namely a look at the history of the focus areas, their current application and use, and finally what is being projected and what are the suggested trends for all three.

The purpose of this history/current/projected approach was to help develop:

> An understanding of the general historical importance of the focus areas and how they have coped with and evolved through changes over time;
>
> An understanding of the current application of the focus areas to understand how they are presently being used; and
>
> An understanding of the evolving trends in the focus areas.

Site visits, extensive use of the Internet and discussions with local Authorities Having Jurisdiction were also techniques used to assist in the research component of the project.

Research

The first portion of the Thesis Design Project was primarily the research of published data. This research was concentrated around the three essential focus areas of study.

The research that was conducted around the idea of "place in architecture" examined not only the concept of "place," but also how we are impacted by and how we impact "place".

Interviews

Concurrently with the published data research, a number of interviews were completed with people knowledgable in the various fields as well as with students. These interviews helped to substantiate the data research. Summaries of three of the interviews are included in this report. Each is gratefully thanked for their generosity of time:

> The Alberta Provincial Minister of Education, Mr. Gary Mar;
> Professional Education Consultant, Ms. Sharon McKinnon; and
> Coordinator of the Distance Learning Centre at the University of Calgary, Ms. Irene Kirek.

The interviews were important to understanding of the scope of the work, and in helping to define the design problem and its programme.

Case Studies

Two provincial initiatives were reviewed which concern the use of technology in educational delivery. These case studies were extremely topical as they are newly introduced programmes.

Analysis and Evaluation

Once both the published research and interview components were completed, and each Section summarised, a number of building needs became evident. These needs essentially became the project's design criteria. The needs indicate the overall and general requirements of the Thesis Design Project and articulate its educational, technological and spatial general requirements.

Various sites were also considered based on the analysis, evaluation and programme development criteria and are included as part of this Thesis Design Project.

Programme Development

The programme was developed at this stage by applying the analysis and evaluation from the published research to the programming requirements obtained from the interviews.

Design Development

From an understanding of the research component of the three focus areas, from the analysis and evaluation of the research, from the development of the design criteria and from a development of the programme, the design objectives, concept and a design approach will be developed.

This will evolve through the use of drawings, sketches, modeling and other similar techniques.

This section of the Thesis Design Project will be completed during the design stages of the project and will be included in the final submission of the Thesis Report.

1.6 SYNOPSIS OF THESIS REPORT

This thesis report follows a linear sequence parallelling the methodology noted previously. That is the report looks at the history, the current and then the future of each of the three focus areas, then summarises the interviews and looks at the case studies. The analysis and evaluation, programme development and finally the design development are or will then be reported in turn. Each major review topic is assigned its own "Section". Essentially, Section two (History), Section three (Current) and Section four (Future) of the report can stand alone as summaries of their specific focus area, however report Sections five and on are based on and are integral to that which has gone before it.

Section One - Introduction

Introduction to the Thesis Design Project, the goals of the project, the methodology employed and the scope of the research are explained.

Section Two - An Historical Perspective

Section two is subdivided into three parts:

Section Two - A	An introduction to the significance of Place in architecture and its application to through history is presented;
Section Two - B	A review of the history of education, and how education has been impacted by man's growth is presented; and
Section Two - C	While the history of technology has been published to death, and we've all heard about how the "computer bug" got its moniker[10], a brief look at how we

have gotten to where we are today is still pertinent to this report and is included. Emphasis is again on educational technology.

It is noted that in the historical sections of education and technology a large amount of detail is included. At the end of each Section is a summary of that which preceded it. The reader may wish to either read through the full text of the report or skip ahead directly to the summary portions. This applies to Sections 2B (History - Education) and 2C (History - Technology).

Section Three - Our Current Endeavours

Section three is also subdivided into three parts:

Section Three - A — A review of what is currently perceived and seen as the essence of place in education.

Section Three - B — A review of how education is currently being delivered;

Section Three - C — A review of the use of educational technology; and

Section Four - What the Future Might Bare

Unlike the previous sections, this section looks at all three focus areas together and concentrates on educational trends only. Future trends are reported for all three focus areas as they relate to the delivery of education.

Section Five - A Review of the Project Interviews

A summary of three of the interviews is included in this section of the report.

Section Six - Case Studies

Two projects are reviewed. A Pilot project in Alberta (AMEE) and a Provincial delivery system in New Brunswick (NBDEN) are looked at for a basis of comparison and bench marking. The focus of these case studies is the application of technology into school building design, the application of technology in Distance Learning and the application of the concept of increasing accessibility of Distance and Life Long Learners through Information Technologies and newer educational delivery systems from a central control facility.

Section Seven - Analysis and Evaluation

The data from the preceding are analysed in hopes of establishing:

- The design criteria for the Thesis Design Project; and
- The site selections.

Section Eight - Development of the Programme

This, the final research component of the report was used to describe the design programme. The completed programme identifies specific area requirements, required adjacencies, future growth needs, functional requirements and other programme requirements.

Section Nine - Design Proposal

This section of the Thesis Design Project will be completed during the design stages of the project and will be included in the final submission of the Thesis Report.

Section nine of the report will present the Thesis Design Project design proposal.

Firstly, the development of the concept and design principles on which the design will be established will be identified. This will provide a base and an overall guide to the design solution.

Secondly, the design solution will be presented.

This Section of the report will include schematic design sketches, site photos, and other diagrams and drawings to illustrate the Thesis Design Project design solution.

Section Ten - Summary and Conclusions

This section of the Thesis Design Project will be completed during the design stages of the project and will be included in the final submission of the Thesis Report.

A summary and conclusions will be presented which will compare the design solution to the design criteria, the programme and the design concept to show compliance with the Thesis Design Project's design solution and goals.

Appendix A - Site Analysis Criteria Sheet

This section of the Thesis Design Project will be completed during the design stages of the project and will be included in the final submission of the Thesis Report.

A sample of a complete Site Analysis Criteria Sheet will be included.

Appendix B - Thesis Design Project Design Solution

This section of the Thesis Design Project will be completed during the design stages of the project and will be included in the final submission of the Thesis Report.

A complete reproduction set of drawings and photos illustrating the full scope of the design solution presentation will be included.

Appendix C - A Series of Supportive Research Notes

A series of quotes and additional information supportive of the research is included.

AN HISTORICAL PERSPECTIVE - PLACE

SECTION TWO-A

"The past and the future need each other - the past informs - the future inspires."
Author Unknown

2.1 INTRODUCTION - EDUCATION, TECHNOLOGY AND PLACE

Section Two of this Thesis report focuses on the historical growth of the three study areas: Place; education; and technology.

The first portion of Section Two is an introduction into the history of Place. The second and third portions of Section Two include a history of education and a history of technology. As was earlier referenced, a summary is included at the end of this section. The reader may choose to skip through this detailed historical review by reading only the Summary Section.

2.2 HISTORY OF PLACE

Introduction

"Place" in architecture is an extremely subjective and complex concept. As before, in order to properly discuss Place, we again look to define it. Initially we will look at the dictionary definition of Place, then how we perceive and sense Place's physical attributes and then look at what influences us in our perception of Place. We will then look at how we react to the factors of Place and what impacts our understanding and perception of Place. Finally we will summarise.

Definition

The concept of Place in architecture has been called variously: "Place"; "a Sense of Place"; "The Idea of Place"; "The Spirit of Place"; "The Experience of Place"; "The Meaning of Place"; "The Essence of Place"; "The Concept of Place"; "a Pattern Language" [1]; "Phenomenology"; "Vesica Piscis" [2]; and "Genius Loci."

Our use of the term refers to all these. Each describes one or more of the elements that constitute a Place. Each refers to a component of how people perceive and understand Place. In one instance a term indicates how we "sense" a Place, in another how we experience it and in another what its meaning is to us and so on. We look to all these to assist in our understanding of Place in Architecture and to convey particular concepts.

This report will use the term "a Sense of Place" to wrap all these meanings into one. Though many definitions do exist for the words Sense and Place, the play of both words together connotes more than just their separate definitions. The inferences and implications of "a Sense of Place" is beyond the immediate definition of each of the words.

We begin with a dictionary definition of both words, as recorded in The Canadian Encyclopaedia Plus (1997).

The word Place is defined by The Canadian Encyclopaedia Plus (1997) as:

"1 *a particular part of space, of a definite or indefinite size: This would be a good Place for a picnic.*
2 *a city, town, village, district, etc.*
3 *a building or spot used for a certain purpose. A church is a Place of worship. A store or office*

is a Place of business.

4 *a house or dwelling: We all went to my Place for supper after skating. They have a beautiful Place in the country.*

5 *a part or spot in something: There's a sore Place on my leg where I bumped the table.*

6 *a particular page or other point in a book or other writing: to mark one's Place.*

7 *reasonable ground or occasion: There was no Place for such behaviour.*

8 *the proper, original, or usual position or location: The book is back in its Place on the shelf.*

9 *a proper, suitable, or designated rank or position: He has found his Place in teaching. Somebody should put her in her Place.*

10 *a position in time: The performance went too slowly in several Places.*

11 *a space or seat for a person: Keep a Place for me if you get there first.*

12 *a post or office: In his Place as corresponding secretary he is responsible for sending out the notices.*

13 *duty; business: It is not my Place to find fault.*

14 *a step or point in order of proceeding: In the first Place, the room is too small; in the second Place, it is too dirty.*

15 *the position of a figure in a number or series: in the third decimal Place.*

16 *a position among the leaders at the finish of a race or competition: John won first Place.*

17 *the second position at the end of a horse race.*

18 *a short street or court.*

19 *an open space or square in a city, town, etc.*

verb.

20 *put (in a spot, position, condition, or relation).*

21 *put in the proper order or position; arrange: dispose.*

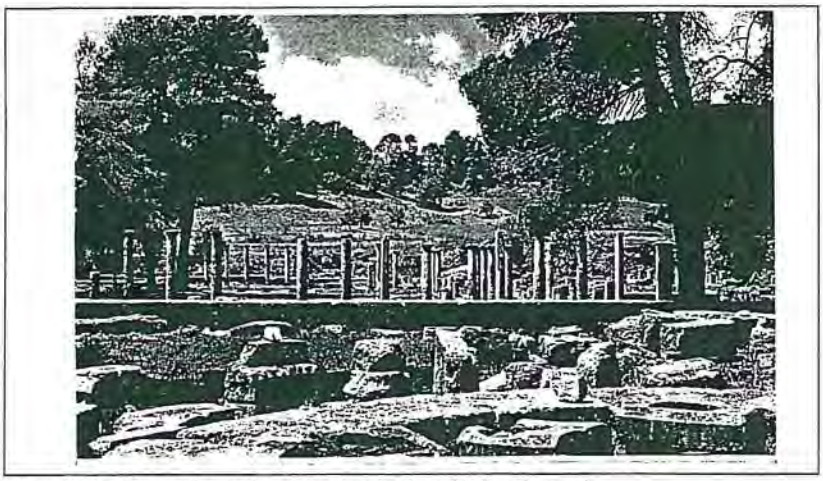
22 *give the Place, position, or condition of; identify: I remember his name, but I cannot Place him.*

23 *determine the date of; assign to an age, etc.*

24 *appoint (a person) to a post or office; find a situation, etc. for.*

25 *attribute or ascribe.*

26 *entrust to an appropriate person, firm, etc. for action, treatment, disposal, etc.*



Place is inside and outside, it is physical and it is ethereal.

27 *a be among the leaders at the finish of a race or competition: He failed to Place in the first race and was eliminated. b finish second in a race or competition, especially in a horse race. Compare win (def. 1) and show (def. 13b).*

28 *produce (sounds of song or speech) with emphasis upon resonance assisted by the body organs*

involved." [3]

We see that the idea of Place has varied, but connected meanings. At one moment it can mean a physical and definable space (definition 2) and yet it can also mean a physical but undefinable space (definition 1). It can mean a physical space for certain functions (definitions 3 and 4) and yet it can mean ethereal, non physical locations or pieces of time (definitions 7, 9, 10, 13 and 14). It can mean space created architecturally (definitions 2, 3 and 4) or it can mean space created through urban growth (definitions 18 and 19). When one looks at the verb one does not stray too far from the meaning of the noun including definable and undefinable space, ethereal time and non-physical locations.

The definition of a Place then is more than any one thing and is more than just a series of physical and visual attributes. But if a Place is more than just its visual elements, then we need to observe a Place with more than just our eyes. We need to observe with our senses. The "Sensing" of a Place, then, is essential to our understanding of a Place - how one senses a Place is critical to how one perceives a Place.

The word Sense, is defined by The Canadian Encyclopaedia Plus (1997) as:

"1 one of the special functions or mechanisms of the body by which humans and animals perceive the world around them and become aware of changes within themselves. Sight, hearing, touch, taste, and smell are the five senses.
2 the ability to perceive.
3 a sensation felt through one of these senses: a sense of pain.
4 a mental feeling: The extra lock on the door gave him a sense of security.
5 the faculties of the mind or soul, compared or contrasted with the bodily senses: moral sense.
6 an understanding; appreciation: Everyone thinks he has a sense of humour.
7 Usually, senses, pl. normal, sound condition of mind.
8 the judgment; intelligence: He had the good sense to keep out of foolish quarrels. Common sense could have prevented the accident.
9 the recognition (of a duty, virtue, etc.) as incumbent upon one or as fitting and proper: a sense of justice.
10 the ability to judge things: a sense of direction, a sense of beauty.
11 a meaning: He was a gentleman in every sense of the word.
12 discourse that has a satisfactory or intelligible meaning: to speak or write sense.
13 the general opinion: The sense of the assembly was clear even before the vote.
verb.
14 be aware; feel: She sensed that he was tired.
15 understand." [4]

From this definition we can draw further information about how we understand Place. We see the words "understanding", "aware", "meaning", "recognition" and "mental feeling" which helps us understand the word. We "feel" the Place with our senses and that "feeling" gives us some understanding, some meaning, about what the Place is and what it is about.

We see that we "sense" a Place by "seeing" it with our senses. We smell its odours, we taste its air, we feel its heat and its materials, we see the colours, size and location of its elements and we hear its sounds. We experience a Place through the perceptions of all of our senses. A Place that is cold (either climatically, environmentally or aesthetically) will be "sensed" differently than a comparable space, even an identical space, which is comfortably warm.

In looking at the definition of Sense, we start to see broader and deeper meanings than just the immediacy of the feelings of our five senses. Sense, like Place, is a multi-valent word which implies many different definitions depending on context, history and many other issues. It means we begin to understand the essential essence of a Place by experiencing it not only with our five senses, but with our knowledge of its history, our own biases and subjectivity and through the context in which the item is placed. We need to Sense the whole of the item to begin to understand it.

But sensing a Place - of seeing the essence of that space - is a nebulous concept. It is a changing and extremely subjective concept about "space". Space is not Place. Space implies the more physical definition of a Place and in this way the difference between Space and Place is as much as the difference between a series of words and sentences to a novel. Words and sentences convey a physical, definable and discrete series of elements that are but one component of a whole. The novel conveys more than just a sum total of words, it promises more - a coherent story, a history and a journey through more than just the words individually mean. For us, Place promises more too - a coherent story, a history and a journey.

The thesis of this Thesis Design Project is the study of trends in education and technology and their combined impact on our school buildings. Inherent in this study is the study of Place in Architecture and in schools. To this end, Place is reviewed first broadly - what Place means in general architectural terms - then it is viewed historically in the context of school architecture. To help with a broad and general understanding of "Sense of Place," an general organisational structure has been used in this report to look specifically at the broad nature of Place. This structure reflects a simple approach to sensing Place in Architecture: first, how do we percieve a place - what physically and emotionally do we sense when we experience a place; secondly, how do we understand a place - what is the essense of how we understand what a certain Place means; thirdly, how do we heighten that experience of a Place - how do we make it more memorable, more profound; and finally, how do we go about creating this Place that we sense, understand and can heighten our experiences within. The following format is used:

<u>Perceiving A "Sense of Place"</u>
- Our Five Senses
- History
- Context
- Time
- Culture

<u>Understanding The "Sense of Place"</u>
- Egocentric Point of View
- The Whole is More Than the Parts
- The Plan
- Innate Understanding
- Asymmetry

Order of Understanding
Heightening The Experience of "Place"
Ownership / Pride
Functionality
Functional and Power Attributes
Natural Connectedness
Fresh Air
Contrasting Elements
Orientation
Serial Vision
Understanding the Details
Bricolage
Security
Creating A "Sense of Place"
Creating Spaces
Codes / Modes
Buildings

Perceiving the "Sense of Place"

We use our senses throughout our lives.

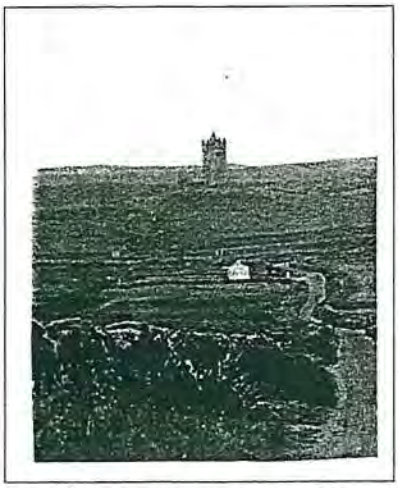
We have seen that the "Sense of Place" is very complex and subjective, but how is it that we begin to acknowledge that which makes a Place? It is our perception of a Place that helps us to understand it. In this section, we look at how Place is perceived.

Our Sense of Place is affected by many variables, each coming to play a part in how we perceive and how we understand and how we react to a Place. We understand a Place through our Sense and perception of that Place and we acquire this perception through different means: (1) our five senses; (2) history; (3) context; (4) time; and (5) culture. Initially, our five senses first come in to play (how we see, hear, smell, taste and feel a Place) but we also perceive and understand Place based on our history and the Place's history and based on our understanding of the context within which the Place resides. We also perceive Place through time, not only our current time but the march of the centuries, and finally, we see Places differently depending on our culture and on our understanding of cultures.

Our Sense of Place is affected by these variables with each impacting how we perceive and how we understand and how we react to the Place. We will look at each of these in turn.

Our Five Senses

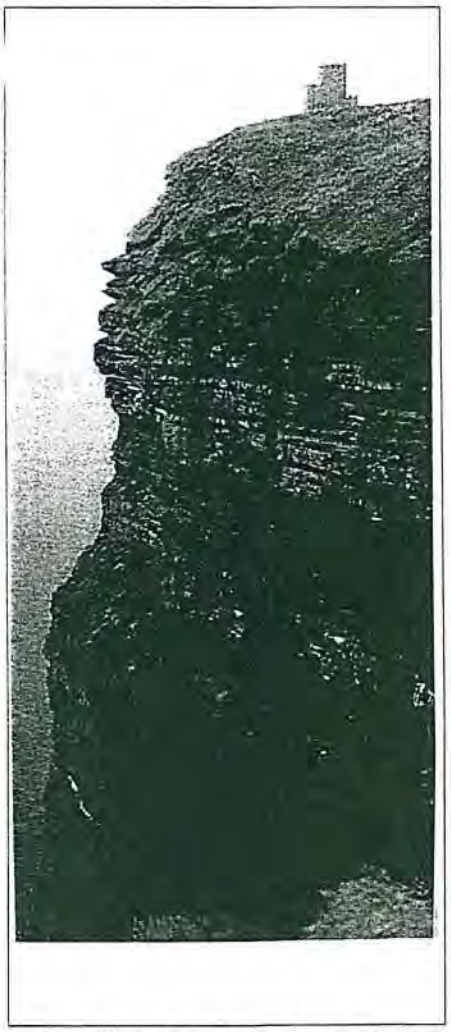
As has been noted, when we experience, or "Sense" a Place, we experience it physically through our five senses: we see; hear; smell; touch; and taste the Place and its elements.



A castle viewed from across a flat plane....

It is natural for our bodies to read our environment through our five senses. Instinctively we tend to see ourselves and position ourselves "in" our environment - and it only seems logical that we should do this. We naturally *see* ourselves at the top of cliff; *feel* the hardness of the concrete beneath our feet; *taste* the bitterness of a sour grape; *smell* the pungent acidity of a rotten egg; and *hear* the aggravating scraping of fingernails along a chalk board. It is so easy to imagine ourselves sensing any of these because it is natural for us to experience them through our senses.

In Gordon Cullen's 1968 book The Concise Townscape, Cullen gives an excellent example of how we perceive space through our senses and our context.[5] To explain this, he shows how our perceptions can and do change when even just one of the elements of our senses is changed. He asks the reader to imagine standing in a hot jungle, perched on the edge of a large 20 metre wide hole in the ground, looking down a 150 metre drop to the distant bottom. One can imagine the smell of moist leaves wafting up and the soft but distinct sound of dripping water puddling far below. A slight echo follows the gurgling sound up the vertical tunnel as your body edges up to the black gaping mouth. You feel your toes curling over the edge and a feeling of horror (or perhaps exhilaration) engulfs you. This feeling of vertigo would probably be quite pronounced - rocking dangerously close to the edge of that tremendous hole; one wrong step and your life is over. Cullen then asks the reader to imagine looking along that same 20 metre round opening, along the same 150 metre length, but this time as if from the end of a long tunnel looking out, not down. That feeling of horror may be there, but probably not for the same reason. One may not now suffer from vertigo but from claustrophobia. The feeling of exhilaration may be changed to dreary resignation at the prospect of having to walk all the way out of the dark dank tunnel.



. . . is a different experience when viewed from a cliff edge

Try to look at this same change of perception not by changing the orientation of the hole to a tunnel, but by changing the orientation of the observer from the top of the hole to the bottom. Take that same deep hole in the ground and picture yourself looking up it - vertically from the bottom. The smell, sounds, and feel from the top of the hole to the bottom are virtually identical, but the experience is entirely different - the space is the same, but the spatial experience is entirely new because of a change in only one element. Therefore an experience of a Place is tremendously impacted by the

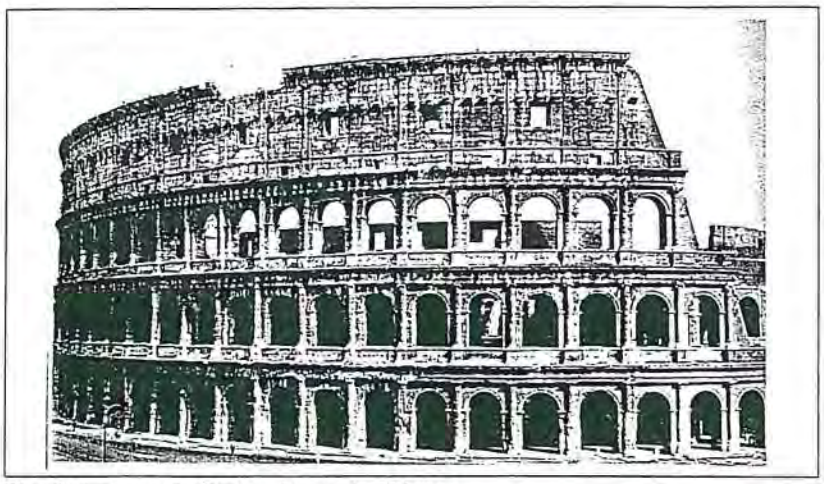
physical senses and a change in any one of those senses can and does change the experience of that Place.

An assault on our visual senses?

But not only does a change in one sense change the experience of all the senses, each of the senses affects each other too. In this way, one sense can heighten other senses which in turn heightens the understanding of Place. In an interesting experiment, two identical television sets were set up to be viewed by a series of people who believed they were viewing different types of television picture tubes.[6] The two screens were identical with identical picture quality, but the sound on one of the sets was upgraded. Overall, people reported the television set with the better quality sound to have the better quality picture. Thus one sense can impact our perception of our other senses.

So each and all of the senses add to the experience of Place. The sense of touch is as important as hearing, smelling and all the other senses. Christopher Day, in his book Places of the Soul, argues that because of the way our senses support each other and reinforce each other, it is important that we do not falsify that which we perceive. It is difficult to design truly natural materials in this age, but wherever possible it should be strived for. New materials should not be made to look like old world materials. The elements and the materials must support what the senses perceive. We must have something that looks like and feels like wood also smell like and sound like wood, in other words, it should be wood. If we do not consider all the senses when designing, we will short change the design and make the design appear shallow and without substance to the observer.[7] In this way, reality is sensed through all the senses - a television programme, while entertaining and informative at times, does not convey the sense of a Place or even of being there as well as reality does. No matter how good the picture is, we do not feel that we are there. It is a pastiche of reality because it does not affect all our senses.

But we should not, on the other hand, design spaces with overcompensated materials and forms. To assault the senses could be or would be as detrimental to the success of a Place as the lack of it. We should not design spaces that exhibit tremendous light contrasts, textural information, profound forms and strong smells. Each of the senses need be considered with the whole [8] otherwise we run the risk of over saturation and overstimulation of the senses. To the point of loosing some of the impact of some of the Place's elements.


The Colosseum in Rome - integrated history.

History

Knowledge of the history of a

Place enhances and accentuates the understanding and the experience of a Place. When we understand what the Place has historically been used for, when we sense what Christian Norberg-Schultz calls the Phenomenology of the Place,[9] we add to our sense that the Place has more than its physical attributes. By comprehending the Place in its history, the thought process that mixes the past and the experience of the present creates an "event".[10] This event is part of the experience of the Place and, because it engages us to think in terms of not only the present, but also of the past, our perception of and reading of the Place is heightened. We therefore experience and sense more of the Place just by knowing its history.

The idea of historical importance to a Place is seen through the writings of many people, one of whom is Aldo Rossi, an Italian architect and lecturer. Rossi speaks of the importance of an object's history in conveying a Sense of Place. Rossi declares the need to understand the "typology" (or the classical history of that type of thing) to more fully understand the object. In Rossi's sense, these objects, be they permanent buildings, monuments or permanent functional Places, exist in space and exist in time. An object is historically in a Place and tends therefore to adapt and evolve based on that Place and on that Place's history. It also becomes part of the history as in the way the Roman Colosseum has remained in one Place, although changing its use over time and therefore the Colosseum has remained a major factor in the evolution of the urban landscape of Rome.

Rossi argues that memory of Place resides in that Place and even though things may change in time, the Place remembers and reminds us of its history:

> " ... *the locus of collective memory* [is] *memory ... the conducting thread of the entire complex structure ... the collective nature and the individuality of urban facts arrange themselves into the same urban structure. Without* this structure, memory becomes the conscience of the city." [11]

The locus of a Place then includes everything that is important about that Place. The space, typology, topography, form, and its location of ancient and more current events. Through these, Rossi argues, one can learn to understand the "theatre of human events" that exists in successful Places. Rossi defines Locus in these terms:

> "*Hence the locus ... is the place on which architecture or form can be imprinted. Architecture gives form to the singularity of place, and it is in this specific form that locus persists through many changes ...* " [12]

Rossi's concept of locus then supports the idea that the past and the present come together to help one understand the theatre of human events of a Place in the present, thus heightening the experience and understanding of the Place. This combination of history and present coming together to form an event that heightens the Sense of the Place is shown in a personal story of my own.

It was on a trip to Europe that I experienced, first hand and in a very profound way, this impact. My wife and I were driving through Germany and wanted to see one of the sites that held a macabre Place in man's history - Dachau Concentration Camp. It was here that upwards of 32,000 people were murdered. I am not sure what our initial reason for seeing a prison of this sort was - perhaps just to be able to say that we had been there, perhaps just to see what it was like, perhaps just to remind us how terrible man can be to man - whatever the reason, we found ourselves driving along

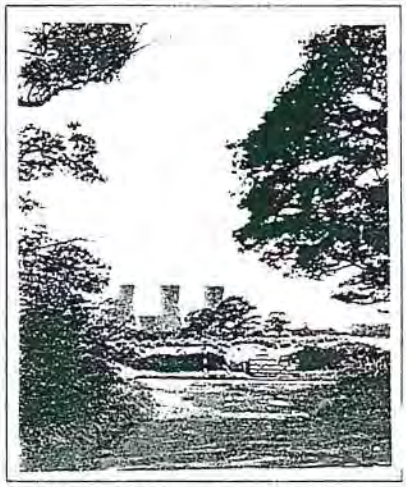
Quaint and idyllic houses.

in Germany looking for one of the most notorious camps of the Third Reich - Dachau. From the map, we knew that the camp sat on the outskirts of the south German city of Dachau, deep in a forested valley in the heart of Bavaria. It is approached by car from the west along a three to four kilometre stretch through a beautiful tree lined and partly cobble stoned boulevard. It was late afternoon as we drove up to the city, and, not knowing exactly where the camp was, we were driving slowly, soaking in the beauty and exquisiteness of the Bavarian forest. The sun flickered through the trees warming our faces. As we approached the town we were struck by its quaint post-card like beauty. The houses were painted with white washed walls and adorned with woodwork in the tradition of the Swiss mountain chalets. Window sills were decorated with flower boxes, grass lawns were impeccable and the streets were narrow and very pretty to drive along. Children were playing in the yards and the pubs were just starting to fill with the townsfolk getting ready to relax for the evening. As we drove along we were slowly taken over by the town's warmth and ambiance to the point of wondering if we had driven to the wrong Place. Suddenly we realised that we were almost out of the town, having driven right through the main thoroughfare. Up ahead we noticed three children playing ball against a large brick wall, laughing and giggling as children do. I slowed the car thinking that we might be able to ask, in halting German, where the camp was. As we pulled up along side the laughing children, I dove into my German/English dictionary. After just a moment's searching, my wife slowly reached over and patted my arm to get my attention. I turned to face her and then, following her gaze just past the children, I saw what she was looking at. There, empty, quiet and horrific, on the other side of the brick wall, sat Dachau Concentration Camp. Dark, sinister and deathly looking, the evil camp was built inside three huge brick walls while the front was a two and half metre high cold steel fence. Inside we could see the barracks where, fifty years ago, people were imprisoned before being gassed. Beyond the barracks were huge sheds of unknown and unimaginable use. My mind wrenched itself from the town's beauty to the horror of those sheds. We sat there dumbstruck staring at the now peaceful yet Machiavellian scene. Here was one of the most evil Places on earth, sitting serenely in one of the most utopian and idyllic towns I had ever seen. The children's laughter caught my attention again and I turned back to look at them. Didn't they know? I asked myself. How can they just play there? I shuddered. The power of that juxtaposition of the children playing ball against that horrid and terrible camp was profound. Their laughter seemed a grotesque mimic of the wailing and absolute anguish that must have been heard fifty years earlier. My wife and I couldn't speak. We couldn't get out of the car. We had planned an evening tour but that was absolutely out of the question. We had been warned by others who had been there that the camp was not for the weak of heart. Even now words cannot adequately describe how I felt looking at those barracks and the sheds off in the distance. After a long few minutes spent just staring through the fence and listening to the children beside us, we drove away. This Place, with its play of the present against the past produced one of the most profound feelings I have ever experienced and illustrates how history plays a strong part in the understanding of the Sense of a Place. Without the history of the Place, the camp would have looked like any peaceful, deserted farmhouse or series of farm-like buildings. With its history, the Place was death personified.

Would this be appropriate in rural? Africa?

Context

When buildings are put together in an urban context, they become more than just a grouping of individual buildings. They become a composition unto themselves. Together they are more than they are individually. When done well, one building sets up a discourse with a different building, thereby connecting the spaces that exist between them and those that are defined spatially by them. They help create a Place because of their dialogue together.



Buildings that do not suit the context - detract from the context.

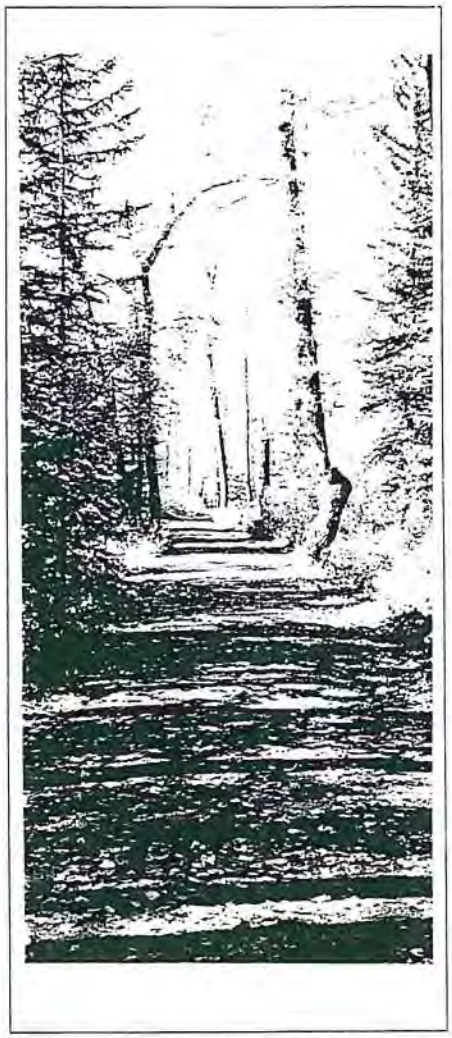
Emotionally, we respond to our environments based on a series complex cultural, contextual and social norms, as well as innate, physiological and physical influences. Knowledge of and consideration to cultural mores and norms is almost as important as consideration of the physical and functional aspects of the building design. A Place design that is not consistent with the culture of the people that is serves, is a Place that will not be used much. Albert Schwietzer recognised the importance of cultural consistency in his work at the Lambarene Hospital in Gabon, Africa[n]. During the French reign in Africa at the beginning of this century. Mr. Schweitzer had a hospital built to service the needs of the nearby rural African population. The hospital was "primitive" by all standards, even by the standards of the day, and was criticised widely for being so unmodern. But what Schweitzer knew was that the people of the villages served by the hospital would not come for help if the hospital looked too modern, too much like a Western style and influenced building. The people felt more accepting and more at ease in an environment that they were comfortable and familiar with rather than with one that was foreign yet modern. One can imagine that the corollary would have been equally true. By placing that primitive hospital into a modern Western setting would have (probably) met with outrage, indignation and utter scorn. People would not expect this form of building in a modern city and would have expected one that was consistent with cultural

Building designs which "dialogue" with one another create successful places. Salzburg Germany.

expectations.

Time

How we Sense a Place depends on when we see and sense the Place. In this way, changes in Place are experienced through changes in time. The seasons are an example of how Place changes through movement through time. The seasons bring different smells, sounds and all manner of changes. Anyone can find personal examples of time and the seasons changing perceptions of Place and the following is one that is familiar to the author.



Fish Creek Park on a warm fall day.

At the time of writing this Thesis Design Project report, I live in the south east end of the City of Calgary, immediately north of a large park called Fish Creek Provincial Park. The park wraps around the southern edge of the city and divides the main mass of the urban city from newer suburban developments. The park is a natural green area which follows a slowly meandering creek which eventually flows into the Bow River. A very large number of foot and bike paths snake through the park, cris-crossing the creek joining with suburban communities at many locations. An 18 hole golf course backs onto the south end of the park yet the rest of the park is awash in natural growing grasses, deciduous and coniferous trees, meandering streams and rough natural terrain. Many outcroppings of rocks follow the creek and Alberta Parks has built many foot bridges to allow people to cross the water. Some wild animals come to the park to graze and eat and it is not uncommon to see deer, beaver, birds, snakes and even a wolf or fox. No motor vehicles are allowed in the park so people are required to park their cars on the edge of the park and walk, run or bike after that. The park ambles between a series of hills which form a kind of a canyon about 2 kilometres wide and about 200 - 300 metres high. The overall feeling in the park is that one is really and truly in a natural wonderland. Virtually all sense of being in the city is lost. Except for the infrequent vistas to some houses on the crest of the hills, one does not see any part of the city.

I go into the park virtually every day for a short run and therefore I am very familiar with certain stretches of the park. The area I know well is the area near Bow Bottom Trail, the Ranche, Lake Sikome and extending to the west Reserve. Because I use this area very often, I "sense" the park as it changes with the time of day and with the seasons.

My usual path, during a hot mid summer evening, is nicely cooled by a breeze that gently glides through the leaves, bringing with it the pungent smells of the creek and the sweet smells of the flowers. While on the path, I hear only just a few sounds: the soft padding and rhythmic shuffling of my runners on the red shale path; the quiet chirping of birds in the trees; the rustling of the breeze

Fish Creek Park on a cool winter day.

through the leaves; the voices of people on the paths; and the ever present gurgling of the water as it winds its way down the creek. By late evening the sun is just starting to set and its intense deep yellow ochre rays peak through the green canopy of leaves overhead intensifying the colour of the red shale pathway below my feet. As I run , the wind starts to die down, and the sun catches an ever so faint mist that begins to form just above the water. I can feel the heat of the day being soaked up into that soothing grey mist as it floats over the water and through the long flopping grass that grows along the side of the creek and the pathway. The grass seems to wilt under the weight of the moisture, straining for a last little bit of sunlight. At this time of evening, I usually pass about 20 to 25 couples or families. Most of them smile and say hello. Most of them are slowly sauntering along, looking at the creek or glancing at the sunlight playing with the trees. Some of the trees reach down from above to wave their leaves just above our heads and as I pass them, I reach out with my hand and push them aside. Touching the soft branches and allowing the lush leaves to slap at my skin is exhilarating, almost as if I am bringing nature that much closer simply by touching it. The pleasant smells of the wild flowers float in and out while I travel down the path and in some areas the smells are so powerful that the paths tend to define itself through the smells: this corner is moist leaves; that corner is sweet lilacs; that bridge is cut wood; and so on.

As I turn around and run back, retracing the exact steps I just took, the path is a completely different experience. Even though the smells are the same and the sounds are virtually the same, and the path is the exact path I just came from, the experience is different. I see the creek from a new angle, I see different homes far away on the hill tops that I didn't see a few moments earlier, and I see the trees from a completely different vantage point, changing the look of the path entirely. The return experience is just as invigorating and interesting as the outward journey but different.

Plodding along the same pathway in the winter with the area covered in snow and the leaves gone, is a new and different experience. The creek is frozen over, the air is crisp and cold and so the pathway is wholly different from just a few months ago. The "space" is the same, but the "Sense" of the "Place" - of the journey - is not.

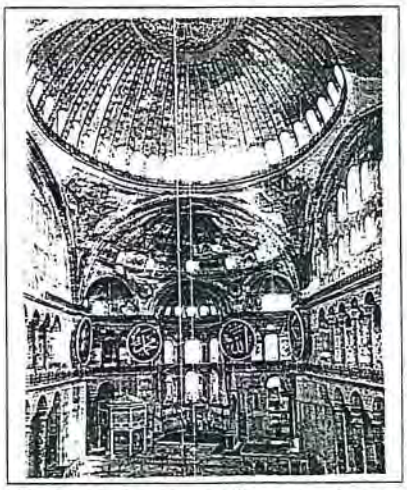
In the winter, I waste no time in getting out onto the pathway trying to catch as much of the day's heat and sunlight as I can. But by the time I'm on the pathway, the sun is usually long gone and I am running along a sometimes bitterly cold and dark pathway system. Even with the snow on the ground the night seems very dark. The wind sounds and feels cold for it no longer is slowed and buffeted by the leaves in the trees. It sails right down from above and hits me with its cold, icy prickles. It

crackles against my jacket with every swing of my arms and it carries the cold and clear antiseptic smells and biting shards of icy air through the scarf that covers my mouth. I taste the searing cold of the winter air with every breath. Sometimes I can detect the faint, but distinct smell of car exhaust caught in the inversion that flows into the creek valley on warmer days. Its acrid taste seems to get into my mouth and reminds me that just over the ridge is a city of seven hundred thousand people. The noise from the city, too, is able to make it down to me through the empty branches of the trees. Every once in a while I hear a beeping horn, a siren, a noisy truck or a speeding car. These sounds seem somehow comforting to me as if to assure me that I am only a short distance away from humanity. As I continue down the path, my snow padded footfalls crunch against the frozen ground cover, sounding in rhythm with my breathing. All sounds appear distant but oddly sharp and clear as if they are reaching my toque shrouded ears from across a large lake. I keep my eyes focused just slightly ahead of where I run trying to make sure that I pick my footsteps carefully - stepping on the wrong bit of frozen snow or ice could send me into a painful fall. While in the summertime, I might see a deer or a beaver, the winter is a different story. On one occasion, I encountered what I thought were either large foxes or small wolves (in the dark and running without my glasses, I didn't want to get too close to them to really find out). I quietly and slowly backed away from them and finished my run a little earlier that night. But this brush with what appeared to be a very hungry animal has made me very conscious of my surroundings in the winter. With the sun down, the wind up, my body wrapped in layers of clothes and the crunching of the snow below my feet, I am vigilant about looking around me to make sure I won't be running into anything nasty or hungry. Beyond the path, the creek is virtually gone, just a few blades of frozen yellow grass sticking up through the snow along the shore remind me that it does exist. Barely visible if at all, it sits frozen under a sheet of ice and covered with a blanket of snow. Sometimes I pass a few people, but quite often I pass no-one. When I do pass people they might smile but usually not, most barely just nod. They, like me, are too busy making it through the snow, the ice and the dark without falling or getting lost. As I pass by some low reaching trees, I duck or bob my head back and forth to miss the broken and leafless branches. Their brittle and hard slap against my face is painful so I tend to try to dodge the few that remain blocking my way. As in the summer, the return journey with its different vistas seems to create a completely new experience even though it is still the same path I just went down. As I leave the park, I pass a small Park Ranger shed, and once past, the city becomes almost immediately visible with my house in sight. This threshold between the park and the city is clearly defined and marks the outward journey from and to the park. As I leave the park, the city becomes real at that exact Place.

I find the park exhilarating. In the summer the pathway is outgoing, gregarious and inviting. People smile and say hello, the birds chirp pleasantly and the water prattles down the creek. The path rewards adventure and exploration with beauty, tranquillity and on a hot day, gives a freshness that no amount of airconditioning could ever offer. During the winter, that same pathway offers different rewards. Because it demands respect, focused attention and vigilant awareness of its surroundings. It makes me stay focused. This focusing is so intense that the overwhelming feeling of a winter run is one of introversion, and looking into myself. My frustrations and stresses of the day disappear quickly - almost immediately. I can't concentrate on anything other than the run or I could end up running into a wild animal looking for food or flat on my back thanks to the ice. This tends to be a tremendously cleansing and refreshing experience and as rewarding and rejuvenating, in a different sort of way, as the summertime.

This experience in Fish Creek Park is not unique. Everyone has many similar examples. The

important issue is how the whole experience, the whole space of the pathway, is perceived differently depending on the time it is experienced. At times it is outgoing and refreshing and at another times it is introverted and cleansing. It is extremely subjective and personal. Therefore the Sense of the pathway - of the Place itself - changes dramatically from one season to another - from one time of day to another and by inference would naturally change from one person to another.



Would this be appropriate anywhere but the middle east? Hagia Sophia, Istanbul.

Culture

When buildings are put together in an urban context, they become more than just a grouping of individual buildings. They become a composition unto themselves. Together they are more than they are individually. When done well, one building sets up a discourse with a different building, thereby connecting the spaces that exist between them and those that are defined spatially by them. They help create a Place because of their dialogue together. In Gordon Cullen's 1968 book, The Concise Townscape, he speaks to the visual impact that collectivity brings to the urban landscape. Cullen and others argue that emotionally we respond to our environments based on a series complex cultural, contextual and social norms, as well as innate, physiological and physical influences. He suggests that knowledge of and consideration to cultural mores and norms is almost as important as consideration of the physical and functional aspects of the building design. A Place design that is not consistent with the culture of the people that is serves, is a Place that will not be used much. There is a story of Dr. Albert Schweitzer who is said to have recognised the importance of cultural consistency in his work at the *Lambaréné* Hospital in Gabon, Africa.[13] During the French reign in Africa at the beginning of this century, Dr. Schweitzer had a hospital built to service the needs of the nearby rural African population. The hospital was "primitive" by the standards of the day and was severely criticised for being so unmodern. But what Schweitzer knew and what his critics did not know, was that the people of the villages served by the hospital would not come for help if the hospital looked too modern. If it looked too much like a Western style and influenced building it would be too foreign to them and would lie there unused. The people felt more accepting and more at ease in an environment that they were comfortable and familiar with rather than with one that was foreign yet modern. One can imagine that the corollary would have been equally true. By placing that primitive hospital into a modern Western setting would have (probably) met with outrage, indignation and utter scorn. People would not expect this form of building in a modern city and would have expected one that was consistent with cultural expectations.

Understanding the "Sense of Place"

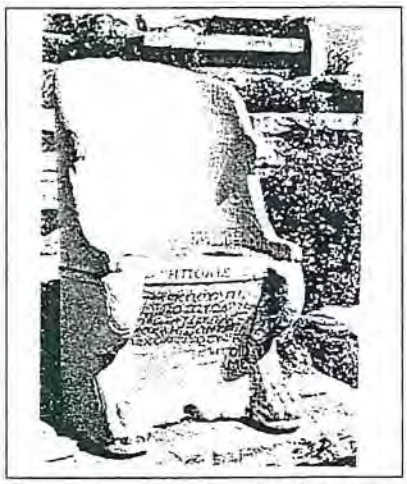
When we perceive a Place through our five senses, through history, context, time and culture, we begin to understand the Place. But to understand a Place, we have to experience and understand it from more levels than solely the immediacy of our five senses, or an objective history, or objective context and so on. We need to understand a Place from our own point of view and from our own understanding of the experience of our five senses, our own understanding of the history, the context, the culture and time. Understanding a Place therefore must come from deep within each of us. Understanding comes from our own egocentric personal subjective understanding of the things

We perceive places the only way we can - personally.

that we perceive of a Place. How we understand a Place through our experiences is therefore necessarily extremely personal and subjective. We cannot experience a Place's history from someone else's viewpoint. As an example, from my Dachau Concentration Camp experience, one realises that it was a profound experience for me. But being Canadian of Irish descent, my experience would be entirely different compared to a person of the same age, sex and general upbringing who is, say, a Canadian of Jewish descent. Knowledge of the history of the Place may be the same for both of us, but the impact and the experience would be very different. In this way it is seen that we can understand a Place differently, even though objective aspects of experience of the place may be the same.

We then "Sense" Place differently - with each person being exposed to the same experiences of Place perceiving that Place differently. But if we see and Sense a Place through an egocentric point of view, bringing our idiosyncratic understandings to our five senses, history, context and so on, can we say that we then understand a Place? No we can not. There are other elements that assist us in our understanding of Place. These elements allow us to better understand by allowing us to better understand the physical properties of the Place. This physical understanding assists us in understanding the essence of a Place. This in turn heightens our experience of a Place.

We now look at how we can better understand a Place. As we have just seen, we understand Places from our own egocentric viewpoint. But to understand a Place, a more complete understanding is needed. By understanding the whole of a Place, (meaning not just understanding its parts), allows us to understand more of the total experience of the Place. And to help us understand the whole, an understanding of not only the parts, but also of how the Place exists in plan is important. And even still, though we understand the whole from the parts, and even though we may understand the plan, the physical elements like colours and textures also impact our understanding. This is brought about through an innate understanding of the physical properties of Place. Beyond this too, as we enter and experience a Place, we must do so both through time and from our physical location (standing, walking or sitting). This understanding through time and physical location is done asymmetrically, that is to say that we do not understand Place from all points of view at once.



Every person experiences the same place differently - egocentrically.

We change our viewpoint simply by walking through a space, also we view the space from a point about one and a half metres above the ground, and so on.

We therefore understand Place through a sequence of experiences, we must explore, learn and experience a Place to begin to understand it. The following is a look at these elements, namely how we better understand Place through: an egocentric point of view; knowing the whole is more than the parts; understanding the plan; believing our innate understanding; viewing spaces

I.M. Pei's entrance to the Louvre.

asymmetrically; and in a particular order of understanding.

Egocentric Point of View

Each observer senses a Place from his own, personal, idiosyncratic anthropomorphic focus point. Although we as architects tend to draw and see spaces and Places through the medium of paper

and computer, most people cannot perceive a Place from this viewpoint (an imaginary point way up in the sky as in a birdseye viewpoint). In real time, most people can only perceive what they "see." To help us see spaces, we naturally try to position ourselves in the centre of the spaces, allowing us the ability to "see" the Place more clearly because we are centred within it.
Although our perception of Place is heightened by understanding the plan (as will be looked at below), we still tend to want to position ourselves in the centre so that we can get a better "feeling" or understanding of the Place. An example of this is the recently completed entrance to the Louvre in Paris by I.M. Pei. The Louvre is a series of buildings bounding a central courtyard. For those that had visited the Louvre before the addition of Pei's glazed pyramid entrance, the immediate feeling was of wanting to walk into the centre of the courtyard and look at the grandeur of all the buildings. From that central vantage point, even though it was just beside a parking lot, the whole beauty of the French eclectic architecture was evident. Pei designed the museum's new entrance as a glass pyramid and positioned it exactly in the centre of this courtyard. The result is that the feeling of being able to understand the space as a whole, from the central focus point of the buildings, has been completely taken away. One can only now walk either around the big glass pyramid (to be accosted by a series of smaller pyramids on the side), or one must walk into the pyramid losing all view of the beauty of the buildings.

The pyramid was made of glass apparently to allow one to view the Louvre through the pyramid. The result, however, is a distasteful tease that pretends to deliver a view of the Louvre but simply does not. The only views one can get of the Louvre contain the pyramid within them. This entrance has been called Pei's monument to himself and because of it, because it takes away the ability to view the Louvre from an observer's point of view, the success of the courtyard is lessened.

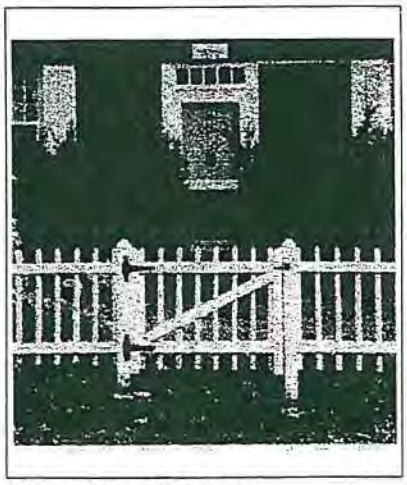
Therefore, as we naturally try to go the centre of a Place to view and experience it, we see that when we are in the centre, we tend to feel more understanding of a Place. But trying to see from the centre is still only part of the story, we have a better understanding of the whole when we can understand all the parts.

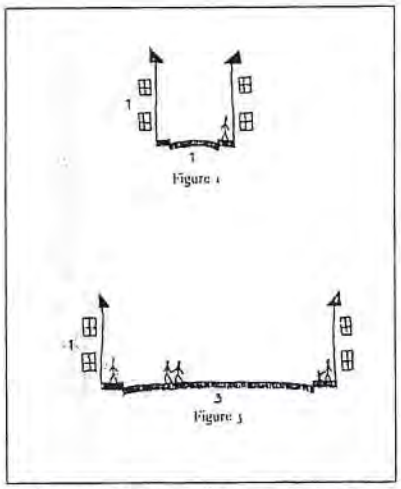
The Whole is More Than the Parts

Take a number of houses ...

It is to this point that Peter Rowe, in his 1987 book titled Design Thinking, noted that one needs to understand not just parts of a Place, one needs to understand the whole of the Place. In his book, he quotes E.D. Hirsch as stating:

"*The meaning of a text [Place] is a complex of submeanings or parts which hang together... it is not merely a mechanical collocation about a relational*

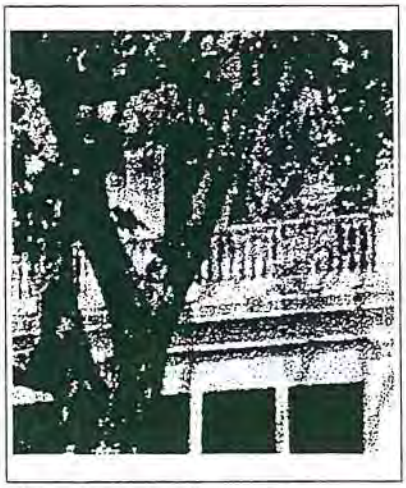

Mix a white picket fence...



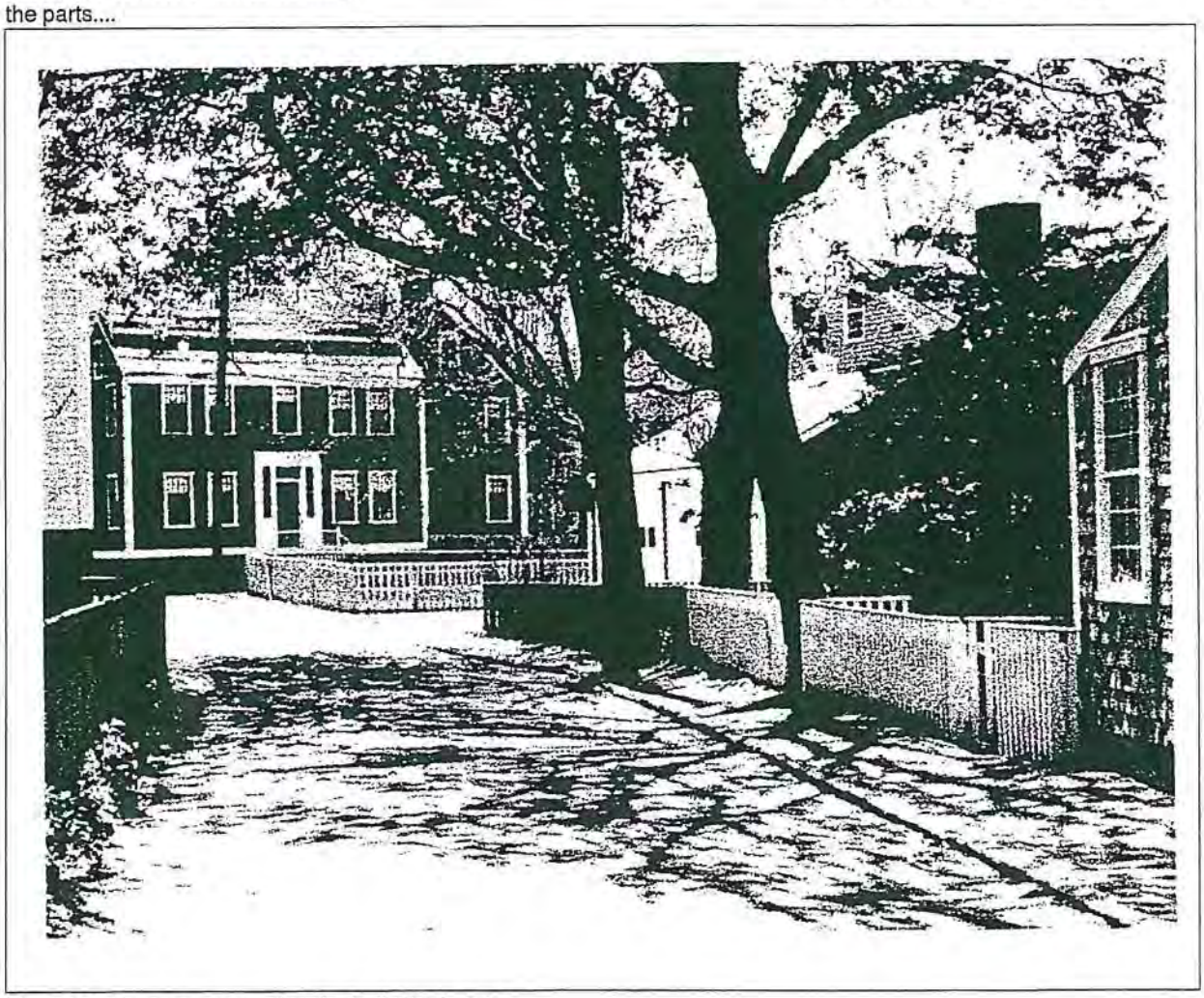
Select the correct distance between the parts....

unity in which the relations of the parts to one another and to the whole constitute an essential piece for their character as parts ... and the character of the whole ... [it follows] *that we cannot perceive the meaning of a part until we have grasped the meaning of the whole."* [14]

In our understanding a Place through understanding of the whole, our innate



Throw in some nature ... and



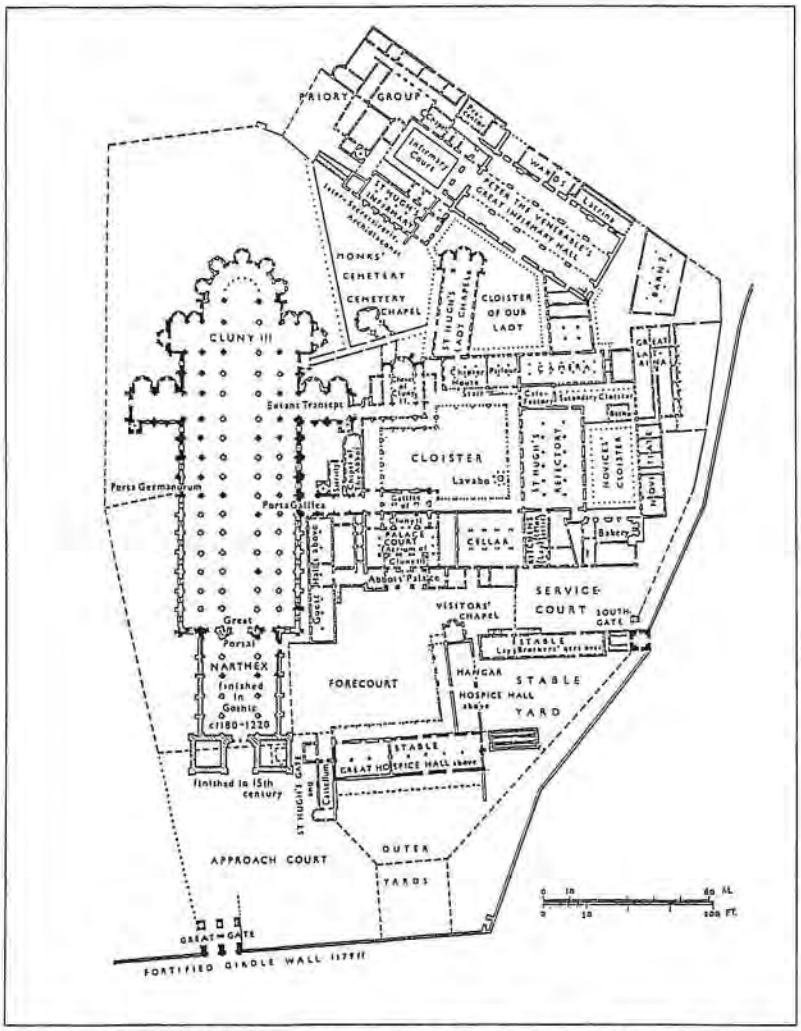
The whole becomes more that the individual parts.

comprehending of how the place works, how it relates to itself, naturally results. It is in this that a better understanding of the plan comes about.

Although we experience Places in reality....

The Plan

When understanding space, or a series of Places or a building, people do not understand the space solely in 3-D, although that is the way we experience it. Rudolf Arnheim, in his 1977 book called The Dynamics of Architectural Form, argues that even though we "see" the Place in our vistas, views and sense it through tangible real elements like sounds and touch, we do not understand the Place until we conceive of it in plan - we do not understand it until we know how its parts relate to its other parts and to other Places. One can test this oneself simply by thinking of one's high school or some other very familiar building. Generally one would not remember just the views, or the materials, but also and most importantly how the building(s) was laid out. Walking down this corridor and turning that corner would open up the courtyard because this wing forms part of the courtyard. That corridor leads down to the end of the gym and the door at the end opens up to the edge of the football field so it is also right beside the parking lot. And so on.



... We understand better when the Plan is known - Thirck Church at Cluny c1120.

A home is also a very good example. People seem to intuitively know that on the other side of their bedroom wall is the washroom sink, or above the basement study is the living room. It is so simple it is not

considered difficult but when we do not understand the relationship two dimensionally we lack a fundamental understanding of the Place and therefore lack fully enjoying the Place.

> *"Although a building is experienced in its vistas, its spaces, its views and in perspective (ie. 3-D) it is not truly understood until the plan is understood."* [15]

Innate Understanding

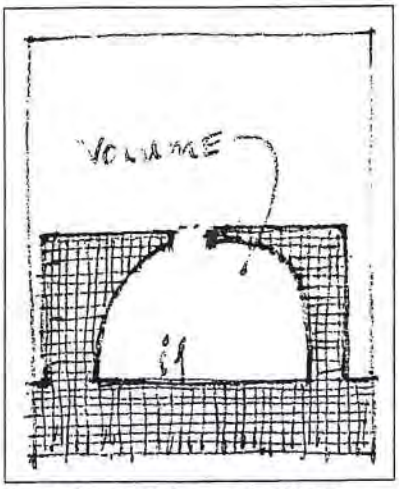
Innate understanding refers to those reactions or understandings that we, as people who perceive places, experience, regardless of influence. These are the natural, cultural and in some instances, instinctual reactions and senses that we experience.

In the use of spaces, it has been reported that people react to spaces in somewhat a consistent and predictable manner. David Canter, in his 1981 book Psychology for Architects, suggests that some paradigms exist:

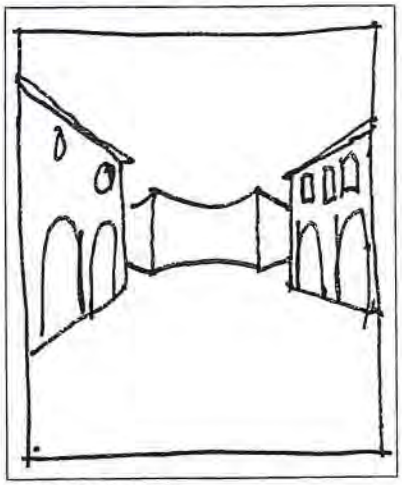
> *"1. That there are constant and consistent mechanisms relating physical stimulus to psychological responses* [ie, blue rooms look bigger]*;*
> *2. That there are no changes in a person's response to the same, or similar stimuli over time* [ie, if one is comfortable in large open spaces, one will generally remain comfortable in large open spaces]*;*
> *3. That reactions to physical stimuli are innate* [ie, when one is in a frightening situation, certain physical reactions automatically occur]*;*
> *4. That people are emotionally similar in their interaction with stimuli* [ie, people from the same culture will react similarly to like situations]*; and*
> *5. That people do not use space in a random way."* [16]

While Canter's paradigms are based on anecdotal evidence, certain truisms can be supported. One is namely that some reactions that we have to certain stimuli are innate, natural and instinctual. Imagine walking out into a busy intersection and almost getting hit with a car. We would all undoubtedly react by immediately having sweaty hands, fast beating heart and tense muscles. Another truism is that people in one culture do generally react the same as other people in the same culture. But this does not mean react always exactly the same. Imagine going to a large stadium, say the Stampede Grounds in Calgary to watch a festival. There are twenty or thirty thousand people in the stands. Imagine a bull getting loose from the nearby stalls and sauntering out onto the field to eat some grass. After the initial laughter dies down, a great outcry would probably result as the people try to make sure the animal is helped away, without incident. One could even imagine a cheer as it is led safely from the field. Now imagine that same number of people in a similar stadium, but this time in Spain. That Spanish crowd would cheer with glee as that same bull now fights for its life and dies in a blood bath. In this way we see that the same situation, depending on culture, would result in a different reaction but within each culture, the reaction would generally be pretty much the same. Generally, but not exclusively, the Calgarian crowd would want the animal to be safely led away, and generally, but not exclusively, the Spanish people would want the bullfighting Matador to reign supreme over the bull.

It is not true that everyone in that culture reacts the same way to similar circumstances. A small child, an elderly poorly sighted person, or a middle-age athlete all would view a long and confusing



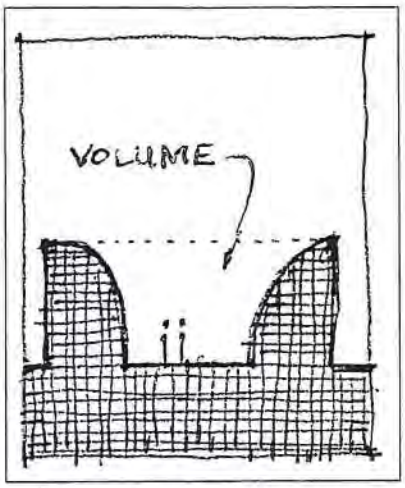
One volume and one experience. Change the form and .....



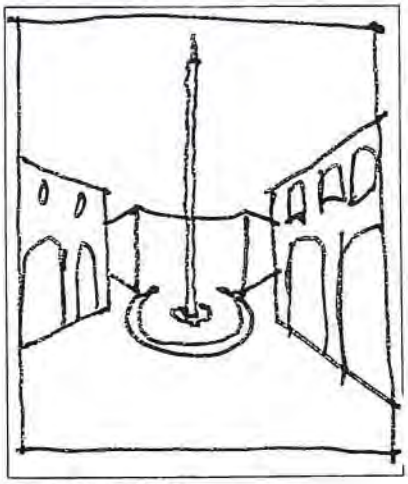
Convex shape vs.....

corridor differently. One needs to be aware of the intended user of the Place.

As well as how we innately react to Places, form also plays a role in how Place is perceived. When space is bounded by an object - as in the form of a building - we perceive the Place in terms of, among other things, the forms of those buildings. The space becomes defined by and subjected to the forces created by the forms of the buildings. Take comparable volume, finishes, smell, light and function and superimpose two different bounding forms and the sense of the space is entirely changed. Imagine one volume, open at the top and sloped to the base where you stand. Then imagine that same volume, with the same light, sounds and smells, but with a small opening at the top and wide bottom. Even though the spaces are identical in the terms described, the sense of both Places is very different. In one we may feel uplifted and free, in the other we may feel claustrophobic and compressed. It is therefore, through form that we add another dimension of our ability to understand the Sense of our Places.



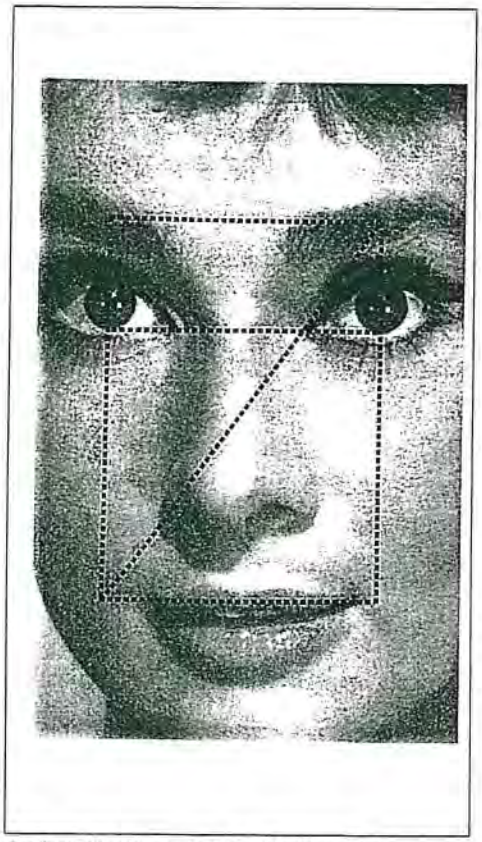
... the same volume - but an entirely different experience.



... concave shape.

According to Rudolf Arnheim,[17] the spaces that appear to be enclosed are so because our mind tries to complete the picture by filling in and connecting the forms. In this way the space is needed to complete the shape and thus the space created by the forms obtains a density. The space needs to work to hold the forms together and therefore that tension and work that the space is performing creates the feeling of denseness.

Another simple example of form affecting the space is a space with a circular form within it. One can imaging the different space that is created simply by inverting the figure of the circle, from being a concave form, in the one example, to a convex form in the second. The feeling of the Place is different between the two. In one, the space appears more inviting and open and in the second,



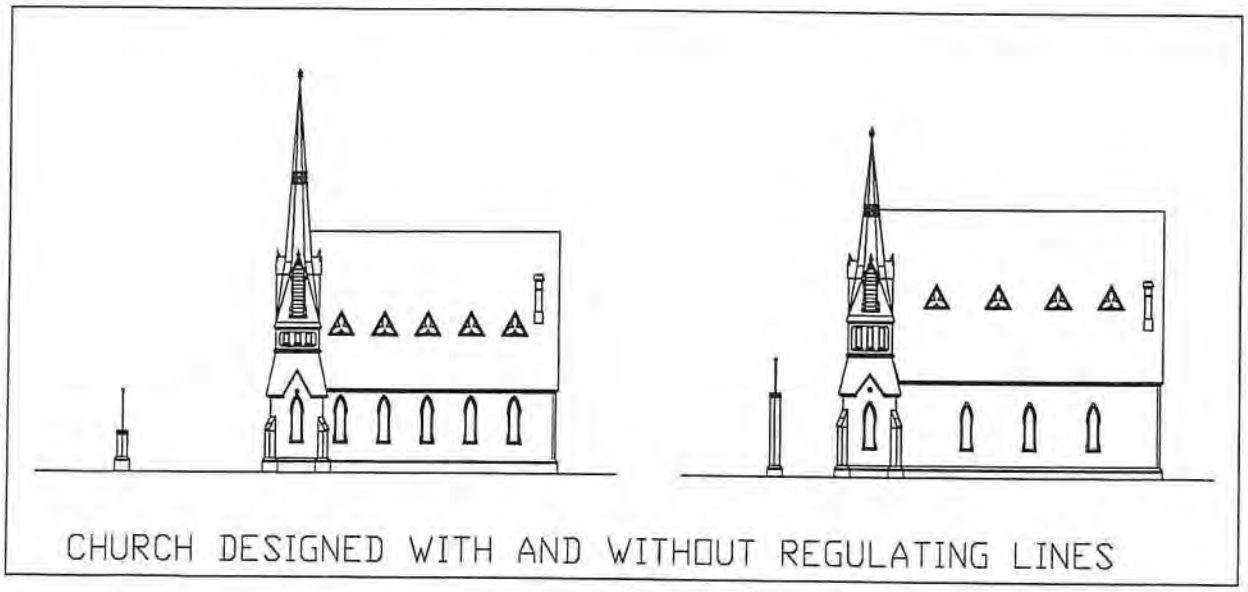
Audrey Hepburn and the Golden Rule.

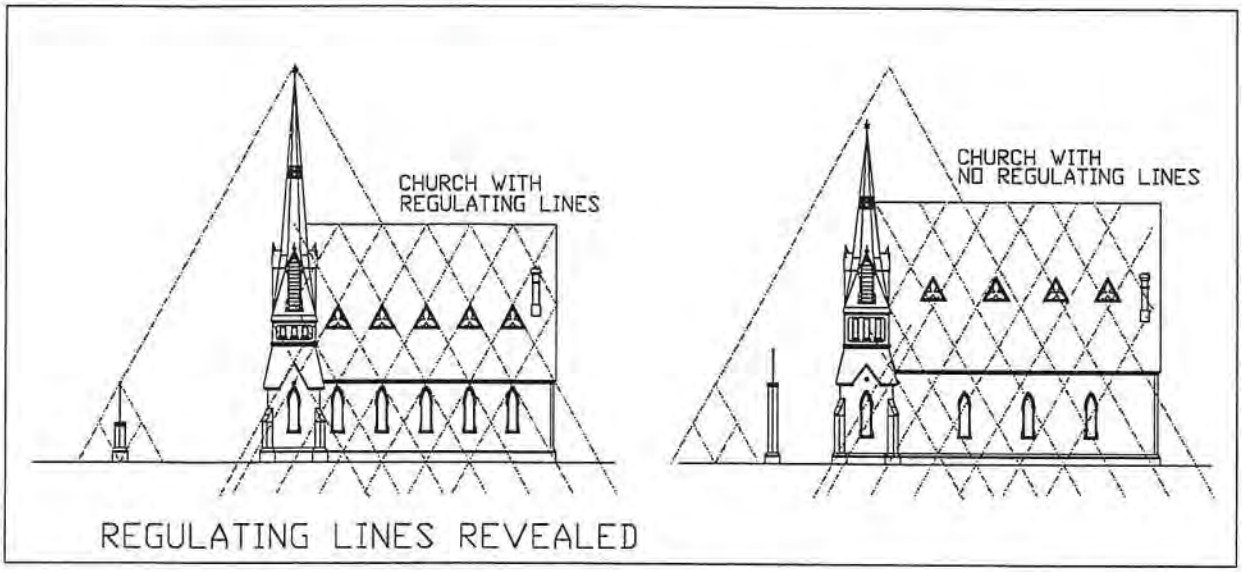
more compressed and aggressive.

In addition to innate reactions and spatial perceptions, there are perceptions of underlying building harmonies and rhythms. When we look at a building, and look at a series of spaces that constitute a Place, we can understand the underlying order, rhythms, harmonies and connections. These are not so much learned as they are innate and unconscious. When we look at a well designed building, we seem to know that it just looks right - that the elements follow a logical order or sequence or harmony. We understand that there is an order to the building that guides the designer's hand in its creation.

> *"I believe that to be recognised as a Place, a building must embody the harmonic patterns of life forms."* [18]

In the quote above, Jonathon Hale, in his 1994 book, The Old Way of Seeing, implies that order, harmony, rhythm and scale are all innately perceived by people. Throughout his book, Hale theorises that these rhythms and harmonies are desired because they are present in nature. Hale says that anything that does not have these elements is not perceived as beautiful or proportionally correct. He uses many graphic examples to convey this idea. Two are reproduced here.





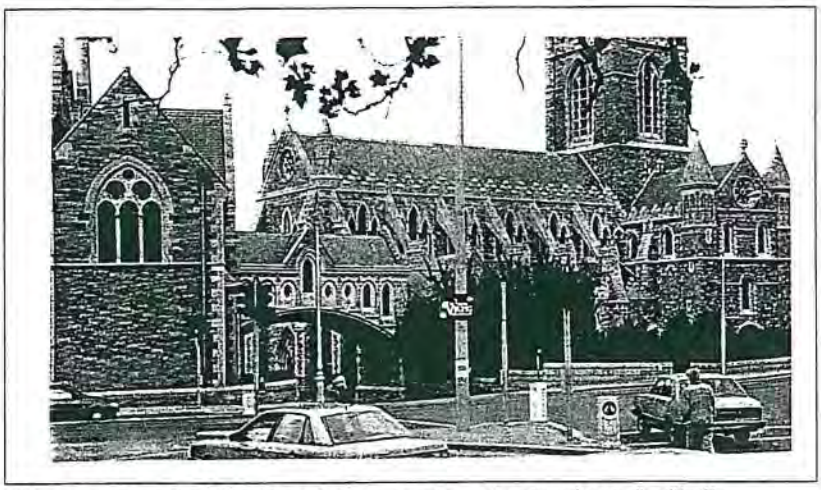
In the first, a photo, we see the face of Audrey Hepburn, a young actress (at least the time of the photo) who, by all counts can only be described as beautiful. She has a certain quality about her that is just "right". Her face is comforting, pleasing, reassuring and intelligent. Her eyes draw you in and seem to caress you. The curve of her cheeks play against the rise and fullness of her lips and her dark hair contrasts against the suppleness of her skin. Her beauty is practically perfect.

Onto this picture Hale superimposes a series of lines that follow the Golden Rule. The golden rule is a succession of geometric proportions that are based on logarithmically dividing and subdividing a rectangle into a series of rectangles, squares and angles. It is seen by many to be a guide for creating correct proportion and pleasing scales. One can see by looking at the comparison of Ms. Hepburn's face, and the Golden Rule picture, that her face follows this golden rule.

The second, a drawing, is very interesting in that it illustrates what Hale calls "regulating" lines. This is seen in the design of a church. In Hale's book, the church is pictured with a graph of lines drawn onto it to illustrate how its building elements have been organised around geometry, harmony and logical rhythm . The same has been reproduced here but with the regulating lines removed so that it can be compared with the same drawing but with the elements moved around so as to break the logic of the regulating lines. Looking at both photos, does one of them appear to be the more pleasing? More proportionally correct? More beautiful? The second series of drawings indicates which of these designs is the original and which one was the doctored up alternate. It is interesting to compare how many people preferred which photo. An informal survey at my office corroborated Hale's findings in that the preferred building facade which follows most closely the dictates of the regulating lines, was most preferred.

Asymmetry

Even though we try to centre ourselves in spaces (egocentric point of view) and even though we can better understand spaces by understanding the plan, we still need to walk through the spaces to



We rarely see a building in perfect symmetry - we experience it with life happening all around - St. Patrick's Cathedral, Ireland.

experience them. This means that as we travel through them which, we must see them from a vantage point that is continually moving within space. This means that we view spaces through a trek through the space. This means that we travel not only through space while experiencing space, but also through time. In this way, we see the space asymmetrically in space and in time, starting from whatever point we're at and progressively through the space. Therefore, an underlying harmony or rational is so supportive of how we perceive a Place.

As we walk through and experience the space, we see the space through different and changing vistas, from different heights, and through different perspective points. Therefore we not see spaces from about 1500 mm above the ground, but we also see them from where-ever we happen to be and, again, in this way, we may be able to "see" that there is a geometric symmetry built up in the facade of a building, we initially perceive these spaces asymmetrically[19] from the Place we view them, and from about 1500 mm above the ground.

Order of Understanding

Once again we look to The Concise Townscape by Gordon Cullen for an interesting view of Place. He speaks of how we respond to space. But this is not responding in the sense of physical or physiological, but in the sense of mentally- how we, as people, look to space and learn about it. Cullen writes that we respond to our environment as one responds to life: first, we are babies and are only self aware (we know basic feelings like hungry and not hungry); then, we become aware of our environment and know our surroundings (we know hot, cold, happy, sad, loud, soft); then we learn that we are manipulated by the environment (go to bed at a certain time, eat at a certain Place); and finally, we learn that we too can manipulate the environment (stay up late if homework is done).[20] Cullen sees the order of responsive understanding of

Spaces need time to be understood - St. Peter's in Rome.

[Then] *They are There. That building is charming or ugly. Awareness of mood and character.*

[Then] *I understand Behaviour. We walk about inside a web of perspective that opens before us and closes behind us. There is a time structure.*

[Finally] *I Organise. I can manipulate Spaces and Moods, knowing their Behaviour, to produce the home of man."*

From this, the passage of time again is seen to play an important role in our understanding and experience of Place. We tend to perceive space through our senses, but also through time. And our ability to understand the space is accented by the passage of time because our knowledge of Place grows with our experience of it.

Summarising briefly, when one experiences a Place, one naturally experiences the Place with all of one's senses, and by changing even just one of those senses, the experience becomes something different. Yet we experience those senses all at once, not one at a time. According to Tony Hiss we "simultaneously perceive" [21] with all our senses and in this way, all our senses come to play a part in how we perceive a Place. It is true that an overwhelming strong impact from any one of the senses (ie a very strong smell) can help to define the Place, but it is an equally true that our senses gives us our overall perception of Place. Because of this simultaneous perception, any change in any one of our senses changes our perception of the Place and in turn, our perception of our other senses.

Heightening the Experience of "Place"

So far we have seen how we perceive spaces in general - through our senses, time, history, context and culture - and how we understand spaces - from an egocentric point of view, through the whole space, in plan, asymmetrically, innately and in certain order of understanding. As people experience a Place, certain elements or biases may make that experience more intense, or more memorable. We continue our broad and general look at Place by now looking at those things that add to, or heighten our experiences of Place.

When an experience is "heightened", the effect from that experience is enriched. By providing positive elements or features that support the experience of the Place, the Place itself is enlivened and made better because the experience is itself heightened. In this, a certain amount of control of a space is needed and is supportive of an enriched experience. To allow a space to be used as a mortuary when immediately adjacent, in the same building is a hockey rink, would not be very positive experience for either use. So we look to certain devices and applications through which our experience of Place is heightened and enriched.

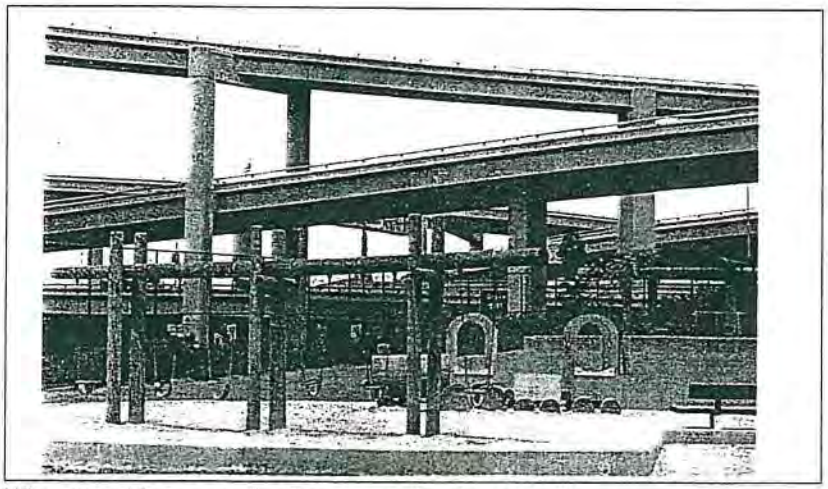
Ownership and Pride of Space, Functional Considerations, Natural Connections, Contrast, Orientation, Fresh Air and Understanding of Details are elements that can be used to heighten the

Ownership / Pride

We benefit from a sense of ownership of Place. This does not refer to the actual ownership of, say, owning a car or a house, but rather the sense that one is permitted and has a right to use a space for a particular function. Use of the space would imply safe and secure use of the space, and in this manner, people feel pride, and ownership in the Place. An excellent series of examples of this was put forward in a book written in 1975 by Randolph T. Hester, Jr. called Neighborhood Space[22] [sic].

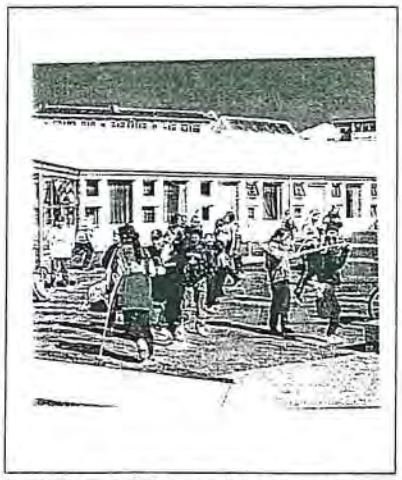
Space can be "owned" by its function or occupied territory.

This wonderful book explains the dynamics of urban neighbourhoods on a micro community level and describes those elements that form good, useable and long-lived urban outdoor spaces. "Ownership" of a Place - that is the knowledge that the Place exists for the observer and for the people heightens and intensifies and in many instances can expand the experience of the Place.

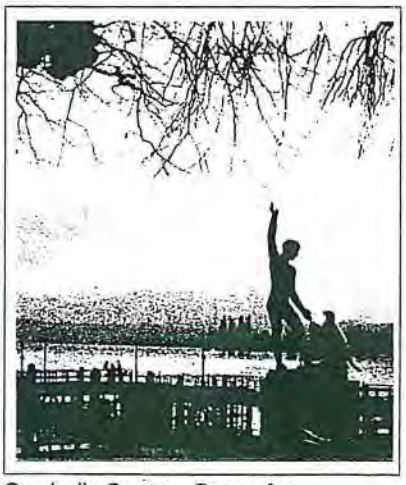

Who owns this space - the Freeway or the playground?

For a simple example of this element, imagine a busy street near your house or near any house. Many unknown faces in unknown cars go whipping by, never stopping or slowing, never belonging, always transient. It would be hard to imagine a person feeling a sense of belonging or ownership to that street when anyone and everyone can use it, and its function is only really useful when used with a vehicle. Children do not play on the street because it is too dangerous, people generally don't talk to each other because they're all strangers. Now imagine a similar, but smaller street right outside your door. The street being only about 200 metres long and ending in a cul-de-sac. The only cars that would go down that street would generally belong in the street. The street would "belong" to the people who live there. One would feel much more comfortable walking down the sidewalk, letting the kids play ball hockey and just sitting peacefully on the front lawn resting in the evening. Not only would you and your neighbours feel more possession of the roadway, but people who make a wrong turn and have to turn around at the cul-de-sac end would undoubtedly sense that the street belongs to the houses. This sense of belonging does not happen in broader, busier streets and shows that a comfort is built up with a Place when it is "owned" by the users or the observers.

Hester goes on to explain three elements that make up the sense of ownership of a public space - what he calls Symbolic Ownership: (1) Jurisdictional Ownership; (2) Status Objects; and (3) Symbolic Space.


Jurisdictional Ownership - input in design process.

Status Objects - A statue of a local hero.


Symbolic Space - Space for gathering.

Jurisdictional Ownership: is seen when people have contributed to the making of the space, either through assisting with the design, in building elements of it, in donating elements, or in having had something designed specifically for them. These all give a sense of having jurisdiction over all or part of the space. The example that Hester uses concerns children and adults in the design of a neighbourhood park. The children feel ownership because the play things were selected and Placed to suit their exact stated needs and desires and the adults feel ownership because they helped design locations for elements in the park.

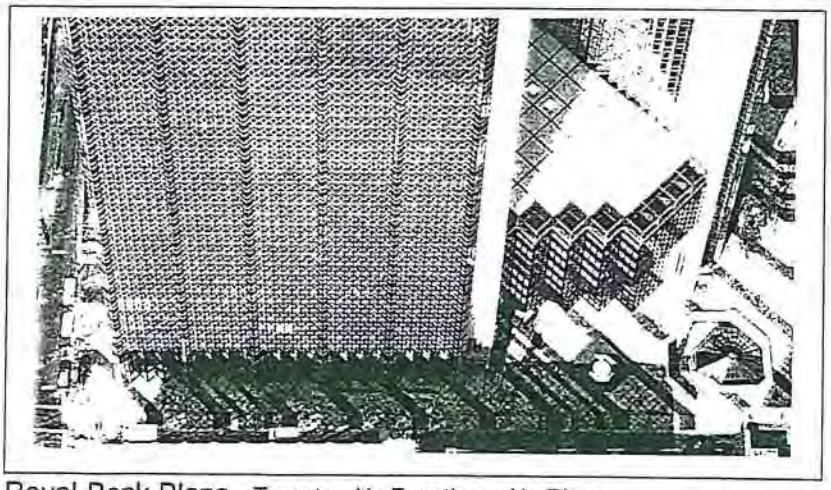
Status Objects: these forms of symbolic ownership refer to those elements that not only convey status, but also convey meaning. An example is a large central obelisk in the centre of a square which means an object of great importance, or even a statue of a local hero. It becomes an icon that is "owned" by everyone in the neighborhood.

Symbolic Space: means those spaces that have traditionally been associated with certain types of quality of area - expensive and exclusive neighbourhoods imply exclusive spaces, open and public spaces near public buildings imply public and open spaces, and so on.

These elements support the idea that ownership of space, the concept of engaging the observer into being something more than just an observer, (to be rather a participant and owner) and heightens the experience and the "Sense of the Place."

Functionality

Each Place must have a function[23] otherwise it is not a Place that people will go to. When people have a function they feel more secure about what they are doing. Just to look at a person in a new job those first few days tells how true this feeling is. That new person is wanting to grab onto something to do, to be useful, as soon as possible. In that way, they feel more in control and more secure. This is also true of Places. When they just exist, without reason for being, they tend not to be used. The square immediately east of the (Webb, Zerafa, Menkes, Housden designed) Royal Bank Plaza building in Toronto is an example. The outdoor plaza space is designed based on the buildings' strong geometric grid pattern, with a series of small steps leading up to it. Central in the square is a modern stainless steel sculpture and bounding the north edge is the entrance to the Toronto transit subway.



Royal Bank Plaza - Toronto - No Function = No Place.

The square seems to exist solely to give a flat plane onto which to Place the huge gold towers. This ground plane up to an abrupt line of glazing as the building smashes into the ground from high above. The central sculpture has a polished reflective surface that harkens to the fine machined lines of the building. The flooring of the

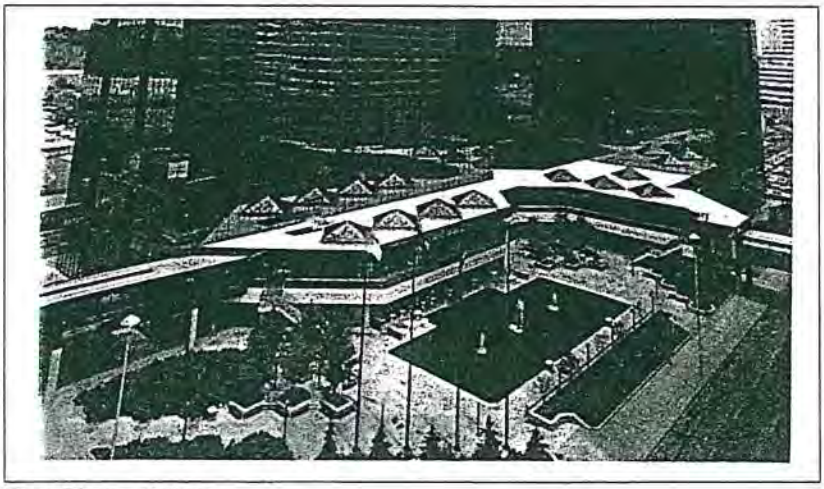
square is a series of large square, 1200 mm x 1200 mm (approx.) paving stones in a non-changing grid pattern. The square has no function other than to transport the multitudes of people to and from the buildings - a function it does very well. But to look at the square during non-rush hour traffic, the always congested Toronto downtown core does not seem to need to use this Place. The square is virtually empty. It can be seen that this square has many problems (little human scale, no human detailing, almost no tactile interest, dislocating visual cues and cold and dark building materials) which may have been overcome to some extent by creating a function for the Place. A seating area with hot dog vendors, a few newspaper stands, a seating area for the lunch crowd, almost any function would help this bleak and dismal Place.

A simple method of functionally engaging the observer in a Place is simply to create the space for the observer. This sounds almost asinine in its simplicity but it is not. - one might think that every space is created for the people that use it. Clearly spaces have been created by designers and architects that bear no relation to the people to whom they serve - even spaces that are supposed to be for the people are not *for* the people. This can be seen in many great cities throughout the world. Two simple examples illustrate a successful and an unsuccessful application of this philosophy:

The downtown Calgary Eau Claire Market area is, in my opinion a very successful public Place. Bounded by Eau Claire Market to the east, Canterra Tower and the YWCA to the west, Princess Island Park to the north and Barclay Mall and the city centre to the south, it engages, excites, invigorates, and anthropomorphises the people within its centre. One cannot walk within the centre of this area and not know that the space is a people Place. The ceremonial columns, textured cobblestones, busy interplay of materials, forms, colours and activities all play together, with the buildings in the backdrop, to produce a very successful space. Leading up to the area from the adjoining streets, each journey enjoys a series of vistas and views but the space does not entirely open up until you actually enter it. Then you get a sense of the whole space at once. The buildings facing and supporting the space, the walkways and streets winding around and the trees, river and island offering a strong contrasting counterpoint to the city behind. Even as one walks north down Barclay Mall from the city centre, one must curve and swing around interesting forms and qualities of textural materials that are quite foreign to most of the rest of the city centre.

An area that, by contrast, is not as successful a public space is the Calgary Esso Plaza square. This area is bounded by a non-descript sidewalk on the south and west, and by the mirrored glass Esso Plaza towers to the north and the east. In the centre of the square is a large, flat, and uninteresting fountain and water pool. Newly installed in the extreme south west corner is a 7 metre high bronze coloured building sign. The plaza has concrete seating

Eau Claire Market - Calgary.



Esso Plaza - Calgary.

benches and the water fountain edge is short enough to sit on. Concrete pathways lead from the sidewalk and cris-cross the square allowing people access to and through the site. When one comes upon the square, because all of the elements are low lying, one can see everything that the square has to offer in one fell swoop. There is no chance of walking through and discovering anything, it is all laid bare and obvious immediately upon seeing the square. The mirrored glass tends to disorient you as you walk by, to the point of having difficulty determining the entrances. The mirror glass is not the only anti-anthropomorphic element in the square, the water fountain is situated right in the centre of the space, thereby stopping people from going to the centre of the square, a natural area from which to view the square. The square's signage has lights that tends to conceal the wording of the buildings from view and the buildings are International Style modern buildings with no ornament, detailing, colour or texture that could be called humanly scaled. The overwhelming impression of this square is one of cold, and fast movement through it.

If the number of people sitting and meandering through the different spaces is any guide to success, Eau Claire, which is almost always filled with people is the hands-down winner over Esso Plaza whose only inhabitants seem to be office people out for a cigarette or people using the walkways to cut across the property.

Functional and Power Attributes

Place has certain attributes outside of the purely physical and perceptual. These are along the lines of functionality which I will call Functional Attributes. This is not function in the sense of what the Place is for - a hockey rink, a picnic ground, a shoe store - but rather function in the sense of what attribute or role the Place contributes to the experience of itself. A wonderfully concise group of similar attributes is given by Gordon Cullen in his book, The Concise Townscape: Possession; Occupied Territory; Possession Movement; Advantage; and Viscosity. While Cullen does not group these terms under any kind of grouping or naming convention like Functional Attributes, it is a term that seems appropriate. Each of Cullen's terms refer to some element of how a space can be used. They tend to mould our actions by physically altering our ability to travel through the Place in a certain way. They direct our exploration of the Place and allow us to experience it in a certain way. They create the opportunity for us to understand how the space works, and best of all, how it is used:

Possession: roads are for movement, buildings are for social and business affairs and squares are for socialising, but possession of the Place truly defines the space. Possession can be a shadow

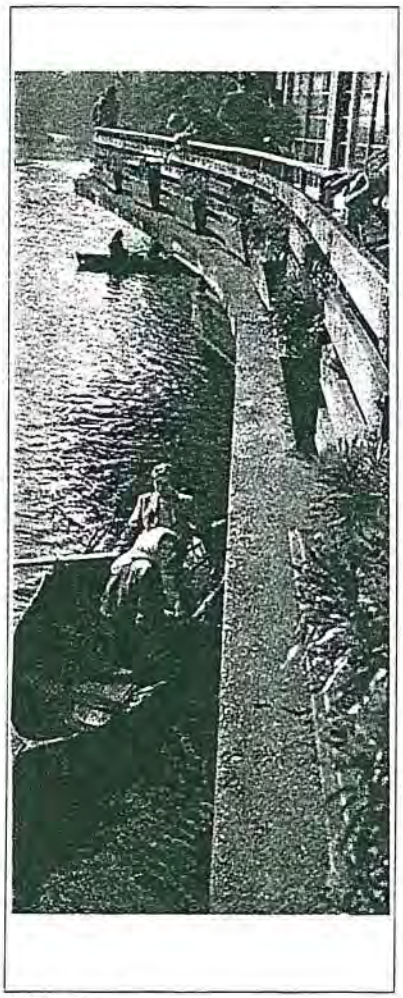
Shadow taking possession.

"possessing" a square so that it defines a particular spot as functioning best as, say, a cool Place to sit down.

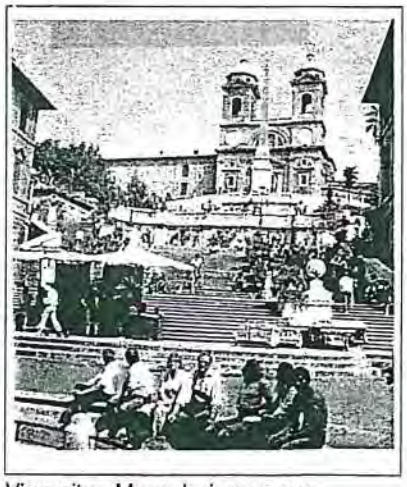
Occupied Territory.

Occupied Territory: where physical elements exist to help define the function of the space. Trees, benches, cobblestone pathway, all tell of the use of the space.

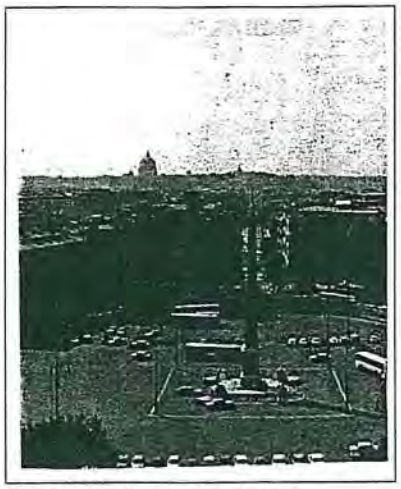
Possession in Movement: this refers to a large, ever present element in view can take possession of areas that are not even remotely near the element. An example is the walk up the main street in Rome to the Vatican and St. Peter's square. One can see Michelangelo's dome from kilometres away, and just that ability to see it, makes the buildings and spaces in the immediate area appear to be or need to be connected to it. They become kind of defined by the presence of the dome and where it is in relation to the nearby buildings. As one continues to walk toward St. Peter's square, the surrounding buildings and spaces seem to exist only to accentuate the procession to the square. In this way St. Peter's takes possession of the movement of the streets leading up to it and uses them to heighten its own experience.

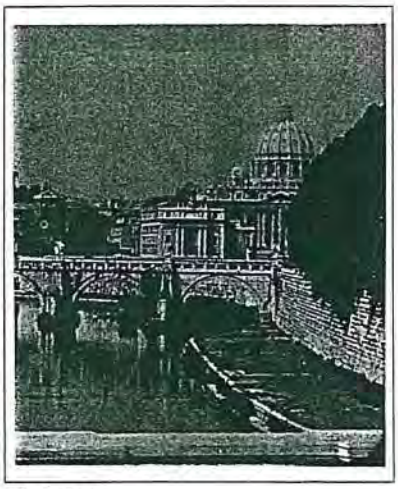

Advantage.

Advantage: this term refers to the physical advantage one gets by being slightly elevated above the main plane of people. By being slightly above, a better understanding of the way in which the Place works is obtainable. This adds considerably to the experience of the Place.


Viscosity - Meandering space.

Viscosity: Viscosity refers to the amount of moveable and fixed elements in a Place and affects the fluidity of that space. The more things that can be seen which must be traversed, or meandered through, tends to slow down movement and heightens the experience of the


St. Peter's dominates skyline.

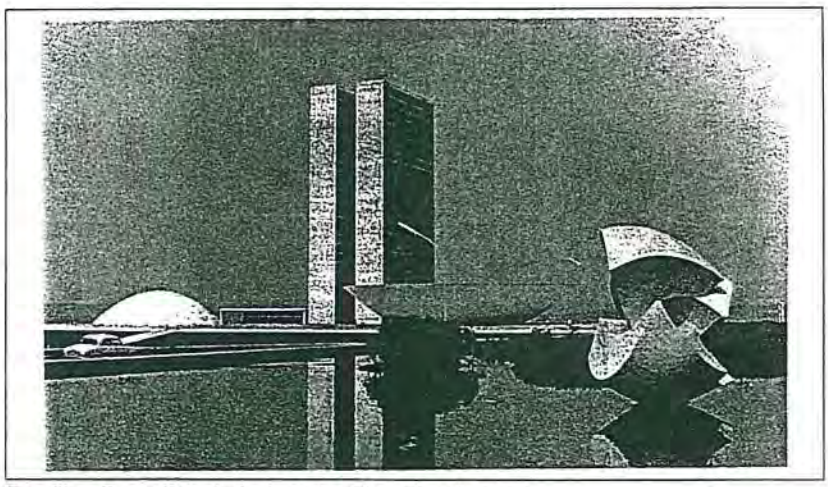

St. Peter's.

A traversing Place.

space. A streamlined, clean and windswept space promotes quick movement and lessens the experience. One need only think of two very common examples to compare the feelings of space viscosity: Compare a busy and exciting street bazaar or market (Ottawa's By-Ward market, or Vancouver's Granville Square) and compare that with the sleek efficiency of a subway station (Toronto's or Edmonton's subways). On one hand one sees a warm, inviting and busy space definitely not appropriate for fast travel function versus a very fast and uncluttered functional space for speed and travel. n these simple examples, Cullen has articulated functional attributes - how the physical characteristics of a Place can help direct the function or the appropriate use of a space. These attributes lead to the immediate and almost innate understanding of a Place. In this way, we can see that Places can be appropriate for certain functions while inappropriate for others.

An additional idea of functional attributes, is the concept of User Needs defining the needs of the space:

"*In the past ten years designers have been awakened to the plight of the uses of ill-designed spaces everywhere. They have begun to realize that it is critical to design the space ... in response to one's idiosyncratic needs. It has been shown that design and planning must be use-oriented, that the design of neighborhood space must relate to the behaviour patterns and values of the people for whom the space is designed not the values of the designer.*"[24]


Brasilia - Beautifully lyrical - lack of functional space.

Chandigarh,[25] Brasilia,[26] and Pruit-Igoe[27] all speak to spaces and Places that were designed for an ideal that had little, if anything at all, to do with the way people used the space or the culture of the people for whom the spaces were intended. They show how spaces, when designed with little connection to the culture or the people, tend to be under used or abused.
In addition to Functional Attributes, Places have attributes that can be categorised by the term Power Attributes. Primarily involved in the forms and detailing of the architecture, Power Attributes describe those elements of a Place that add dimensional "power" to a Place. If a Place makes one feel secure and safe, then that space can be said to impart a certain power of security. In an essay by Kim Dovey called Power / Place, the authoress cites seven of these Power Attributes:

"Myth / History: architecture uses metaphor and constant mythology to convey meaning;

Colossal / Insignificant: scale / mass / volume can intimidate and seduce;

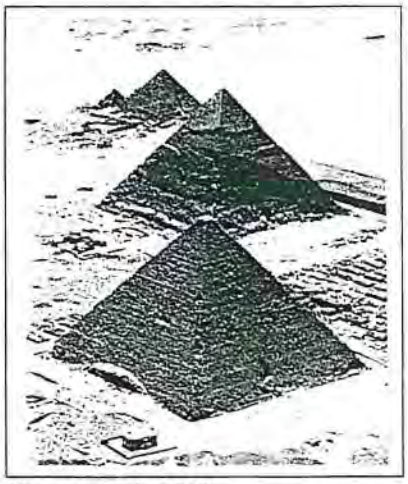
Stability / Change: images of a stable social order which legitimises the status quo (ie. a pyramid equates to power);

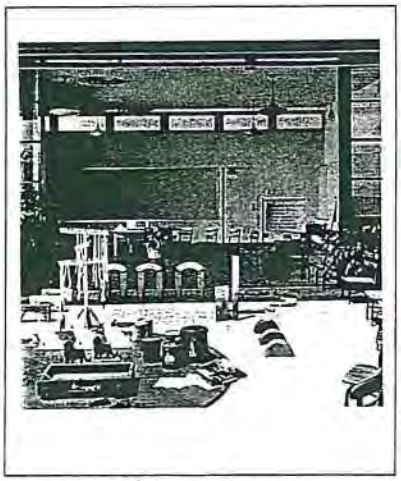
Disorientation/Reorientation: disorient and reorient through spatial order

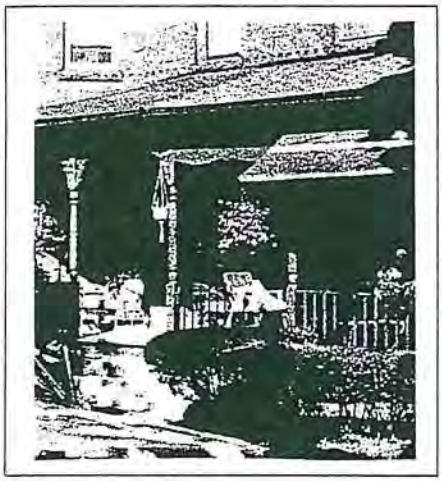
Surveillance/Privacy: segments of space achieve these (ie. small secure alcoves or niches);

Segregation/Access: segregates through status/gender/class/age; and

Distortion of Benefit.


Strength and stability.

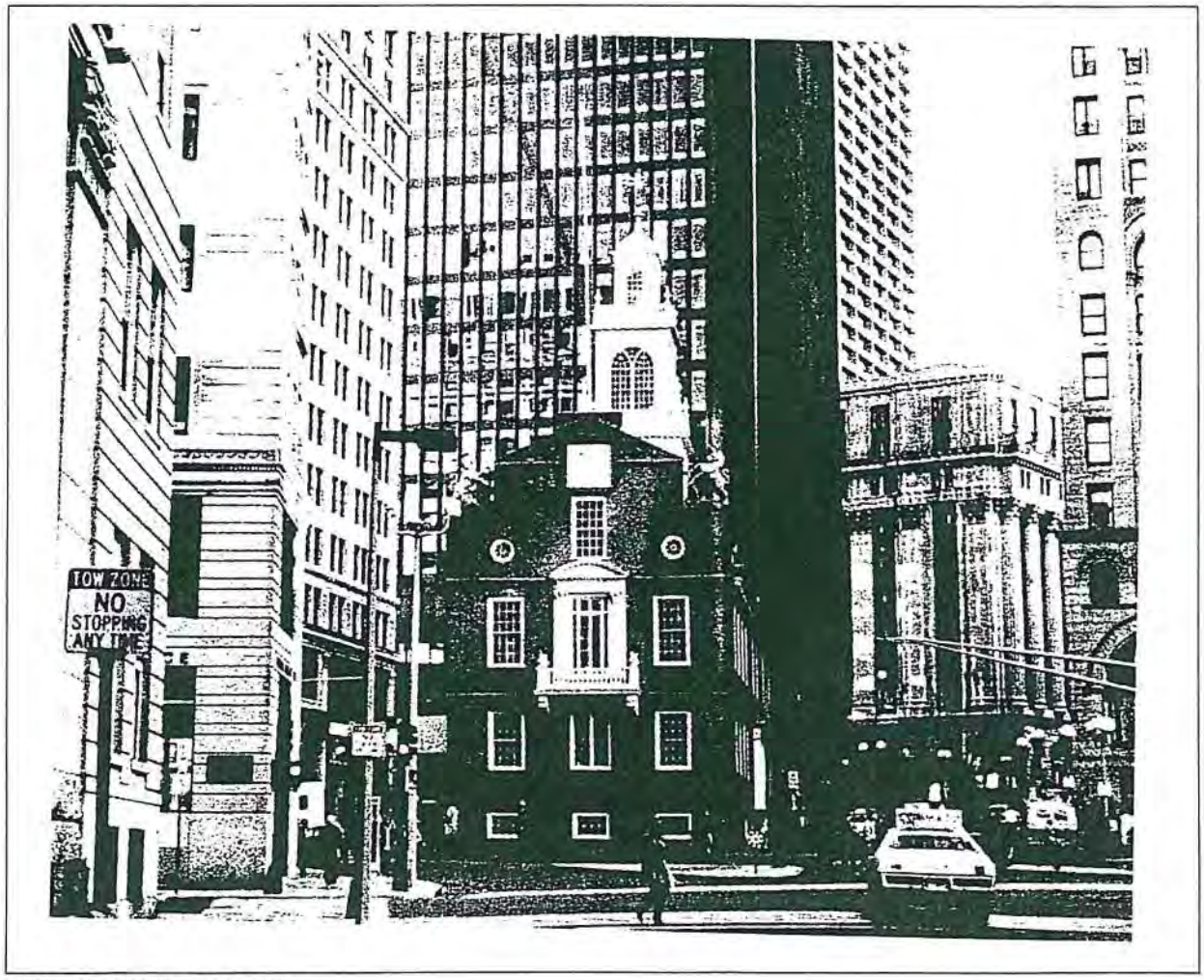

Segregated functional space.


Surveillance of Street.

Disorientation through monotony.

Simulation / Distortion: benefits and design goals are highlights."

What these Power Attributes convey is the ability of the form's physical detailing to control certain impressions of observer. A space that is heavily detailed with Gothic details will evoke a different feeling than the same space detailed in a whimsical modern kitsch style, or a large exposed space may feel less secure than a comparable area that is subdivided into visible, but contained areas.



Colossal and intimate together.

Natural Connectedness

Looking at the environment of our buildings and notwithstanding the comfort of the occupant and how we perceive space's climatic changes, there is an large element of a mediated environment in many of our spaces today. In some larger office complexes, we do not see daylight, nor do we feel the outside temperature, hear the wind, or smell the grass after a rain. It is many a time that I myself

have walked out of the office only to realise the bitterly cold snowy day that I had left outside when I arrived at the office, has been changed to a warm and bright sunny day. I am robbed for not even knowing what the weather was like that day.

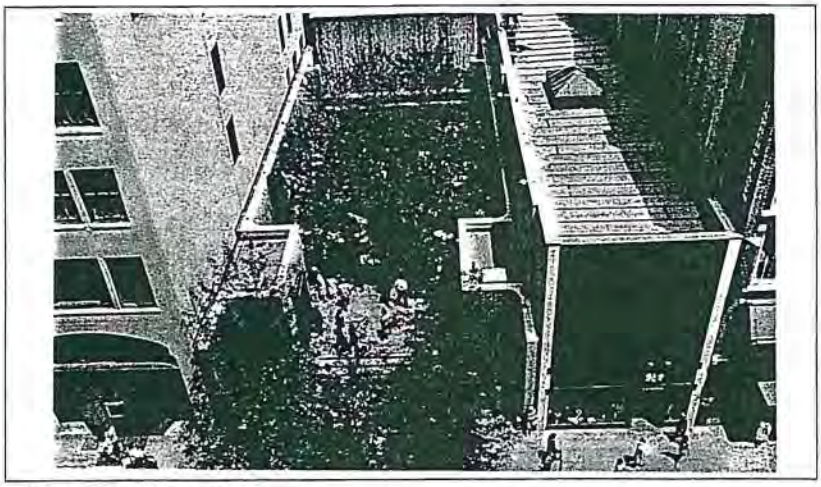
One very important method of heightening the experience of Place is by increasing the connectedness a person or observer has in a Place to nature. Needing to relate and connect to nature is innate to the human condition. We are *of* nature, we are *from* nature, and we, up to only

A beautiful, natural Place ....

very recently, lived, breathed and died *because* of nature.

Throughout history, nature has impacted every facet of our life. The changing seasons impacted on food production, the climate impacted on our building design, the way we dressed, the way we looked, the colour of our skin and even our economies. Virtually everything we were, did, are or built was affected by nature. But now, and only very recently, for the first time in man's existence, we no

longer are irrevocably and directly impacted by nature in most aspects of our life. We can get food of any description at almost anytime of the year, we can travel to any destination, day or night, winter or summer, with almost no regard for the weather, and soon we are told that we will be able to visit any Place in the world without ever leaving our home.[28] We speak to people across the world through computers, we watch weddings and funerals across the world live. Storms, weather, distance, geography, topography, practically nothing can stop our ability to eat, learn, listen, watch, speak, and work anywhere in the world, at anytime, and for whatever reason. This is something that we had never been able before to do. We are becoming disconnected from our natural, innate and instinctual earthy and organic heritage by living in an ever increasing mediated world. Two earlier quotes come back to mind:



... in a very urban setting.

"All this [technology] *is tending to marginalize the physical body - the physical presence - you don't need to be 'there' anymore . . .* "written by Mark Slouka in his 1995, War of the Worlds.

"There is no 'there', there anymore." a quote attributed to Gertrude Stein.

Randolph Hester in his book Neighbourhood Spaces refers to a concept of "relatedness through interaction with the natural environment".[29] This concept states that relatedness to nature:

> *"... is a sense of intimate kinship with nature and a sense of personal identity apart from nature, and thus implies a dynamic balance between a sense of oneness with nature and a lack of oneness with it."*

In other words we feel comfortable and we feel more whole and we feel more at "oneness" with ourselves when we feel we are, in part, connected to nature.

Hester postulates four components of this concept of positive relatedness with the natural environment: (1) easing feelings of painful anxiety; (2) fostering self-assurance and control; (3) deepening perceptions of reality; and (4) fostering acceptance and appreciation of others. To reinforce this concept, Hester offers a series of anecdotal comments regarding what he typically hears students say about experiencing nature:

> *"I go there to get myself together, to see ducks flying, to watch clouds, to relax, to see what is real after a hectic day, to chase butterflies, to sit in the same grassy spot everyday and watch the sun set; I come away with a better feeling about myself and others."*

Even Plato, way back in time, saw the benefit of connectedness to the environment, particularly when considering education. Plato has been noted as saying that the child must learn to experience his environment:

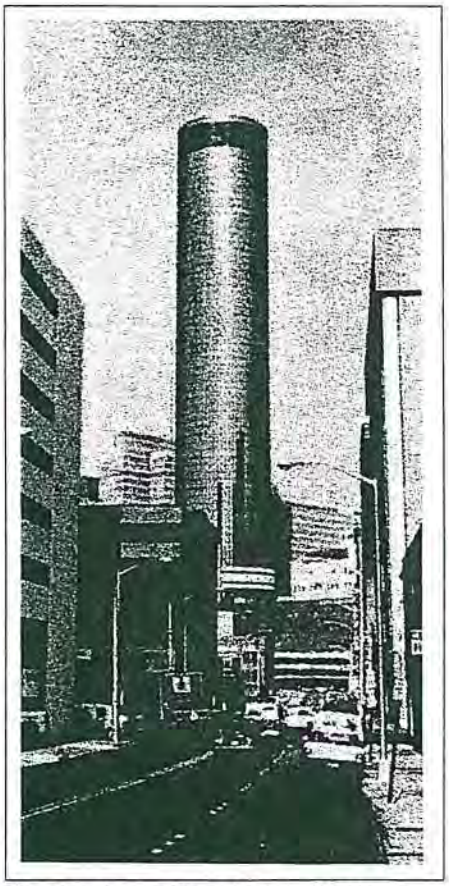
> *"The goal of education should be to teach every child to associate feelings of joy with the concept of the good and feelings of pain with the concept of evil."*[30]

This, if taken literally would appear to mean spare the rod and spoil the child, but we are told by Alfred Roth[31] in his book The New School House that this actually refers to Plato's desire and belief that the physical environment and children's reaction to and in nature should have a profound and positive affect on education and should indeed be a part of every educational curriculum. This implies that the connectedness to nature is beneficial not only to people and their feelings of well being, but also to the student. It only seems to make sense that if nature is beneficial to humans in general, then it should also be beneficial to students specifically.

Fresh Air

One of the most interesting attributes of man is his ability to adapt, and one of the most important aspects of man's adaptability is his ability to make his environment adapt to him. When man cannot change and control his immediate environment, his level of dissatisfaction increases. It is to this dichotomy that we now look.

When man initially created environments, he did so to protect himself from the elements. Later, functions began to be housed inside man's structures such as religion and public ceremony thus giving meaning to the built environment. Later still, protection, commerce, manufacturing and sport were housed inside buildings. And now we are even going indoors to be able to see the outdoors through the use of the computers and televisions and other technologies. But throughout most of this time, at least up to the early part of this century, man has let the air in, allowing us to live and breath outside air within our buildings.



The Peach tree Plaza Hotel, Atlanta - a sealed glass chimney.

But outdoor air would of course bring in not only the freshness of the outside air, but the heat and the cold, smog and noise. Because of this, controlling the interior environment was seen as a positive enhancement to building design. Heat, cooling, and humidity are all now controlled centrally such that we live in a mediated environment. The immediacy of our ability to control our environment has been removed and replaced with central air, central HVAC and the like. We are at the hands of an omnipotent building engineer controlling the very air we breathe. In studies of air temperature, humidity, and smell

preference ranges, it has been found that occupants of buildings will put up with greater variations and swings in ranges of these environmental elements when not only do they have control over their micro climate, but when outside air is available through the use of operable windows and doors: " ... b*uilding users are far more tolerant of variations of wider range of conditions in naturally ventilated buildings than they are of variations in a controlled environment."*[32]

An example of this is a hotel room. By and large, hotel rooms which have operable windows are preferred rooms. This does not mean that they are better designed, or better spaces, this means that they are more desired by travelling public. In my own travels, I always ask for a room with an operable window. I do this because I feel more comfortable in a space that is open to the outdoors. Even if I open the window just a little bit, and keep the air-conditioning or the heat on, I still prefer these rooms. In my travels, asking for this type of room often is received with questioning glances from the clerk. The answer is either "all our rooms have windows that work", or "I don't know if any of them work, I'll check." This invariably returns a "no they don't work," upon which I usually just grin and bear it. But in one hotel, The Harbour Front in Vancouver, there is a combination of operable and non-operable windows to various suites, and upon asking for my typical room, I was once greeted with a "they always go first" comment. This unscientific bit of research supports the idea that natural air is preferred over conditioned air at least by the travellers that ask for it.

We prefer spaces that have natural ventilation as part of their design and are more forgiving of the environment when we are able to "feel" the outside air.

Contrasting Elements

The "sensing" of our environment can be heightened by contrast. Where an element needs to be smooth and needs to convey the idea of smoothness, contrasting the smooth with an adjacent coarse texture would make the smooth seem even more smooth. A simple but effective example of this phenomenon is the hot and cold water test. Place before you three bowls of water. In the left one, put cold ice water, in the middle, put water at room temperature, and in the right one put hot water. Place a finger from your left hand into the cold water and one from your right in the hot water and let stand for one minute. Then place both fingers in the room temperature bowl at the same time. The contrast from the hot to the colder will make the water seem colder to your right hand finger and from the cold to the warmer will make the water seem hotter to your left hand finger. The contrast from that which went before, tempers and affects our perception of the present.[33]

Kaufman House - contrasting smooth concrete, rough stone, nature and building.

In this way too, we understand that we can compare and contrast elements very well (this is brighter than that, or hotter than that) but we cannot absolutely quantify what we perceive around us. To say unequivocally that it feels 22°c today is much less accurate than saying it is hotter than yesterday. It is sufficient to provide a manner of contrast, then, to accentuate the element. Absolutes are not critical.[34]

Orientation

Dome of Duomo in Florence.

One of the hallmarks of a well designed Place is understanding. When one understands one's environment, one can perceive it and experience it with more intensity than if one is just simply trying to understand it and not get lost. To assist us in understanding Place is the ability of one to orientate oneself- the ability to understand where you are anywhere and anytime within a given space. This orientation allows people to gauge their location within the space and can be achieved by the presence of a very visible and easily recognisable object.

A good example of this is a city that has an element that is visible from many, if not most locations. One tends to orientate oneself to the location of this element. The Eiffel Tower in Paris, the Dome of Duomo in Florence, the CN Tower in Toronto, all have a presence on the urban landscape that is visible from a great distance and from many points within the city. A progression and walk around Florence is a beautiful example of how an icon, in this case the Dome of Duomo, can be used as an orientation device. Even from afar, the dome helps to orientate people and this is especially true for tourists to the city. Wherever you may be you can understand your location in the city just by locating the dome.[35]

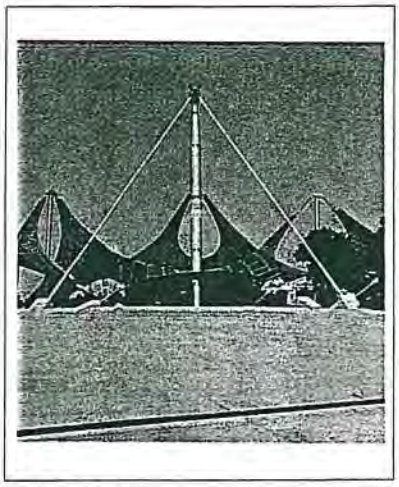
It is a tremendously calming effect to be able to look up, from virtually anywhere in that city (especially as a tourist) and be able to gauge your location relative to the Dome.

Serial Vision

Gordon Cullen, in his book on urban design, The Concise Townscape, uses the phrase "Serial Vision" to describe experiencing a space sequentially. Serial vision, he says, is the process of seeing with one's eyes the progression through a Place or an urban context. Cullen speaks of the significance of this as a series of "revelations". The person walking through a space travels at a uniform speed, and sees, as an example:

"... a straight road off which is a courtyard, at the far side of which another street leads out and bends slightly before reaching a monument. Not very unusual. We take this path and our first view is that of the street. Upon turning into the courtyard the new view is revealed instantaneously at the point of turning, and this view remains with us whilst we walk across the courtyard. Leaving the courtyard we enter the further street. Again a new view is suddenly revealed ... "[36]

Serial Vision is a processional of revelations. Here, a processional view going to the Munich Olympic Pool - starting at the Parking lot ...



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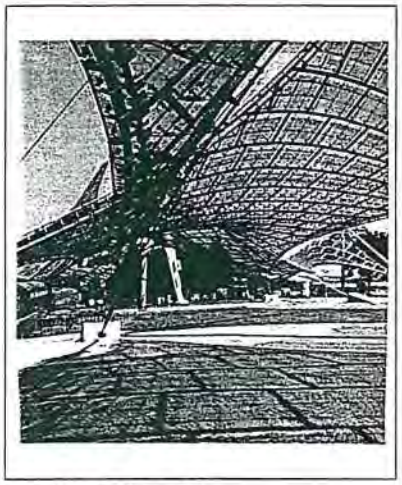
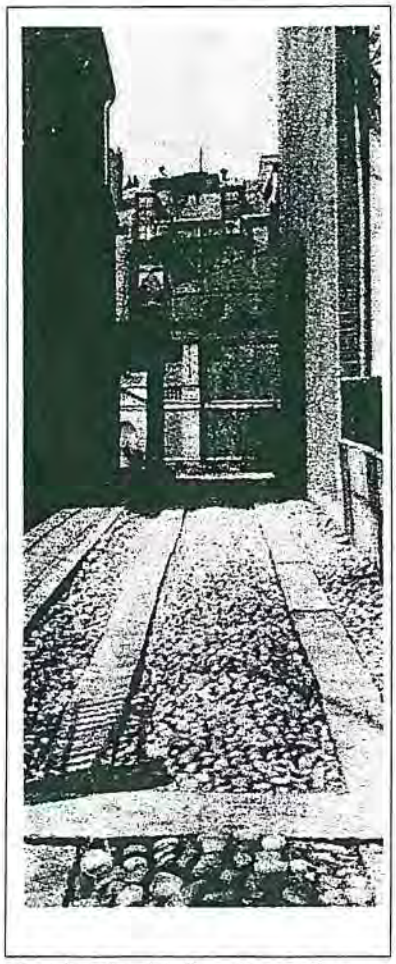


... going to the pool

... the pool



Knowing the details enlarges the space.

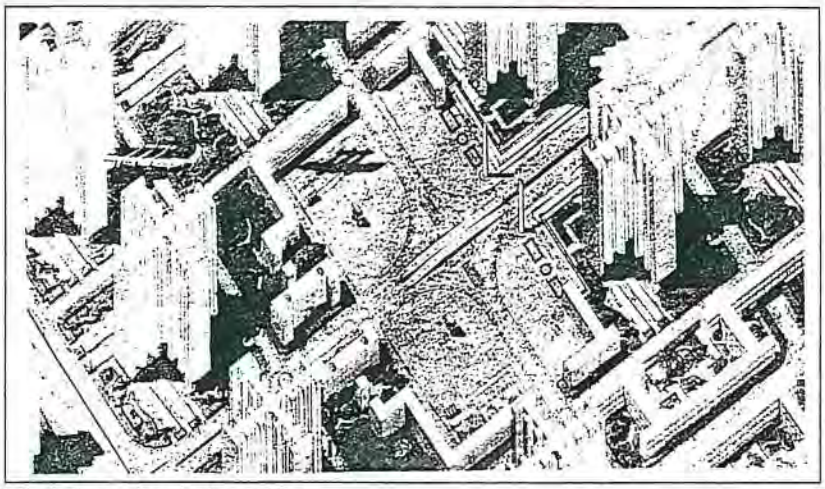
In this manner, the person travelling through the space is engaged, is a participant in the evolution of the vistas that unfold before him. Without his walking through and exploring the route, the exciting and interesting vistas and views would remain unseen. It is through this manner of making the observer part of the scene that the impact of the experience is heightened. In tweaking one's curiosity the experience is that much richer.

Understanding the Details

Another method of engaging the observer is to ensure that the details are understandable. The more the details are understood, the more expansive the space seems to become. This means that the more familiar we are with a Place, the larger that Place tends to feel. This is because the amount of detail that may be able to be perceived increases - and therefore we seem to feel that the amount in the space is increased.

This is true of any space that one can remember. Recently I returned to the first house that I had lived in. As the story goes, it felt smaller than I remember it being. I was seeing the building more as a whole instead of the details. Each room seemed smaller than my memory told me because a detailed understanding was not there. The rooms were the same but the house seemed smaller. The small area in the attic, the crawlspace under the living room, the storage space under the stairs, they all seemed smaller. This is especially true when one is a small child, these spaces can seem huge because children can get down and see every single detail of an area, making it appear larger than it really is.

Bricolage


The fallacy of a single architect.

It is through the passage of time, that Places become Places. Our built environment cannot be said to be a static element on the landscape, but must be seen as an ever changing and dynamic human creation. It is in this context that the critically acclaimed architectural theoretician, Colin Rowe, speaks of designing Places and (in his context) urban Places, over time. In Rowe's monumental work, Collage City he puts forth the idea that an urban designer must act as a "bricoleur." [37] A bricoleur, according to Rowe, is a person of many talents, a person able to bring together knowledge of the history, the present, the future, the culture, economic, and other elements of a Place to help design that Place. He argues that for a Place to be successful, many differing, conflicting, supporting and dynamic urban design issues must come into play. Rowe argues that many designers designing over expanses of time is much better than one designer designing a whole project over a short period of time. He argues that super Mega building projects, such as those at Chandigarh in India and Battery Park in New York, do not portray successful Places because they were designed by one firm / person and contain one single concept, image, design strategy and so on. Mega projects like this lack the fundamental history, context and dynamism that Rowe argues is essential to and a natural offshoot of a city designed as a Collage.

Security

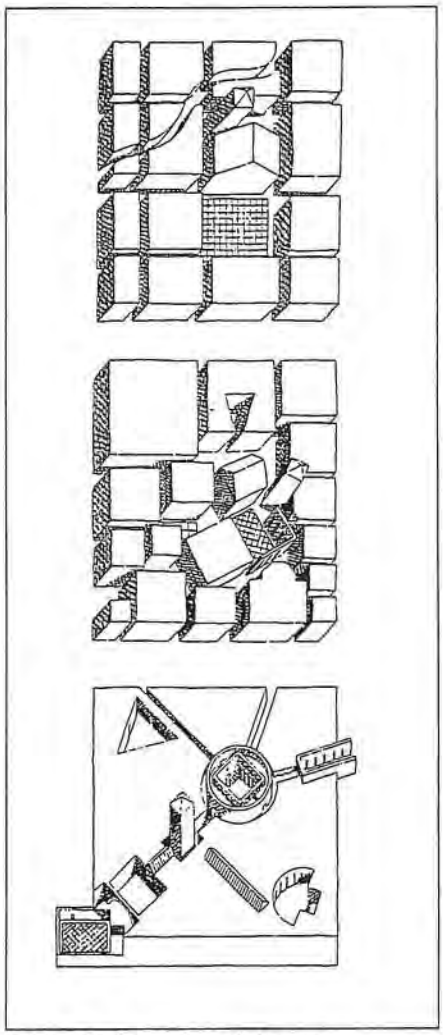
Emotionally, too, we respond to physical elements that speak to intangibles. Two of the more notable are safety and security. These are among the most basic of human needs and are fundamental to our innate need to survive and live. When we feel threatened, everything that we do, see, hear and feel is impacted and altered by our fright. When we feel safe and secure, everything we perceive is tinted with that feeling of security.

Creating A "Sense of Place"

Briefly summarising again, we have so far looked at how we perceive Places, how we understand Places, and how we can heighten our experience of Place. But there is one final item that needs to be looked at, and that is how do we can help create Places that we can sense. It is not enough to say that a Place must have a certain cultural meaning, we must be able to translate cultural meaning into a tangible and physical element? To achieve our goal of creating spaces that enliven people, inspire uses and help create enriched experiences, we must look at how we can convey these meanings to people. We need to look at what physical elements we can use to give clues or suggestions of what is meant by certain elements. We may need a door, but a large ornate door may mean one thing in one culture while something completely different in another culture. To achieve

these clues, we will very briefly look to the elements that are used to create spaces. We will look at creating spaces, we will look at what codes and modes of application are and we will look at buildings themselves. It is through these that we can inculcate all the elements that help us perceive, understand and heighten our experience of Place. These elements help us define the meaning of our Places.

Creating Spaces



Grids, Blocks and spatial types.

Places are composed of buildings and elements . We, through our culture, education, history and upbringing, learn to understand what these elements mean. Our understanding is culturally based, yet follows formalized learning lines. We learn about form and about Places by our experiences based on how often we experience a particular type of element. As an example, if every time one sees green paint one is reminded of the farm house and the green fields, the colour green will begin to take on a homey and natural connotation. This dictates our reaction to similar Places in the future.

In this way, our past experience of similar elements affects our current experience of Place. David Canter in his book Psychology for Architects suggests there are four key elements that we use to learn about architecture and Places, all of which are products of our past experience:

Reinforcement: understanding that something good comes about from learning, a knowledge of how to use a Place or a manner of getting around;

Transfer of Training: after having done a particular thing over and over again in similar circumstances, it is natural to continue to do it that way;

Discrimination and Generalisation: one discriminates all stimuli to know which one produces and reinforces the desired outcome and understanding the generalities to apply elsewhere; and

Experience: every experience we come across is approached using all of our previous learned experiences and this new experience is just added to the base knowledge.[38]

From creating spatial understanding based on our experiences, we now look at the spaces created between our buildings. Again looking at Peter Rowe's concepts in his book Design Thinking, he states that essentially there are three ways in which to create spaces between buildings: (1) blocks resulting from a street-and-square pattern; (2) streets and squares as a result of positioning blocks; and (3) streets and squares as precise spatial types.[39] In this manner, regardless of how a building

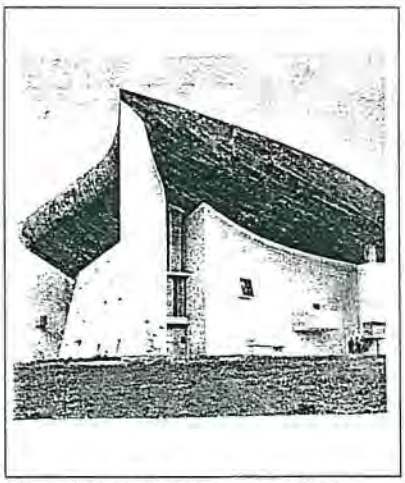
is designed, it forms part of and is integral to some form of Place. Whether it is a street scape of a roadway or a square for public gatherings, all buildings inescapably form part of at least a backdrop for a Place. Through these three modes of spatial apportioning, we see that every building does form at least a part of a Place.

Colin Rowe (no relation to Peter Rowe) uses a graphic device to highlight and analyse the urban creation and layout of blocks of land. He uses a device he calls "figure/ground" layouts. From these, one can get an very basic understanding of street and block patterning.

Codes / Modes

"Reading" buildings is another facet of how we perceive Place. The alway erudite Charles Jencks, in his book The Language of Post Modern Architecture[40], cites four main modes of reading a building and because the reading of buildings directly impacts our understanding of the Place, created by buildings it is an important element in the perception of Place.

Metaphor: seeing one thing in terms of another. The more a metaphor is used, the more it is understood. An example of this is the Chapel of *Notre-Dame-du-Haue* at Ronchamps designed by Le Corbusier. This church can be variously seen as representing a ship, a series of faces, a series of supportive hands or a series of monks;



Metaphor adds depth to building design and to the Sense of Place for a building.

Signs / Conventions: the more an object is used in a building type, the more it comes to represent that building type - curtain wall glazing and steel equating to office buildings;

Codes: some codes or modes in architecture have come to be associated with certain issues and emotions. A building that looks like an egg-crate box should not be an opera house. Visually, codes from one culture may have a different meaning in another culture.

Symbols: the literal "saying" of a building type - the donut shaped building which sells donuts, the hot-dog stand shaped like a hot dog.

It is through our ability to read these codes that an architect can communicate meaning of the building and of the environment. And it is this reading, in combination to the perception of our senses, our understanding of the history of the Place, the context and contrast that we sit the Place in that we develop a rich and effective experience of Place.

Buildings

One could ask why do we have a built environment? What is the reason for building and creating and forming spaces and buildings and Places? Aside from the obvious of keeping the rain out and the warmth in, what do buildings and spaces do for us?

In the book Buildings and Society - Essays on the Social Development of the Built Environment, (Anthony King ed.), a series of purposes for the built environment are suggested. They explain that a building:

- Is a Principle settings for certain activities;
- Reinforces these activities;
- Signifies status, power and privacy;
- Expresses and support cosmological beliefs;
- Communicates information;
- Helps establish individual or group identities;
- Encodes value systems; and
- Separates domains.

In this way, the built environment can provide concrete metaphors for ideals and beliefs of groups of people or cultures.

Summary of a "Sense of Place"

Summarising, we have defined Place in terms of the "Sense of Place" and see it as a nebulous, changing and very subjective anthropomorphic understanding of the intended and unintended use, function and meaning of a space, building or series of buildings. "Place" is a subjective and complex. It refers to inside and outside, here and there, of this time and of times past. It refers to those foggy and ethereal "things" which make a Place special. It means everything physical about a space and everything non-physical about a space. It refers to that which is important - physically, physiologically, contextually, historically, personally, culturally and socially. It can mean one specific defined location or it can mean more than one. It is more appropriately referred to as a concept rather than as physical space.

We have looked at:

1) How we perceive a Place, namely through:
   - our five senses;
   - history;
   - context;
   - time; and
   - culture

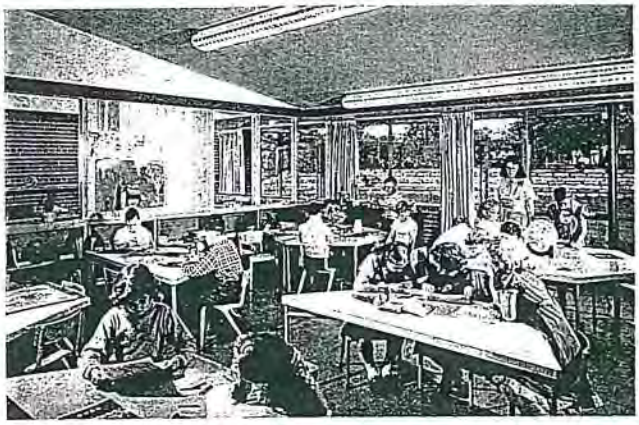
2) How we understand Place, primarily by understanding space:
   - from an egocentric point of view;
   - the whole is more than the parts;
   - the plan;

- from an innate and instinctual viewpoint;
- asymmetry; and
- in a fairly common order of understanding.

3) How we heighten our experience of Place, namely:
- through ownership and pride;
- by functionally logical spaces;
- in using functional and power attributes;
- by a natural connectedness;
- through providing fresh air;
- in the use of contrasting elements;
- in the use of correct and logical observer orientation;
- through serial vision;
- in understanding the details;
- bricolage; and
- a sense of security

4) And finally, how we create Places:
- by physically creating spaces in which our Places can exist;
- by using codes and modes in the space and building details to evoke and solicit memories, histories, actions and responses from the observers; and
- by designing buildings which consciously support all the ideals of a positive "Sense of Place."

People, students and teachers interact with their environment - their school - they do not just react to it, and in those reactions, they create a special ambiance, a Sense of Place:



A School Classroom - c1951.

"... [as] alike as schools may be in many ways, each school has an ambience of its own and, further, that its ambience may suggest to the careful observer useful approaches to making it a better school."[41]

The Stone Age - The First Buildings - Man's Beginnings to 8000 BC

Evidence of man living in "buildings" does not materialise until somewhere around 100,000 to 40,000 years ago with Neanderthal Man who lived in the only buildings known at the time - caves. There does not appear to be evidence that the caves were changed or modified in any way as one might do in "building" but some cave paintings and the remains of fire pits have been found. Although Neanderthal Man lived in caves, used fire and painted on his walls, he did not appear to change his environment to create different types of rooms or spaces.

The first shelters built by humans are credited to the Cro-Magnon Man of about 40,000 to 10,000 years ago.[42] These were nothing more than pits dug into the ground and wood and bushes stacked up to create a roof but were still, nontheless, shelters purposefully built to protect people. Later Cro-Magnon Man was also the first to begin to develop communities by building smallish fishing and hunting villages. While the population was still very small and still nomadic, these pit dwelling and attendant communities were our first cities. The spaces which were created were a fairly simple series of dwellings arranged around a central fire / open area for eating. It is certain that no formal school or classroom structure or shelter ever existed but it is equally certain that education began here and prospered (see Section 2B - History of Education).

The Copper Age - Mesopotamia and The First Classroom - 8000 BC to 2000 BC

The Copper Age is interesting in our study of education because it was in 2000 BC that the first known classroom was built. Based on the photograph, this classroom appears to be about 9 metres by 5 metres and would seat approximately 17 (if the bench in front is a writing surface) or 34 (if all benches are seats). It is striking in its similarity to our present day classrooms. Seated in row upon row were the students, all facing the same direction, passively watching and listening to the teacher. Each row of benches virtually identical to the previous. It is chilling how little our classrooms have changed over the last 4,000 years. This image is only very recently being supplanted by newer educational spaces, particularily only since the evolution of the Modern Era and certainly currently with the advent of technologies. These changes are examined in later sections of this report.

Historically, the Mesopotamians, because of their burgeoning agricultural systems and religious beliefs, are credited with building the first temples. They built what appear to be the first large(r) scale public storage facilities. These were seminal advances in the "art of architecture", particularly the development of the first temples, because for the first time a building became a tangible symbol of more than just shelter. For the first time, a building form signified a "Place".

The temples were places where the high priests would mediate between their malevolent gods who controlled the climate, sun and the earth and between man. Sacrifices and offerings of food were brought to appease the gods and the temples became places of reverence, subservience and honour. In this way the temples became more than just a space for sacrificial offerings, they became "Places" that had meaning, history, and importance outside of their physical properties. In addition to this, the temples became even more important for it was here, ostensibly to deal with the overflowing abundance of grains and other sacrificial food offerings, that written language first started. As we have seen in previous sections, religion played a pivotal role in the development and advancement and maintenance of education and even here we see it as essentially the creator of the first written language.

The spaces of the Mesopotamians were very contained, rigid and geometric and it is perhaps

The first known classroom - c2000 BC.

because of this that our first classroom was also very contained, rigid and geometric. Large public spaces were generally built up from masonry / stone and typically contained within a walled fortress like palace building. Spatially they were very similar to Egyptian Architecture.

Egyptian Architecture - Compressive Space - 3000 BC to 1800 BC

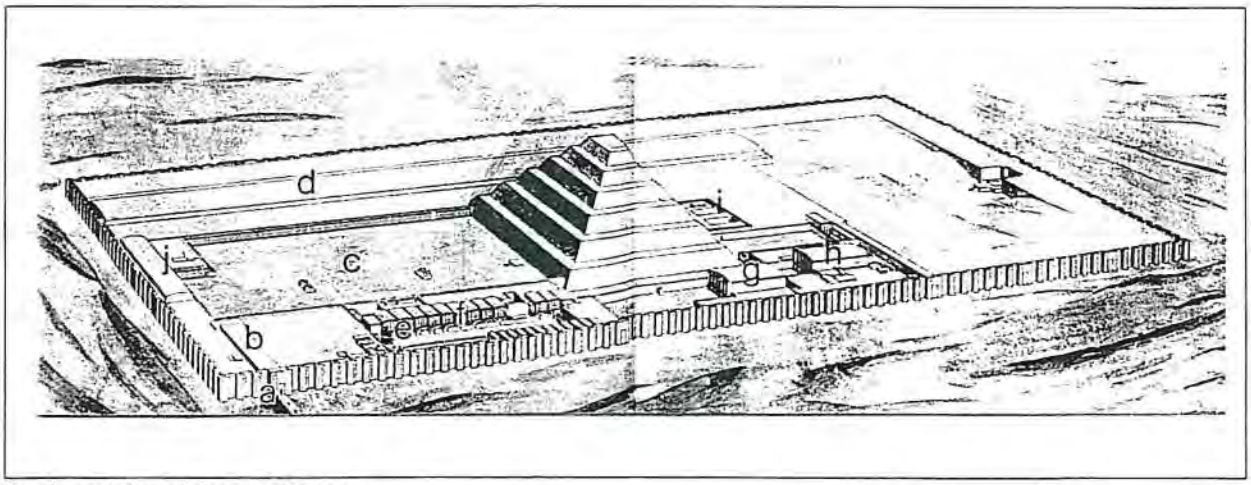
The Egyptians perceived space in the same way that they perceived the world and the sky - as a flat sloped plane such that the sky was supported by the plane of the ground as in a pyramid [43]. The pyramid shape was seen as the most appropriate form for it emulated what they saw as their real world. In this way, they saw spaces as flat planes under the straight triangulated sides of a finite world. Their buildings tended therefore to become heavy, dense finite things that seemed to have the space carved out of them. Buildings did not seem to exist in a space, but seemed to exist to

define a space, a carved out space that tended to be internalised. The pyramids are obvious examples, of this approach, but so too were their temples and other public buildings.

> "*A massive, static, and serene architecture emerged ...*"[44]

from their almost treeless landscape. The buildings had massive walls, sloped at the base and were unadorned with virtually no ornament on the exterior. The buildings were designed to achieve a permanence. Only small openings and doors, and a number of painted hieroglyphics were on the exterior walls while the interior spaces were built typically around a central courtyard with columned interior porticos.

Egyptian spaces were therefore very internal and defined by physical building elements. The "Place" created by the Egyptians was very much in keeping with the austere nature of the spaces they created. In the oldest pyramid, the tomb-complex of Zoser at Saqqara of circa 2680 BC, there is found the first known pyramidal shaped tomb, the precursor to the pyramids. This building is a



Tomb complex of Zoser at Saggara.

seminal building in architectural history because it is the first example of a "*contrived, considered and designed*" [45] space. It is from this development that "architecture" can be said to have begun as a discipline. The architect of Zoser, named Imhotep, was the first architect because he was the first to design a series of forms and spaces, all with the same common goal and function in mind. But it was not just a series of functional structures, which individually may or may not have had a special meaning, it was the total that was a conscious and deliberate design intent which was to solicit, evoke, imbue and inspire an intended outcome.

> "*Imhotep was made a High Priest of Re the Sun God, and was assured of honour in this world, and of immortality in the next.*"[46]

The design of Zoser included a combination of a walled outer enclosure ringed with smaller buildings and a huge pyramid in the centre. During the earlier parts of the Egyptian empire, this form of

pyramid was most prominent, and attained its greatest application in the huge tomb of Cheops in circa 2575 BC which was designated one of the Seven Wonders of the World and was the largest pyramid ever built. It covered 13 acres (5.3 hectares) and was 756 ft (230 m) along each side of its base and 482 ft (147 m) high.[47] During the latter parts of the Egyptian empire, pyramids were less and less used in favour of mortuary temples. These temples recalled the spatial feeling of the first temple of Zoser by creating an enclosed compound like area that housed a series of buildings / temples. The buildings were placed in a formalised arrangement toward the centre and would form a central courtyard between themselves. In this way, the compressed space was maintained. The outer courtyard wall would also contain the buildings which contained a central courtyard.

The Sense of Place was not lost in these contained spaces. The temples, even to look at some of the photos today. evoke a kind of awe and reverence. The shear size is imposing, but so too is the history, function and spatiality of the spaces which speak to the Place of the temples.

The Greeks - Expanding Space - 1000 BC to 146 BC

Where the Egyptians created compressed and austere Places, the Greeks were virtually opposite in that they created spaces that flowed, and moved across the landscape. Their Places were larger than the physical environment that contained them. They used buildings and far off landscapes to define Places and brought aesthetics, harmony and intelligent use of rhythm into their Places.

The Acropolis.

The Greeks tended to have their classrooms outside. The classrooms, while very much in the same form that we see today with the one teacher (or Sophist) at the head and the students sitting nearby in passive learning mode, were held outside. It is interesting that this meant that the Place of the school was defined not by physical walls, but by elements arranged out on the landscape. This is evident throughout the Greek Period where the definition of a Place was strongly associated with, if not altogether defined through the elements which resided outside the immediate physical location of the Place. An excellent example of this approach is seen in the centre of ancient Athens in the Agora. The Agora was a square which was sited along the Panathenaic Way. The Panathenaic Way was a parade held every four years in worship of a Goddess. People would traverse diagonally across the Agora travelling from the city gates to the Parthenon. The west edge of the square was defined by a series of government buildings and the east and south were defined by large public buildings. The south east corner was the processional Way, which connected through to the Parthenon and so the view was defined by a clean vista all the way (about two more kilometres) to the Parthenon. The north face of the square

was defined, not by buildings or by changes in material, but rather by the distant view to the horizon. The north edge of the square was therefore created by a far distant series of elements that were made part of the near space just by being visible, as if in a picture.

Great effort was used to ensure that the connection to the distant views were obvious and understood by everyone. The rhythm of the foreground buildings set up and anticipated the rhythm of the Parthenon and the flowing foreground land defined the northern square's edge, but was consistent with the distant hills on the horizon. In this way, space was expanded to include distant elements.

The Greeks seemed to intuitively understand Place. They built temples on the spot where the Gods were reputed to have lived, and in this way, connected history with Place and the history of the Place to the people in their observance of the Gods. Thus the Greeks would scope out a location for a new temple, and then erect the temple at the very spot that felt like a God had existed there.

The Roman Empire - Town Engineering - 250 BC to 5th Century AD

The Pantheon.

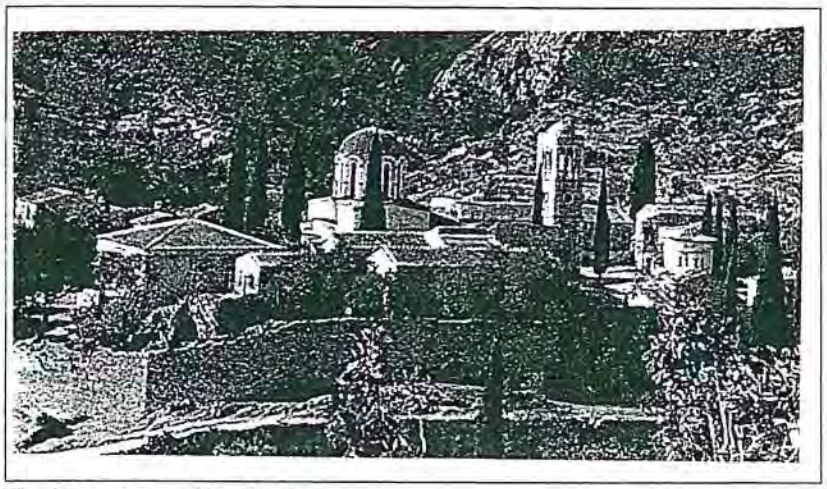
The Romans were very good at assimilating and building upon that which went before them and they were engineers of great merit. The Roman concept of Place was centred around the town and public pomp and ceremony. Virtually every town had an outdoor forum or open public square. These were surrounded and defined by a row of colonnades and principal public buildings in a regimented, formal axial arrangement. The forum is an excellent example where the central court was bounded by a large series of columns in a colonnade and was open to the public.

Roman amphitheatres were also very common and again showed the outdoor public awareness that was the Hallmark of the Romans. Triumphal arches too, signified the importance of Place and highlighted the importance of ceremony. One of the most impressive designs of the Roman times is the Pantheon in Rome. It is a humble building from the outside, but spectacular on the inside. The building was designed to house a perfect circular volume of 43.5 metres in plan and in section. One large "sun" opening is present on the upper quadrant of the upper arch and seven naves (to match the seven known stars at the time) are also present along the base. The building, while speaking somewhat to the spaces created by the Romans, speaks more to their ability to engineer and design, however it is a beautiful and uplifting space on the interior.

The Dark and Middle Ages - Monastic Life and School Space - 5th Century to 15th Century

Throughout the Dark Ages, the physical form of schools was virtually only seen in the monasteries. These buildings were very much segregated and separated from the people of the towns. They tended to be in the mountains or high in the hills, and generally were very difficult to get to. This tended to make the monasteries appear not only aloof, but secretive and mysterious. This undoubtedly was very purposefully done. The monasteries were the central seat of all religions and

so the aloofness and mysteriousness of the Place, and of religion, added to the apparition that was religion at the time. People tended to be swayed because of their fear of the unknown. Unfortunately, this fear seems also to have translated itself over into what a school became to mean. The aloofness and distance that was evident for centuries during this time seems to have crystallised into practically a permanent feeling of distance between the general people and the scholars of the time.



The Monastery of Nea Moni.

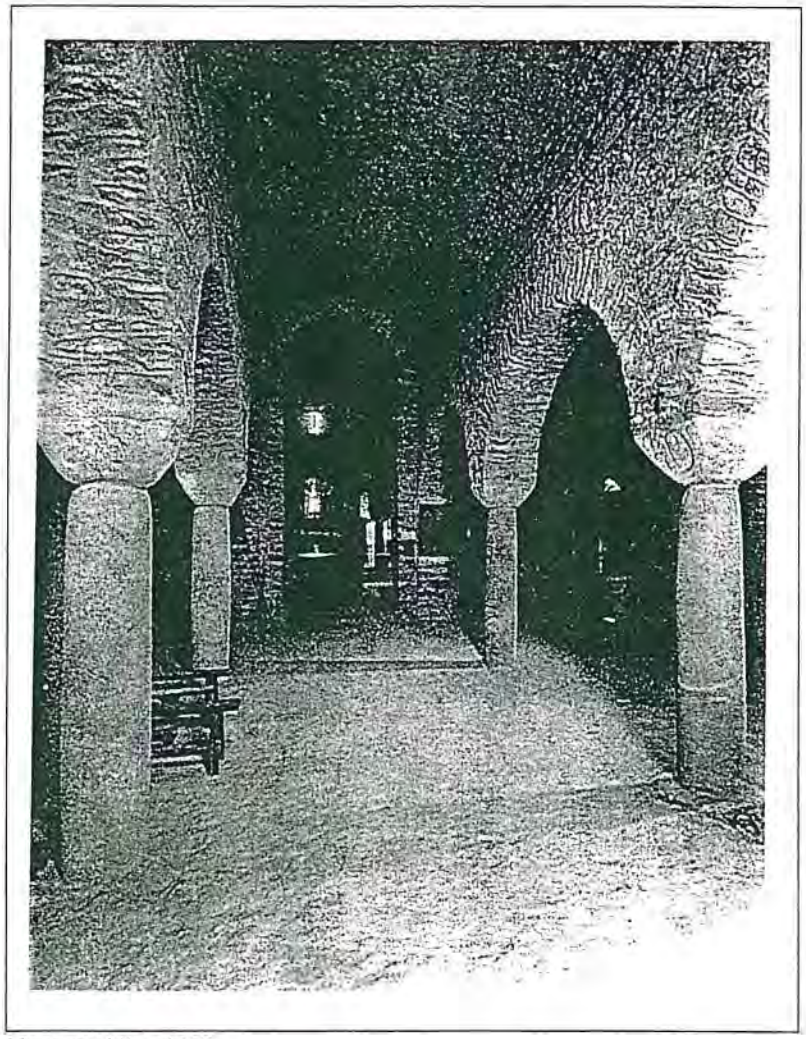
Some educational Places did not exhibit this distance and mystery. An excellent example are the Guilds and their system of trade based secular training. Guilds, as noted previously, were groups of like trained people who taught and advanced their own work through a series of technical schools, through vocational schools and apprenticeship programmes. These Guilds, some of whom still exist today (ie. the Freemasons), would set up building beside their current project and use that building to teach their members their trade. In this way, not only were they able make a living, but were also able to teach their young a trade. The school was not only not separated from the main masses of the people, but was directly beside the application of its education. What one learned in school, was directly applicable to real life. These schools were, again as noted earlier, the precursors to community colleges and for probably the first time, showed that an organised structure of teaching (outside of apprenticeship and familiar teaching) could be responsive and current outside of ecclesiastical control.

The "Sense of Place" then for the schools existed through two different venues: (1) monastic; and (2) the guilds.

From the one side, the monastic and ecclesiastical side, the Sense of Place of the school was one of reverence and stand-offish distance. The scholars were the priests who taught young boys to be priests. Because of this, they were looked upon as different from most people and the mysticism and distance that accompanied the monasteries supported this appearance.

The Guilds on the other hand, were down to earth, approachable, topical and practical. They did not deal in mystery, rather stone, wood, clothing and all manner of day to day goods and building. They were tangible and palpable. They brought exotic teachings from far away places[48] and made them practical. The schools themselves were near or in town and were built not from special designs but from everyday materials. Although the Guilds did have strict membership entrance rules, their schools must have appeared to be very approachable and attainable compared to the monasteries.

One of the most powerful and lasting images of Places for higher learning had its genesis during the



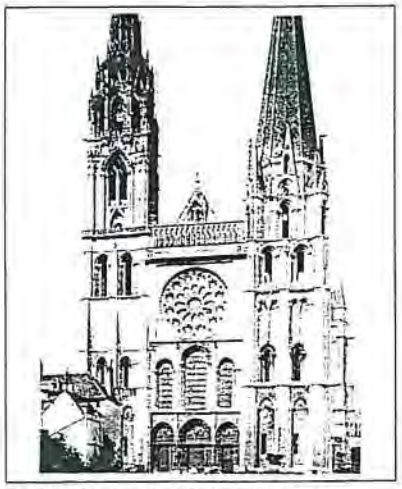
Monastic Life c1000.

middle to late Middle Ages - the Cathedral Schools. As has been noted previously, the Cathedral school was an attempt by the clergy to offer education that was more secular. This was in retaliation against the growing acceptance of the Guilds. The Cathedral Schools literally were schools attached to cathedrals. Around the 12th century, these schools became hotbeds of secular higher learning and were immensely popular eventually displacing the monastic schools. Because of their popularity and their location (near high traffic economic areas), the Cathedral schools began to virtually negate the need to be attached to a Cathedral and slowly they began to be built separated from the church. Soon a series of most prestigious universities were built - Oxford, Cambridge and Notre-Dame de Paris all of which would become the defining classic form of the university.

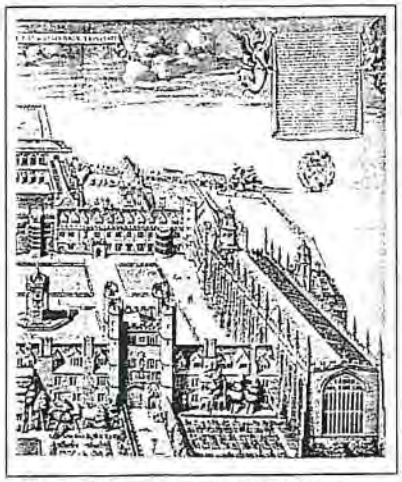
The connection to Cathedrals, through the impressive visual art of Gothic Architecture was and is obvious. The image of Oxford, Cambridge, and later schools like Trinity College Dublin (1592)[49] and Yale (1701) and Harvard (1636)[50] is forever connected to the soaring verticality and splendid harmony of Gothic architecture and its derivatives.

Spaces within these schools were not so much functional as they were "assigned". A cookie cutter approach to spaces and the assignment of room upon room seems to be the standard planning concept. The architecture lived for the image and the veneration it conveyed, and less so for the functionality of a school. The Sense of Place created seems to be one of awe and splendour geared to impress, uplift and (perhaps) intimidate. Main lobbies and entry courts were imposing with large central circulation spaces focused on the central entrance. Open courtyards, cloistered away from the view of the townsfolk, were common student areas. Large, impressive libraries were built to house large library collections, then and still seen largely today as the icon of higher learning. The sense of austere reverence was reinforced in virtually every detail. But for the impressiveness of its forms, the buildings held a wonderfully humane scale. Gothic architecture is a carved, and flowing

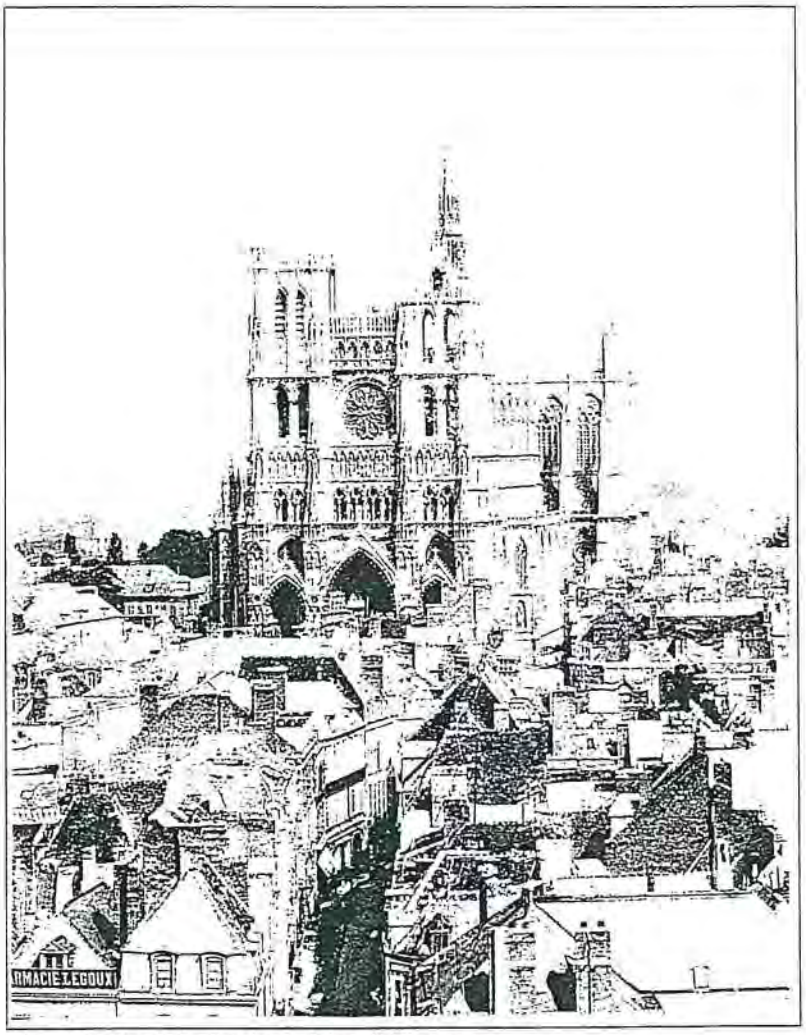
architecture that seems to live and breath through a sculptural poetry that expands space and invigorates the observer. It would appear that the Places created by these schools were tremendous, but the spaces were much less so.



Earlier Cathedral Schools were adjuncts to a massive church ...



... later, the school dominated the church (right wing).



French Cathedrals dominated the city Scape.

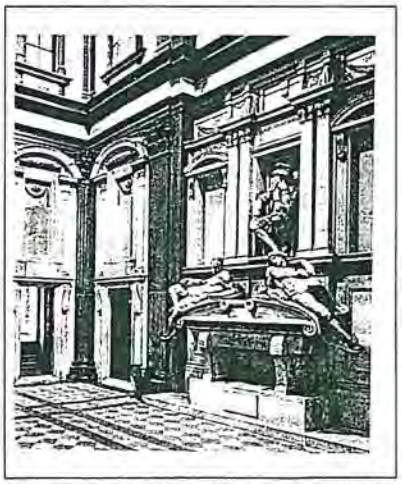
The Renaissance and The Reformation - Spatial Humanism - 15th to 19th Century

The Renaissance was a time of movement to humanism. This was, as has been noted, obvious in the arts, humanities, education, music, science, rhetoric and literature. This humanism was in the form of a re-awakening of the connectedness to humanity and was seen in architecture in the form of humanly scaled Places. The human element was embraced in design to form part of and become integrated within the buildings. The Sense of Place was designed right into the buildings through this humanism. Michelangelo was a master at this and his design of the Medici Chapel in St. Lorenzo,

Florence is an excellent example. The chapel is relatively small (13 metres square) and is a "symphony" of architectural detailing, sculptural friezes and ornament. It portrays beautifully what the Renaissance was all about - humanism. Through its continually breaking down of the planes and larger volumes, it achieves a lyrical and poetic human scale that highlights not only the architecture, but more importantly, the people there to experience it.

Use of space was generally gregarious during this time. That is that the Places were created wherever the space was available and people would use those Places for social gatherings. This is highlighted by a common difference between North American ideal of space and the European ideal of space and is seen in the way in which both use the street. In Europe, the street is seen not only as a conduit for cars and vehicles, but it is seen as a Place to meet, talk, do business, mingle and do all sort of day to day affairs. In great contrast, most streets of North America are set aside for the motion of vehicles - and generally the very fast motion of the vehicles. Very infrequently do we find streets that can be considered Places where one would feel comfortable stopping and talking. While walking through Europe, in practically any city, warm or cold climate, the gregariousness of the street is palpable. In North America, the street can be very dangerous simply because of the speed of the cars. This phenomena is very evident during the Renaissance.

It is interesting to look at these various developments in architecture and see a parallel in life in general. The Renaissance very much was a breaking forth of intellectualism and humanism as was very evident in the development of architectural spaces at the time. This parallel can also be seen throughout other eras.


Renaissance Humanism at its height.

Schools during the Renaissance however would seem were quite different from this gregariousness, appearing to be heavily influenced by the ecclesiastical ideal of education. During the early part of the 16th Century, a school appeared to be a rather dismal Place. It consisted of the barest of elements. The master would read or lecture to the students as he sat or stood at the head of the class, while the seated students, with no equipment of any kind, would listen and presumably learn. Absent were any kind of technology which might assist in the delivery of education - there were no blackboards or writing equipment for the teacher, no desks, pens, ink or paper - just benches or chairs to sit on. The books of the day were exclusively religious and were "catechetically" arranged to secure rote and mnemonic responses from the pupils. The better the student's memory, the better the student's grade.[51]

An interesting quote concerning the standard method for prelection that school masters were to follow during the 16th Century was set forth and articulated by the Jesuits during the latter part of the 16th Century (1599). It had been in use for a millennium before it became the standard Jesuit (religious) way of teaching:

"*The form of the prelection shall be about as follows:*

1. *Let him* [the master] *read the whole passage without interruption, unless in rhetoric*

and the humanities ...

2. *Let him explain the topic and, if necessary, its connection with what has preceded.*

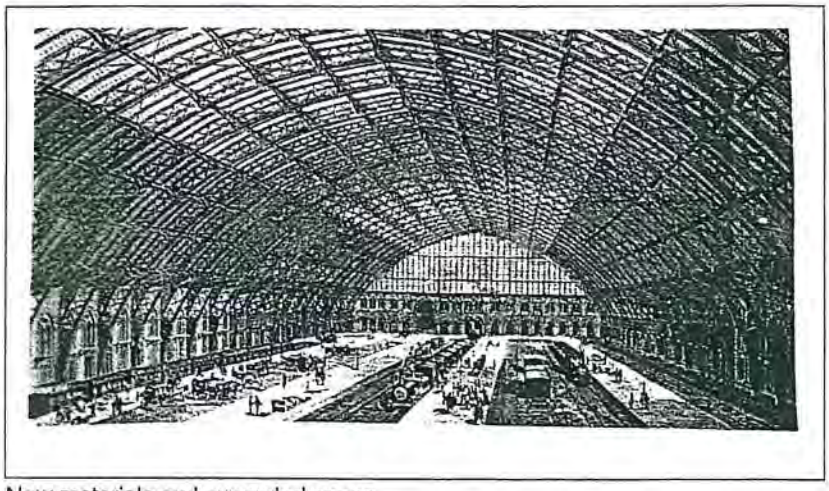
3. *After reading a single sentence, if he is interpreting Latin, let him explain the more obscure parts ... let him first explain all things word for word, and* [only] *afterwards* [explain it] *according to the vernacular idiom.*

4. *Starting from the beginning, unless he prefers to insert them in the explanation itself, let him give observations suited to each class ... but it is usually considered better that grammar pupils write nothing, unless ordered.*" [52]

So it was during the Renaissance and The Reformation that the common pedagogy was a single teacher at the head of the room, droning on and on in Latin about a topic deemed appropriate by only the master himself. The master being the sole person engaged in anything active at all and even at that all he was doing was talking or reading. The class was not supposed to speak, was not supposed to write, was not (it would seem) even supposed to ask questions unless so directed by the master. And while this pedagogical illustration does not directly describe the physical attributes of a classroom or a school, one could easily visualise a stark, cold and foreboding box of a room, cloistered away in the bowels of the abbey, or the Cathedral School. Row upon row of benches with students quietly sitting, listening to the master. Not a very appealing picture of engaging the student or enlightening the mind through exploration and wonder. If our continued development from the Renaissance to the Industrial Revolution can be seen as a positive step, then one might wonder if this picture of a staid and cold educational space assisted the learning process, or whether the learning process progressed despite the environment.

The Industrial Revolution - Large Defined Space- 18th to 19th Century

As new materials were being discovered (reinforced concrete and stronger metals) structural spans and their enclosed spaces expanded. Especially evident were the more generally accessible public halls, manufacturing plants and exhibition halls. Notwithstanding the ability to expand the spaces through the uses of thinner supporting wall materials, and fewer columns and longer spans of structure, was the demand for more space. People were moving into the cities in numbers and speed never before witnessed by man. Never had such a massive movement of people been seen. And when they arrived in the cities looking for work, what they found was squalor, pestilence, disease, and



New materials and expanded space.

extremely crowded spaces. The ability to open up structures and buildings was seen as a very strong reason to build bigger, cleaner and better.

Schools, where new schools were being built, tended to exhibit the austere nature of their predecessors, but attempted to attain a bigger and more open feeling than in previous centuries. Large open vistas, broader windows, greater thinness of exposed building structure were all seen. Even mirrors, now able to be made to a much higher quality than in years past and to much larger size, were now being used, especially in older buildings, to seem to expand the space - to make it appear bigger than it really was. But the form and the look of the schools, for the most part, remained as in the past. Architectural styles varied, building siting varied, material thinness varied, and the created spaces tended to get bigger, but still the overwhelming impression is one of *status quo.*

During this time, schools took a regimented architectural form. This is especially evident when one considers some of the classical universities of this time. Oxford, Cambridge, Trinity College, all speak to the same spatial concept that was prevalent:

> *"... a series of standard - non-changing non specific classrooms stacked one on top of another."*[53]

The biggest change in school design during the Industrial Revolution, and this was seen throughout the world, was the great increase in the number of schools. This had the result of making the schools seem much less foreign and much more approachable - more for the masses than just for the elite. This is arguably the single biggest contribution of the Industrial Revolution to the evolution of the school - the sense that the school belonged to the people.

The Modern Era - The International Style - Late 19th to 20th Century

The spaces of the Modern Era can be defined by the spaces of Modern Architecture which are most notable through the manifestation called the International Style.

While a detailed review of Modern Architecture would be informative, only a very restricted overview is in keeping with the needs of this report. Modern Architecture ostensibly was the inculcation of the machine aesthetic and machine ideal into everyday use. It was seen in the development of new and sleek looking household goods (lights, pots, pans, stoves) and the development of all manner of human artifact, art and culture. The architecture of the day, which we still live in and practice to a great deal today, was one of architecture "on" the landscape as opposed to "of" the landscape. Buildings were placed on the landscape and designed not to mould and form and work with the landscape, but to oppose it, to appear different, to celebrate the machined and "manufacturedness" of the building. Rather than humanity and humane needs, modern buildings were created to be an *objet d'art.*

An example of this *objet d'art* approach can be seen, on an urban scale, through the design by one of the masters of the Modern idiom - Le Corbusier's in his design of the city of Chandigarh. The design of the buildings of Chandigarh in India (1959-62) were in answer to the Indian government's need to create a new capital city in the region of North Punjab. Conceived, planned and designed

by Le Corbusier (nee Charles Edouard Jeanneret, 1887-1965), the city design is most known for its design of the Parliament Building. This building was an extension of Le Corbusier's evolving Brutalism Style - exposed, rough hewn concrete walls, heavy expressive forms, large, deep recesses, sharply defined changes and contrasts, *pilotis* and other elements were all present. Present too were other buildings which followed the same idiom and design philosophy - the Secretariat, the Assembly Hall and the Governor's Palace. Each building, indeed the whole city, was based on a Cartesian grid with the main government buildings at the "head" of the city plan. Each government building was separated from its neighbour and was therefore not in close proximity to any other building. The central square within the parliament buildings tends to be dehumanising and a space of dislocation and non-connectedness. When one is near the centre of the space, bounded by the buildings, not only can't one feel connected to any of the buildings because of their great distance apart, but none of the buildings feel connected to each other either because of the distance. Adding to this difficulty at the centre of the main space, a water garden prevents people from walking to the centre of the space. So not only could the observer not feel connected to the buildings bounding the square, but he couldn't even go in to its centre, its most important spot.[54] The term used here as square may in fact be misleading because the "square" was an open space bounded by the Assembly Hall and Governor's Palace on the west, the Supreme Court Building on the east, mounds concealing the city from view on the south and nothing on the north. Where in Greek architecture these unbounded spaces were defined by their vista, the buildings in this case are too far apart to feel connected and therefore the open view the north and south only adds to the discontinuity of the buildings and the space.[55]

The design of these objects of art fulfil their intent - they are separate and individual structures. Because of the distance, the observer is not engaged by the play of the buildings against each other nor does he experience the excitement of discovery as buildings come into view around corners or over hovels or rises in the ground. And so the space and the Place becomes static - passive - and flat. Though not all modern urban designs create these passive and boring museum like Places, far too many do and we are left with a poorer urban landscape because of it.

The impact of Modern Architecture on schools was profound. It was during this time of revolt against the status quo of Victorian, Beaux Arts and Vernacular Architecture that the conceptual idealogy of "all the arts under one roof" approach of the Bauhaus school was begun. The Bauhaus tended to be a doctrine bashing school that eventually manifested itself into the legacy of the Modern Movement. But through the Modern movement, educational building design was beginning to be questioned. The validity of cookie cutter box design and the "old boys" mysticism of the classical form of school building were found wanting and new approaches were being sought.

In a quiet and somewhat benign book called The New School House (1958), Alfred Roth describes a Modern approach to planning techniques for schools. Roth offers a simple, no-nonsense and authoritative exploration of school siting, building organization, form, school layout, classroom function, classroom layout, connectedness to nature and public and student amenity spaces. This book was a watershed in school design idealogy wrapped up in the iconography of Modern Architectural idioms. The book explains that spaces should vary with function, that building organisation impacts learning, that urban context is important to school design, that engaged and captivated students learn better and a host of other anecdotal beliefs. The important philosophical point of this book, and perhaps an unstated agenda, was that Modern Architecture was for the first time, questioning the then spatial and functional truism of school design. For the first time questions

about the size of a classroom, the amount of glass and light, the views, the internal function of the classroom's space were being posed and new answers were being offered.

The answers suggested in the book substantially follow Modern Architecture's machine aesthetic, but go further by suggesting new opportunities for a school's spatial concepts. Some of the more notable are catalogued below:

Flexible Space: the classroom space was no longer a finite space bounded by three walls of concrete and one wall of punched windows, but of moveable dividers, flexible walls, and moving and flowing spaces;

Continuous Space: the classroom and the school itself now found boundless space. Glazing allowed the flowing in of nature from the outside, and the flowing out of the school interior. Rooms were bordered by partial height and moveable wall systems, spaces flowed over and under the partitions.

Light and Greenery: clerestory glazing and large expansive glass was ubiquitous, bringing in huge amounts of light.

Functionally Defined Spaces: classrooms not only were to have desks and chairs and blackboards for the students, but also were to have break-out rooms for noisy or quiet work, play areas separated from the main classroom, built-in storage and sink facilities for use by the students and custom designed facilities for sports, laboratories, libraries and other service spaces.

Functional Clustering: gone were the rectangular classrooms clustered down a long corridor. They were replaced by clusters of spaces about "core" circulation routes. The clustered classes could have their separating wall demounted to enlarge the space.

Central to his book, Roth suggests that architectural school designs should strive to attain six essential goals:

1. The child is the subject - not the object of the school - therefore design for the scale of the child;

2. The goal of education is to teach the whole human being, physical, psyche and intellectual life and so differentiated space planning offers the greatest possible flexibility to achieve this;

3. Teaching methods must be adopted to the child's age and talents. Because some children work better in groups and others individually, group, clusters and flexible spaces are mandated;

4. Elementary education must be considered a continuum from home to the school and therefore the school should have a close affinity to the home;

5. The entire environment in which the child lives and is educated is integral to education and therefore unity between nature and building design is essential; and

6. "*The child is gifted by nature with imagination and loves all that is true and alive ...*" [56] and therefore lively, natural and honest architectural design, not schematic nor artificial design, is appropriate.

The intent of school design during the Modern Era, as was true for most Modern building applications, was to enliven and uplift the user (the student) through the "proper" and "honest" use of materials, forms, spaces and structures and thereby improving the user through the architecture. Much has been said about the fallibility of this omnipotent and utopian ideal, but what is critical is that the barriers in school design that had existed for literally thousands of years, at least from that first classroom in Mesopotamia, were now being struck down by Modern thinking and being replaced by new concepts.

Post Modern Architecture - Late 20th Century

The spaces of Post Modern architecture tend to be creative, emotive and generally reflective of past spaces. We see a strong sense of individuality in the designs, even in large mega-projects are designed by one architect. The spaces attempt to create many smaller, more humanly scaled building environments rather than one large mega-build project. This leaves a nicely human scale to the Place of the buildings. Places tend to become more like Colin Rowe's Collage City ideal where spaces and buildings are created over time to help augment the march of time. But while Post Modern architecture tends to create these collage environments, they tend to fall down on one important count - they are still designed by one person. Michael Graves is probably the most known of the Post Modern architects, having designed huge hotel projects for Disney Corporation. The Swan, The Dolphin and Disney World Headquarters are three of his more seminal building designs. These tend to overemphasis the coding and emotive detailing however they create spaces that are strongly supportive of the Collage City concept.

Smaller spaces created by the juxtaposition of building elements and ornament tend to compartmentalise the Places. This is not a negative, rather it is a very positive solution. Spaces are scaled right, generally place the observer at the centre of the important spaces and colour, texture, sounds and smells are all supportive of the overall ambience of the Place.

History of Place - A Summary

So where have we come with our historical review of Place?

We have summarised the defining parameters of Place on page 53 of this report as an amorphous mixing of how we perceive a Places, how we understand Places, how we heighten our experience of Places, and finally, how we create Places.

Historically, we have seen that man's first shelters were built for protection from the elements back during the Stone Age of around 100,000 to 40,000 years ago. By the time man was organising himself into villages, pits dug into the ground and branches and leaves formed the building of Cro Magnon man of about 40,000 to 10,000 years ago.

The first real "Places" were created by the Mesopotamians when they built the first temples. By 2000 BC, the Mesopotamians built the first classroom in the Castle of Mari.

Egypt's architectural legacy, from around 3000 BC to 1800 BC was the creation of the first true architect (Imhotep) with the design of Zoser where function and meaning were for the first time, consciously brought together into a building design. This structure eventually led to the proliferation of the pyramids.

Greeks, unlike the Egyptians who looked at space in a finite way, saw space as expanded and encompassing everything up to the horizon. With the conquering of the Greeks by the Romans, expanding space became formal and finite because of the Romans push for engineered and controlled solutions.

Spaces, especially educational spaces, during the Dark and Middle Ages were directly tied to religion and the monasteries. The vision of educational spaces evolved, at the beginning (5th Century), from severe spaces carved out of monastery to, with the development of the Cathedral Schools and universities by the early 15th Century, very awe inspiring, and controlled spaces.

The Renaissance, The Reformation and the subsequent few centuries from the 15th century to the 19th century saw variations of the spatial use based on the stylistic leanings of the day but few, if any, changes to the underlying design philosophy were seen. The staid, controlled and cookie - cutter assigned nature of educational design remained almost unchanged for centuries.

The Industrial Revolution of the 18th to the 19th Centuries laid the ground work for the major changes seen during the evolution of Modern Architecture. Because of the need to create larger spaces to accommodate the engineering marvels in the factories, new design principles and new materials all gave a predisposition of architectural spaces during the Industrial Revolution to expand.

But this predisposition in no way fully anticipated the tremendous spatial changes seen because of the evolution of Modern Architecture in the 19th to 20th Century. Open planning, object-d'art, the 5 points of architecture, flexible and mouldable spaces, large expanses of spaces all came into maturity if not actual creation at this time.

Probably the most important and profound legacy of Modern Architecture is its willingness to question long established paradigms and truisms. Questions about materials, functions, size, goal began to be posed.

Post Modern and Deconstructivist architecture, currently seen rather commonly, question the omnipotent position that Modern Architecture has acquired (as in the case of Post Modernism) by looking back to spaces of previous architectural epochs or (in the case of deconstructivism) by looking ahead for new images that question the very essence of architecture itself.

Over time, our Places grow, expand, shrink and change. Squares and piazzas in Rome, or in many European countries, all tend to be extremely dynamic Places that allow change, support growth and allow evolution. But this dynamism is all within the bounds of what is right for the Place. When one sees many of the Places in Italy, Germany, Britain and elsewhere, even modern buildings tend to support the Sense of Place. Discourse, dialogue, contrast, context, and dynamic interplay of forms all tend to be a cohesive whole in many of Europe's squares. These Places are almost a growing, living thing. It is one of the true hallmarks of a successful Place that dynamism exists in these Places yet they maintain staying power through continuity of function and cohesiveness of design.

We need to create Places, as opposed to spaces, for Places tend to humanise structures, buildings and spaces with qualities only humans can bring to them. History, context, contrast, the senses, dynamic forms, functional and power attributes all tend to anthropomorphise a Place and make it special.

It is through these that Place acquires meaning and significance.

AN HISTORICAL PERSPECTIVE - EDUCATION

SECTION TWO-B

"It immensely adds to the zest of an investigation, my dear Mr. Mac, when one is in conscious sympathy with the historical atmosphere of one's surroundings."
Sherlock Holmes in The Valley of Fear

2.3 HISTORY OF EDUCATION

Definition

Education is defined by The Canadian Encyclopaedia Plus as:

"1 *a development in knowledge, skill, ability, or character by teaching, training, study, or experience; teaching; training.*

2 *the knowledge, skill, ability, or character developed by teaching, training, study, or experience.*

3 *the science and art that deals with the principles, problems, etc. of teaching, training and learning.*" [1]

Education is seen by many as a method of inculcating important community ideals (morally and philosophically) and imparting important practical knowledge [2]. This includes how parents teach their mores to their children, how a religious order teaches its congregation moral values and how a government teaches its people philosophical and moral approaches to freedom, life, economy, business and all manner of vocational needs of day to day affairs.

Clearly evident though, are the many possible ambiguous meanings of education and learning. It can mean almost anything from rote learning of inconsequential facts and minutia, to acquired good and bad habits, to physical learned behavioural responses of certain stimuli, to abstract conceptual thinking - it is a broad, expansive area. While not exclusively so, education has generally come to mean the teaching of vocational, conceptual and practical knowledge through classroom study delivered by a professor to a passive student audience. For the purposes of this Thesis Design Project, education shall be understood to mean the body of knowledge delivered through various methods of delivery, offered by our current education facilities, including elementary, secondary, post secondary and adult and professional practice learning centres.

Historical Context

While our restricted and simple definition of education is fairly ubiquitous in the way Western Education is understood and taught, it has not always been this way. From time-immemorial, we have changed the way we learn and have changed what we learn. For this reason, it is difficult to summarize the evolution of education in just a few pages. The need to skim over major advancements tends make the reading choppy. This report tries to focus on only those major events and turning points, rather than review the subtleties and nuances between the various epochs.

Throughout history, man[3] has evolved and grown through a process of teaching himself about how to manipulate his environment. What was being taught, how it was taught, who was teaching it and who was learning it has changed, but teaching has been with man for millenniums. Man's ancestors first appeared on earth somewhere around one to two million years ago, and true man - vertical standing bi-pedal Homo Sapiens - appeared about 35,000 years ago. Over this time, man's brain and cognitive functions have grown and changed. From anthropological research, it appears that only very recently, relatively speaking at about 35,000 years ago, we have began to advance beyond

a "cranial capacity" into a cerebral capacity[4] - advancing beyond an animalistic instinctive level to a thinking level. From our very early history, this capacity is evidenced in the discovery of man's use of tools and other implements to change his environment. More recently, from the time of the Egyptians, Greeks and Romans to the present, detailed information in the form of actual written accounts of education *matériel* has been found.

From the early non-written clues scholars have been able to put together the who, the what, the how and to the whom questions of educational delivery.

The Stone Age - Man's Beginnings to 8000 BC

From the time before recorded history to about 8000 BC, written parchments or etched slates do not exist. During this time, man either did not have the ability to write or we have lost all record of any written language. Because of this, we have no real knowledge of how and what was taught nor to whom and therefore archeologists have had to look at the uncovered evidence and piece together likely scenarios.

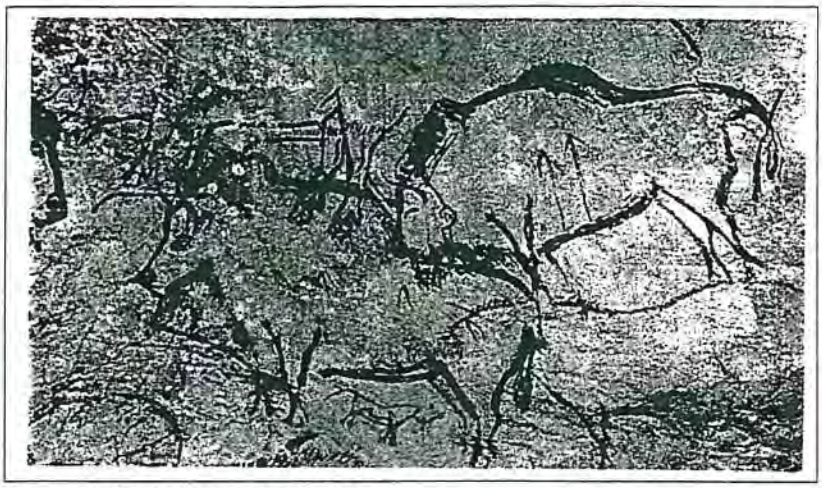
From the very earliest example of stone cutting tools, the number and complexity of tools that archeologists have discovered has increased over time. This shows a growth in tool making abilities that in turn shows that a progression in education and in learning. Since the beginning this progression is virtually self evident because the types of tools early man used, the number of tools used and the location that these tools were being used, over time, increased and expanded. Without the ability for man to learn and without the ability for man to teach, this use and growth of tools could not have continued.

The way man taught and learned, it is surmised, was through watching and mimicking the actions of others. But man's ability to learn was more than learning to use tools from simple rote behavioural such as with "Pavlov's dog's" [5]. Man learned through a larger, more complex cognitive understanding. The possible uses for and the applications of these tools, as well as their refinements were seen and acted upon by early men. This was a quantum leap over any other animal's ability to learn and is believed to reside in the higher intelligent species[6].

Aerial view of Palace of Mari in Mesopotamia.

This learning process was not exclusively man's only area of growth during very early times. It was supported by man's development in societal ways. From about 100,000 years ago to about 40,000 years ago, man moved from small tribal units to smaller community villages. Supporting the evolution of these communities, as well as feeding off the development of these communities was again man's need and ability to learn. There was a need to begin to understand acceptable behaviour and morals. As man grew and as time progressed, man began to ceremonially paint their dead. This was seen as man's first belief structure (a religion).

So as time proceeded and man became more social, so too did his education become more refined and more social and more involved with belief structures and not just practical day to day



Cave painting in Lascaux c13,000 BC.

matters.

While archeologists do not know exactly how this learning was imparted to the young of the communities - in classrooms, by a single educator, by an elder of the tribe - it is believed that it was not a formal process. The first evidence of any form of formal classroom was in the Egyptian palace of Mari in Mesopotamia which was built around 2000 BC[7]. Before this time, nothing has been found that resembles classrooms.

Therefore we see that before antiquity[8] understanding of education is conjecture, based on inferences from found archeological items. The first real example of man's cognitive evolutionary processes are the Palaeolithic cave paintings of Lascaux in France.[9] These animal and man paintings have been carbon dated back to 13,000 BC and mark a major leap in man's learning. While paintings dating back as far as 25,000 years ago have been found, these 15,000 year old French cave paintings represented social and environmental contexts for man and animal and thus are the first evidence of man's ability for abstract thought. They are seen as the first evidence that man could see himself as a distinct object, separate from the subjectivity of his environment. Man thus began to understand that he was a part of a bigger world, part of an environment.

The Copper Age and the Ancient Orient - 8000 BC to 2000 BC

From around 8000 BC to around 2000 BC a tremendous increase in the world's population and a great dispersion of that population throughout Europe, Asia, and Africa was seen with the heaviest concentration of growth seen in the eastern Mediterranean region known as the Ancient Orient.

The Ancient Orient's climate and its relatively fertile agricultural lands are related to changes in tools and food production. The climate in this region was sufficiently benign to allow man to expand past just the immediate needs of survival. Simple forms of shelters and agriculture were developed around village life and the Copper Age saw the change from Palaeolithic Man to a new culture: Neolithic Man.

New tools were made (the hoe, the sickle) and refinements to stone tools, and settled agricultural communities abound during this time. The domestication of animals is first seen, and the growing number of agricultural communities which were largely sited up in the hills, where fortuitous farmland was more abundant, but around 6500 BC, a push from the hills down to the valleys along the Nile, Tigris and Euphrates rivers was seen. This was the first major community of non-nomadic people on land. These lowland valley areas were changed over from less hospitable lands to lush arable farmlands by the cultivation of communities, sharing of agricultural know-how and the development

of irrigation systems.

Around the fourth millennium, copper was discovered.[10] This led to fast growing settlement groups centred around agriculture slowly taking over from hunting nomadic groups. Food producing abilities grew because of new forms of tools made from copper which in turn resulted in surplus harvests and therefore surplus foods. The result of this increased capacity for food production was that people were freed up from the minute to minute, day to day toil of living. Commercial and service sectors began and expanded and complex patterns of traffic and trade were established and eventually grew to be called the "cradle of civilisation" [11].

Around 3000 to 2000 BC in Mesopotamia, the first temples are found. Before 3000 BC no record of a temple or a place of worship has been discovered. The temples had a high priest who was seen as the only one able to talk to the Gods. The Gods were seen as malevolently controlling the world of climate, sun, wind, earth and other natural occurrences. To appease the Gods, offerings of food and other cherished items were continually made. The high priests, who were the recipient of these offerings thus would became extremely rich. As the offerings continued, huge stock piles of stores mounted. To assist the high priests in keeping track of which God was getting which offering, and to keep track of what was in each storage container, the priests developed man's first written language. The priests first started to use simple, single graphic representations that described the contents and time of storage of the containers and therefore these graphic symbols, which were no more than designs pressed into small lumps of clay and used as official seals on jars of temple financial accounting, were the first written language.[12]

Oldest known language - Mesopotamia c3200 BC.

With the use of writing, the priests also catalogued and kept track of the stars eventually creating the first calendars. These calendars were important to the priests because they allowed the priests to predict the harvest seasons and other important agricultural events. While not entirely accurate, these calendars were the first example of man exploring the universe of the sky and they helped create an important place for the high priests, along with their direct link with the gods to everyone in everyday life.

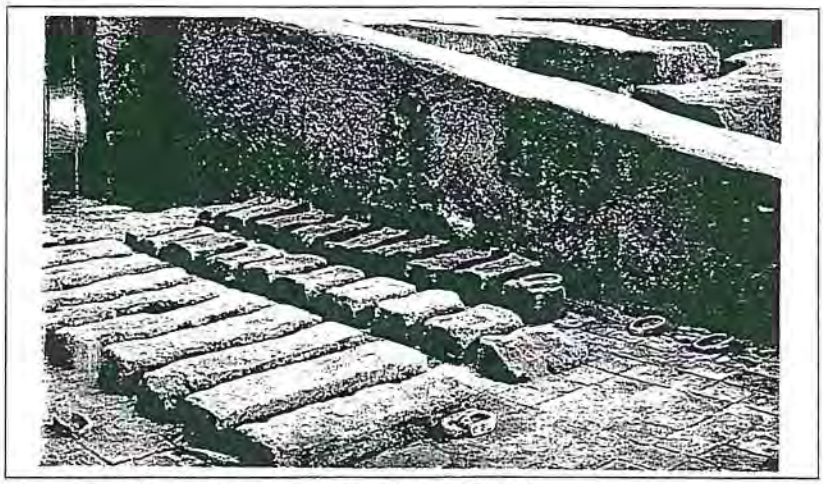
Education flourished. The high priests began to be regarded as the educators (they were the only people who spoke directly to the gods and therefore very special) and took over the role of mentor and teacher of everyone in the villages. They used their development and knowledge of the calendar to "teach" the peoples what was agriculturally needed and used their rudimentary knowledge of written language to recorded the calendar.

The most important element regarding education during this time was the change of the method of education from one of informal mentor / apprenticeship / familiar relationships (family teaching family) to a single educator. This was the emergence of the high priest as the teacher of agricultural needs. The high priests slowly began to replace the need of everybody in the village to be teaching the young. Now, for the first time, a single person was seen as the main giver of knowledge.

Mesopotamia - The Emergence of an Education System - 2000 BC to 500 BC

This time in man's growth is seen as a strongly intellectual time. A time that saw great strides in four main aspects of political and social life: (1) the development of autonomous dominion over large groups of peoples; (2) the creation of social classes among peoples; (3) the creation of highly refined governmental bureaucracies; and (4) the continuing development of written language. It was during this time that a complex and very robust written language came into its own and is now seen as the first fully functional symbolic language called Classical Babylonian.[13]

Life revolved around the temples, and as such, the high priests were ever more highly regarded. As time progressed, a highly developed and ordered governmental and bureaucratic society formed. These governments were based at the palace(s) and were supported by the temples. To control and organize these large institutions, the need for and the use of written language came into its own. Laws and financial transactions were written down and recorded, family trees were similarity recorded and updated, levels of hierarchy, forms of medicines and cures, and agricultural news were all duly recorded. This were seen as essential information for the society to maintain. And in the realm of maintaining this information, a very structured form of temple / priest hierarchy came into being. Multiple layers of bureaucracy both in the government and in the temple fuelled even more complex reporting structures which in turn fuelled the need for a more organized reporting structure.



The earliest known classroom in the Palace of Mari.

From this strongly hierarchial system came the first evidence of structured learning. About 2000 BC, the first classroom was built in the City of Mari[14] in Mesopotamia. This first classroom is the image of what we see today in many of our own classrooms, rows of students with one teacher at the head. The classroom was built at the Palace of Mari and therefore brings to question the High Priest's role. The priests, while still in charge of the educational system, were slowly allowing the move of the centre of educational learning from the temple to the palace by allowing the 'classrooms' to be located at the palaces. This move, coupled with the evolving class system meant that, education was something for the haves, as opposed to everybody in the city - it was made available to society's elite, and taken away from the common man. It also showed a move from the omnipotent control of the temple (over all things educational) to a slightly more secular institutional approach. This shift of education away from the common man to mostly the elite of society had its origins in many of the societal developments at the time: development of sovereign states, development of written language, society's class structures, autonomous governments and growth of religious and governmental bureaucracies.

Teachers were scribes who were educated from a very early age. Young boys (no girls seem to have been allowed to be scribes) joined the temple to study and spent their whole early life studying and learning. When they reached an age or an ability that would allow them to teach, they were then full fledged scribes. One new subtle nuance in the approach to teaching was the growth of specialisation. Each scribe would specialize in a different type of teaching: religion, law, medicine, mathematics; language and agriculture, showing a strong inclination for and evolution of structure in education.

As previously noted, language and mathematics were very advanced at this time. Language used a cuneiform[15] script with between 600 to 700 symbols and mathematics used a system employing base 60 (instead of the world standard today of base 10) with complex fractions, negative numbers and close approximations to highly refined number combinations (as an example: circles were calculated using a number of 3 instead of pi at 2.9717...).

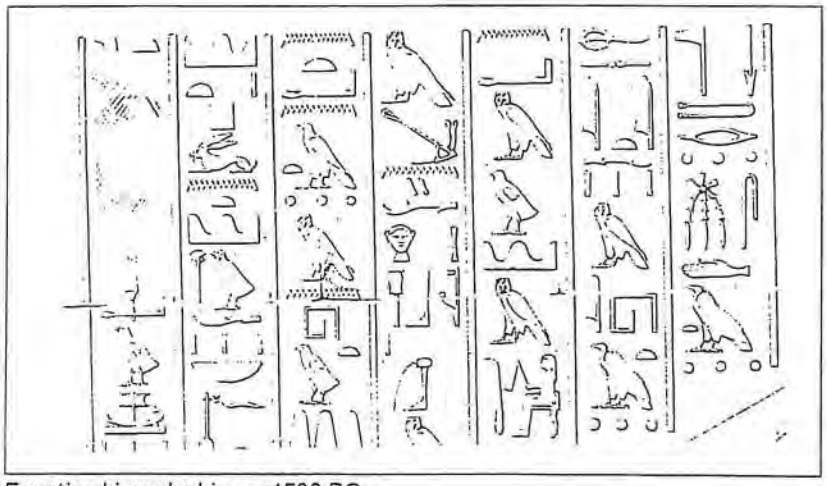
Teaching tablets from this time have survived to today and are in evidence throughout archeological museums and show a standardized method of teaching was evolving. The tablets, because of their re-useability (they were made of stone) and because they were standardized (multiple copies of similar tablets have been found) show that education was using standard teaching curriculums across multiple sites.

It would seem that teaching was done very strictly by the scribes and was based on rote memorisation of principle and rules:

"The whole tradition of scribal literacy demanded obedience and compliance by the student; there was virtually no scope at all for creative thought or speculation."[16]

Egyptian Education 3000 BC to 1800 BC

Somewhat concurrently with the evolution of Mesopotamia, was the growth of civilisations along the Nile River - primarily the Sumerians, the Babylonians and the Egyptians. The Egyptian societal and sovereign governmental systems related to that of the Mesopotamians described previously, but one area where the two cultures differed greatly was in the application and the use of written language. While the Mesopotamians taught written language to the elite, and allowed its use by all levels of government and temples, the Egyptians had created a representative symbol system called hieroglyphics.[17] hieroglyphics were so complex and could mean so many different things in different contexts, that written language was too difficult to learn for



Egyptian hieroglyphics - c1500 BC.

most people. It was only used to formalize and record Egyptian history by an elite group of scribes rather than as in any form of day to day use as was done with the Mesopotamians.

Egyptian mathematics, too, was not used globally nor was it made widely available through the education. It was, oddly enough, a rather simplistic form of "reckoning" that:

> *"... scarcely amount*[ed] *to mathematics . . ."*[18]

But even though Egyptian mathematics was not very highly refined, it was adequate enough for them to create and build the pyramids which are, still to this day, looked upon as marvellous feats of engineering. Evidence of the use of mathematical symbols, in the form of a written language of symbols, has not survived well from the early period (3000 BC) but some more recent scrolls (c1680-1570 BC) have been uncovered. From these it is evident that Egyptian scrolls were owned by one scribe, and not given out as a standardised curriculum, as in the Mesopotamian method. No evidence of formalized educational system been found either to suggest that the early Egyptians used or taught in classrooms or schools. It appears that most of their learning was done by way of home learning, direct apprenticeship or in informal settings. Therefore, the Egyptians used the scribe process of teaching, like the Mesopotamians, but seem to have adopted a more mentor / student, one-on-one type of learning - teaching only the upper elite.

Mesopotamian cuneiform tablet - c800 BC.

Around 1000 BC most of the dominant cultures that lived around the Ancient Orient, had come into contact with one another including the Egyptians, the Mesopotamians, the Sumerians and Babylonians. Either because of this, or in spite of this, the form of education in all these Ancient Orient dominant cultures began to look like that of the Mesopotamians: a more institutionalized, formalized and systematic process of education. It is also around this time that the first known evidence of an alphabet[19] was discovered.

Who and where the alphabet originated is unclear. It appears that the use of the Mesopotamian cuneiform and Egyptian hieroglyphic forms served only as stimulants, rather than as guides. The development of the first alphabet probable did not grow directly from these two because of their complexity and subjective representations. The use of the alphabet was so widely and quickly adopted that it soon developed into three major forms of language, all of which are with us today in some form or other: Aramaic, Early Hebrew and Phoenician. The early alphabet was based on 22 consonants and four following vowels and was so easy to learn that:

> *"... despite its many local variations,* [the alphabet] *eliminated*

the difficulties and tedious study required by the more formidable ... scripts which had previously confined literacy to a select minority of initiates ..."[20]

Thus the use of the alphabet was very widely adopted by many classes of peoples. And through its widespread use, it became so ubiquitous, that by the time of Aristotle, it was looked upon not as a special element to learn, but merely as a learning tool. It was so ubiquitous that even slaves were taught to act as recorders and scribes because writing had become no longer a highly regarded education, but a tool. It had become a necessary skill.

Eventually, the Phoenician alphabet would move westward and northward to form the Greek language which in turn was the forerunner to all European language alphabets.

Greek Education - Development of a Theory of Education - 1000 BC to 146 BC

The period of the Greeks is regarded by many as the Classical Time of Antiquity. Great strides in art, philosophy, education, athletics, literature, architecture and many other areas of day to day life abound during this period.

Although Greece is a relatively small geographic area, many sub-cultures were present and thrived in Greece: Hellenes, Mycenaean, Aegean, Early Helladic (c.2800–2000 BC), Middle Helladic (c.2000–1500 BC), Late Helladic (c.1500–1100 BC), Minoan and the Dorians. The most notable tribes of the Dorian culture were undoubtedly the Athenians and the Spartans who ushered in the final period of decline for Greece before the Romans conquered it in 146 BC.

Education in Greece during this time evolved through two major epochs: the Old Greek Period and the New Greek Period with the division established about 459 to 431 BC. This separation of educational approaches coincided with epoch changes in culture, society and philosophical approaches to the hegemony of the governing states.

The "Old Greek" educational period is typified by three main philosophical approaches: the Homeric Period; the Spartan Period; and the Athenian Period.[21]

Greek Schoolboy"s wax practice tablet - c200 BC

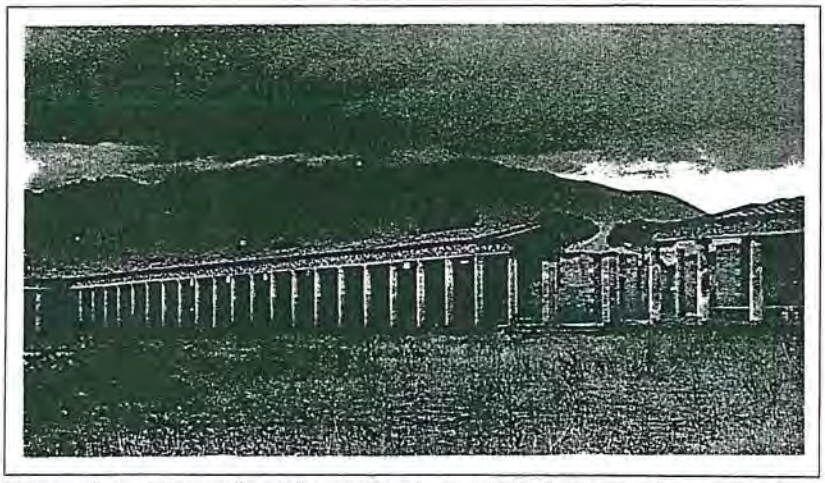
The Homeric period is best exemplified and is related to Homer's epic poems, The Iliad and The Odyssey (c900 to 800 BC) which exhorted the ideals that man was a creature of action and a creature of wisdom. The type of educational beliefs, then, that came about from this conceptual approach was one of freedom, bravery of man, temperance and reverence of man's primary virtue which was a combination of wisdom and practical judgement. The educational system that supported these ideals was based in a city run government which was consistent with the city-states or "polis" [22] on which Greece was founded.

The Spartan educational approach is identified as typical "Old Greek" educational system. It was a system based on the complete subservience of the individual to the government and it prized courage, complete obedience and physical perfection. The

organisation of Spartan education was around a "superintendent" who had a series of assistants who were all charged with the education of the young. Upon reaching the age of seven, every youth was taken away from his family and given to the state to educate and train to become a warrior. Every adult, once they graduated to warrior status, was billeted a student, and every student had a mentor. Each student inturn would still report to the superintendent for overall educational direction. This system produced people who were classified as "citizens" which meant that they belonged and were sworn to support the central state. The abilities and opportunities of the individual were subordinated to the needs of the state. Every person (excluding slaves) in the state was expected to serve the state and both women and men were educated equally. Women were expected to be the training mothers of warriors and men were expected to be the warriors. This system was a formalized mentor programme.

The Athenian approach was almost diametrically opposed to that of the Spartan approach. Where the Spartan training regime yanked children out of their home, the Athenian way left children with their parents to be nurtured and fostered by the family. The family was seen as the main provider of education. Any school that existed, and there were many, were virtually all private with the state only providing school education as preparatory to military service. At age sixteen, the student (always male) would stop his literacy (language, mathematics, reading) and musical (art, poetry, drama, oratory, history and sciences) education to concentrate on physical education. The Athenian model, while less formal than the extremely regimented and severe Spartan model, was successful at nurturing the family morals and a student's personal knowledge within a confined envelope. But, like the Spartan model, the emphasis in this period was still very much on what type of "citizen" the student could become - on what benefits he could bring to the state - as opposed to the student's own personal and individual growth. This system was a formalized home teaching system.

The "New Greek" education period followed closely the Athenian period and was brought about by a few very brilliant men: Socrates (469 to 399 BC); Plato (420 to 348 BC); and Aristotle (384 to 322 BC). These three men, along with a host of other radical thinkers and teachers called Sophists, questioned the Old Greek way of education (the ruling that each person was a citizen of the state) and thus slowly shifted then contemporary educational thought from the "citizen" approach to a more individualistic personal benefit approach. The substance of education, under their influence, slowly became one of personal knowledge and personal welfare, in contrast to state welfare.



Gymnasium at Pompeii - while not Greek, the similarity to an outdoor class is striking.

Socrates has been quoted as saying that *"man is the measure of all things"*[23] which sums up the anthropomorphic direction education was beginning to take in this later period of Greek dominance.

Two forms of educational

institution evolved at this time because of the growing importance and relevance of the Sophists: (1) the Rhetorical School; and (2) the Philosophical School.[24] The Rhetorical schools prepared students for the practical requirements of life such as the oratory, languages and general vocational knowledge. The Philosophical schools questioned metaphysical and ethical conundrums and was generally a very esoteric form of school education.

But the naming of these schools as schools is perhaps not entirely accurate. They were more gathering and groupings that Sophists like Plato and Aristotle would convene by gathering students around them and discussing various philosophical points. Eventually these school concepts were adopted into the Roman system and (especially the philosophical schools) lost their creativeness and *avant-gardism* once they were Romanized into a finely tuned bureaucratic pedagogy. This is seen as an intellectual educational decline.

While the development of the "university' as an intellectual and educational grouping of school faculties or colleges focusing on research and learning did not evolve until the Medieval World[25], Greek education evolved into an early, short lived forerunner version of the university model. The predominant schools at the later period of Greek dominance - the Academy, Aristotle's school and the Rhetorical schools - evolved into The University of Athens whose main purpose was the extension and growth of philosophical learning. The university's head was elected by the Athenian Senate so it was very much a state and government run and controlled institution. It contained an elaborate bureaucratic system of governess which is still seen in many of today's universities.

Thus, throughout the growth and prosperity of the Greek "polis'" - from the early Homeric educational systems, through to the Spartan, Athenian and on to the Plato, Aristotle and Socrates schools and finally in the development of the University of Athens - great strides had been taken in education. The dominant predisposing factors for this intellectual growth appear to involve complex societal issues and the setup of various and differing governmental systems and their varying goals. For the first time, the impetus for educational growth seems much less driven by advances in technology than in society.

The Roman Empire - Refinement of Educational Bureaucracy and the Demise of Intellectualism - 250 BC to 5th Century AD

The historian Francesco Cordasco relegated Roman education to no more than an insignificant extension of the Greek educational system:

> *"After the Roman Conquest of 146 BC, Greek civilisation in general was rapidly appropriated by the Roman conquerors, and Greek education extended its boundaries without changing its character. In a sense, Roman education is but one aspect of the cosmopolitan education of Greece."*[26]

But this may not be fair. The Romans brought to education what the Romans brought to the world and left as their legacy: a strong and regimented bureaucracy; a large central government; and societal respect for rules and order. These ideals are still seen today in our schools and in our governments.

In early Roman times, as in the late Greek times, the dominant method of teaching the young

children was through the family. This was the Greek's Athenian way of leaving the child in the family, but instead of stressing the "citizenry" aspects of the student's education, Roman's stressed agricultural knowledge and day to day trade information. The heavy dominance of agriculture in Roman times accounts for this approach. As time passed and as the Roman Empire grew - eventually swallowing Greece in 146 BC - education became more and more formalized until every type of school had a formalized structure and a physical building. Even elementary schools, which were populated with Greek slaves as teachers, became universal throughout the Empire.

The use of elementary schools was more in keeping with an general educational approach, although it was still mostly geared for the well to do of Roman society. During the Roman Empire - perhaps even thanks to Julius Caesar - writing and reading were becoming more recognized and understood in virtually any other culture up to that time. It was Julius Caesar who decreed that all the consul and senate proceedings would be published daily, thus making the skill of reading a necessity if the layman wanted to obtain a general knowledge of day to day governmental affairs. As well, the extreme numbers of soldiers and the powerful hegemony that the Romans experienced meant a very large number of people were exposed to educated people like never before (every soldier was educated). Thus the average person began to regard education as less special - less for only the intelligentsia.

Relief of Roman School Scene - c300 AD.

Throughout the first century AD, because of the proliferation of elementary and higher schools, the demand for teachers skyrocketed. The profession of teacher came down from the high levels of godlike scribe and sophist to become a respected profession, and later, with the use of Greek slaves as teachers, down to an undesirable trade.

So it was up to the middle period of the Roman Empire - rather than just an extension of the Greek education, Roman education brought a highly structured bureaucracy and inculcated the idea of general education for the populous to a very large series of cultures.

Toward the latter part of the middle period of the Roman Empire (the second and third century AD), Roman life became, in a word, decadent. The city of Rome had become the greatest city in the world in military and civic strength and year after year saw nothing but peace and prosperity. Life became characterized by an insatiable greed for fun and play. The circus grew to become daily extravaganzas in gore and satanic zeal such that the only important element in one's day seemed to be the games and therefore the proliferation of the circus' abounded. Many were built and enlarged. The largest is reputed to have had a seating capacity of 250,000 (The Circus Maximus during Caesar's time). Other notable circus included: the Circus Flaminius; the Circus Neronis, of

Caligula and Nero fame at which many Christians perished; the Circus Maxentius; and the Circus of Septimius Severus. The Roman economy became increasing consumer based and wrought with "*moral flaccidity and social repletion.*" [27] Hedonism, in its most vulgar physical meaning and a detached type of Stoic philosophy[28] became the norm for the way the Roman people approached life.

It is in this declining state of apathy and lethargy that the Roman educational system (which really meant education in general) was faced with one of its biggest setbacks. Virtually only one form of education was seen as worthy of study and that was oratory - the art of public formal speaking. The thought that oratory was education was so endemic that practically nothing else was taught with any vigour as evidenced by the fact that only a very few significant handbooks survive today on topics other that Roman oration.

Other educational difficulties during the latter period of the Roman Empire included the dwindling state support for schools and an emperor developed educational policy (which was based on political oratory). These difficulties tended to undo most of the good that the Roman Empire had done for education. During Roman times education saw: a strong and growing bureaucratic structure; a level of respect for teachers; a wide demand for higher education; and the creation of the first real elementary school structure.

The decline of the Roman Empire, once it began, came quickly and unmercifully. The West sank into anarchy, and Italy was ravaged by invaders. By 410, Rome had fallen and by 476, the fall of the Empire was complete with the last emperor falling to the Goths.

The period from the fall of the Roman Empire to the emergence of the Modern Era in the form of The Renaissance in the 15th century is generally referred to as Medieval Times or The Middle Ages. Major epochs within this lengthy era are further subdivided into the Dark Ages (5th century to approx. the 9th century) and The Late Middle Ages (approx. 9th century to the 15th century).

We will first look at educational developments in The Dark Ages.

The Dark Ages - Educational Poverty - 5th to 9th Century

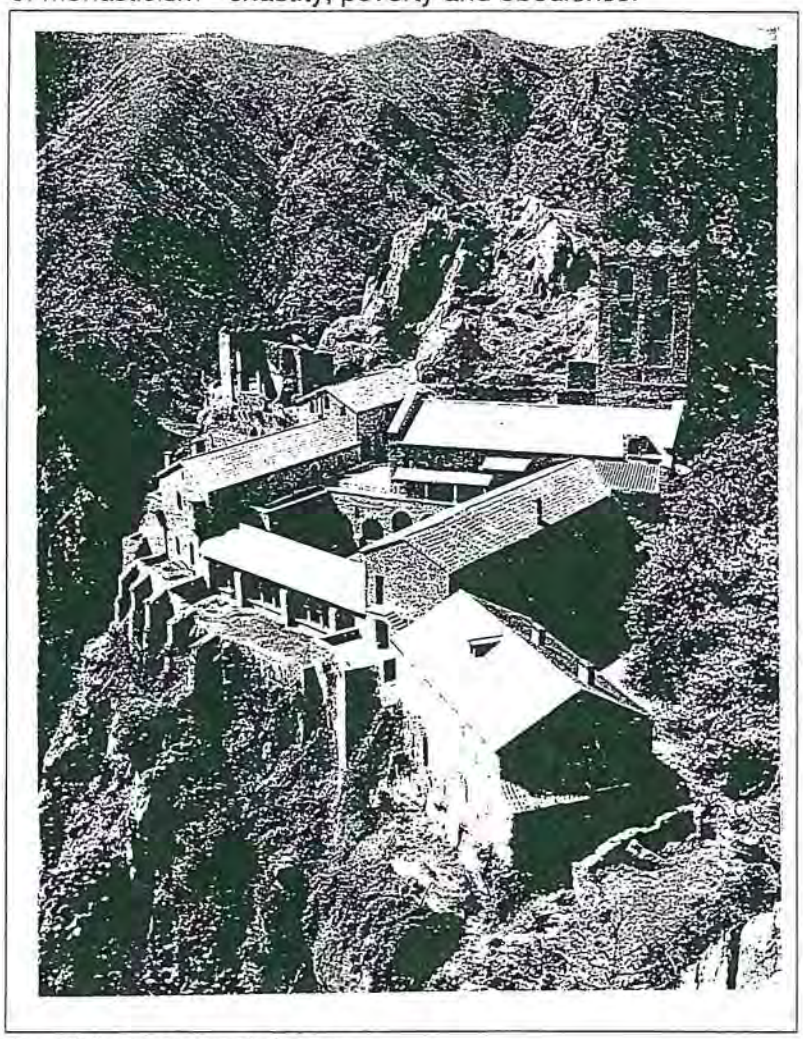
The Dark Ages have been so named because of a general profundity of economic and intellectual deficiency. The dominant characteristic of this period is a lack of invention, lack of societal and governmental growth, small banded feudalism and a general spreading of barbarism.[29]

Education in the Dark Ages is predominantly centred around religious beliefs and religious doctrines. It could be said that without the religious orders of the day, or monastic life throughout this period, neither education nor the written word (the alphabet) would have survived.[30]

It was the Christians in the West that dominated religious beliefs. Christians and Christian education had been around for hundreds of years - (during the time of the Roman Empire, Christians were persecuted and killed for their faith) - and even though they were not allowed to be teachers by Roman decree, Christians still set up two forms of early Christian schools: (1) the Catechumenal Schools; and (2) the Catechetical Schools. Only moral and religious teachings were on the curriculum[31] and with the fall of the Roman Empire in 476, these schools, along with the

monasteries, were the only remaining schools.

The most famous monastery is that of St. Benedict, who in 529 created his "Benedictine Rules". These rules, many of the idealogies which are still with us today included: the value of manual labour in education; reading two hours a day; practice of the school curriculum (homework); and the ideals of monasticism - chastity, poverty and obedience.



Benedictine monastery in France.

During the Dark Ages, the monasteries were virtually the sole schools for teaching. Priests alone offered training, preserved books, maintained libraries, carried on the written language, produced scholars, and proffered any religious teachings. And even during these dark times, in their own small way - the priests studied the world around them through agriculture and the use of the calendar - as did their ancient predecessors, the High Priests of Mesopotamia. In this way the priests became and remained for a long time the holders of virtually all learning and literature in the Western World.

Over time the importance, dominance and demand of the monasteries as educational institutions grew to such an extent that by the tenth century even though they were still the sole teaching facility they had to divide themselves into two distinct instructional schools: (1) inner monastic schools (for those boys taking the vows); and (2) the outer monastic schools (for those boys not taking the vows). This division anticipated the development of the university and college split a few centuries later.

'School' at the monastery consisted of a building or series of (class)rooms set aside for the sole purpose of teaching. Perhaps in large part due to St. Benedict's rules, monastic schooling had become strongly and sternly regimented, and the monastery schools manifested this sternness and the austerity by being cold and severe places. Monastic schools became places where hard work, quiet contemplation, great amounts of introspection and little amounts of physical play (although

great amounts of manual labour) was the norm. It is interesting to view this fifth to tenth century imagery with our common imagery of historic schools like Oxford, Cambridge, Harvard and Yale. The image of a stuffed shirt still pervades some conceptions of higher learning and therefore some of our imagery of school is reminiscent of this Medieval educational system of regimented, subservient, active teacher/passive student roles.

Change came slowly to the Dark Ages and the monastic system of education but change did eventually come in the form of increased interest in higher learning and a split from ecclesiastical educational governance. The impetus for the change finds its roots in many factors but one of the most prominent predisposing educational factors was a series of "letters of advice" [32] from one of the most powerful emperors at the time, Charlemagne[33]. These letters of advice were a set of triticei papers preposing changes to educational pedagogical delivery and governance. These letters essentially suggested the split of education from a religious base to a dual governance between both ecclesiastical and secular authorities. The letters stated governments and religion should both support and promote education - not just the ecclesiastical authorities. While this may seem somewhat banal nowadays, it spoke to a growing rift between church and state which turned into one of the hallmarks of educational change seen during the Late Middle Ages period.

The Late Middle Ages - Origin and Evolution of the University - 9th to 15th Century

The Late Middle Ages were a time of breaking away from the past. It was a time of evolution. It was a time of heightening intellectualism and awareness of new approaches to philosophy. It was a time of diminishing religious fervour and diminishing religious control and a time of educational diversification, specialisation and growth.

School scene - tomb relief - c1360.

Toward the end of the 9th Century, notwithstanding the "letters" of advice to the contrary, religion still housed the only educational facilities, even though it happened to be facing a (slowly) degenerating support from kings and rulers. The religious orders at the time, however wanting to bolster their own support, tried to strengthen a hold on religious education by creating a mandatory educational system. It was around the middle of the 10th century that ecclesiastical laws came into

being which made it the responsibility of priests to:

> "... *keep village schools, to teach small boys freely, and even to maintain schools in their own houses ...*" [34]

Relief of class in cathedral school - c1300.

Bishops and clergy were required, by their own church, to maintain schools. This slowly brought about the development of what are called the Cathedral Schools. A Cathedral School (cathedral literally meaning throne of the bishop) was a school that was directly connected and affiliated with a church - a cathedral - as opposed to a monastery. The first Cathedral School is believed to be Chartres in France developed circa 990 to circa 1028 and one of the most notable of the Cathedral Schools was Notre-Dame de Paris. The cornerstone for Notre-Dame was laid in 1163 and this school became one of the most popular and successful Cathedral schools of the time.[35]

The emergence of the Cathedral is important in our study of education for two reasons: (1) it allowed the evolution and continued growth of religious education in an emerging secular climate; and (2) it gave a form and image to a range of schools which had not, up to that point, existed before - a sense of "place" to higher education.

Of all the many Cathedral Schools, the most successful were situated along strong trade routes, in areas of relative peace and economic growth. The schools taught the vestigial remains of the Roman and Greek liberal arts, but mostly concentrated on the foundations of literacy, grammar and theology for it was believed that these were essential skills in the development of an understanding of God:

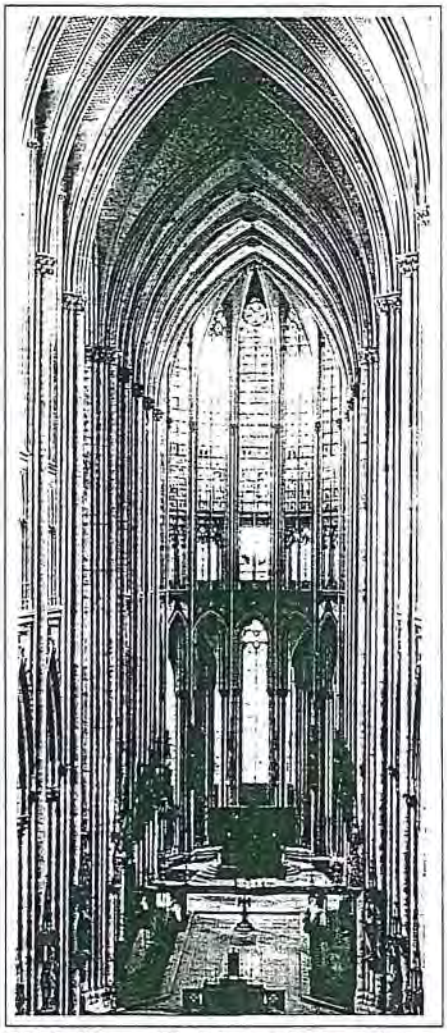
> "... [the clergy] *shall assiduously teach grammatical studies and the principles of the liberal arts, because in these chiefly the commandments of God are manifested and declared.*" [36]

Later, during the early part of the Late Middle Ages a more structured system of monasterial religion began to form. This was in part due to the growth of economic trade in regions like France, Germany, England and Italy. Transportation was slowly growing both on water and on land which fuelled the economies of the many varied cultures throughout the areas. Increased travel, increased populations and a growing stability weakened the growth of religious hegemony in communities.

To mitigate this weakening religious educational governance, the church needed to bolster their presence. They began building huge churches - Gothic Cathedrals. Gothic churches, starting primarily in France in the 12th Century and spreading throughout Europe until the 15th Century, were

an attempt to maintain the mysticism, enthusiasm and respect of the religious orders. Gothic Cathedrals were and are extraordinary in their expansive use of ribbed vaults, rose windows, buttresses, geometric tracery, pointed arches, and variegated stained glass and were designed to inspire masses and to honour God. The larger glass windows showed the thinness of the building envelope; the immense height and slenderness of the supporting columns showed knowledge of building structures and material strengths and so on. The Cathedral Schools soon became recognised through the image of the Gothic Cathedral Churches and therefore an image of higher learner environments was started.

So it was that during this period, the church saw the development of Cathedral Schools as a very important element in their push for a rejuvenated papal stronghold. Yet in spite of this deliberate ecclesiastical push, two separate influences came about toward the end of the 11th century which helped to segregate the church from their sole influence in education and to create a more separate church and state run educational system: (1) the Craft Guilds; and (2) a secular society focus.


Gothic light and height inspired - Cologne Cathedral - begun 1248.

This first was the emergence of craft guilds. Craft Guilds were formal groupings of men who were like employed or trained who set up schools which supported the education of their vocational techniques. Guilds were present in one form or another from antiquity, but did not find their structured hierarchy or guiding principles until the Late Middle Ages. Guilds slowly gained prominence in the 11th century and then proliferated throughout Medieval Europe up to the 19th century. Many of these guilds survive even to today. One of the most known of these is the Stonemason's which, later in the 15th century, evolved into the Freemasons.[37] These guilds would set up a school (in the case of stonemasons the school would be built beside the building they were building) where they would train and teach apprentices in their trade. Over time the guilds became so insular and so closed minded that they would only permit certain members to join (such as sons of members), They also developed entry requirements to restrict access and used secret ceremonies for initiation rites, they developed and awarded special degrees for acquired levels of training.

Education and indeed society in general was changed by the emergence of these guilds through the development a what became a second tier of education. This second tier was separate from the Cathedral Schools who taught scholarly curriculum aimed at a boy becoming a priest. The Guilds' primary pedagogy was the development of technical and vocational training. This two tiered approach to education is still seen today in high school and post secondary levels where liberal art schools (universities) are separate from the technical schools (colleges).

Guilds also changed the face of education by developing a structured degree granting procedure. While levels of attainment and degrees were always present since in Antiquity the general public acceptance of the validity of a "degree" was not put into tangible practice until the widespread acceptance of Guild education. Thus it was that across Europe an apprentice woodcutter (or any other trade) was understood to have attained a certain level of expertise and experience commiserate with and based on his level of Guild Degree attained.

Guilds also sought new technologies and new techniques throughout the known world and were instrumental in expanding knowledge and learning. They became the creative research schools of the Late Middle Ages. As an example, they brought to Europe the use of gunpowder, paper-making and block-printing- all three technologies of which were to become tremendously influential in the growth of European society.[38]

The second influence that came about toward the end of the 11th century which helped to separate the church from their primary influence on education was the emergence of a more secular societal focus. This was brought about by a number of factors, including the strength of trade in the economy, the growing acceptance of vocational trades, the evolution of market based guilds into municipal governments (which decreased the role of sovereign state control) and the growing intellectual irrelevancy of religious education. These factors all tended to create a climate of intellectual interest in economic affairs rather than in religious affairs, and the apparent growing irrelevancy of scholarly education only seemed to exacerbate the trend:

> "... [scholasticism's] *educational system had many limitations among which may be included: (1) its interest in argument, not in the validity of conclusion; (2) its abstract and metaphysical character;* [and] *(3) its discussion, which possessed no reality, no relation to the world about it.*" [39]

So it was that a schism was happening between society and religion and this schism was seen in many areas but non more so than the widening division between the papacy and the various emperors and sovereigns. Through Germany (Pope Innocent III vs Frederick I and Frederick II) and England (Henry II vs Theobold and later Thomas Becket, Archbishops of Canterbury and John vs Walter Archbishop of Canterbury) great rifts between the state and the church led to great unrest, tremendous power struggles and even murder and death.[40] This struggle easily found its way down to the 'common man' where the growth of secular education, (originally seen in the evolution of guilds), became more familiar and accepted. No longer were the Cathedral and Monastic Schools the only opportunity for education, now other educational facilities were

University lecture hall - c1350.

beginning to avail themselves.
To counteract this, the Cathedral Schools started to develop a more secular, less religious curriculum. Some of the more prominent cathedral schools were under the greatest pressure to 'get with the times' and develop programmes geared for the growing need for lawyers, schoolmasters, clerics, administrators, medical doctors and the like rather than more priests. The Cathedral Schools began by developing companion (and in some cases replacement) schools whose pedagogy was more rounded, topical and less religious. These new educational institutions, originally called "*studium generale*", and became the first real universities.

A university necessarily offered a number of opportunities for education in a number of different professions. The very first universities were governed by Christian religion, however German emperors, French Kings and other sovereigns began to establish universities in their own dominions. Schools of higher learning were not just run by the clergy, as had been done for five to six centuries, but were now also run by the state. Of the first universities, that have remained, virtually the who's who of higher learning centres - and include: Notre-Dame in Paris, Oxford and Cambridge in England, all originating in the 12th century.

The big difference between these universities and the previous school systems were threefold: (1) the universities were run by a democratic government borne out of the growing democratically developed municipal and guild institutions; (2) universities were primarily located where heavy populations and strong economies abounded, rather than where there was a need for social or religious control; and (3) the universities were conferred special privileges such as the right to teach (previously the sole purview of the church) and a right to carry on business in different locations. It is in this tradition of secular democracy and economic rationale that universities survive to this day.

From the 12th century up to the modern era of The Renaissance in the 15th century, we see no great educational changes. The method of delivery, which had been established for the most part back in Mesopotamia would continue to remain as the preferred delivery method. The growth of the Guild Schools, which spoke to an earlier time of apprenticeship dating back to time immemorial, saw a great resurgence during the Late Middle Ages and would remain relatively strong through to the 19th century. Intellectualism and scholarly inquiry, not truly in evidence since the classical period of Greek intellectualism, was again finding a fertile environment and was slowly beginning to prosper again.

The Late Middle Ages, therefore is seen as a time of great change in education. A shift from the hegemony of Christian religious education to an emergence of Guild Schools and secular universities.

The Renaissance and The Reformation - Educational Humanism - 14th to 16th Century

The period of The Renaissance is most notable for its evolution into an intellectual humanism. This humanism was seen in all the arts: music; architecture; science; rhetoric; and literature. Interest in the ancient Greeks and Romans, interest in the natural world and interest in the subjective world were all central themes of The Renaissance's humanism. Generally associated with Italy but more appropriately describing a manner of approach to life that was prevalent throughout all of Europe, the Renaissance extended to northern Europe in the guise at the end of 16th century of the Reformation.[41] This time saw the development of a number of firsts: the first true public library (1437 in San Marco); and the origin of the Burgher schools (schools located in smaller burgh's and towns).

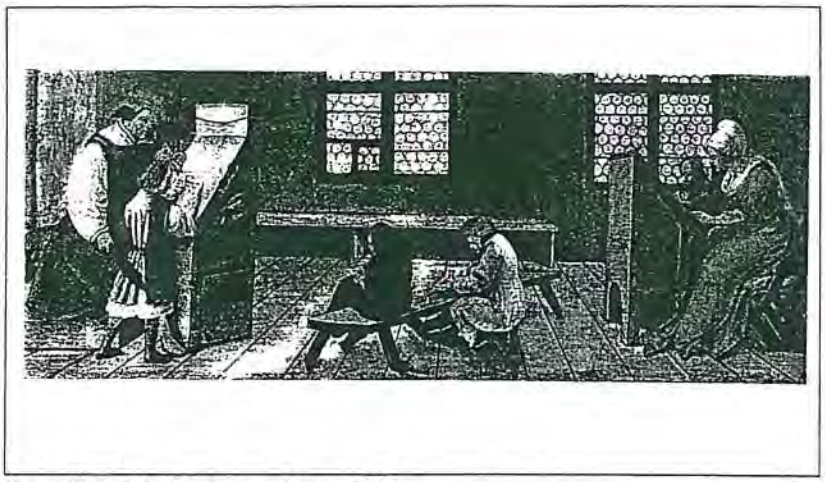
Evident too at this time was the revival of a more liberal education and the previously noted growth of humanism in education. The Reformation was an important time in education as well with the most notably advancement being the movement toward universal education.

The Renaissance's liberal education was based on a revival of interest in Greek and Roman antiquity yet was aimed at intellectual physical and natural studies (in opposition to meta-physical studies) that were:

> "*... worthy of a free man ...*" [42]

This liberalness of education, its interest in antiquity and its intellectual study of the physical and natural environment brought about a newly acquired appreciation for the aesthetic. This was especially evident in the architecture and art of the day with such memorable geniuses as: Michelangelo (1475–1564); Leonardo da Vinci (1452–1519); Filippo Brunelleschi (1377–1446); Donatello (c.1386–1466); and Leone Battista Alberti (1404–72).

Humanism in education manifested itself in the study of the humanities. The humanities ranged from, in the beginning, a broad range of enlightened study to, toward the end of the 16th century, a restricted and narrow study of grammar of language and literature of the ancient world. During the beginning of the 14th century, the study of the humanities had broad intellectual and scholastic implications. It meant the study of learning concerned with human ideas and values, the social sciences, and the intellectual role of man in the physical and natural environment. It was rooted, not in the esoteric irrelevance that the previous Medieval religious clergy had become mired in, but rather in a reasoned and physical approach to study. From this wide creative and intellectually challenging base, through the 14th century to the 15th century, emerged a restricted and narrowly focused study of extraneous grammatical and linguistic analysis of Greek and Roman literature and language. This narrow focus would remain, in the form of ciceronianism,[43] with Western education until changes in the 19th century uprooted its control of education. Both the original creative and then the subsequent restricted methods of study were called Humanism and was taught in the predominant type of school at the time, the Latin Grammar School.



Hans Holbein's Burgher school - 1516.

Originally, humanism surfaced in the universities early in The Renaissance but eventually moved into the growing number of smaller, community schools called the Burgher Schools.[44] As this movement started to stagnate, a small evolution of schools was to come into being - that was the court school of Johann Sturm in Strassburg in Germany in 1537. This school, called a *Gymnasium* appears to be the first school to develop a formal organized grade system of nine grades based on age

and advancement of the student. Although school advancement and age allotment existed from antiquity, this was the beginning of a regimented, more globally applied systematic application of *both* age and ability. The *Gymnasium* schools were still very much like the previous ages of schools where the predominant type of schooling was geared to religious studies through rote learning:

> "*... this was* [seen] *not in terms of any major change in the pattern of rote learning of classical authors, but simply as improving the grading of traditional studies and the correlative matching of the student's capabilities and attainment.*" [45]

Again it is interesting to look at today's schooling and realize that, as with many of the other noted throughout this report, this form of school advancement is still with us today.

During this time, the growth of the Guild Schools continued. They grew through The Renaissance and The Reformation and, to a great extent, flourished. The growth and support of the Guild Schools was so great, that along with the evolving universities, they became the great researchers of technical innovation and inventiveness. From these schools:

> "*... came emerging technologies and empirical sciences themselves* [which] *were instrumental in effecting change, although their effects were not felt immediately. The two most striking immediate outcomes of this trend were the invention of printing*[46] *and the great voyages of discovery.*" [47]

As we all know, the widespread use of the printing press and the explorations of The New World and the Passage to the Orient changed the face of the world forever.

Outside of the immediate realm of the school, the climate for change was strong and many changes were seen. One of these changes, which had been slowly creeping along for a few centuries, was the general demise in the role and respect of ecclesiastical society. During the later parts of the 15th Century, a person emerged who held a great amount of influence over scholars and the general population of the day. The one who wielded this power in the support of the growth of elementary schools and mandatory education for everyone was Martin Luther (1483 - 1546). Martin Luther was an important minister for the Church and became most famous during the early part of the 16th Century by penning a series of treatises called "Ninety-Five Theses". These theses were a public condemnation of the Church's current day corruptions and (reputedly) were posted on the door of a Cathedral to be found and read by everyone. With the advent of the printing press, the ninety-five theses were widely distributed and pushed the secular / religious divide ever

Martin Luther - 1483-1546.

wider. This publication won Luther wide acclaim and much respect - so much so that his teachings were read and formed a great part of the idealogy of the reform movement.[48]
Throughout much of educational history, from the Roman Empire to this point in time, Aristotelian thought dominated the sciences. Aristotelian thought expounded the "heavenly sphere's" concept of cosmology. That is that the earth is the immovable centre of the universe and that the outer sphere of the universe is geocentric, finite and continuously rotating. This papal sanctioned theory set aside breathtakingly genius advances by people like Copernicus (1473-1543) and his theory of a sun centred planetary system and the rift between evolving science and the church was made worse by the church's rejection of these advances.

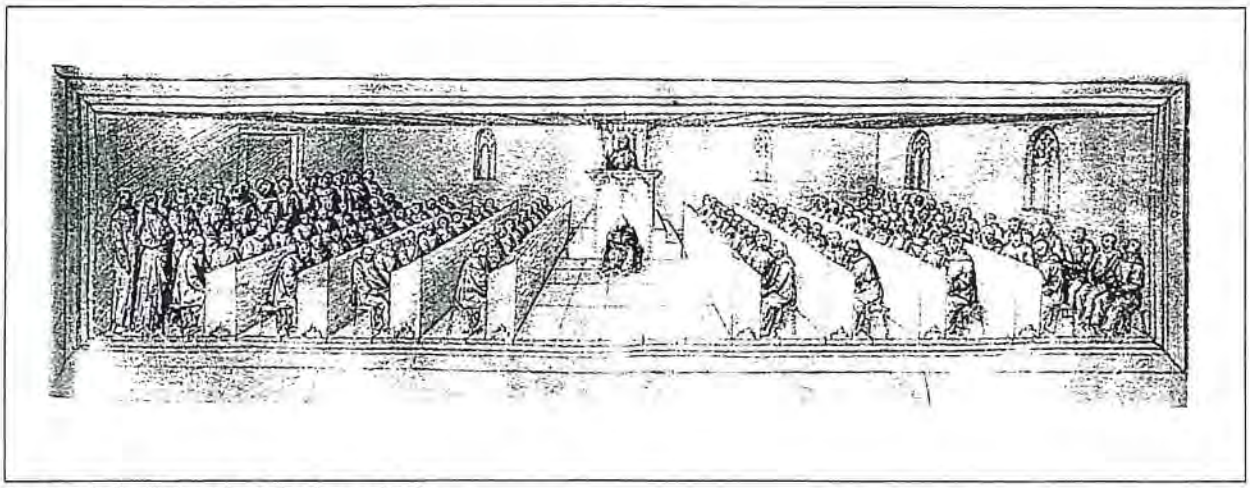
By the end of The Renaissance, the schism between church and state was reaching epidemic proportions. In England, Henry VIII disestablished the pope's authority, in Rome the papacy failed to return to its previous glory after the "Great Schism", in Florence claims of corruption brought abuses against the church and all over Europe the church was losing its significance and domination. This intense degradation meant that virtually all the educational control that the church had enjoyed over the last few centuries was disappearing. In its place came a strengthening state controlled secular education supported by a growing circle of influential private schools (England called them 'Public Schools'). These secular changes manifested themselves in the virtual demise of the ecclesiastical schools (Cathedral Schools and Monastic Schools) and the growth and progression of the universities into a more worldly, scientific system. Additionally, the state operated (and therefore secular) burgher schools grew thanks in part because of this ecclesiastical backlash but also in part because of increases in demand due to population and due to expectations of accessibility to education.

These important changes in intellectual thought and practical day to day living (including the souring of the Church's influence) were seen especially in the growth the period called The Reformation. The Reformation was a religious revolution that took place in Western and Northern Europe and involved the fight of society against the overbearing doctrines of the church. In England, this led irrevocably to the establishment of the Protestant religion with the sovereign head of England as the leader of the Church (The Church of England) and thus, by default, the definition of Roman Catholicism as a secondary religion in England.

One of the most important educational outcomes from The Reformation was the establishment of a universal programme of education and mandatory attendance for all children. This was the first time a mandatory education was provided and represented a fully cohesive education. This was important because it indicated that education was for all the people, not just for the religious or just for the well to do.

But as much as education was available to the masses, university and scholarly education was not excessively attended. In all of Germany for example, in the year 1503 a total of approximately 4,000 students attended university (including all the post secondary institutions).[49] At an estimated population of 7,400,000 people[50] an attendance to population rate of less than one percent (.054%) of students existed. This rate compares to our current Canadian rate of 3.36% of all peoples enrolled full-time in a post secondary institution. This is based on a population of 940,000 students in a (1995) population base of 29.6 million Canadians.[51]

As the period of the 16th Century drew to a close, the church fought back against society's growing



Lecture hall - University of Padua - c1500.

secular emphasis and the church's dwindling influence through the creation of The Society of Jesus - The Jesuits. This was to become one of the most influential groups in education in North America, and especially in Mexico, Latin America and Canada. The Jesuits set up strongly religious schools whose primary goal, again, was the progression of religion in general and the Catholic Church in particular. But its emphasis was no longer on serving the people through religion, it was now on leading the people to religion. Thus a new, aggressive approach to education was being formulated. The influence of the Jesuit's new assertive type of education was immense. Over the next few decades, schools were built at an alarming rate compared to anything hitherto found. Schools were soon found on five continents: North America, Asia, South America, Europe and Africa. Their strongest and longest impact, though, was in the Americas. Their influence was growing so much that by 1599 they formalized all their global educational systems into a fully formulated standard academic plan. It was named *Ratio atque Institutio Studiorum Societatis Jesu* and was the most widely standardized educational system of any kind up to that point in history, perhaps ever. It was centred around religious studies and was:

> " ... *more commonly abbreviated as the Ratio Studiorum (the Plan of Studies)* [and] *remained unaltered until 1832.*" [52]

The Enlightenment - Realism, Naturalism and Science in Education - 17th to 19th Century

It is at the end of the 16th Century, with the movement into the "The Enlightenment" that the formulation of our Western educational system is virtually complete and will remain unchanged over the next few hundred years. We do not see great leaps in pedagogy nor do we see great strides in educational delivery. Refinements in the general philosophy of education and great increases in the availability of general and universality of education are the primary elemental changes that occur during this period.

The Enlightenment, or the Modern Era as it is often called, was marked by a rejection of traditional social, religious and political ideas and heralded an emphasis on rationalism in the arts, politics and the sciences. This period of Enlightenment was particularly evident in England where tremendous

growth would exist for centuries, and it was particularly absent in France where sovereign reign held a stranglehold until the French Revolution in 1789. The Enlightenment's political climate was translated directly to the New World where France held extremely tight reigns on the growth and development of New France (and its education) while Britain took a more 'enlightened' approach by allowing the colonies to grow and evolve their educational systems autonomously from European influences.

The Enlightenment saw three main pedagogical approaches: Realism, Naturalism and Science.

Realism was evident in the 17th Century and was seen in a decidedly visible backlash against the ciceronianism that was still endemic throughout the school systems. Even though The Reformation had reduced its influence by adding new types of school systems (Public/Protestant), the emphasis in study was still predominantly Latin grammar. Realism brought a new curriculum that emphasised the physical, moral and social development of the students. This was still centred around the study of Greek, but study focused on Greek scholars by concentrating on their philosophies as opposed to their literature and grammar. As was true of most of education since Antiquity, the purpose was still religious:

> "*The ultimate end of man is eternal happiness with God.*" [53]

Naturalism grew during the latter parts of the 17th Century and most of the 18th Century and was a recognition of the increasingly important role education had in the rise of democracy across Europe. Governments were creating national educational programmes in attempts to promote the democratic trend and educational systems focusing their educational thrust around the growth and development of democracy. This trend was particularly evident in Britain where a modicum of success was seen in the growth of free schools for the poor, and the changes of the general thrust of universities to democracy based studies.

Science became an important element during the latter part of the 18th Century and into the 19th Century culminating in the period called The Industrial Revolution.[54] The great push for technology was so strong from the incredibly influential entrepreneurs (the new factory owners) that this translated directly to changing curriculum at the schools. Influence from business was a new phenomenum to schools and manifested itself in pedagogical shifts toward a science based curriculum. This was particularly true in Britain where the Industrial Revolution started. This time also saw the growth of a new type of school, called Infant schools which are our modern Day Care.

Concomitant with The Enlightenment, the powers of Europe were expanding across the World. This expansion found countries like Britain, France and Spain in lands such as Asia, India, Africa and the New World. With this expansion, systems of government, education, economy and all manner of societal values followed explorers around the world.

Education in the New World - A Microcosm of Pedagogical Evolution - 17th to 19th Century

Our historical summary will conclude with the North American educational evolution and special emphasis on our own Canadian system. While it is true that European and North American educational systems did not parallel each other during this time, it is fair to say that the methods of delivery, pedagogy, and sponsorship were somewhat comparable. The development of North

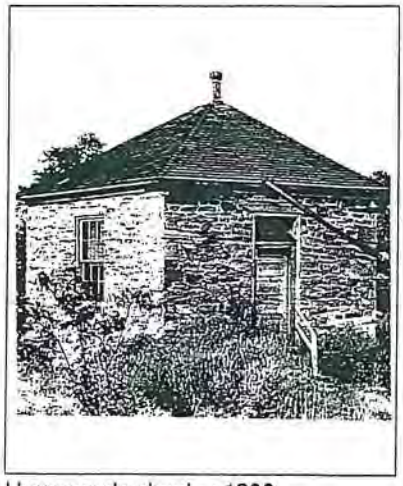
American education, which parallels European education, however is largely seen as the development of the education in the United States.[55]

The colonisation of North America began in the 16th Century and really took a foothold in the 17th Century with the primary countries who influenced education in the New World during this early settlement period being Spain, France and England. The first English colony to prosper was Jamestown in 1607 and in 1620 the Pilgrims arrived on the Mayflower.[56] The *Compagnie Des Cents-associés*[57] was established to promote immigration to New France (Quebec) in 1627 and the Puritans arrived on the east coast of the United States in 1628.

Tremendous effort had to be put just into surviving for these very earliest of settlers, but even with hard colonial times, the Spanish and the English saw an immediate need to establish institutions of higher learning - universities. The French did not immediately start to build but eventually followed with a few small universities. Some of the more notable early schools in America were: Harvard (1636);Yale (1701); William and Mary (1693); Princeton (1746) - and in Canada: Laval (1660); and *Collège Des Jésuites* (1635).

As was the case in Europe, when schools did start to develop, the Catholic and Protestant churches continued to have great influence over education. This influence was so strong that when the schools were set up, their sole purpose was again the training of priests for the vocation. This was principally due to the English, French and especially the Spanish seeing the growth of education and religion as an opportunity to inculcate their traditional cultural values. This manifested itself in a (relatively) large number of schools being built in the very early years of colonisation. To allow and support educational growth, two slightly different approaches were used: (1) the English who were somewhat more lax and less bureaucratic let the schools run autonomously; and (2) the French and the Spanish who both approached the New World with control and domination, completely controlled all aspects of education in the New World.

After the initial strong building spree of schools was completed, around 1750, the expansion dwindled and virtually stopped altogether. One of the problems with the early school development was the availability of books. Throughout the original colonies of North and Central American, there were no publishing or printing facilities. All printed matter and educational supplies came from Europe. This was a very slow and costly exercise and was frequently relegated to lower importance compared to the settlers' basic needs. Therefore the most important element of a school (books) was greatly lacking in the New World. This meant that the development of a library became one of the crowning glories of a school. Books generally became the most expensive element in education and a very precious commodity and one can see that aura of importance is still present in many of the older school libraries today.


Hexagonal school - c1800.

In the United States, responsibility for education rested with the individual states, while in Canada, the responsibility for English education rested with the territories (provinces) and French education rested with France. It was through a strong sense of family, a strong commitment by the British to allow autonomous

educational rule, and a weakening ability of France to support educational growth that created an environment for a predominantly family based Canadian education:

> "*During the 18th and Early 19th Centuries, the family remained the unrivalled setting for education; few children in what was then British North America received formal instruction either from tutors or in schools.*" [58]

Regardless of the early development of some very notable universities (Yale and Harvard) and thanks to the lack of printed matter, the economic uncertainty, a labour intensive economy and social and early settlement growing pains. Only a very small handful of schools were built through the first hundred years of colonisation even though a slow growth in the number and location of schools was seen in all school levels throughout Canada. A singly important development during this period was the push by the English to gain control over the strong French presence and their desire to promote cultural identification with the Protestant religion, English law and British customs. This push was manifested in the growth of English schools and the development of mass English schooling. Toward the end of the 18th Century and well into the 19th Century, the influences from the European and British Industrial Revolution were just starting to be felt in Canada and this saw great growth in the number and level of schools. Both the French and the English continued their religious and secular support of education such that two equal, but different forms of education resulted: the Public and the Separate. Both these two systems saw the need for expansion so they increased educational support. This continued growth was so great that toward the end of the 19th Century, the number and availability of Canadian schools (and certainly American schools) began to rival that of Britain and the rest of Europe.

An interesting nuance in the progression to our uniquely Canadian system of education was an early rejection of the American system and its materials. This anti-Republican stance was seen in the rejection of American teachers, school books, and capitalistic, self righteous republican based anti-monarch society. Because of our early anti-American leanings we imported great amounts of British (for the English Protestant schools), Irish (for the English Catholic schools) and French (for the French Catholic schools) textbooks, teachers and educational strategies. With the development of (relatively) strong publishing and printing systems helping to standardize Canadian texts and courses, the growing base of highly educated people spawned a slowly expanding recognition of the Canadian student as a highly educated student.

Perhaps one of the saddest outcomes from our Canadian educational approach, was the Native Canadian Boarding Schools. These schools, more commonly referred to as Residential Schools, started out in the early part of the 19th Century and flourished in the early part of the 20th Century. They grew from the mentality of the earliest schools set up by the Jesuits such that they were geared to impart Western culture and religious mores. The schools have recently come under intense political, criminal and educational scrutiny because of alleged and proven moral, physical and psychological abuses so that the Canadian governmental approach to native education has changed over recent history evolving from a separate and conquer attitude to recognizing Native educational needs.[59]

Apprenticeship, in the guise of Guilds, held a much less important role in Canadian education, however formal apprenticeship from Canadian colleges, family agreements with craftsman and professional associations were well respected and used. The apprenticeship approach to gaining

an education is still very prevalent today, as evidenced by a combination of school curriculum and field work seen in trades such as electricians, plumbers and such professions as architecture and computer sciences. These variously are called co-op programmes or apprenticeship programmes but never-the-less, still contain the mentor / student pedagogy.

Early 20th Century Canadian Education

The period in Canada immediately after the impact of The Industrial Revolution and before the current time saw the growth of education on three distinct fronts: (1) continued changes from ecclesiastical studies to the sciences, humanities and economies; (2) continued intense growth of the number and availability of schools; and (3) a preponderance of girls in every facet and every type of school.[60]

By the late 19th Century, virtually the only reason girls attended school was to either learn Home Economics or to learn religious studies. Through a push of universality, and the onslaught of the first World War ,the demand for girls' education grew.

The split between public and separate schools remained, although the bureaucracies that were in place to govern them slowly began to look more and more alike. Compulsory attendance was legislated (except in Quebec) in the latter 19th Century and then in the early 20th Century in Quebec. Literacy in Quebec was far below that of the rest of Canada until the 1960's "Quiet Revolution." [61] The most important change during this time was the royal commission report about Quebec education called the Parent Report. From this report came the recommendation to change the Separate Schools' sponsors from the Catholic Church to the government. This hotly contested issue was finally adopted in 1966 and soon tremendous amounts of money was poured into Quebec education. The Quebec population went from the lowest literacy rate in the country to one of the highest boasting one of the most universally available educational systems in the world.

Pressures from the Baby Boom saw another immense increase in the number of schools and a continued emphasis on sciences, maths, humanities and economics which lasted clearly up to the late 1970's.

History of Education - A Summary

To summarise educational history in a few short paragraphs is virtually a fruitless task. We will highlight only the briefest of the "what". A move detailed overview can be had in the previous portions of this report Section.

In brief then, the earliest evidence of any educational teaching is inferred from the growth of stone cutting tools which were first evidenced in The Stone Age of about 100,000 years ago. Because of the growing use of stone cutting tools and their growing complexity, scholars believe that early Neanderthal man taught his young. This is believed to be a familiar type of teaching (parent to child).

The Copper Age saw the growth of metallurgy and the development of more complex and productive farm tools allowing man some free time. Temple and religion truly began during this time with the first written language and the first classroom (circa 2000 BC in Mesopotamia) being developed during this epoch. During the evolution of Mesopotamia, education and social structures flourished.

This blossomed until the rise of the Egyptians who created their own form of written language called hieroglyphics. This was a very cumbersome and difficult language to learn and for the first time, took education out of the hands of the everyone's day to day, and planted it firmly in the hands of the upper class and elite. Only the very learned and the very well to do were to learn the fine art of reading and writing and were the only ones to see any form of education. Oddly enough, Egyptian math was very simple and was eventually entirely replaced by Greek Intellectualism.

Greek education (c1000 BC to 146 BC) is seen as the classical time of education and philosophy, bureaucracy and mathematics really began during this time. The first formal schools were started during this period (the Rhetorical and the Philosophical schools) and Aristotle and Plato developed an early version of the university in a school called the Academy. The Academy ultimately, in the Middle Ages, found its final form in the University of Athens.

Greece was conquered by the Romans in 146 AD and this began the first truly comprehensive bureaucratic pedagogy. With them, the Romans brought order and hierarchy to the schools of the time. They educated every one of their soldiers and in this way, brought education to many more people than the Egyptians or the Greeks ever did. But because of the Roman's general social and moral demise, so too did education run a downward spiral. Virtually the only thing taught in schools, by the end of the Roman Empire, was Oratory - the art of public speaking. Oratory, though, died away with the coming of the Dark Ages.

Were it not for religion, education and written word may have altogether disappeared during the Dark Ages and the Late Middle Ages. It was monks like the Benedictine Order of Monks that cloistered themselves away yet maintained libraries and schools. The sole goal of these schools and libraries was the advancement of religion, but it was none-the-less education and a manner of maintaining an historical account of man's endeavours. These Dark Ages lasted from the 5th Century to the 9th Century and grew into the period called the Late Middle Ages.

This period saw the control of education remain firmly in the hands of the clergy but this period was a time of growth like never before. Population, exploration, invention and all manner of human endeavour flourished. From the 9th Century all the way up to the 15th Century, education grew and expanded. During this time, the push from business and commercial interests pressured the church to change their goal of education from ecclesiastical to secular ends. Two enormous outcomes from this business push were: (1) the creation of Cathedral Schools which ultimately led to the first universities like Notre Dame in Paris and Oxford in England; and (2) the proliferation of Guilds (like the stone masons) which eventually led to colleges and apprenticeship type pedagogies. This period was truly quite an epoch in the history of education and flourished up to the 15th Century and the Renaissance.

The Renaissance saw a retrenching of religious control over education and a general lack of acceptance of new and innovative ideals. While geniuses like Michelangelo and Da Vinci roamed the streets, equal giants like Galileo were locked up because of (what was seen at the time as) their anti-religious and heretical claims about the earth revolving around the Sun.

Along with the Renaissance's suffocating of intellectual discovery came a growing schism between the church and the state / between secular and ecclesiastical interests. This schism cemented the division between the Cathedral schools (higher education, universities and religion) and the Guilds

(vocational education, colleges and secular interests) and both these forms of schools would remain virtually unaltered until the Industrial Revolution.

The time between the 17th Century and the 19th Century was a time of "enlightenment" which manifested itself in the tremendous growth and acceptance of science. This laid the groundwork for the growth of the world into the Industrial Revolution. But while Europe was readying itself for the Industrial Revolution, North America was floundering in the wilderness. Some universities were built in the early stages of colonization (circa 1600's) education quickly became apprenticeship and familiar based and would remain so up to the Middle 19th Century.

In Europe, originating and having the greatest influence in Great Britain, was the Industrial Revolution. The greatest movement of people in man's history occurred at this time because of the Industrial Revolution. Educationally, elementary schools became mandatory to offset child labour problems and the number of schools exploded to compensate for the need to educate a huge workforce and allow 2 parent families to both work during the day.

In North America, great influence was being wielded by religion. Education slowly grew from the family based type of learning to a more government governance. This evolved slowly and parallelled the Industrial Revolution as it swept into the Americas. Eventually Government replace the family as the main educational deliverer and so education then became a struggle, as was seen in Europe, between religion (generally Catholic) and government (public). The influence from the Benedictine monks was felt in Quebec most strongly and remained a force up to the Parent Report in the 1960's where education, regardless of religion, came under government control in Quebec.

Change in the Americas quicken to catch up to pedagogy in other parts of the world such that traditional education today is very comparable everywhere, especially in the Western and developed countries.

Thus far in the report, we have looked at the history of education and highlighted accounts of changes in educational delivery, pedagogy and sponsorship. We have seen that the evolution of education from the earliest man to the 20th Century modern man followed a series of changes that eventually coalesced into what is essentially a world standard educational format. We have seen a development in learning and teaching skills grow from the very first humans up to the refinement of educational delivery. We have seen the growth from nomadic familiar teaching to precise, hierarchal, and systematic administrations. We have seen the establishment of degree granting, age and grade evaluation, and the creation of elementary, middle and university level schools. We have seen a shifting secular / ecclesiastical sponsorship and its resultant transformation of its (still shifting) goals.

We have seen the evolution of formal and informal apprenticeship programmes and the growth of colleges and universities. We have seen the growth of the small and informal Monastic Schools up to the great Cathedral Schools and then back to the suburban Burger Schools. We have seen the division of schools along secular and religious lines and we have seen the creation of state, religious and private sponsored schools. We have seen the division between scholarly universities and vocational / technical schools and the first evolution of globalization of educational pedagogy. We have seen the creation of Day Care Centres and the evolution of school goals to a more humanistic and science emphasis. And finally in Canada, we have seen the initial retraction from colonial universities into a predominantly family based educational system which then and eventually grew

into the development of a universally available, province sponsored school system which is comparable to that which is found anywhere in the world.[62]

We have briefly seen the seminal events in the development of education and from this review we can draw some conclusions.

The first and most pervasive conclusion is the ever present desire on the part of the educational systems to keep status quo. It is only through major upheavals in economics and the underpinnings of society itself that tend to alter the what and the how of education. We see this in two major epochs: the shift from the Dark Ages to the Middle Ages and the shift from the period of Enlightenment to the period after the Industrial Revolution. Changes in the form of shifting sponsorship from religion to government, emphasis on the science and intellectualism rather than ecclesiastical and vocational studies and increases in the number and location of the universities to accommodate shifting economic centres are also seen. But it is exactly the lack of drive and initiative to make these changes that draws the conclusion that school administrations and school pedagogy is slow to react, and slow to change. It was not an aggressive, forward thinking school system that started to offer secular studies instead of only ecclesiastical studies . It was the general population that was turning their back on religion in every form of life that pushed the church's back up against the wall in a do-or-die kind of attitude. They either made the change and offered what the world wanted, or they let the secular universities take over.

The evolution into the Industrial Revolution was a long time coming. The education system of the previous epoch was in transition from the Latin Grammar schools, which we have seen offered little of substantive education other than Latin studies to a more practical education. But it was only through the push of business and the new entrepreneurs that the old schools started to change. And finally, we see the push into the New World and the immediate adoption of the status quo from the Old World. The first schools which were built were smaller versions of the ecclesiastical universities in Europe. It was only through the sheer need to make a new life in a harsh New World that slowed the push of the universities to allow a couple of hundred years to pass before getting back into the business of educating students.

The second conclusion that we can draw from our historical review is that one of, if not the, prime catalysts for substantive educational change is business. The economic booms of the Late Middle Ages and of the Industrial Revolution are excellent examples of this. The push from business during the Late Middle Ages meant a weakening of the clergy's stronghold on education, the creation of Guild and vocational colleges and the mass availability of access to education.

The Industrial Revolution also created tremendous change in educational delivery and pedagogy. Unheard of growth, mandatory attendance, child labour laws, university and universality and mass educational acceptance forever changed education.

Through epoch changes like these, we see that education, while changing and growing, does not do so without great influence.

AN HISTORICAL PERSPECTIVE - TECHNOLOGY

SECTION TWO-C

"Built environments are more than shelter. Built environments, in fact, have various purposes: to shelter people, their activities and possessions from climate, from human and animal enemies and from supernatural powers; to create a humanized, safe space in a profane and potentially dangerous world; to establish place; to stress social identity and indicate status; and so on. Socio-cultural factors in the broadest sense are thus more important than climate, technology, materials and economics in influencing built form. In any situation it is, of course, the interplay of all these factors which best explains the form of environments."

Amos Rapoport

2.4 HISTORY OF TECHNOLOGY

Introduction

The history of technology is really a history of man's discovery and of man's growth. In this light, it is truly a history of how various influences have impacted and changed man. When one looks at how technology affects and leaves its effects on man, one can look at virtually any field of development and see an impact. In this report, we concentrate on the impact of technology on education. While not every change in technology impacted the evolution of education or on school buildings, similarly, it is true that not every change in education was necessarily directly caused by inventions and growth of technologies. It is from this somewhat interrelated cause and affect that we study technology over the ages.

Definition

In the Introduction section of this report we defined technology in our context to mean predominantly higher and electronic technologies - ie computers. But while this definition in our context may apply throughout this report, over the millennium the term has meant more generally those elements that assist man. And so in our historical review, we must redefine what we mean by technology.

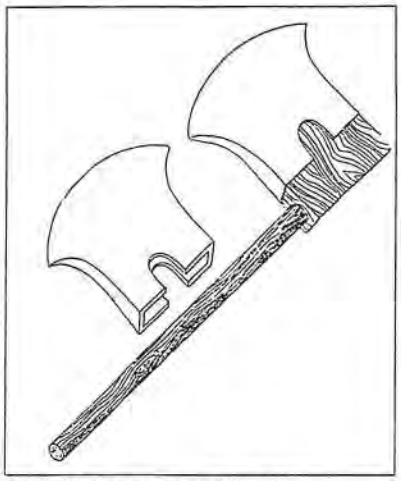
A general definition for the term "technology" can be:

"1 *scientific knowledge applied to practical uses; applied science: Engineering is a branch of technology.*

2 *the system by which society is provided with the things needed to sustain life or desired for comfort.".*[1]

A further definition, perhaps more timeless is:

3 *"... improvements in technical processes that increase productivity of machines and elements of manual operations or operations done by older machines."*[2]


Early technology - c400 BC.

Under these definitions we see that ancient pre-historical artifacts are regarded as technologies. The term technology can and does refers to both machine advancements, electronic computers and any implement of assistance to man. Thus the working term that will be used in our context will be any time saving development as a technological advancement.

Historical Context

To put man's technological evolution into perspective is a sobering reminder about how short a time we have been here on this earth. It is amazing to look back and see how we have been able to wield such enormous earthly power in so short a time:

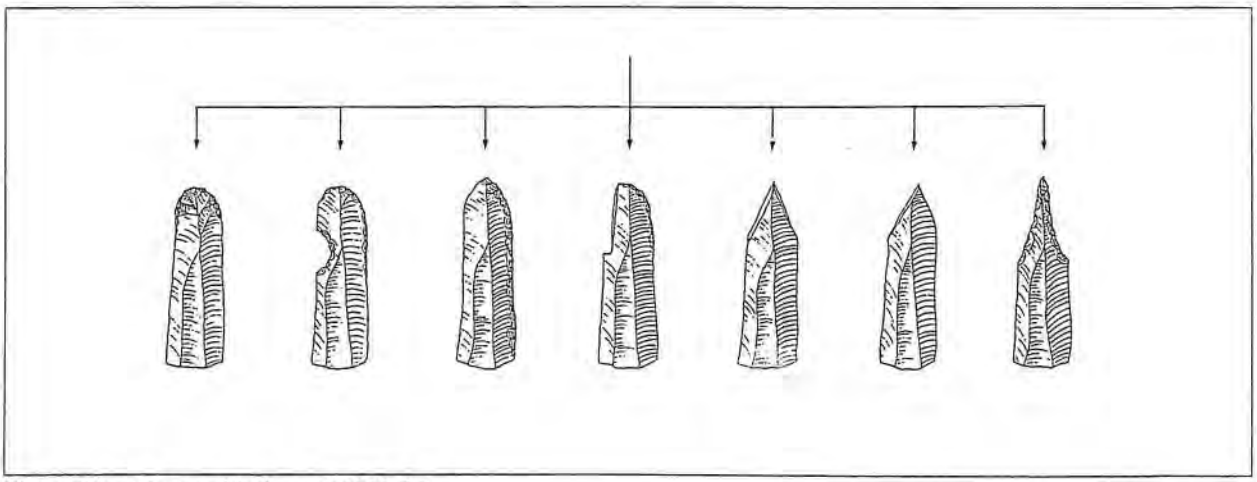
" ... scientific and industrial progress ... has been achieved in an extraordinarily short period in history. Scientists tell us that the earth is about 4 ½ billion years old. Imagine this period represented by a 24-hour earth clock. The first faint traces of life appeared at about 2 p.m. (1400 hours). The dinosaur showed up at about 11 p.m. (2300 hours). And the human species? Man finally made the scene at two seconds before midnight. The entire last 6000 years of human [technological] *endeavour have occurred in the final one-tenth of a second.*

Within that tenth of a second, it took man 1750 years from the year 1 AD to double his technological knowledge. A mere 150 years later, by the year 1900, he had doubled his knowledge again. the next doubling took only 50 years (1900-50); the next, ten years (1950-60); and man's knowledge has quadrupled during each of the last two decades." [3]

The Stone Age - The First Technologies - Mans Beginnings to 8000 BC

The further one looks back in time, past Antiquity and on to pre-history, the less and less artifacts and remnants of past civilisations exist and the more we need to rely on archeological supposition, inference and conjecture. In looking at the evolution of education this is certainly true. But, in looking at technological advancements, there is less room for error. Archeologist have found remnants of tools, villages, day to day condiments and all manner of items which speak specifically to the technological ability of early man. It is true that because wood and other organic materials decay over time, it is impossible to say whether technology existed previous to that which is known through the remains of rocks and stones but it believed that the first stone tools were the first technologies.

Evidence of man's first technology is attributed to the Lower Palaeolithic Period of around 2 million years ago to about 500,000 years ago with the use of cut stone tools. The Stone Age, which is more formally called the Palaeolithic Period has been subdivided into three major subcategories:[4]



The making of stone blades - c25000 BC.

Palaeolithic Period / Old Stone Age The earliest period of human development and the longest phase of mankind's history. Beginning about 2 million years ago and ending in various places between 40,000 and 10,000 years ago, This period is defined by the evolution of man from an

apelike creature to the true bi-pedal Homo Sapiens we are today. The following three periods form the Old Stone Age:

> Lower Palaeolithic Period: this period ranges from about two million years ago to about 100,000 years ago[5] and is best known for being attributed with the oldest recognizable tools and eventually the development of the first complex tools in the form of axes with wood handles and stone heads which date to about 230,000 years ago.
>
> The Middle Palaeolithic Period: this period ranges from between about 100,000 years ago to about 40,000 years ago. It is best known as signifying the rise of Neanderthal man - Homo Erectus - who is important as he was the first example of man using fire. Neanderthal man also painted their dead for burials, so the first form of religion has been attributed to these people.
>
> The Upper Palaeolithic Period: this period ranges from about 40,000 years ago to about 10,000 years ago. Homo sapiens such as Cro-Magnon man and Grimaldi man replaced Neanderthal man. This period heralded the beginnings of small communal hunting and fishing community groupings. Also important was the first evidence of a belief system (magic and supernatural). Evidenced too in this period was man's first man-made shelters and sewn clothing.
>
> The final stage of the Upper Palaeolithic Period is the Magdalenian Period. This is the final and arguably the most important phase and ranges from about 13000 BC to about 8000 BC. Large growing communities of fishermen and hunters are the most striking achievement of this period but the most important historical achievement is the cave paintings. These cave paintings - the earliest having been painted in France around 13000 B.C. - are the culmination of Palaeolithic art and are proclaimed as the preeminent evidence of man's earliest ability to think abstractly. The cave paintings show bison being hunted down with complex tools and complex hunting strategies and shows the first evidence of man using multiple stages of planning to achieve a goal.[6]

Based on archeological analysis, scholars have pieced together an understanding of technological growth from this period. The emergence of tools not only foretold man's control over earth, but is also seen as the first evidence that man was now learning and teaching. Through the advent of these first tools a need to "learn" how to use them is evidenced. If a society or community in these early millenniums was to benefit from a new technology (ie a tool), many in that community would need to know how to use these tools. Not only that, but they would need to learn how to make more of these tools to support the population and also would need to know how to develop better versions. This necessitated that man needed to teach and that man needed to learn.

With the advent of technology, one of the essential factors which led man to the need to learn was brought about. Therefore technology was an essential catalyst in the growth of early man's education and therefore the development of tools is then the first milestone is man's education .

The Copper Age - Mesopotamia and The First Written Language - 8000 BC to 500 BC

The Copper Age was so named for its discovery of copper. Tin ores, gold and eventually bronze and silver were also discovered and therefore this age is notable for its development of metallurgy. The Copper Age was a time of great growth in the use of tools and technology which led to changes in society, the economy, culture and education.

Between 8000 BC and 2000 BC, the population and economy in the Ancient World grew as never before. This was because of a number of factors, three of the most seminal being: (1) the domestication of grains such as rice, wheat and barley around 8000 BC; (2) the development of tools to harvest the grains (the sickle and hoe) and to plant the grains (the plough) around 6500 BC; and (3) the creation of the first written language (before 4000 BC).

Collection of scrap metals - c1000 BC.

The development of domesticated grains meant greater control over the food harvests which necessitated the development of the sickle and hoe. These allowed greater amounts of food to be made available to greater numbers of people. Everyday living up to this point was mostly day to day, but with domesticated grains and implements to economically harvest the crops, larger populations could be supported and hence, villages evolved and grew. The great increase in food production necessitated the storage of foods which necessitated the need for recording and cataloguing the food - hence a written language.

An inventory tablet from Mesopotamia - c3000 BC.

Writing was used to identify and catalogue these stores of food which were housed in the religious temples. Food was placed into pottery containers and sealed and left to be re-used later when the need arose. To keep track of this, the first written language, called cuneiform, was created. It was a series of graphics scratched or etched onto wet clay which would then be stamped into the seal of the pottery, designating its contents.

Copper is obviously central to this era. The first copper smelting site was built in present day Yugoslavia around 4500 BC[7] but the actual date of discovery of copper is unclear. It is believed that the discovery of copper was a result and by-product of the kilns used to cure pottery. By placing raw metals into the kilns (perhaps done to produce a colour dye for personal decoration) a poor grade of

copper was produced.

Looking at the discovery of written language and the discovery of copper, both were soon put together to produce an relatively efficient way of repeating a graphic. Copper was used to create a "negative" form, into which the unhardened seal for containers was placed to create a graphic relief on the seal. In this manner an early printing press "stamping" machine was created. This of course is common practice today, but was a significant advance at the time. Eventually Mesopotamian's written language of cuneiform graphics was replaced by the Egyptians' hieroglyphics, however the method of a positive / negative punch used to produce this written language remained in use up to the development of the printing press in the 16th Century.

In the area of Mesopotamia, around 3500 BC, another tremendous technological advance allowed further growth of the villages and efficiencies of farm land - the first system of irrigation. The Mesopotamians created dykes to funnel river water which had been flooding over the land, effectively creating the first system of irrigation. This was a tremendous boon to agriculture allowing crops to be planted earlier in the season which produced, rather than one poor harvest, produced two bountiful harvests.[8] The importance of the development of irrigation cannot be understated. This was a seminal discovery which allowed man for the first time to be able to affect and manipulate his environment on a large scale. This truly heralded the emergence of man's domination of the earth.[9]

The final important technological advance that occurred during The Copper Age, even though it did not have a great impact until the Romans exploited it, was the wheel.[10] The wheel was first developed around 3500 BC and saw very limited use on two or four wheeled wagons.

These factors all grew to support great growth and stability in the Mesopotamian empire. As noted in the History of Education section of this report, changes in society and the development of the first passive student / active teacher classroom occurred by 2000 BC in Mari. The growth of the economy further supported schooling as more time was available to devote to teaching, rather than just finding food to live.

Egyptian Advancements - Less Than Meets the Eye - 3000 BC to 1800 BC

Although the Egyptians left one of the most impressive groups of structures in the world - the pyramids - they did not advance technology tremendously. Egyptians tended to use the technology available to them, in the form of metals, the wheel and agricultural implements. They refined their usages and applied them on large scales. But they did not spend much energy in coming up with new technologies nor new applications for existing technologies.

As has been noted, the Egyptians developed a written language called hieroglyphics. This was a derivative of the Mesopotamians' cuneiform language and re-recreated written language into a very complicated, subjective and changeable - and therefore very exclusive - form of language. This effectively placed all the knowledge of writing in the hands of the rulers in their scribes.

Of the building of the pyramids much has been written. We note here that the process of building did not appear to incorporate the technology of the wheel. The large stones building blocks, weighing upwards of 2 tons each, appear to have been pulled along the roadway by a large sledge with runners[11] with only brute strength used to manhandle these huge stones into place. Thousands upon

thousands of slaves were used.

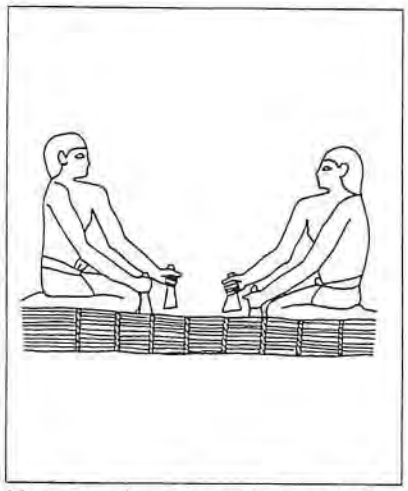
The pyramids of Giza - section and aerial view - c3000- 2000 BC.

This brings us to one of the most odd axioms of technological growth - where cheap labour (slaves) are in abundance, technological growth is curtailed, if not altogether stopped. During the time of slavery, which has been with most cultures at one time or another[12] - the need to make work easier and more efficient was not important. All that was needed to produce more was to throw some more people (slaves) at the problem and it was usually solved. While this state was true of the Egyptians, it was more accurately described for the fall of the Roman Empire:

"Historians reviewing this state of affairs, this falling-off in the rate of technological innovation, have tended to attribute it to a number of causes, the first of which was the widespread use of slave labour. The dirty end of production, it is argued, was put entirely into the hands of slaves, and increased output could be achieved only by one of two means: either by acquiring more slaves or making those that one had work the harder. Since it is not in the nature of slaves either to invent new means of production or to exploit new materials, the possibility of any further technological development came to an abrupt end."[13]

One of the more important technological advances brought about by the Egyptians during this time was the development of papyrus rolls - the forerunner to paper. Papyrus is a reed ubiquitous in the Nile River delta and was made into paper-like rolls by placing perpendicular horizontal layers of the reed on top of each other and then beating the reeds until they were flat and entwined. This fused the layers producing the paper-like material. This led to the use of inks and writing instruments in lieu of the previous "stamping" seal process or wet clay etching process. This allowed the Egyptians the ability to record large volumes of information in a relatively easy to use and small format. But with the type of language in use at the time, the use of the rolls was strictly for the very well to do, and definitely not for the masses of people.

A very important, influential and lasting development brought on by the Egyptians was a standard method of measurement. The use of typical body parts, while somewhat problematic for its non-perfectly standard size, was the first widely used method of measurement. For the most part, the system is still in use today in some countries. It was based on the hand, foot, fingers and forearms. While variations of this system existed throughout the Ancient World, the Egyptian system appears to have survived almost intact. The development of a standard unit of measure, as well as the development of the papyrus rolls, led eventually to a supportive roll in the standardisation of approach to elements, including education.



Men preparing papyrus by beating it - c2500 BC.

Two final important technological developments evident in this era, but not exploited, were the wind driven (square sailed) ship and the wheeled chariot. Egyptians developed the sail boat as the first example of a ship using large foils cupped to trap the wind. This added considerably to the attainable distances and speeds of the Egyptian ships but was not used to great advantage. The development of the chariot, from the use of the wheel, was also an important element in that man had not, up to that point, used animals and wheeled vehicles for transportation. But again the dichotomy existed in both these technologies. The faster and longer travelling ship, as well as the chariot were used, almost exclusively, for the deployment of armies and in battle. The exploitation of a method of commercial transportation was not seen by the Egyptians. Widespread economic, agricultural day to day use of the wheel was not exploited until the Romans developed an advanced roadway system.

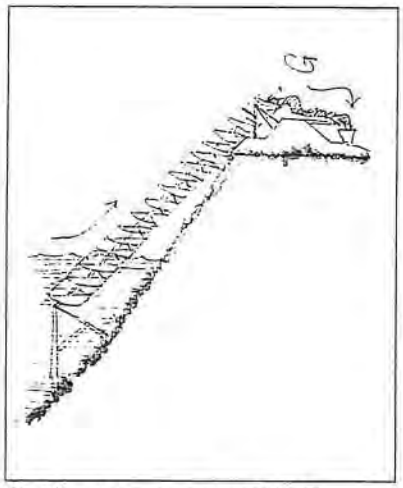
Egyptian chariot - c1200 BC.

The Greeks - Refinement and Innovation - 1000 BC to 146 BC

As has been noted previously, the Greek epoch was a time of enlightenment and intellectualism. Similar to the Egyptians though, it was in this climate that the Greeks developed only a few true technological innovations. Developments during the Greek time were primarily geared around artistic and intellectual pursuits and with the existence of slaves, the beneficial and supportive climate, and the relative peace of the region perhaps, slow technological advancements resulted.

Some very important discoveries were made, though, at this time. One of the most important was

the Archimedean Screw.[14] This was a new and extremely efficient method of extracting water from a river up to a higher elevation and led the way to greater agricultural diversification. The Archimedean Screw is a simple device made from a cylinder which houses a continuous screw. By placing the lower end in water and by revolving the screw, water is raised to the top. It allowed the peoples of Greece to inhabit higher levels of the island while still maintaining a high degree of farmland nearby. The device may have led to the propeller for the form of the curved and turning shaft coupled with the application of the movement of water, are very closely related.



Archimedean screw - c500 BC.

With the growth of intellectualism came an interest in refining existing elements and also of trying to understand the environment. Philosophy and astronomy were essentially invented during this time and this desire for understanding led to great strides in, among other things, metallurgy. Trying to understand the processes of chemistry and metal usages led to the development of iron and high degrees of purification of copper and bronze and silver. With the development of iron, a much harder material than copper or bronze, came the ability to cut stone more accurately. This led to the ability of the Greeks to create some of their intensely beautiful architecture through the extreme accuracy of their tools and the extreme high finish possible on those materials. Increased mathematical precision, brought about by the study of the great scholars, could start to be, in some small way, manifested into physical existence because of the new tool material. Further developments in the smelting and manufacturing process of iron implements led to new uses of the metal materials. Not only weapons, but day to day tools, wheels, bowls and all other manner of articles have been found that were made from iron during this period.

Standard tools which allowed accurate measurement were now possible. Two of the most notable during this time are the gromar and the sundial. The first was the gromar which was a series of finely manufactured right angle crosses with weighted bobbins at each end of a series of strings. These gromars were in use through much of the known world in the building process for creating right angles but it was the Greeks who first devised a method of using it to assist in naval navigation. Greater distances, more accurately travelled were now possible, helping to expand Greek horizons. This development could not have been possible without other intellectual advancements at the time, namely astronomy and mathematics. The second tool was the first accurate time piece, in the form of a sundial. This technology made use of educational advancements and made reasonably accurately predictions of changes in the seasons while still maintaining accurate day to day time.

So it is that the time of the Greeks can be seen to be a synergistic type of innovation. They tended to take existing or new thought, combine it with existing thought, to produce new and beneficial technologies.

One of the most lasting innovations that the Greeks were to give the world, again a further refinement on an existing idea, was coin money.[15] While China used unmarked nuggets of metal for trade as early as 1000 BC, it was not until the Greeks embossed a refined standard sized coin that money began to replace the chattel type of barter economy. The coins were essentially of a

guaranteed weight and purity and thus reimbursable for other goods. It soon became the standard of acceptance for traders the world over - very analogous to our current "gold standard" today. Silver was the material of choice and was prized for its consistency and highly refined manufacturing process. This would not have been possible without the highly refined metallurgy processes brought about by the advancement of educational knowledge in chemistry. Thus again we see one area of study supporting a second area of study.

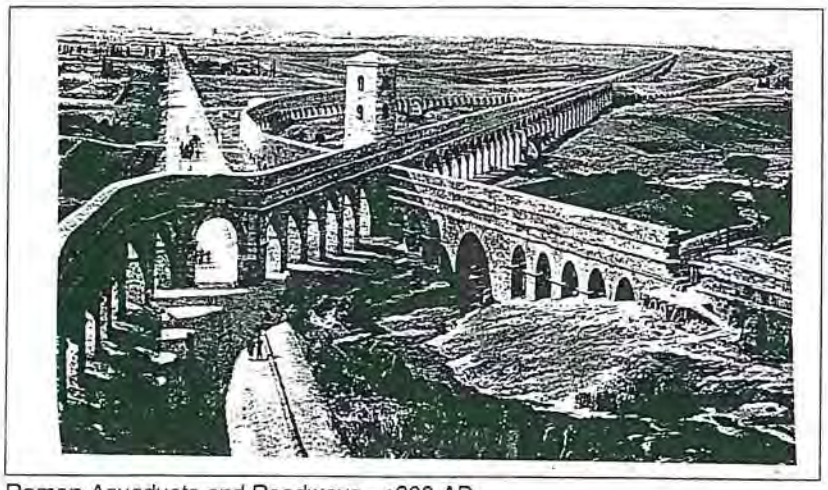
As is true of most of the Greek developments, intellectualism was paramount. In 323 BC, Ptolemy created what appears to be the first research laboratory at the Museum of Alexandria. In time, its museum and library would become the most famous in the world. It was here that Hero, Strato and others appear to have created the first text book on engineering. The unfortunate issue with the museum is that many of its interesting and potentially great discoveries were more seen for their educational value, rather than their economic opportunities. One good example of this is the development of a very early steam engine by Hero. The engine used the process of heating a volume of water to produce high pressure steam to affect a mechanical advantage on an item. This process did not change from this point up to when the British exploited it in the evolution of the industrial revolution. But sadly, the application in Greek time seems to have been relegated to opening temple doors and play toys.[16]

The Roman Empire - Explosive Engineering Development - 250 BC to 5th Century AD

It has been noted that The Roman Empire did not innovate much in the realm of education, rather they established extensive hierarchies and bureaucracies that supported a widely expanded existing educational system. In this vein, so too is technology seen as advancements on existing ideas. The Roman Empire's legacy, technically speaking, is its tremendously exploitive use of existing technologies:

> *"It is true to say that virtually ... no really novel method of production was to be introduced. What new advances were made were to be almost entirely in the field of engineering ..."* [17]

Two of the most notable and certainly the most seminal of the engineering developments were: (1) the vast and expansive construction of aqueducts; and (2) the construction of vast roadway systems. Both were put into place throughout the vast Roman Empire where the aqueducts provided water and irrigation to a huge areas while the roadway systems allowed the advancement of commerce and troops.



Roman Aqueducts and Roadways - c200 AD.

These advancements, while perhaps seeming small in comparison to the development of the wheel itself, were

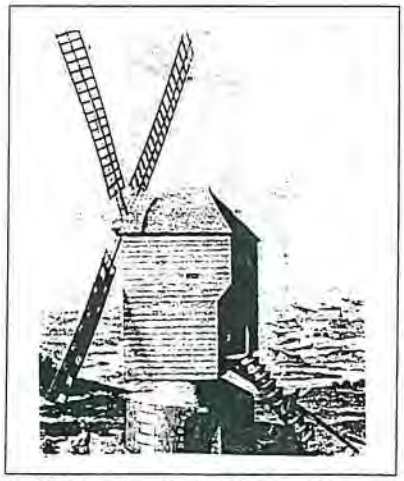
essential to the economic and military power wielded by the Romans throughout their reign. The roadway systems allowed, for the first time, great efficient movements of troops across vast distances. This allowed the Romans to govern their vast empire as had no other hegemony up to that point in time. Their development of the roadways, while not tremendously innovative in creative design, was instrumental in advancing many aspects of man's life.

Another area where the Romans evolved an existing idea was on the water. The Egyptians developed the sail boat while the Romans made if very fast. The Romans had many slaves from whom to solicit great amounts of work but they also saw the military benefit to developing faster-than-man sailing ships. This was a series of sailing ships which had three tiers of slaves (or rowers) who were placed behind/in a three tiered series of outriggers. These ships became the fastest ships on the waters and allowed the Romans to dominate not only the land (through the use of their roadways) but also the water through their use of the ships.

It can be argued that the growth of the Roman Empire was in part due to great strides in civil engineering projects and hence the growth of technologies of building. The road system that stretched throughout the land, the aqueduct system of water irrigation, and the development of new farming techniques all supported the tremendous control the Romans saw over their land. Without these technologies, it could be argued, Romans may not have been able to maintain the level of compliance (because of the better way of life) of the conquered states. Thus technological growth which yielded great civil engineering advances provided a climate for acceptance of cultures to being conquered and provided a market for economic stability afterward. It is in this market of stability that educational bureaucracies grew, demand for elementary and other schools grew, and the need for teachers grew.

The Dark Ages - Technological Poverty - 5th Century to 9th Century

In the review of educational history, The Dark Ages were shown as a time of stagnation and entrenching of ecclesiastical teachings. Advancements in the field of technology, too, are virtually non-existent. Fully the most prolific area of innovation during the Dark Ages was not in the west but in the East, in China. Here, the wheelbarrow came to great use, the windmill was developed, an iron-chain suspension bridge, a segmented arch bridge, porcelain and even an astronomical observatory were all invented or developed.[18] In the West, technological advances were very few with just thirteen being recorded in Kevin Desmond's book Chronology of Inventions, Innovations, Discoveries, From Pre-history to the Present Day for the period of the five centuries of the Dark Ages. Some of these are very important (development of the Arabic and Slavonic alphabets and the nailed-on horseshoe), others are more benign (the development of stained glass, prayer beads, 24 hour burning candles and Gorgonzola cheese) and others - in retrospect and depending on taste - can be argued are even somewhat negative (the development of whiskey). These times can be said to truly be the "dark ages" of technological innovation.



In China many innovations were discovered, including the windmill.

In his introduction to Turning points in Western Technology, D.S.L.

Cardwell paraphrases a French scholar, Robert Lenoble, who seems to sum up the common philosophy of the Dark Ages toward innovation and intellectualism:

> *" . . The scientist is bad enough - he pries into the dark, awful secrets of nature; but the technologist is worse - he tries to bend nature to his will and usually succeeds in doing so. Metaphorically one shudders at his impiety and longs for the comfort and emotional security of the ancestral cave. It is not 'natural'; we cannot and should not try to do what nature does."*

This is believed to stem from religious control over knowledge and so this feeling of claustrophobic ecclesiastical domination seems to sum up the Dark Ages in terms of technological advancement. The church held great reigns on virtually every facet of life and appears only to have allowed certain thought and certain advancements but only where those advancements did not conflict with religious beliefs. Concern and indeed perhaps fear of learning and advancing knowledge - one can surmise also of advancing technology - was the result of this omnipotent control the church possessed.

The Late Middle Ages - Breaking Forth From the Darkness - 9th to 15th Century

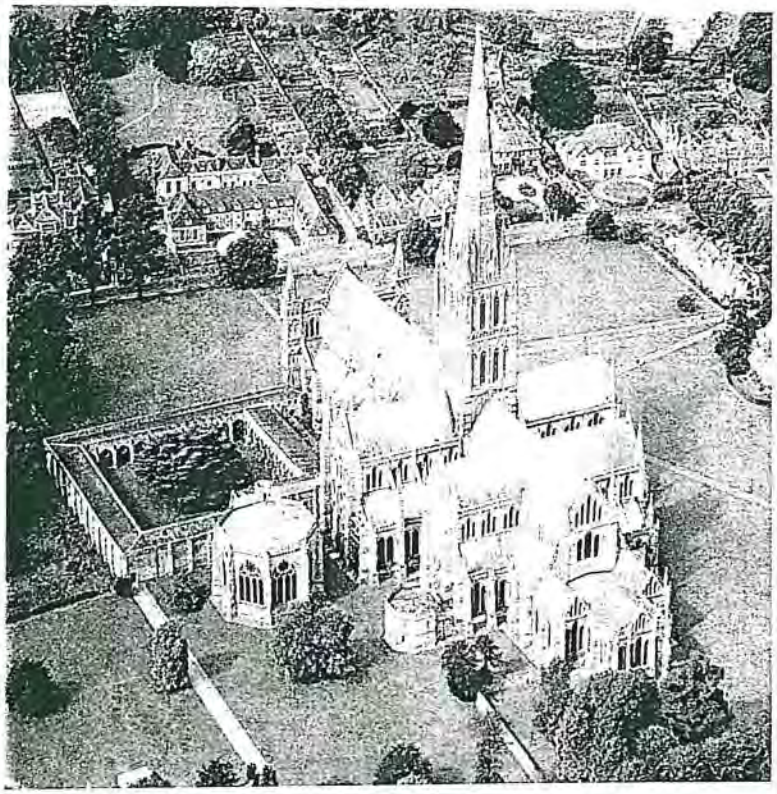
Where the Dark Ages were bereft of Western innovation, the Late Middle Ages were overflowing with advances. Even with the ever present chiding from the religious imperative and the religious Crusades, great strides were made. The Late Middle Ages were a time of transition, from the empty Dark Ages, to the ripe intellectualism of the Renaissance.

Primarily the innovations were made in the practical applications of technology, as opposed to theoretical advances, however we do see both forms of innovation. This mirrors the evolving divide between universities (theory) and colleges (vocational) studies which began during this period and has flourished to today.

The technological advancements during the Late Middle Ages were brought about primarily because of business and economical interests. It was these interests that offered tremendous opportunities for anyone willing to make the effort (anyone in the realm of the elite of society). We have seen in the History of Education section that The Late Middle Ages was a time of breaking away from negatives, and a time of embracing a new awareness of intellectualism, natural laws and philosophies. And so here too we see a great bringing together of both the practical and the theoretical, the intellectually and the economically driven forces.

One of the prime hotbeds of technological innovation were the Guild Schools. These vocational centres were set up to promote teaching and learning in a particular trade and so their prime *raison-d'etre* was the promotion of a trade. In the manifestation of this goal, they continually evolved existing technologies and inventions. An example of this refining process is seen in the built form of the great Gothic cathedrals. It is from the Stonemasons that existing technologies were exploited. The pulley and rope, in use from antiquity, found their most widely used forum in reaching the great heights required. Offset weights, still in use today in elevators, were first developed to compensate for the extreme heights and weights used with these pulleys. The building arches themselves were further developed. The segmented and built arch was in existence for centuries, but it was through the growth and development of the guild schools and their training techniques, that the pointed Gothic arch evolved. And the cathedrals' great heights from such slender and delicate structures

were possible because of the invention of the flying buttress.



The great Gothic cathedral churches.

A most interesting element of the guild schools was that they not only wanted to advance knowledge for their own people and tradesman, but that they were very willing to embrace other cultures' technologies. In this manner, they were virtually diametrically opposed to the cloistered, closed minded view of the religious societies. Where the church wanted to either completely disregard a culture (as in the Chinese) or completely take over a culture (as in the New World's native peoples), the Guilds openly incorporated technological advancements, regardless of origin, and assimilated and moulded them to their own Western needs. In this way the guilds brought the idea of universality and global thinking, in the realm of technological advancement, to a high level.

This helped create a feeling of emancipation from the timorous Dark Ages. There was a:

"... boldness and a lack of inhibition about both the medieval approach to nature and medieval technics. They were not frightened about meddling with nature by carrying out chemical operations, dissecting dead bodies or voyaging across the oceans ..." [19]

Engineering, mineralogy, metallurgy and especially medicine benefited directly from this new found intellectual freedom. If we consider medicine as a typical example, we see directly the result this new approach, especially in education. Up to the time of the late 14th Century, it was not only considered against the will of God to dissect a corpse, it was against the law.[20] With the advent of more liberal thinking, blinkered and heretofore restricted avenues of medical research were thus opened.

Studies in chemistry and engineering, while not quite so dramatic a change as medicine, were equally important. Even mining, which up to that point in time was done virtually exclusively with the

use of slaves, now bore a new approach through the use of free men with the intellectual curiosity to explore. This in no way compares with the extensive mining which was to become the legacy of the coal bearing areas of England in the 17th and 18th centuries, but was a quantum step forward toward a new economic, rather than solely religious centred community.

One should not get the impression that religion was solely a restricting type of life. On the contrary, if it was not for the monasteries and cathedral schools, one cannot predict how little of our knowledge and education would have survived the Dark Ages. One of the predisposing factors in the intellectual and technological emancipation that we see in the Late Middle Ages, oddly enough, came from the Church. Although the church did foster a controlling and omnipotent approach to everyday life in the Dark Ages, it was the growth of Christianity in the Late Middle Ages, and efforts to expand religion by attracting more people, that a universal feeling of growth could exist.

> *"If we seek the reasons for this remarkable emancipation of the human spirit we shall find ... that the basic cause must have been the universal religion of Europe. Christianity laid positive duties on men while at the same time rejecting the enervating fatalism of so many ancient and Eastern religions."*[21]

The Renaissance, The Reformation and the Move to Enlightenment - 15th to 19th Century

The Renaissance saw the growth of virtually every facet of human life - the arts, education, philosophy, technology, economics, architecture and religion and the flow of technological advances that had begun in the Late Middle Ages found intellectual fruition in The Renaissance. Following the Renaissance The Reformation in the latter parts of the 15th Century and the 16th Century advanced technology even further and especially made wide use of existing applications bringing technologies to a broad audience. The shift into The Enlightenment, brought a strong emphasis of technological advancement in the area of mechanics and economics.

During this time "science" was not a credited course at the university level. The first science discovery at the early universities was the work of Copernicus (1473-1543) and his study of a heliocentric theory of planetary motion. In religious circles, this was seen as a heretical discovery. Up to that point in time, the Aristotelian earth centred geocentric universe was religiously sanctioned and officially followed. Copernicus' theory was so contrary to the day's religious doctrines that Copernicus left the publishing of the theory until the year of his death (1543).[22] The heliocentric theory of planetary motion was later corroborated and substantiated by Johann Kepler (1571-1630) and through the discovery of the modern day telescope by Galileo (1564-1642), the heliocentric theory was proved.

From the macroscopic in astronomy, we now move to the microscopic with the discovery of the microscope. In 1590, Zacharias Janssen in the Netherlands made the first microscope (Janssen was a spectacle maker). This led Galileo and others to examine the very small and to discover more the make-up of our bodies and our environment. The development of the thermometer (Galileo 1603) and atmospheric pressure gauge (Torricelli 1643) and the initiation of electrical and magnetic studies (William Gilbert 1600) were all important scientific advances.[23]

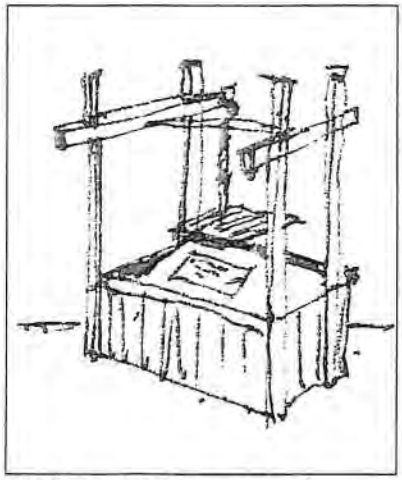
And with this scientific and technological growth came a great change in education. The universities, which were going through an evolution of their own from an ecclesiastical pedagogy to a more

secular approach, were being pressured to opening up a "mechanical arts" university. One that specialized in physics, geometry, arithmetic, mechanics trigonometry, optics astronomy and other sciences. While some universities did offer chairs in science and mathematics (Cambridge introduced this in 1663), it was not until the great discoveries and scientific debunking of contemporary thought were known to the general population, that changes started to occur. This eventually culminated in the creation of a more strongly voiced science department at most of the universities. The main streaming of the sciences had begun a slow climb to respectability.

In England, Francis Bacon (1561-1626) had always been a staunch supporter of the sciences and he regularly condemned the universities for their lack of research and initiative in the study of the sciences and of "Realism" (as opposed to the "Humanities").[24]

It was at this time that technologies which would and did directly effect the delivery of education came into being. The most influential of these was the innovation of cheaply produced paper. This development was a tremendous boon to the students of the early 16th Century. This was the first time that students were encouraged to start to take notes. Now, a semi-permanent, form of recording device was available to the mass student population.

Supportive of the development of paper was the refinement of the printing press. The printing press, by Johannes Gutenberg in 1451 (it had been invented in Asia hundreds of years before),[25] helped to spawn the growth of enlightened scientific and religious thought. Before the development of the printing press, relatively few books were published and certainly only a very few were available for general use. The most prominent book available throughout most of the Middle Ages and into the Renaissance was the Bible. The printing press made the proliferation of other intellectual materials almost ubiquitous in scholarly circles, and at least more well known with the general population. Within years of its creation, printing presses were available in France, Holland, Switzerland, Hungary, Spain and England. It supported the ideals of The Reformation, sectarian propaganda, scientific literature and idealism.[26]


The Gutenberg Press - c1490.

This had two very profound effects on the scientific community: (1) because scientific literature was more widely available, more than just a handful of scholarly people were now in contact with scholarly scientific work. Thus the exposure of the sciences increased and started to come into the day to day experience of the general population thereby gaining a certain level of acceptability; and (2) with the mass production of scientific discoveries around Europe, scientists were able to begin their investigations and researches based on the detailed work of others that had preceded them. This was not realistically achievable before the advent of the printing press because the availability of printed matter was extremely restricted.

Another of the developments that supported the widespread growth of education was a somewhat surprising outcome of the evolution and mastering of the printing press - the dictionary. A dictionary in the format of what we understand a dictionary to be today was first seen in the 16th Century. In

England in 1538, Sir T. Elyot published his prototypical dictionary called The Dictionary of Sir T. Elyot. This self titled book was for only Latin and its usage, which was the primary language of intellectualism and higher education at the time. But it was a breakthrough in four essential areas:

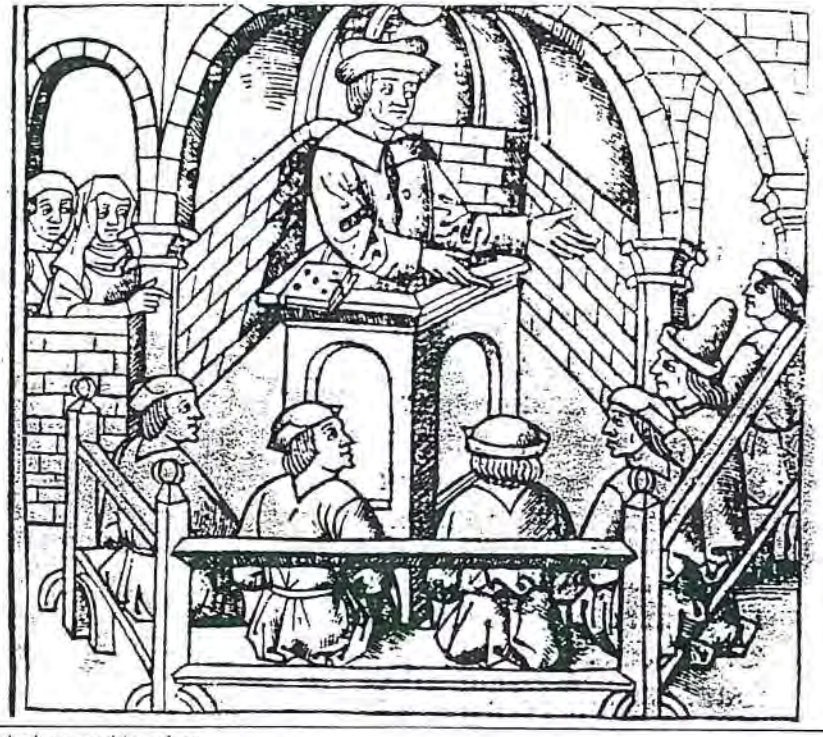
1 It defined the words in the English equivalent. Up to that point in time, dictionaries defined Latin in terms of Latin. Only a very educated Latin scholar could really understand the definitions;

2 It was published using the newly developed printing presses, therefore it was widely distributed;

3 It defined the words. Most of the dictionaries to that time specified the language and grammatical usages of the word, rather than what the word meant; and

4 It defined the words in an English vernacular language sense.

Now the common student could use and learn from this new medium - the Dictionary. It no longer was an esoteric grammar benchmark, it was an English vernacular description of Latin words that the average student would need to know. It was, in this sense, one of the first real technologies made available to the student that was geared to assist the student in learning, rather than in showing the student what he ought to know. It was an immediate hit across Europe and became one of the most widely distributed books up to that time



Sixteenth Century scholars and teacher.

Another tremendously important educational change, brought on by technology, was the creation of the first school of navigation. From the studies of Copernicus, the explorations of Columbus, the development of highly refined compasses and the Mercator Grid system all of which were widely published through the newly discovered Gutenberg printing press, scientific developments expanded the study of astronomy into the study of navigation. A truly worldly understanding of our earth was beginning to unfold which brought scientific and world altering exploration into the everyday world of European man - The time of Enlightenment was here.

The Enlightenment was a period of exceptional scientific advancement with the practical side of technology supported by the theoretical side. The study of metaphysics (the philosophical study of the real nature of the universe) began at this time substantially through the systematic studies of René Descartes (famous for his "*Cogito, ergo sum*" [I think, therefore I am] statement). It is from Descartes that our current and rigorous studies of methodology are derived.

The adoption of a more formal and scientific research methodology had a very positive effect on schools. It meant that through a very formal and regimented structure, supported by the growth of the printing press schools could advance the study of scholars by studying previous scholarly work. Because of much greater consistency in methodology, a wider understanding and quicker results were possible. This led to the establishment of a school system of scientific communication and reporting which substantially is with us today.

It is from this era that advancement, both theoretical and practical, continued for a hundred years until, in the middle of the 18th century in Britain, a new epoch grew from the fertile soil of educational scientific achievement - The Industrial Revolution.

The Industrial Revolution - A New Dawn - 18th to 19th Century

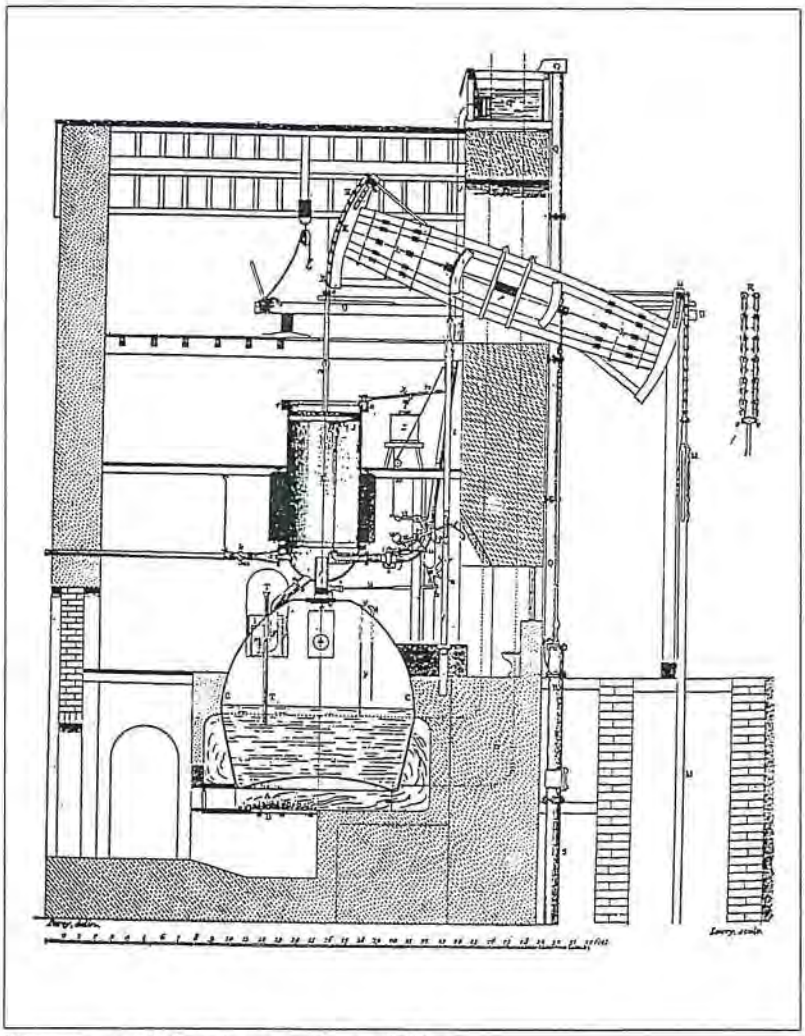
The Industrial revolution was a world phenomenon. It began in the middle of the 18th Century in Britain and lasted there until the middle of the 19th Century. It made its way to France, Germany and the rest of Europe, then moved into the United States and finally to Canada.[27] In the United States, it arrived around the middle of the 19th Century and eventually reached Canada in the very late 19th Century where it continued into the early 20th Century. The Industrial Revolution is defined as:

> "*the social and economic changes that mark the transition from a stable agricultural and commercial society to a modern industrial society relying on complex machinery rather than tools. It is used historically to refer primarily to the period in British history from the middle of the 18th century to the middle of the 19th century. ... Dramatic changes in the social and economic structure took place as inventions and technological innovations created the factory system of large-scale machine production and greater economic specialisation, and as the labouring population, formerly employed predominantly in agriculture (in which production had also increased as a result of technological improvements), increasingly gathered in great urban factory centres.*"

The single most important technological innovation which fuelled The Industrial Revolution was the steam engine - called the "rotative" steam engine during the early days. Originally discovered by Hero in 325 BC in Greece and further developed by Thomas Newcomen (1663–1729) in the middle of the 17th Century, it was James Watt (1736–1819) who in 1769 patented the first efficient steam

engine. Up to then, there existed large factories, but their prime energy source was wood and manual labour. With the advent of the steam engine, a huge source of efficient, inexpensive energy was available to the factory owner. The ability of a factory to now run simultaneously hundreds of wool looms, weaving kilometre after kilometre of fabric was not even conceived before the steam engine. Its invention virtually blew the top off any mill using a waterwheel and essentially created the image of the factory that we know today of Victorian Britain.

The Industrial Revolution in Great Britain led to a vast and stimulated economy and was central to Britain's world economic and political dominance during the 18th and 19th Centuries. An exceptionally strong money economy grew as none had ever grown before. This exploding economic expansion of trade fuelled the economy and stimulated the development of new financial institutions and credit houses. Capitalism predominated economies and a new type of commercial entrepreneur developed from the old class of merchant adventurers. The British Empire grew to include territories on every continent that totalled over a quarter of the world's population - "the sun never sets on the British Empire" was never so true. As Britain's economy grew, so too did other countries' economies.



Newcomen rotative steam engine - c1712.

In Britain, France, Germany, the United States and in Canada, the impact on education was strong- that is that the need for mass education became paramount. Because of the change in the economy from rural based agriculture to urban based industrial, a mass migration of the population was the outcome. One of the largest migrations of population ever in the world (from the country to the city) was occurring and with this mass movement of people from the country to the city, new facilities, not the least of which were schools, housing and hospitals were required.

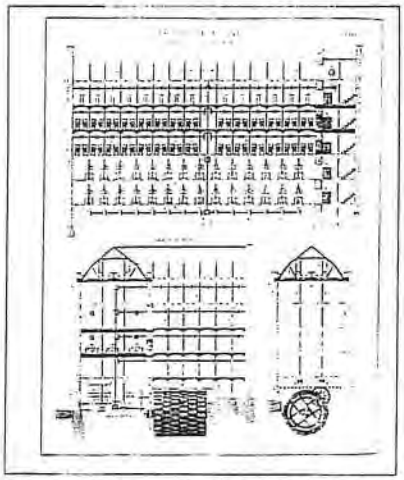
In Britain the first Day Care centres were developed. These schools came about because of the

tremendous need for low skilled people within the city. People moved from the country to cities that were not designed to accommodate the increased population. Millions of people came and stressed systems to the limit. Cities were awash in dirt, disease, poverty and decay. To this squalid environment, the uneducated, low skilled people of the rural areas came to get jobs. The situation was so wrought with poverty and despair that a need for both parents to work came into being. In Addition, a great many children were put to work in the factories and the mines. From this, a need developed for a free government sponsored centre for children. This centre would take children out of the factories and keep them in a safer environment. It would also house children during the day so both parents could work. The centres were called "Infant Schools" and received children at about a year old. The children would continue to go to the school until elementary school of age six.

The steam locomotive engine could move vast numbers of people.

Another impact on education was the push for mandatory attendance at schools. Although mandatory attendance had been in force in most of the European countries, it was somewhat loosely enforced. But because of the hue and cry to keep students out of the factories and out of the mines, the government started to enforce mandatory school attendance, especially for the younger children.

A third impact on education was the sheer volume of schools that were built. All form of school, from the newly created Day Care Centres to Universities were needed to support the increased student population base. This afforded great strides in the need for teachers, professors and head masters at all levels, which in turn brought a new down-to-earth kind of respect for the profession. Previously it was primarily an elitist thing to be a professor, but with the great need, more and more positions were required to be filled. This brought the profession within closer reach to the common man, and hence the respect and acceptance of the profession increased.



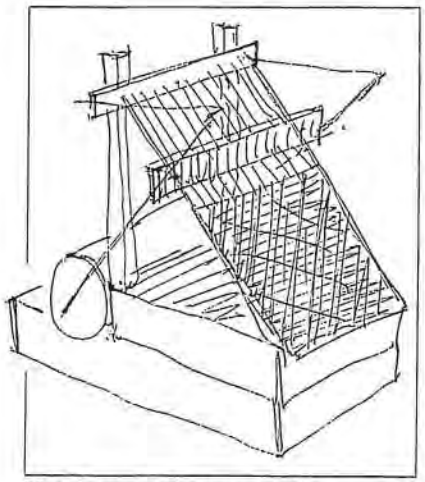
Cotton Factory - England. Note the "School Room" on top floor c1300.

As the demand for goods produced by the new factories grew, so too did the need for a better trained workforce. This again had an impact on the need for training in the schools. And with the push to increase and improve, greater strides in innovation took place, again fuelling the need for improved schools.

In the United States and in Canada we see the same shifting educational needs. As the New World's economy and population grew (from an estimated 250,000 in 1700 to an estimated 2 500,000 in 1800), the growth of Latin grammar schools, vocational and elementary schools and universities began in earnest in the latter parts of the 18th Century. While not much emphasis on child labour existed like in Britain, the tremendous urban shift resulting in the increased demand for schools and teachers did exist.
Throughout The Industrial Revolution an enormous number of critical and very important technological innovations and

discoveries occurred - design of the first iron bridge (1755), the sextant (1757), hydrogen (1766), electric battery (1790), chain driven machines the forerunner to bicycles (1775), breech rifles (1776), circular saw (1777), war rockets (1781), hydrogen balloon (1783), paddleboat (1783), lightening conductor (1786), steamboat (1787), galvanic battery (1879), submarine (1801), the first regular train line (1825) and on the list goes. Fully thousands of new technological innovations, all of which were important in the growth of the economic state of nations, were occurring. One of the most influential discoveries at that time, and one which was eventually to have a great impact on one of our current day technologies, was discovered - the Jacquard Loom.

The Jacquard Loom was a coloured fabric weaving machine and was invented by J. M. Jacquard in 1801, patented in 1805 and was so popular, that by 1834, hundreds of thousands existed world wide with some 30,000 in Paris alone.[28] The loom's design solved one of the most perplexing problems of the time - how to economically and quickly weave a repeating patterned and variously coloured fabric. If one can picture a large fabric requiring a pattern of many different colours, two methods present themselves as possible ways of incorporating the different coloured yarns: (1) printing the pattern onto the fabric by way of dyes; or (2) weaving in the pattern as if embroidering. The printing method was not highly desired because if did not generally last as long as the embroidered method and appeared of lower quality. The embroidered method was very time consuming and therefore very costly but highly regarded. To create an inexpensive method to weave the various coloured yarns thereby creating the embroidered designs Jacquard looked to a mechanised solution. The difficulty was to devise a machine that could keep track of up to 30 different coloured yarns (eventually 120 different colours were incorporated) while at the same time controlling when the machine would weave with one colour versus with another colour. Jacquard's solution was a much genius as it was simple. He devised a punch card system which would allow a springed indicator bar to either be "on" (extended through the hole in the punch card) or "off" (not extended through the punch card). This system allowed the "intelligence" of the pattern design to be cut into a punch card and then copies of the cards could be made and be distributed to many looms. This system allowed unskilled workers to work very quickly and very efficiently to create superior quality designs of complicated woven pieces. The idea spread like wild flower and virtually created a new standard of quality, consistency and cost that was there-to-fore unheard of.


The Jacquard Loom - c1810.

But even more importantly than the tremendous economic advance for the fabric industry, were two consequences that had been completely unthought of in the initial application of the loom: (1) the concept of "programming" a machine; and (2) the idea of solving complex interdependent actions based on a simple "on/off" concept.

To the first point, we note that the idea of programming a machine was never understood, let alone practised before 1800's. Any machine would either perform a certain range of actions, alway linear, always the same and always repeating, or when a machine was able to perform multiple tasks, it could do so only at with direct control of a human. The Jacquard Loom was a break through in how people perceived what machines could do. Now machines could do different things depending on a predetermined set of instructions and the operator did not need to have great

knowledge or hands-on ability to create the product.

To the second point, the technologically minded reader will have already seen the contemporary application of the "on/off" concept. The concept of on/off and open/closed is exactly parallel to our current day computer's binary coding of yes/no, 0/1. It is this binary code concept that forms the basic building block of the logic used in our modern day computers. It is reported that the first "modern" computer logistician, Charles Babbage (1792-1871),[29] was directly inspired by the Jacquard Loom and its punch card mechanism and used them to design an "analytical engine" in 1833. Thus heralded the start of the idea that a computing machine - a computer - could be created.

The World Wars - Of Necessity Comes High Technology- Early 20th Century

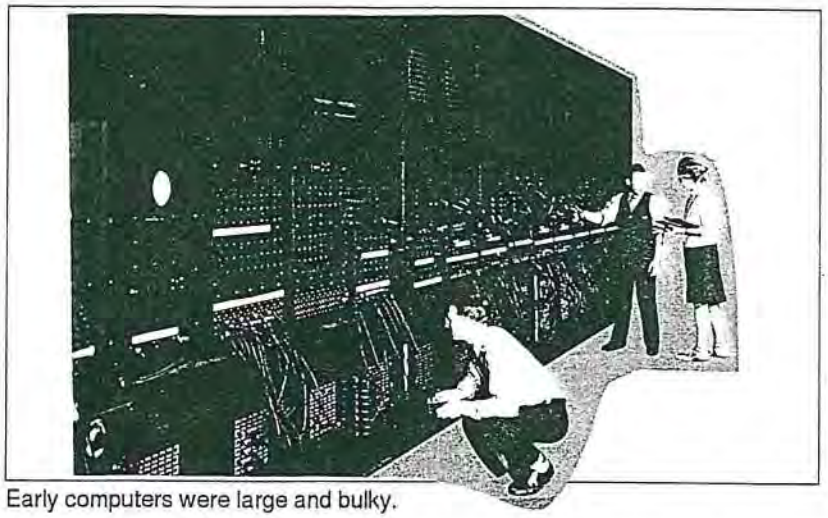
Sadly, throughout man's existence, the need to dominate and control seems to pervade virtually every nation. In the name of religion or territoriality or both many wars have been waged: the Romans; the Visigoths; the Mongols; the British; the Iranians; the Germans - The Hundred Years War; the Thirty Years War; the Arab-Israeli Wars; the Boar War; the Cold War; the French and Indian Wars, and countless thousands of others.

During the recent two world wars, great strides were made in technology and during the last World War the concept of high technology really came into being. These advances usually came from government sponsored research programmes through the efforts of the best scientists in the world. The impetus may have been the creation of bigger and deadlier machinery and weapons but the outcome was not only that - but also the innovation of many new and existing technologies.

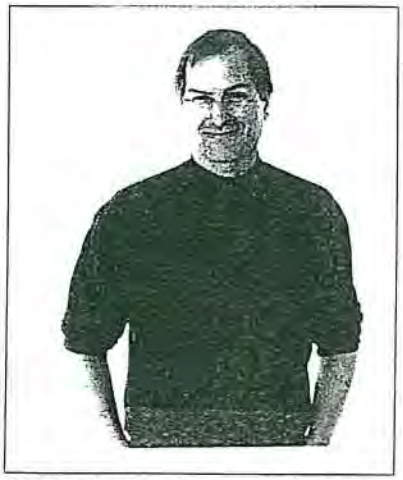
To list off even a tiny representation of the massive number of innovations, all mainly attributable to the war effort since the 1900's is to list virtually the what's what of technological advancements: the electric typewriter (1908); theory of atomic structure (1911); the pocket camera (1912); the engine starter (1912); the Amplitude Modulation radio (AM radio) (1916); the X-ray spectroscope (1916); Sonar (1917); and microfilm (1919). The First World War list also includes all the obvious advances in weaponry like the tank, chemical warfare, aircraft propeller and synchronised machine guns and many others. The Second World War saw the advancement of still more weapons but with a concentration on higher technologies like: radar (1940); microwaves (1940); atomic reactor (1942); supersonic long range bombs (1943); Alan Turing's Enigma Machine decipherer "Colossus" - the first computer (1943); ENIAC "the Electronic Numerical Integrator and Calculator" - the first US computer(1946); and of course, the atomic bomb (1945). The list could include thousands of less high tech, but equally influential advances like: the Jeep (1940); the bazooka gun (1942); an electronic flight simulator (1941); and the aqualung (1943).

Colossus, the German Army's Enigma Machine decipherer was devised by Alan Turing and built by Max Hewman and T. Flowers at Buckinghamshire, England. It was a machine used to decode secret German messages sent via "wireless" and it helped the Allies win the Battle of the Atlantic by informing them of the location of German air raids. The infamous German Enigma Machine was based on a shifting, random and variously referenced set of control cards which would change each letter of the original message to a different letter based on a rotating card index. As each new letter was assigned, the control card would shift its reference, thereby selecting a new letter. In this manner, the first letter "A" in a sentence may have been replaced with an "E", but the next letter "A" may have been replaced with a "Z". The frequency and positioning of the letters could not be used

to decipher the message. Without the matching control card the message was unintelligible. What Turing devised was an electronic devise that used 1 500 valves which would analyse each successive letter and come up with a number of options for the control cards and apply them to the cypher. As each scenario card was applied (if it is this letter this time and this letter the next time) each message was analysed. Eventually it would go through millions and millions of variations that a correct interpretation would come about. Colossus was a success because even though humans could have figured out the codes, given enough years, the machine could run methodically, fast and continuously to complete the task. It was through this machine that the undecipherable was deciphered and the efforts of the Allied forces in the war became more effective. Turing proved to the world that extremely complex (but repetitive) analysis could be obtained from wires, tubes, diodes and buttons.


Early computers were large and bulky.

A little time later, in 1946 at the University of Pennsylvania, John Mauchly and Presper Eckert built the Electronic Numerical Integrator and Computer called ENIAC.[30] Somewhat later still, In the late 1950's, electron tubes were replaced by transistors which was a great reduction in size and power consumption. Integrated circuits (computer chips) were soon developed that permitted even further reduction in computer component size and the reduction in wires, tubes, and components came to mean an increase in reliability. The stage was set for a package of parts to be available to piece together a computer that would perform to reasonable requirements and be small enough for the average person to not only to use but to afford. In 1976, the world was changed by two 21 year old entrepreneurs: Steve Jobs (1955-) and Stephen Wozniak (1955-) who, built the Apple - (the first personal computer) - in Steve Jobs' parent's garage. This first Apple computer, created the phenomena of the personal computer. Later, in direct competition to IBM, Jobs successfully established Apple's line of MacIntosh user-friendly computers and so again made history by creating the first mass produced truly user friendly computer interface. The brilliance and leading edge creativity of Steve Jobs changed the economy of the world.


Steve Jobs - co-founder of Apple Computer Inc.

Looking at educational training and computer science, as early as 1964, the science of computers was being taught in at least at 22 universities and technical schools across Canada.[31] Now, virtually

all post-secondary institutions offer programmes and courses. The high school level is especially aggressive in teaching computers and more and more elementary and junior high schools are embracing computers in the classroom.

High technology is everywhere. It is in our homes in the form of personal computers. It is in our hospitals in operating rooms, in our TV's, our microwaves, our cars, toys, home entertainment, phones. It is even in our running shoes monitoring us at road races for accurate time and place counts. It is at the ball game, the hockey game, the football game. It helps us move reticent muscles and regulates heart beats. High technology touches virtually every facet of our life. High technology has become a most pervasive and inclusive mediating factor man has ever probably ever devised.

History of Technology - A Summary

Our summary of the history of technology takes us from man's beginnings up to our current day computers. It, as with the History of Education, is necessarily brief.

Man's first technology - stone cutting tools - have been back dated to approximately 2 million to 100,000 years ago. Copper and other metals, which allowed the growth of social hierarchies, came into being with the Mesopotamians of around 8000 BC to 500 BC. The use of metals allowed greater efficiency tn hunting and agriculture pursuits for people. Based on the teachings of those that went before, the technologies of the day grew in complexity, and use. Education is seen in this way as contributing greatly to the evolution of technologies.

Egyptian advancements in technology were nominal except for standardizing measurement systems. The Greeks, primarily because of their more intellectual pursuits, produced some very finely detailed and refined instruments. These allowed highly refined building design.

The Romans, unlike the Greeks, did not innovate, they refined. They took the wheel and made it useable by creating roads, they took the idea of bridges and made huge systems of aqueducts and so on. In this manner, the Romans were engineering marvels.

During the period immediately following the Romans, up to around the 9th Century, very few innovations occurred in the Western world. But with the growth of the population starting around the 9th Century and continuing on through to the 15th Century, came a tremendous boom in business. To support this business boom, great strides in technological innovation were was seen however innovation during this time was mostly practical applications. The Guilds were the most influential business influence on education at this time.

Innovations in science slowly began to flourish toward the end of this period but was halted altogether by religious pressures during the Renaissance of the 15th Century. Slowly though, science made a come back and by the 19th Century science was the main push of all form of innovation. Tremendous intellectual, educational and business growth paved the way for the invention of the Jacquard Loom and the Rotative Steam Engine. The Jacquard Loom was the first application of a machine being able to be programmed to perform different functions while the Rotative Steam Engine created the ability of industrial owners to produce vast quantities of different products very efficiently. Thus the Industrial Revolution was born.

From the push of the Industrial Revolution, which reverberated around the world, to the first and second world wars, unimaginable advances in technology allowed the ultimate creation of the first computers - Alan Turing's Colossus in 1943. From that point on, smaller and faster became the goal and coalesced in the creation of the first affordable Personal Computer in 1976 by Steve Jobs and Stephen Wozniak.

As we look back on our technological growth, we see a pattern of great growth followed by long periods of virtual stagnation and as time has marched on, the period of each cyclical oscillation has decreased, the intensity of the innovative period has heightened and the intensity of the stagnation period has lessened. As noted in the introduction, man's knowledge is increasing at an ever increasing rate, so although we still see creative bursts and restful lapses, the bursts are more intense and the lapses are less restful.

One conclusion that we draw from this review is that growth in one area of man's endeavours is fuelled by and is in a synergistic relationship with many other areas. In this light, we cannot say that the origination of a certain technological innovation is solely the result of those technological advancements that went before it. All of technology's advances have come, not only at the heels of previous technological advances, but also at the heels of intellectual, educational, research, bureaucratic and other advancements. An excellent example of this synergy creating innovation is in the development of the steam engine. The original piston driven steam engine was conceived in the mid 17th Century by Thomas Newcomen who based his concept on the atmospheric device created as a toy by Hero back in 325 BC in Greece. The engine was abysmally inefficient, having great problems with condensation of the steam on the interior of the piston chambers, thereby reducing its power stroke and increasing the need for energy to create enough power. A second gentlemen, James Watt, later studied the theoretical aspects of the engine's inefficiencies, and coupled his knowledge of the theory of atmospheric pressures, the current research in theoretical modelling and the precision in metallurgy of the local watchmaker's mechanics, a new and effective steam engine was produced.[32] Here then the educational background of Newcomen produced the first idea, the educational knowledge and scientific research combined with current state of manufacturing processes, all came together to produce a new technological innovation. Take away any one of these influences and it is questionable how long it would have taken to arrive at the final, innovation of a steam engine. Thus advancements in technology do not happen without advancements in other areas especially including educational research and business. It is fair to further conclude that the corollary is true - that advancements in educational research, pedagogy and business fuel innovation in other areas, including technology.

Yet another conclusion that we can draw is the point that one technological innovation cannot, alone produce great change. An example of this is the innovation of the wheel. The wheel has allowed some of the most important technological innovations to occur - the chariot, the car, the steam engine and a host of many, more. Each and every one of them changing the face of the world. But the wheel by itself, while ingenious and inventive, is nothing without the innovation of other elements through which the wheel can perform. Without the wheel, chariots would not have been as useful and the chariot would not have proliferated without the development of the Roman roadway system, In Tom Peter's 1983 bestselling book, In Search of Excellence, he speaks of an interesting turn of events that speaks to the point of connectedness in technological innovation. He speaks of the discovery of the incandescent light bulb and how everyone expected it to be used in the home:

> "... *and then suddenly* [he says] *what everyone would have expected to happen, happened: it went straight to night time baseball."*

This of course could not have been predicted, but someone saw a use for it and applied it to create a great growth potential for baseball. Now the game could be played at night, Advances in light efficiency and power ensued to support the unexpected outdoor use, which in turn advanced the innovation of light design. This back and forth use of technologies is ubiquitous and essential to technological growth.

Technological growth, can also be concluded, is borne out of economic and war needs. Where great need because of economic opportunity exists, business supports growth and research. But where national security and safety are involved, the government supports the growth.

OUR CURRENT ENDEAVOURS - PLACE

SECTION THREE-A

"The data from our observations from more than 1,000 classrooms support the popular traditional image of the teacher standing or sitting in front of a class of placid students."
John I. Goodlad

3.1 INTRODUCTION - OUR CURRENT ENDEAVOURS

Section Three of this Thesis report reviews the current approaches to the three focus areas: Place; education; and technolgy.

Where Section Two attempted to development a foundation for an understanding of the historical growth of the focus areas, Section Three will concentrate on an overview of current approaches and techniques. It should be noted that because the three focus areas are currently undergoing a great deal of change, virtually anything that will be recorded here, by the time the report is read, may indeed be out of date. This section of the report then will necessarily be very general.

3.2 CURRENT APPLICATIONS OF PLACE IN EDUCATION

Today we see essentially two forms of Place in education: (1) Virtual Places; and (2) Real Places. In the term virtual, the ethereal, electronic and physically non-existent Place as a representation of a "Real" Place is meant. In the tern "Real," the actual, physical and palpable manifestation of Place in space is meant.

Nicholas Negreponte, from his "Being Digital" book of 1995, suggests a definition of the phenomena of "virtual" versus "real" in a discussion on information and data. He speaks of "The DNA of Information" as the building blocks of our use information and describes them in as taking two forms: (1) atoms; and (2) bits.[1]

Atoms refer to the actual, molecular, physical things called atoms. When a book is made from atoms, it is a real book. It can be touched, it can be moved, it can be opened and it can be closed - it exists in our real world. It is a physical thing that has substance, takes up space and has permanently altered another material to create its own existence.

Bits, of course, refers to those elements within a computer that are the basic unit of information - a single, binary digit that is more a unit than a physical entity. The bit, in Negreponte's definition, refers to the ethereal nature of the computer. This report, until it is printed, does not have a physical reality outside some commingled bits of electrons magnetically stored on my computer's hard-drive. By looking at my computer's hard-drive, the report does not become clearer or even understandable. It does not look like the hundred or so pages, photos, and other elements that make up the graphics and text of the report. I cannot read the electrons to read this report. The computer must translate the stored electrons so that it can be presented, on the monitor, as a representation of the report. On my screen, I can see the edges of the page, the headers and footers, a white paper, and even the photos and graphs. Nevertheless, am I looking at a real book? No. I am looking at a simulation of a book. I cannot touch the paper, I cannot store the book on my shelf (in the bound paper form), and I cannot rip out a page or put a yellow stickie on it. To do the things that I like and need to do with books, I have to commit the report to atoms - to print it. If eventually I do not like the report, I can copy a computer file or programme or game right onto my computer hard-drive and so tell the computer to rearrange the electrons of the report to be something else entirely. In this way, the somewhat more permanent nature of a book or of the physical presence of real atoms has been supplanted by the changeable world of the computer electron.

Place is similar to Negreponte's example of books and texts. In the real world one can be "in" a

Place. We walk through it, talk in it, feel its heat and its cold, touch its walls, hear footfalls on the flooring, smell the air and feel the compression or expansion of its Place. In the virtual world of the computer we can metaphorically do these things through the mediation of a monitor but we do not actually experience these elements fully.

Thus, looking at the common and popular educational uses of Place today, the two essential and defining manifestations are: (1) virtual; and (2) real. Virtual World Places are Places created in the computer that reside only in the computer. Sometimes they can be printed out as pictures or videos (so that they may be seen in the "atoms" form), but virtual Places by this definition really exist only in the computer world of bits. Contrasting this is reality - Real World Places. These are Places that actually exist in the atom form and can be experienced by all the senses and be experienced through time and space. I categorise these two manifestations as follows:

Virtual World: Computer generated virtual Places comprise four approaches: (1) Metaphoric Places; (2) Virtual Reality Places; (3) Simulated Places; and (4) Falsified Places.

Real World: Architecturally, Place has been traditionally regarded through its various style definitions such as: Renaissance; Post Modernism; Modernism; and others. In educational Places today, however, we see the application of spatial concepts evolving separately from the definitions of architectural styles to become spatial approaches that bear applications for technology rather than style. We see: (1) Open Yet Enclosed Places; (2) Changeable Places; (3) Multi-functional Places; (4) Modular Places; (5) Shared Places; (6) Distant Places; and (7) Individualised Places.

We will now look at both of these two in turn.

Virtual World Places

Although an apparent oxymoron ("Virtual" and "Place"), Place can and does apply to the computer. In the computer cyberworld, people can create spaces that are simulated and lifelike enough to almost seem real. If we were to judge many of our reactions to some of these worlds, just watching a person play a computer game and see their anxiety, angst, glee and physical movements and reactions would imply that this person is dealing with a situation that is real enough to them to solicit blood sweat and tears. The following is a listing of those types of places that have been seen while completing this research. They represent not necessarily four distinct conceptual approaches, but rather more a general inclination of many of the programmes and "Places" that I have come across. It would appear that the main goal of these places is to either directly or metaphorically replicate that which we deal with in real life every day: in other words to replicate real places. The limiting element in how far some of these places go to emulating real life appears to be restrictions on cost, hardware and true need.

Virtual World - Metaphoric Places

Metaphoric Places refers to those Places created on the computer (usually the Internet) which are used primarily for people to communicate. These Places do not exist in any visual or graphic form, rather they exist as a programmed "area" that is a series of programmes that allow people to type conversations. What is seen on one computer is seen by all who are logged onto that computer

session. Each such programme has one or more rooms to communicate in, some public and some private.

Chat rooms are the best example of this type of Place. A typical chat room does not have a visual presence, but a metaphoric presence. As one "enters" the room by clicking on an icon or by typing in a Web Page address, one sees only text. The text is comprised of text from the computer programme naming itself and (usually) identifying the room one just entered but also contains text from various people typing and writing conversations. In the Appendix Section of this report, (Section 13.5), a sample of a school chat room session is included. This "chat room" session is from the University of Waterloo and is, in this instance, strictly an area (programme on the computer) where the students can type a conversation with the professor and other students. It has no physical properties that can be seen. A student sees only a blank screen with typing on it. Any pretense to making the area look or feel like a room is gone. The only visual is the typed words and the only reference to a Place is the actual name of the Chat Room itself being called a room. Yet prior to getting "to" or going "into" the chat room, one has to double click an icon that represents a graphic image of a small school with a room in the school. This reinforces the idea that the chat room is a metaphor for a real place.

In this sample of a chat room, registered students can log onto the University of Waterloo Web Page, and through a series of different Web Pages, click onto, in our instance, the "Chat Session of the English Technical Writing Course 210g." Once logged on to the session, the student can type questions to other students, offer suggestions or ask questions of the professor. What is noticeable in reading the excerpt is the disjointed and often banal type of conversation that goes on. When I first logged on I expected to find a rather intriguing and somewhat esoteric English class rhetoric and banter about the course, the content, class assignments and that sort of thing. What I found was mostly questions about who was on the session, what they were doing and where was the professor. The conversations were also very disjointed. By looking at the time frame between the questions and the answers (in many instances, minutes between question and answer), one cannot help but feel that the conversation was stilted and time delayed. It certainly was not a one-on-one, in-depth or informative real-time session between a professor and his distant students.

Public Chat Rooms, in contrast to school chat rooms, often use elaborate textual references to create metaphoric physical presences; much more so than that shown in the school example. This means that while references in text are made to elements that are typically physical Places, no graphic or visual representation is offered. The following quotation is from Mark Slouka's 1995 book, War of the World's and shows a more elaborate metaphoric Place called LambdaHouse:

> " ... *The worlds one entered through the conceptual window of the computer screen, after all, were infinite; there were no borders in the usual sense of the word. Physical space was fluid. So was identity. Lambda House, for example, a cyberspace mansion, was an intricately detailed labyrinth of playrooms and dungeons and forgotten hallways, pubs and pools, and a Department of Psychology for those in need of counselling, populated by entire subcultures whose existence and behaviour were limited solely by the whims of their creators.*
>
> *What did this mean, in practice? It meant that as soon as MOOers typed the code for LanbdaMOO* [see below for definition of MOO] *into their computers, the following words appeared on the monitors:*

an E-mail or Internet address.[3]

While Metaphoric Places are generally used for communicating, other activities also take place. Cyberwars (called flames and flame-outs), educational study, sales of merchandise, games (lots of games), reporting of news, promotion of services and virtually any human activity can and does metaphorically take place over the typed anonymous media of the computer monitor. Again from Slouka's War of the Worlds, we see that even sex, called cybersex happens (cybersex is the sharing of a sexual fantasy over the computer):

> "*What did this mean, exactly? It meant, according to Stenger, that physical sex was going the way of the dodo and ivory-billed woodpecker. That cybersex - a sort of expanded version of phone sex - was the wave of the future: cleaner, simpler, less risky than its messy prototype. It was an interesting vision. If it came to pass, I thought, it would require that we update Hector St. Jones de Crèvecoeur's eighteenth-century question, "Who then is this New Man, this American?" In the New Age, apparently, he would be the one in front of the video monitor, one hand on the keyboard, the other firmly grasping his, er, mouse.*"[4]

Metaphoric Places, then, are not real "reality" places, but computer generated imaginary "locations" accessible to many people. These Places use text to describe the physical attributes of the Place. Communication generally takes place in these places, but other human activities also metaphorically can happen.

Virtual World - Virtual Reality Places

Virtual Reality is one of the most common computer phrases of our time. "Virtually" everything we read about concerning the computer, somewhere references virtual reality. The most public example of virtual reality is probably the Holo-Deck on the Star Ship Enterprise from the contemporary television show Star Trek, The Next Generation. The Holo-Deck is a fictitious room on a fictitious star ship that creates Holographic places based on user input. The Places are so lifelike that the original and the holographic image cannot be distinguished. While we are a way off from creating such a complex imaginary world in our reality, the Holo-Deck image is an appropriate example for what Virtual Reality Places are trying to achieve: to emulate reality by creating a computer generated, mediated yet user interactive and controlled reality.

Where Metaphoric Places obviously allow the user to imagine their own Place, Virtual Reality tries to replace the users' reality with its own version of reality. It tries to emulate reality to the point that the user is able to "suspend disbelief" in the imaginary Place and allow it to become reality. The word "virtual" means to be "*something in effect, though not so in name or according to strict definition*"[5]. So Virtual Reality Places are places that are in effect, though not actually, real.

The most important connection to reality that virtual reality offers is its interactive nature. When we turn our heads in reality, what we see rotates and changes to reflect what our eyes are seeing and what is reality about us. In Virtual Reality, through sensors, our head and eye movements are monitored and the view that is projected onto the monitor(s) is specific to the view that would be seen by our eyes should the vision be a real vision. In other words, the image rotates and moves with our eyes. But interactivity is more than this and concerns a second important element. In the previous Current Endeavours of Technology section, an number of examples of universities using

> *'The Coat Closet: The closet is a dark, cramped space. It appears to be very crowded in here; you keep bumping into what feels like coats, boots, and other people (apparently sleeping).'*

> *From the coat closet, they could exit (by typing the appropriate commands) to the Living Room, and from there to wherever they wanted. In one room, people might be having a conversation; they could join in if they wanted. In another, since cyberspace citizens could pretend to be anything under the sun, a four-foot teapot might be discussing Michael Foucault with a bottle nosed dolphin. In still another, someone might be sleeping "on a soft beige sofa"; the sleeper would be "a virtual corpse," ... a cipher for someone not currently logged on to the MOO."*[2]

In this instance, Slouka experiences Metaphoric Places first hand. Elaborate text and characters define the space and allow each of the different people logged onto the session to create their own version of reality - a metaphor of what their reality is. Spaces are textually described but not graphically and in this way, people envisage and image the space in their own terms and based on their own experiences, culture and history. Metaphoric Places are therefore very personal and subjective Places.

In the quote above, Slouka references a MOO. In the world of the Internet and Metaphoric Places, there are not only a large number of acronyms, there is a whole new language coming into everyday use (we no longer break away for a small meeting, we now go "off-line" to have a small side bar meeting). The following are a very few of the more common computer "Place" specific terms that are more widely used:

Avatar	the computer persona one adopts while in cyberspace;
Cyberspace	not a space in the traditional real-world sense, but a metaphoric place which people can "inhabit" in a computer. It is not a real or physical place;
MUD's	Multiple User Dungeons or Multiple User Dimension are textually created user imaginary places;
MOO's	a Multiple User Dungeon but based on Object Orientation. In other words, a MUD but based on hyper-imaged icons. One can double click on an icon to "enter" that room rather than just reference text. This is not a room drawn graphically, but an icon that indicates the room;
MUSH	Multiple User Shared Hallucination. Broadly speaking, a MUD is a MOO is a MUSH. These MUD's, MOO's and MUSH's can indicate a room, a building, a village, a city, a province and so on. Some are simple, some are extremely complex;
BBS	Bulletin Board Service is a non-commercial service dedicated to a topic or specialty that allows conversations, down loading of information, games and other related items; and
PONA	Person Of No Account - a person who does not count - a person who does not have

virtual reality were given and the most commonly known is that of flight simulators. Flight simulators show the second important element of interactivity, the ability of the computer to change its reactions based on user input.

When one pulls back on the throttle to raise the plane, or when one decreases speed, the image that is projected changes to suit. The ground may disappear below the horizon of the plane's lower glass, or the trees flying by may become more pronounced and understandable and slower to pass.

By combining these two elements: the user changeable point of reference; and the interactive nature of the programme, programmers can create computer Places that really do allow one to suspend disbelief. Even poor graphics do not greatly hamper the ability of the programme to move the user to believing.

My son has a computer game that allows the user to "fly" a space ship through a complicated three dimensional maze, the goal of which is to free a series of prisoners. The maze is wrought with enemies, pitfalls and obstacles as any game is, but this game has the two elements noted above that really make suspending disbelief pretty easy. I have watched my son play this game a few times, and find myself, more easily able to jump right into the monitor and be the pilot of that plane each time. By pressing a certain key, his "view" in the pilot's seat shifts around the cockpit and by pressing another key, the plane eases up or down or sideways. This movement is not stilted nor choppy, it is natural and much like a real plane, hovering and bounding when the "wind" buffets the wings. The plane cannot turn without having a forward momentum and when it does turn, the plane tilts its wing down in the direction of the turn in a very natural motion. As well, the enemies are not stationary items. They move and hide all throughout the game. He needs to seek out and destroy them or, if forgotten, they will follow and destroy him. When playing this game, it is very hard not to "lean" into the turns, or to bend forward trying to get a better view out the window when you "virtually" turn your pilot's head. And it is very hard not to get angry at the "enemies" trying to learn where each of them likes to hide and what guns they like to use to kill you. The ability of this little computer game to help one suspend disbelief is enormous, even though its graphics are not very good. Making the computer interactive and reactive to our movements, our minds tend to fill in the missing graphic images allows us to virtually believe what we are seeing.

As noted in a previous section, most Virtual Reality uses the HMD (Head Mounted Display) which monitors and senses our head's movements. As we turn our head, so too does the image on the monitors on the screen move, however this is not always the case. Regardless of the actual hardware that allows viewing of Virtual Reality, there are two central applications for Virtual Reality Places: (1) creating a virtual place to replace actual and real places; and (2) creating a virtual place to suggest a possible real place:

> Creating a Virtual Place to Replace a Real Place: Throughout the research I have completed for this thesis, this application of computer Place was not found. This is the Holo-Deck version of reality and refers to the ability of the computer to simulate, to the point of virtually recreating, a place or a series of places, that may currently exist, but cannot be physically used. In other words, and as an example, this would apply to a school that allows a student to log onto the computer and visually be "in the classroom." On the computer monitor would be a series of desks with other students and a professor who is "virtually" giving the class lecture or leading the science lab. The image of this virtual Place would be to emulate the

reality of the classroom, without recreating the physical presence of the classroom. This form of Virtual Reality was not found in any of the research that was completed for this Thesis Design Project.

Creating A Virtual Place to Suggest A Possible Real Place: This is a much more intriguing and (perhaps) useful application of computer technology. This refers to the ability of the computer to "model" Places where we cannot go currently. As an example, this would include creating a Place that would allow us to go and view the reactions of certain chemical molecules as they interact to create new chemicals. We could "virtually walk" on the molecules as they mould with each other. We could go and view distant planets or stars and watch how gravity and moons interact to create Saturn like rings. With the data currently available, models of reactions or interactions are programmed into the computer and then the outcome can be viewed, "virtually", as if in real life and in real or simulated time - regardless of scale, location or time. This has great potential in education and is currently being used to study (as noted previously in the Current Endeavours of Technology section) the visual effects of physical forces, the affects of gravity on space objects, molecular docking systems, the rain forests and sociopolitical studies in Florida.

As the complexity, speed and imaging ability of the computer increases, the graphic image portrayed by these Virtual Reality programmes will become much more lifelike and real looking. The ability to distinguish between the real thing and the copy will become fuzzy, blurred and virtually impossible to discern.

Virtual World - Simulated Places

A Simulated Virtual Place is a Place that has been created to replicate the visual reality of a Place. This primarily applies to images that are not interactive nor connected interactively to Virtual Reality and are representations of Places which try to, *ipso facto*, be a Place.

An excellent example of this is the Chat Room entry graphic in the Appendix section of this report (Section 13.5). While the chat room itself is a Metaphoric Place, the entry icon is a Simulated Place. The graphic includes a series of walls that simulate, by way of representing real elements, a school. The walls are lines that encompass rooms, doors, furniture and even a small library area with books. The simulation allows the user to enter the rooms (by double clicking the mouse) and explore its contents. The books can be looked at and "opened" but they can not be read. One must order and purchase to books to read them. This school, while not trying to create an exact image of the school, simulates those physical elements that constitute a Place: the walls, doors, furniture and the like.

We see in this example, all the fundamentals that simulations have, namely: commonly understood elements, spatial clarity, physical spaces that need traversing (in this case only two dimensionally, but three dimensional examples exist) and the need for some amount of involvement from the user (in this case, the user must go from one room to another). In many cases, the simulation is much more graphic and at times, almost interactive (doors close behind you, bulletin board have changeable notices on them), but these types of Places exist mostly for the user to be able to imagine the Place. They replace the user's need to imagine the Place by showing the Place.

Some simulations can be very real looking. They can be generated using complex and sophisticated

computer equipment and incorporate material finishes, sound, light and shading and other visual and auditory techniques. Because of the complexity of creating these simulations, these are generally not interactive, however with the increasing speed of computers, the line between Simulated Places and Virtual Reality Places will be gone.

Virtual World - Falsified Places

This type of Place refers to those Places that are created to trick the observer or to create Places that cannot physically exist. These Places are used by advertisers, movie makers, artists and hoaxers alike and very often appear very real. The main goal of these Places is not only to coax the observer into suspending disbelief, but in fact to make the observer believe that the created image is a real Place. Most of the uses of these are entertainment or commercially oriented, such as those from the movies and advertisers, but some are not. Some, as the following example illustrates, are there for the sole purpose of, who knows why?

In using the Internet for the research for this Thesis Design Project, one can find thousands of "hits" for word searches such as "virtual university" or "Online School." One needs to read and weed one's way through each school's literature to determine which are schools with a "virtual address" as well as a street address and classrooms versus those schools that really only exist on the Internet. The use of the word "virtual" is so overused and abused now, that it is very difficult to determine which ones are real physical schools and which ones exist only in the computer. One university was found, called the Virtual University (not to be confused with Virtual U. or Virtual Online University or Open Learning Virtual University or a host of others) that looks and reads like a real school, but (probably) is not. This Virtual University, if it is real, is the most un-virtual university there is. It is replete with a mountain address, a sports complex, astronomy museum, a multitude of class and school blocks and dormitories and a student centre. It's Internet literature states:

> "*A mere 40 minutes by plane to Springfield, USA, Virtual University promises unique educational and cultural opportunities. Located in Sans Re'al* in the heart of the San Isabel Mountains, Virtual University overlooks gorgeous Lake Solitude."

Sounds, almost *"sans* real" doesn't it? Is it just a coincidence that this real school has a name that appears to say it really doesn't exist (the word *sans* is French for "without")? Is this a "without real" university? The Web Page goes on:

> "*Enrollment: 15,062 -*
> *Housing: On Campus -- Divine Hall, Orlando Hall, Fleming Hall, and Westwood Hall*
> *Off Campus*
> *Students may live off campus ...*
> *The Virtual University Centre includes: The Virtual UC has a food court, a lounge, a travel agency, and a bookstore, where students may enjoy virtual social interactions."*

Are the "virtual social interactions" and the food court all virtually in existence through a metaphor of physical and geographical entities existing only in the bits and bytes of a computer? Are the photos and school images included on the Web Page only electronic pictures of what the university looks like in the minds of its real or virtual students and creators? Is the map only a visual clue for virtual walks around campus? The line between real reality and virtual reality is becoming

frighteningly blurred. Is there some Machiavellian pride that the creators of this Web Page gain in creating a school that is so near the line of "*sans Re'al*" that it is difficult to know if you are being taken in or if the school really exists? To continue to read the Web Page only muddies the already blurred understanding of its reality:

> "*Let's go back a century or so, when two literature-loving explorers first stepped foot in this peaceful region ... Rudy von Reest ... and Nyla Gnikne ... decided that cultural and educational endeavours in America were unfulfilling, so they set off North, in search of a place known as Auquantna, or the "City of Heavenly Paradise and Lots of Other Fun Things To Do," ... only referred to in ancient folklore ... Hallucinations ebbed and flowed through their minds as they broke through the upper formations of the Chasm of Great Expectations ...* "

Okay, so now it is obvious. This has got to be a joke! But how could I really know? Continuing to follow through the myriad Web Page references and Hypertext links, I could not absolutely say that this was someone's idea of a farce and a lark. The line between what we know as reality, and what we know as fiction is now so thin on the computer that it is hard to define it, let alone find it. And the capabilities from computer use, of what I call Falsified Places, only tends to exacerbate this blurring. I was afraid to keep going on this Web Page for fear of: (1) having my E-Mail address recorded as a sucker and then getting crazy letters; (2) eventually coming up across a Web Page that would say something to the effect that I have just been had and am I ever a schmuck for falling for it; (3) just feeling dumb because I could not tell the difference between reality or a poor joke; and (4) coming across something that would ask for money without me ever figuring it out. The more I read through the Web Page, the more I was convinced that it was fake. But I never did actually find out because I gave up and quit.

The important element is not whether Virtual University really exists, or whether Linus Murphy is a schmuck - the important element is that the computer can create apparently very real Places which blur, very effectively, the lines between reality and fantasy - between reality and non-reality. And because it is on the computer, it has a certain amount of credibility. This blurring is so good, that one, even when looking and searching, cannot determine what is real or what is not. It is easy to argue that this Web Page could be just as confusing if it had been in printed form rather than on the computer. But I would also argue that the computer alone and by itself has so much credibility - because it is on the computer - that this joke appears to be legitimate. I found this Web Page through the same search engines and in the same way I found all the legitimate schools and therefore this tended to give it added plausibility. The mere fact that it was on the computer helped it appear more real to me. And even when I started to suspect that it was a joke or a hoax, I still kept looking through the various linked Web Pages trying to find where they actually said it was a joke (never to find it).

Some could argue that this ethereal world created within the computer is as real as any world - that the perception of space, time, volume, light, day and night and others can be understood just as well through the virtual lens of Virtual Reality glasses and computer software as through our own real eyes. To me its an idea that, quite frankly, scares the hell out of me.

See Appendix C Section of this report, (Section 13.7) for a view of a couple of pages from Virtual University's Web Page. While these Falsified Places offer the ability to mould and model creative and inventive Places, pulling our imaginations to greater and more exultant heights, they also offer

the opportunity for the creation of sordid and deviant Places which denigrate, humiliate and subjugate, Time will tell which, or how both will be used.

We now look at the second type of Place we see today in education: Real Places - Real World Places.

Real World Places

In educational Real World Places today, we see Places that are characterised by the integration of technology.[6] Traditionally, architectural styles have been used as the defining basis for spatial planning in architecture but this is now being replaced by planning that uses technology as its defining order generator. The "*objet d'art*" single minded philosophy of Modern Architecture is being supplanted by new thinking that is geared around the integration of technology into our schools. That is not to say that architectural style does not play a large part in the design of our schools, it still does and always will, but what is meant here is that planning principles, those principles that underlie the layout and the conceptual planning that in years past were borne of an architectural style and supported an architectural style, are becoming less and less the single most important planning and ordering element.

An example of this shifting ordering element seen today, as was seen in the recent past, is open planning. Today, open planning is not an offshoot of the ability of a structure to span large open spaces (ie as it was in Modern Architecture which exalted the machine aesthetic by, among many strategies, showed large open expansive spaces). Today we see open spaces that are a solution to the need to provide malleable and changeable spaces that accommodate changing and evolving technologies. The outcome of open spaces may be the same, but the underlying conceptual approach and reason for the planning technique is different. When this is combined with other planning principles focusing on technology integration, the product is a series of Places and spaces that are different than traditional educational Places.

Real World - Open Yet Enclosed Places

Open spaces are today well known and are seen in "open landscaping" planning approaches in offices, factories, homes and almost any form of architectural Place. This is not an extremely recent concept in that we have seen the use of open planning in the interior of Frank Lloyd Wright's Larkin Building of 1903 and Mies Van der Rohe's Barcelona Pavilion of 1929 and much longer ago, in the Colosseum in Rome which was rung with open spaces for people to mould and use to suit changing internal functions.

Open planning (or open landscaping) is most notable for its lack of built, semi or permanent walls. Expansive defined or undefined spaces are common. The image of walking onto a large floor plate in a downtown office building and being able to see the building's perimeter walls, peering over the furniture is common. From thousands of years ago, when the image of the enclosed classroom with static benches / chairs for the students and one teacher at the head of the class, the contained classroom has been the norm in school based education. Now, at least since the mid 1940's when the concept of open planning was beginning to be explored, the use of open planning is becoming much more familiar. As noted in the Historical Review of Place Section of this report, in his 1958 book, The New School House, Alfred Roth was proposing the use of open, functionally defined

spaces for school classrooms. The idea behind Roth's ascertain of the need for open planning was firmly rooted in the Modern Idiom, and has little if any direct counterpart with today's technology but the application of the concept is very valid, and very common today.

This may be a "chicken and an egg" type issue: did Modern Architectural open planning anticipate the needs of future technologies, or does the need of today's technologies happen to be favourable to open planning? The answer is not really important. The issue is not what came first, rather the issue is that our spaces now need open planning concepts that for a large part, just happen to follow much of the opening planning techniques of Modern Architecture.

While the driving reason for this current push to open planning may be said to be technology, it is really what the technology is doing to the way we study and the way students now interact that is really driving this open planning. As we have seen, the roles of the teachers and the roles of the students are changing. The traditional passive student class listening to the active lecturing teacher is now changing to a group of students being guided by a mentor / coach type teacher. The teacher no longer stands up and pontificates to the class, rather he/she suggests, guides and mentors the students along in their individual learning. This form of mentoring and coaching, along with technology's ability to repeat and hone curriculum has produced, to a great extent, what is now being called individualised learning. The ability of educators to support individualised learning is directly related to the ability of technology to support the teachers' efforts to teach. This symbiotic relationship needs an environment that is supportive of the individual nature of this new learning process and this in turn manifests itself in open planning.

Open planning serves the concept of individualised learning by offering an environment that supports both team and individual learning approaches through its ability to create concurrent Places of communicative nodes for interaction and individualised study areas. Individualised learning is the process of teaching a student at his or her own pace, be that fast or slow, and in the manner most suitable to the student's needs. The course is moulded to concentrate on the student's needs, while striving to reach the overall course goal. Open planning also promotes the democratization of the classroom by making subservient the omnipotent role of the teacher.

Some students learn and interact better in groups while others work better on their own.[7] Open planning supports both approaches interchangeably and quickly. In today's design jargon we see Caves, Commons, Oasis, Streets and Neighbourhoods all of which describe different aspects of not only a shifting cultural design acceptance of open planning, but also a pedagogical acceptance. These terms refer to real physical Places that exist in our every day lives. Caves describe small areas where one can seclude oneself away for concentrated study and work. Commons describe Places which provide good spaces that allow team work and group interaction and play. Oasis describes a Place where one can break away and relax, while at the same time being provided the opportunity to chat with fellow students and teachers. Streets and Neighbourhoods describe Places that support common ideals of urban and city design. These familiar concepts are understandable and everyday and assist in the understanding of the Place. They also, by way of acting as central organising elements and circulation routes, create opportunities for greater interaction between students and students and staff. In these ways, by allowing the environment the ability to accommodate the various roles and needs of the students and teachers and through the application of open planning techniques, many of the needs of the students' study abilities are better met.

But while the open classroom generally refers to the physical openness of a classroom, the term also applies to a pedagogical approach to open learning- to individualised learning. The concept of open learning is a dual purpose concept that stresses both the openness of the space, and the openness of the teachers to learning new teaching techniques. In Appendix Section C of this report, a short excerpt regarding this dichotomy between these conceptual "paradigms" is included. The excerpt is from a 1984 book called Methods and Techniques of Holistic Education edited by Isadore L. Sonnier. While the reading of this book is difficult because of rambling scholarly references, verbose and complicated language and a somewhat difficult concept, the excerpted chapter is interesting in that it concludes two important traits regarding the dichotomy between open classroom education and open classroom planning:

1. The teacher is the first and most important element in the success and development of open classroom pedagogy. This pedagogy is based on an "openness in education" that is derived from the teacher's ability to allow students to self-direct their education. The editor supports the concept of open classroom, when promoted by a motivated teacher because:

   "... it is more meaningful to open the course content so as to promote more effective student interactions in the learning environment." [8]

2. The physical environment can support the concept of "open education" because it supports the student individualised learning and interaction that effectively is open education:

   "*One can open the physical environment, or 'open space.' Some teachers practice this quality of openness for student interactions and involvement so as to provide a learning experience in the affective domain ... The student-centred educator who displays strong tendencies toward affectively oriented cognitive objectives thrives on a course in which students select curricula content. For the self-directed teacher, it is more meaningful to open the course content so as to promote more effective student interactions in the learning environment."* [9]

One of the prevalent hallmarks of educational history and evolution that we have seen in this report is again seen in this book: the desire of the traditional educational establishment to continue *status quo*. To highlight this, Methods and Techniques of Holistic Education cites one of the most difficult barriers to overcome in the successful implementation of the open classroom: the teachers' lack of willingness to impart some of their classroom control and curriculum selection to the student, this manifesting itself in both the physical and practical as parts of the classroom. This conclusion, although applying to the pedagogical acceptance of individualised education in 1984, applies to today's classrooms just as much, if not more so because of the way that our individualised education is becoming very much mainstream:

> "*Traditionally, educators have tended to be authoritarian in the nature that teaching objectives were strongly oriented toward the achievement of teacher-developed plans in the cognitive domain. An educator who displays strong authoritarian tendencies is not inclined to open the content of his* [or her] *course to the scrutiny of students. The student's cognitive domain encounter is best left in the hands of the teacher according to the traditional educational philosophy."* [10]

Real World - Changeable Places

The physical aspects of open planning necessarily need to be supported by systems that allow easy integration of technology and easy movement to accommodate student and teacher needs.

One of the most important systems is the furniture. While the traditional student desk with its integral seat, storage bin and work surface - replete with student names etched onto every surface - is very changeable, it is not supportive of the technology and needs of today's students. Today we see a decided shift away from this traditional classroom desk and chair to ergonomic work areas and work stations. In corporate Canadian design, modular furniture and workstations have been the norm for thirty years and the standard for these workstations for many years has been Steelcase 9000. This system of furniture is ubiquitous in the design industry and provides for virtually all of the typical furniture requirements offered by many of the system furniture manufacturers: moveable part height screens; interchangeable pieces; modularity, connectability; demountability; connectivity of electrical and computer requirements; ergonomic design considerations; and user adjustability. While this workstation is now seen as the workhorse of the seventies and a dinosaur today, it set a standard and a level of expectation of user specific use that furniture manufacturers have been using as a guide ever since. In educational furniture, if the research completed by this author is any indication of the current stage of educational furniture design, we are now in the very early stages. Furniture in educational Places now is shifting from the traditional desk to more systems furniture, however what is seen is the use and minor modification of standard office offerings to accommodate the needs of students rather than a new, education specific furniture system. I have not seen a major attempt by any major furniture manufacturer to address the specific needs of ergonomically designed workstations for educational purposes. There is a large need for this type of new market product because now we see standard office furniture coming on-stream in schools.

So today's need for changeability stems from a number of areas: (1) the need to change because of the student/teacher's daily class needs; (2) the need to change because of changes in technology needs; (3) the need to change because of evolutionary trends in educational delivery media; and (4) the need to change to accommodate technology upgrades.

The need to change because of changing student needs has been previously discussed. Two new pedagogical approaches (both previously discussed) are mandating this changeability: (1) the changing role of the teacher to mentor and coach rather than purveyor of all knowledge; and (2) individualised learning. With the thrust of teachers becoming mentors, their traditional role of a lone teacher disseminating his or her knowledge to a class of 30 students is disappearing. The teacher supports, prods, coaches and assists students while the computer is (slowly) starting to become the medium of educational delivery. We see in many of the readings referenced throughout this Thesis Design Project report, suggestions and direct recommendations that the computer, through the use of intelligent agents and sophisticated teaching tools like "CSILE," should become more commonplace.

The changeability of our educational needs has a broader implication than just our environment. Yes it is true that our classrooms, furniture and other physical elements that make up the "Place" of school needs to be changeable, but so too do our teachers, our technological, our infrastructure and most importantly, our students. Our classrooms need to be able to accommodate the changing needs of our schools, students, teachers and the overall trend in pedagogical change. It needs to

be able to change to suit the evolving needs of the community and the educational system as a whole. But additionally, our teachers need to change to adopt a "mentoring" role rather than the oft seen more traditional role. The pedagogical shift to "open classroom", as we have seen, involves not only a physical environmental change, but also a teaching/philosophical opening up. This change has been and will undoubtedly continue to be resisted by many for many years to come.

We also see changeability needed in our technology. As we continually evolve our technology, and as we have seen in previous sections of this report, our knowledge and technological accomplishments are on a spiralling incline, our technology continues to grow and evolve. No one can reasonably predict what will happen in the future and especially with technology no one can even reasonable guess. We must therefore build systems and technological infrastructures that are upwardly expandable, flexible and scalable.

Changes to infrastructure not only applies to the "architecture" of our technological systems, but also to the infrastructure of our schools, both physically and organizationally. Our schools must be able to be changed, to grow, shrink, change use, change function, allow technologies to grow and change and to allow class sizes, pedagogy, teaching approaches and learning techniques to change and evolve.

Wrapping all these "changing" influences together, we today see educational spaces that need to rely on physical operable, moveable and demountable walls and furniture, adaptable technologies, flexible schools, flexible teachers, flexible students and flexible technology infrastructures and finally we see evolving teacher roles coming into play all these influences of which that our schools must accommodate change.

If our review of the historical aspects of the three focus areas is any indication of the future, and I argue that it is, then change will not only be a continual event in a school's life, but the speed and severity of the change will continually increase.

One of these changes that we see currently and will continue to see in educational Places is the sharing of facilities with students of different age groups. Traditionally, a classroom would have only students of virtually the same age, or at most one year up or down from the classroom median. But today, we are seeing spaces that are being shared with more than one age group intentionally. This is typically called the Multi-Aged Classroom. It is an intentional mixing of students of different ages. From a recent Calgary Board of Education home Flyer (February 1998 School Newsletter Insert), a quote at length a reference by the Chief Superintendent of Schools, Dr. Donna M. Michaels is included:

> *"In a rapidly changing world, public education has been called upon to make fundamental changes. These changes must reflect the anticipated future that will be the everyday world of children.*
>
> *Public education has responded in many ways. One of them is called multi aging.*
>
> *A multi-aged classroom intentionally blends two or more grades to improve student learning. It usually refers to learning communities composed of children from different age groups, with two staff members.*

Multi-aging is not to be confused with split grades. Split grades are an administrative organisation, usually in response to evening out class sizes. In split grades, teachers usually divide their time between the grades.

In a multi-aged classroom, students learn how to work cooperatively and collaboratively to help one another. Children quickly learn that there are times when everyone is a teacher aw well as a learner. The classroom teachers Is no longer viewed as the only source of knowledge.

At Glendale Elementary School in Calgary, a multi-aging organisation has been in place for six years. Teachers at Glendale believe that multi-aging better reflects the way we interact with others in society.

Some advantages of multi-aging are:

- Multi-age classes take the focus off meeting the needs of a group of children and puts it on meeting the needs of individual children.

- Younger children have older children to model. This enhances positive behaviours and attitudes. With older children as examples, the yonder ones tend to become more self-reliant and develop independent study habits.

- Older students may help younger children. As they assume increasing responsibility for their younger classmates, many older students develop socially and emotionally and gradually take the initiative in classroom activities. Research indicates that many children develop a positive feeling when they are placed in the role of helping other children.

- There is an earlier acceptance of varying abilities in children. Children who progress more rapidly or more slowly than usual attract less attention.

- More flexible grouping is possible. Each child can work at his or her own level of achievement and challenge.

- With multi-age grouping, teachers no longer have grade level designations dictating learning activities. Teachers are able to look at each child and determine what learning situations are needed.

- Multi-age classes are likely to reflect the range of social situations in which individuals work for themselves throughout their lifetime.

CBE schools strive to meet the greatest range of student needs when they offer choices to students, parents and teachers through approaches to learning such as multi-aged classrooms."

Real World - Multi-Functional Spaces

As with most of these somewhat arbitrary titles, there is a very fine and blurred line between what I mean by Changeable and by Multi-functional spaces. In the previous example, the aspect of educational spaces that requires constant change was described - the need to allow spaces, technologies, students and teachers to change with evolutionary trends. But here, in the heading called "Multi Functional Spaces" I do not mean those spaces that need to change because of evolutionary changes in school based infrastructures, but those spaces that need to change to suit a new function. Changeable spaces see changes from a group centred form of classroom to an open form of classroom, but the function - that of a classroom - still remains essentially unchanged. Multi-functional spaces on the other hand see educational spaces that really do change function.

According to the Organisation for Economic Co-operation and Development (OECD) one of the dominant trends that will be seen in the future of schools is the requirement for schools to be adaptive not only new learning and teaching approaches, but to be adaptive to completely different educational functions within their spaces. In this way, schools must change from the traditional spatial approach to a more multi-functional approach.

The more traditional spatial uses (at least up to the mid 1940's and 1950's) was the specific and direct relationship between function and space - "Form Follows Function". In other words, a space was created for a very specific function and that function, generally would not change. A library was a library and a classroom was a classroom. A gymnasium was a gymnasium and so on.

Today educational spaces must be able to accommodate various learning approaches, such as individualized learning, group learning, small or large team learning, but must also be able to switch the format of that educational delivery. We see the need for a space designed for learning needing to be able to accommodate a teacher "teaching" to the "classroom" - in the traditional pedagogy - and we also see the need for that space to be able to accommodate functional changes that would allow any combination of: (1) the "teacher" mentoring to a class, (2) a "teacher" mentoring to individual students; (3) a student or groups of students teaching and learning together in small or large teams; (4) a student learning from a remote (ie distant) fellow student; (5) a group or team of students learning from a remote (distant) teacher/mentor; (6) an individual student studying on their own; and (7) year round schools.

While each of these are the same use - that of being educational delivery - the specific function of the space varies. The space needs to be multi-functional.

But with the ability of technology to change the face of our spaces by, in some instances, replacing them with a computer monitor (ie we no longer need a "T.V. room") we also see more profound multi functional changes. One most obvious example is the library. Throughout the research, many references to the ability of the computer to replace the library has been seen. Again, Nicholas Negreponte's in his book "Being Digital" goes so far as to say that the physical building of a library is not needed in the future. While a study of trends in educational libraries and the impact from electronic technologies concludes that schools will be forced to change their libraries to electronic form simply because of sheer cost (from Barbara B Moran's book, Academic Libraries -The Changing Knowledge Centres of Colleges and Universities), the editor and authors argue that because of the cost of maintaining real books will be very high, the need to be cost competitive will

mean that electronic purchasing of new volumes will eventually replace full libraries.

In this way, the "classroom" will also become the library because there will no longer be such a great need to go to the library for books and reference materials. A CD or similar storage technology will be available in the classroom or directly off the computer. Our classrooms then become a space where not only traditional teaching and more topical teaching delivery methods are used, but also become centres for research, library study areas and other library related functions.

Multi-functional spaces also incorporate other functions such as "assembly" spaces. We see students being able to log onto the Internet and, through very inexpensive cameras and monitors see and talk to multiple numbers of other students and the professor. A current example of this use of technology is the University of Calgary's AMEE programme where students use the technology to collectively "chat" visually - to assemble. (For a more in depth review of AMEE, see Section Six of this Report).

Although assembly in this instance refers to assembly on the computer via technology, it could and does also mean assembly in the more traditional physical sense of the word. In the physical world, and in the real world of budget cuts and dwindling budgets, we see schools that must make multi-functional use of spaces such as the gymnasium being used as the auditorium which is probably very familiar to all of us.

Real World - Shared Places

We have seen that educational spaces today need to be changeable (same function, different layout) and multi-functional (different function, same owner). Today we see yet another variation on this in what I call Shared Spaces.

Shared spaces differ from changeable and multi-functional spaces in that Shared Spaces describes the sharing of school facilities with completely different users, functions, and even owners. For example, this would refer to schools leasing out their facilities for use at night by local drama troupes or businesses or clubs or communities.

The Organisation for Economic Co-operation and Development (OECD), in their publication **Making Better Use of School Buildings**, (OECD / PEB Publications, 1996) cited issues that predispose school boards across the world to need to share their educational spaces with other users. The single most prevalent factor in sharing schools with others and one that is certainly corroborated by my own research, is cost:

> "*This process entails changing the use of educational buildings for economic reasons rather than extending their use as educational buildings.*" [11]

But in addition:

> " *... to the purely economic logic of optimising the return from educational buildings and facilities, there is another, socially oriented logic which involves considering the social and cultural requirements of the community. I(t is not sufficient merely to consider the bare bones of the problem. A more general approach which includes the role of the school in society is*

required." [12]

Shared functional spaces include: housing assistinace; child-care programmes; community clubs; private courses (tax courses); trade shows; flea markets; business courses; and many others.

Real World - Modular Places.

In corporate Canada today, and indeed for many years past, we have seen many elements becoming modular. In point of fact, the Modern idiom of manufactured, standardised elements has been with us for many years. Modular in our sense means more than just a standardised brick or block or glazing module-modular means furniture, systems, components, pedagogical approach to educational delivery and spatial applications.

Furniture systems: As noted previously furniture for educational use is seeing a shift to standardized and ergonomically designs systems furniture. The hallmark of these systems is their interchangeability but this ability for easy change is based on the systems modular size.

Components may vary (very slightly) between manufacture, but generally standardized furniture is designed based on a 6" (note not a 150 mm metric size) increment. This allows adaption of the system into most standardized building modules which are generally in the range of a 4'-0" x 5'-0" x 5'-0" grid size spacing. These systems furniture allow greater interchangeability of parts (changing work surfaces, screens, pedestals etc.) but also, allow changes to the technology and people they support. Without the modularity, the ease of changeability would be greatly diminished, reducing their benefit.

Systems components: We see modular applications in most systems within our educational (actually within most buildings) today. Modular Components exist in everything from the mundane electrical and HVAC systems (outlets, diffusers, grilles etc.) up to the much more refined and technological applications of electronic hardware. In computer "patch panels" individual systems are more a kit of parts than an ordered fully cohesive and custom system. Each item fits into the system, but is a standardized individual piece.

This is seen especially in computers. One can purchase the hard-drive with any varying ...out of RAM or ROM or memory capacity (by placing a "chip" of suitable size, peripherals can be added or subtracted at will as the need or desire requires. A mouse, terminal, speakers, tablet, camera, printer, fax, scanner, or any number of add-ons can be used to augment a computed system. This additive approach would not be achievable were it not for the modular add-on, interchangeable philosophy of the technology.

Pedagogical approach to educational delivery: This is related to the push to individualised learning and the slowly growing use of computer delivered concise material. While this is very akin to our traditional text-book format of learning, chapter by chapter, the technological applications are more strictly geared to allow lateral teaching through the use of hyper text and individualised learning. That is to say that students still learn in "modules" (ie. through "chapters" in the computer system) but that because of the depth and breadth of the related information that is structured, modular approach to the delivery of the information is required. We see that information in one area of the course may lead to another area and another area and so on but the information must all still relate back to the

original course material, always reinforce it. In this modular, may be small in comparison to the whole, or may seem disjointed, the wearing together of these in the guise of computer teachers, makes a cohesive and modular whole.

Spatial Application: Through the use of shared and changeable spaces, educational facilities are tending to adopt a more modular approach to their spaces. This is much derived form the standardization of materials and building components but also in the shared uses of the spaces. In a recent book by the Organisation for Economic Co-operation and Development (OECD) titled, Schools for Today and Tomorrow: an International Compendium of Exemplary Educational Facilities, a series of buildings were cited as being representative of exemplary educational design. A review of these buildings reveals a preponderance of the design, to rely on standardized building materials (especially curtain wall glazing). While this is not indicative of all school buildings, it does show a general direction on the part of architects to adopt a modulaar approach from a standard and common kit of well used parts. Of these schools reviewed in the book, we see:

School:	River Oaks Public School, Oakville, Ontario
Architect:	Mekinda Snyder Partnership Inc. Architects / Planners
Date Completed:	1990
Levels Supported:	K-8
Number of Students:	650

River Oaks is a school that supports the "Open Classroom" and "Open Education" concepts. This school uses many modular building materials that are commonly used today and for many years in the past. These include exterior face brick, curtain wall glazing, standard T-Bar ceilings, standardized mechanical and electrical systems and removable carpet tiles. In addition, the plan is based on a ring of classrooms around a central library / resource centre. The classrooms are subdivided by folding partitions and as such, can be made smaller or bigger depending on need.

Furniture is common tables and chairs for the resource centre and classrooms, but the computer laboratories contain a simple version of modular office furniture.

School:	Ueno Elementary School, Taito-ku, Tokyo, Japan
Architect:	Shozo Uchii
Date Completed:	1991
Levels Supported:	K-6
Number of Students:	321

Ueno Elementary School, at first glance, appears to be anything but modular. It has flowing wall and roof lines, curved planes, rounded turrets, gracious and swirling stairs. But upon closer examination, the school's glazing is still standardised curtain wall used variously in punched or curtain wall installations, contains standard ceiling T-Bar, foldable partitions, standardised mechanical and electrical systems and sports modular furniture (although very much similar to traditional student desks). This school, while exhibiting modular design principles, was the least successful of all the schools reviewed.

School: Kuokkala Lower Secondary Education Centre, Jyväskylä, Finland
Architect: Arkkitehtitoimisto Kauko Lahti
Date Completed: 1994
Levels Supported: 6-9
Number of Students: 400

Kuokkala Lower Secondary Education Centre in Finland is probably the most modular of the schools reviewed. The steel structural system adopts a common grid and the architects have let the interior planning flow free and clear of the structure. In this way, the planning looks very random and open, yet is based on a modular structural system. The materials are, again, very common curtain wall glazing, folding walls, concrete block and stucco. The interior is a series of pods arranged around a central street. The furniture is octagonal and round tables with stackable chairs and looks as much like an office workroom as a school classroom. Interspersed throughout the design are pockets of green spaces where trees, grass and planting can thrive in a conservatorium like atmosphere. The most interesting element of this design, aside from its success with bringing nature in and maintaining a nicely creative environment, is the use of demountable walls. The classroom pods not only are subdivided by folding partitions, but they are also built out of demountable walls such that the walls and even the doors can be taken down and repositioned as the need arises. The issue of sound transmission was not discussed in the research on this school.

School: Thomas Telford School, Telford, England
Architect: Barnsley, Hewett & Mallinson
Date Completed: 1994
Levels Supported: 9 - 12
Number of Students: 1,000

The Thomas Telford School in Telford, England is by far the most aggressively modular planned school in this review. The steel structure and the design planning is based on a standard grid system which drives the placement of elements within it. The central street and all functional rooms and classrooms rigidly follow the superimposed grid. The regularity of the design is reinforced by exposed columns and gridwork which expresses itself in many locations throughout the school. Interior and exterior wall constructions are standard building materials (concrete block and block and stucco respectively). The most interesting modular planning issue seen in this building is the gridded layout of the classrooms and other areas. every area is based on the 7.2m x 7.2m planning grid. Classrooms become 14.4m x 7.2m, offices become 2.4m x 4.8m, janitor rooms become 2.4m x 2.4m and so on.

School: Blackstock Junior High School, Port Hueneme, California, USA
Architect: Scott Ellinwood & Associates
Date Completed: Renovation - 1995
Levels Supported: 7-9
Number of Students: 807

This school is interesting not in its use of modular building materials but in its use of modular planning and modular furniture systems. Each classroom, which is called a Smart Classroom, has a standard square footprint. Surrounding the exterior walls of the classroom is a continuous series of modular furniture stations. Each stations is designed for the students' technology needs with

computers, printers, desk top and other standard elements. The planning of the room, the grid spacing and the selection of the modular furniture is designed to allow and facilitate the repositioning of the furniture. To date, eleven different "prototype" room layouts have been tried and various configurations have been adopted for different courses (ie students around tables and facing each other for math classes and students sitting at desks with their backs to one another for research classes).

To look at the modularity of our schools, then is to look at the modularity of virtually everything that is involved in schools - from educational delivery to the spaces created for shared functions. The following Section of this report, titled "What the Future Might Bare" reviews a little further these schools and others.

Real World - Distant Places

This form of educational Place, in reality, refers to any place that a student studies, a teachers mentors, or a class gathers through distance education.

This Place refers specifically to the created spaces of the computer. In this definition, I do not mean the created worlds within the computer world (ie the virtual worlds reviewed earlier in this section). Here I mean the real spaces in which the computers reside that the students and teachers use. So while somone's basement, or someone's lap on the slope of a grassy knoll is not really a common space for use by educational facilities as not only a study place (the kitchen table for doing homework) but also the primary place of delivery. This has been seen in the past, but never as much as we see today. Should the trends continue to grow in popularity and use so that we will never see the "classroom" becoming the home's basement or kitchen.

We have seen that many universities, some high schools and fewer yet K-8 schools are now totally virtual, totally delivered through the computer. We can therefore expect to see these distant places in educational delivery.

Real World- Individualized Spaces

Individualised spaces are, in some respects, the most contemporary and modern and in other respects the most ancient and traditional form of educational space. As we have seen from the historical sections of this report, individualized / familiar / mentorship / apprentiship type of educational delivery may indeed be the truly original type of educational delivery with the child learning how to cut stone tools to create useable tools for the family. But with the development of written language, religion and social hierarchies, a more formalised educational delivery system has been shown to have evolved of the traditional classroom in Mesopotamia - c 2000 BC.

Therefore individualized learning is really the first form of educational delivery. However today we are seeing educational spaces being designed for individualised learning too, which is borne out of the ability of the computer to deliver user specific courses and learning modules. CD's and the Internet, combined with centralized and co-ordinated computer programme formats, support the ability of students to use individualized spaces. This is primarily seen with Distance Learners and Life-Long Learners in that they study and take most of their course materials at their own home. The home then is one of the individualised spaces used by students.

But individual places occur at schools as well, not just in the student's distant home. Through the application of the open classroom and individualized learning, schools are finding that spaces created specifically for individual study and course delivery are needed. In the Chapmanskolan school in Karlskrona, Sweden, we see a perfect example of what is generally envisaged by many when thinking of individualised learning spaces. The space is a single, all encompassing cubicle style environment that accommodates not only computers, but audio, video, computer conferencing and other technology aids, as well as environmental controls for a totally controlled individualized learning environment. The photo illustrated here shows this individualized space as it currently exists in the school but one is quick to question whether this kind of individualised environment is cost effective on a larger scale.

In school designs today that accommodate individualised learning and spaces, we more traditionally see spaces that, while being connected to the whole of the classroom, still can be used individually. The photo included here, which is the Ueno Elementary School, Taito-ku in Tokyo shows this more common approach.

Both illustrations are valid and exhibit the aspects of individual spaces; enclosable enclosure; smaller spaces for a single student; access area for teacher to assist the student; accessible and changeable space for technology; and a somewhat controllable environment.

Summary

Where we once saw long antiseptic staid corridors bounded by cookie cutter identical classrooms, our current educational spaces see a changing and evolutionary growth to many forms of space. If there is any one single conclusion about space that we can draw from our review, it is that today the defining spatial application is one of myriad selections. We see not only the ever present traditional classroom, but also computer generated virtual spaces and multiple physical spaces. Unlike the past where almost regardless of function all spaces were the same, we now see spaces that mould, flow, open and close to suit the application of the technology and the pedagogical approach.

We not only see spaces that are designed for educational uses however, we also see spaces that necessarily need to be designed to suit virtually any use or function or group that may require access to technology or assembly spaces or other traditional educational facilities. We are truly seeing a flexible, malleable use of educational spaces and when one includes the use of virtual spaces, there is a myriad opportunity to create the right space for the right job.

No longer will we see the classroom as the classical icon of education with the teacher at the head of the room with a passive student body sitting in row upon row of identical desks or benches listening and learning. Now we are seeing an amorphous, flowing, non-linear classroom layout. Classrooms that no longer are focused on the teacher. We see pods of furniture around which students are seated, working in groups, teams or individually. The teacher moves and mentors the students while wandering around the room. The students flow and ebb within the bounds of their own learning.

OUR CURRENT ENDEAVOURS - EDUCATION

SECTION THREE-B

"Educators are concerned with preparing students for living and working in societies where new information technologies are ubiquitous."
The Organisation for Economic Co-operation and Development

3.3 CURRENT EDUCATIONAL PEDAGOGY AND DELIVERY TECHNIQUES

Canadian School System of Governance

The Canadian educational system is based on section 93 of the Constitution Act (formerly the British North American Act) of 1867 which, in part, stipulates that local school boards are governed by locally elected boards of trustees, who, as legal entities report directly to their provincial legislature. The provinces have virtually complete governance over all the educational matters except those denominational rights in place in the province prior to joining federation. In Alberta, British Columbia, Ontario and Saskatchewan, Roman Catholics and Protestants have their educational rights guaranteed. In Newfoundland, eight different religious denominations are safeguarded their educational rights. In fact Newfoundland's schools are exclusively denominational. Private schools exist in every province and territory in Canada however only account for 4.8% of the students attending school in 1996.[1]

Throughout Canada in 1996, 5.35 million elementary and secondary students attended some form of school but the number of school boards managing these students have continually dropped across all the educational jurisdictions. In 1930, 4,000 boards existed in Alberta, in 1994 that had dropped to about 150 and in 1996, just under 70 existed throughout the whole province with most of these recent board changes imposed unilaterally by the provincial government. The number of teachers in 1994 (delete space the most current data available) is estimated at 321 800 which includes principals, teachers, counsellors, administrators and resource personnel. The teacher / student ratio has continually dropped over the past twenty years as well. During the height of the baby boom (1970-71), the number of elementary and secondary students was at its highest level before or since at 5.8 million students. At that time, the teacher / student ratio was at its worst, hovering around 20 to 1. During the 1980-81 year, the ratio was 17.2 to 1 and in the year 1994, it was 15.7 to 1. Again these numbers include principals, teachers, counsellors and others and appear somewhat misleading because they do not reflect the classroom teacher / student ratio which is (arguably) the most direct indicator of educational quality.

The average age of teachers in Canada is increasing with the average teacher's age rising from 35 in 1976 to 42 in 1996.

Education is expensive. In 1992-93 in Canada, an estimated $55.3 billion was spent on all levels of education compared to an estimated $28 billion in 1989. Although the rising costs of education have very recently been slashed by provincial governments in Quebec, Ontario, New Brunswick, Saskatchewan and Alberta. Current figures are unavailable but overall savings in the range of five to ten percent are common goals of provincial governments. Funding for education is obtained through levied taxes at only the federal and provincial levels but some property tax rights have been transferred by the provinces to local municipalities. Estimated costs to educate a full time k-12 student per year run in the range of a high of $7 500.00 (Quebec) to a low of $5,000.00 (Prince Edward Island).

At the time of writing, all provinces but one follow a common system of governance: locally elected trustees reporting to a municipal board of education which then reports directly to the provincial minister of education. New Brunswick is the only province to adopt a different system of governance which includes, rather than elected trustees, school parent councils who elect members to 12

provincial advisory councils. These in turn report to the minister of education.

Depending on the province, boards are either Public or Separate (generally Roman Catholic), English or French or a combination of any or all. Nationally, the federal government is responsible for native, armed forces and Inuit children's education. At the post secondary level, somewhat over 80 universities and colleges provide degree granting courses; twenty are French and six are French and English. Since the end of the second World War, when the first major push for Post Secondary Education (PSE) skyrocketed enrollment, the percentage and number of PSE students has continually risen. Prior to the war, approximately 5% of the 18-24 year olds were full time PSE students. In 1993 32.6% were enrolled as full time students which equals approximately 930,000 full time students per year.

Within the scope of PSE, the western provinces of Manitoba, Saskatchewan, Alberta and British Columbia have adopted a policy of controlled university development, restricting the number of new PSE schools. Other regions in Canada do not have this form of restrictive growth agreement. The Western provinces also have adopted an "*emphasis on extension work and applied research*" [2] somewhat concentrating their educational curricula on a more business related, market driven pedagogy. As with the K-12 grades, the PSE is also under a system of provincial governance but is based on a two-tier system: board and senate reporting to provincial government.

Distance Learning (also called Open Learning), which refers most commonly to education that takes place where the student and teacher are separated from each other, is the third major form of education in Canada. It is mostly evident at the higher levels of the K-12 and at the PSE level. Virtually every PSE institution offers some form of distance learning, either through only correspondence courses or, more recently, through various communication technologies. The two CASE STUDIES in Section Six of this report (AMEE and New Brunswick) are examples of these progressive use of communication technologies used in providing distance learning services.

Distance Learning first began in Canada at the PSE levels in 1889 with McGill University and then later at the K-12 levels in 1921 in British Columbia. The number of students enrolled in Distance Learning is continuing to increase. In 1941, approximately 10,000 full or part time students were enrolled, in the 1960's the number was in the range of 27,000 and in 1994 (the most current data), over 225,000 students were enrolled in degree or diploma granting programmes. When considering all students enrolled in some form of Distance Learning programme (ie. personal development courses) the number increases and:

> " *... it is estimated that each year at least half a million people in Canada study through distance education.*" [3]

By looking at the total population of full, part-time, elementary, secondary and post secondary students enrolled in any calender year, it is estimated in the range of 6.78 million students are enrolled in courses each year. This number, while appearing surprisingly high, does not even include personal advancement courses, community courses, business courses, and other non-provincially sanctioned non-degree and non-diploma granting programme. The true number of students attending some form of school would therefore be still higher yet. But even just considering this number, it is staggering to consider that at any given time in our country, over 23% of all people - regardless of age, financial status, geographic location or employment - are in a registered,

recognised and validated educational course. Almost one in every four people are currently taking a degree or diploma course right now. When considering this over the life of a generation, it is estimated that up to 70% of all (North American) adults take a degree or diploma, vocational or self-help training course at some time in their lives ![4]

Current Educational Delivery Systems

In Canada today, we see a myriad of educational delivery systems, some very traditional, some less so. With the growing and changing technologies that exist today, with the needs of families to change careers, with the aging student body, with increasingly diverse student backgrounds and with the increasing complexity of educational delivery combined with dwindling resources and budgets, we are seeing many different forms of education coming into mainstream use. These various forms of educational delivery systems can be summarised as follows:

Public, Separate and Private Schools - K-12 and PSE - Traditional Systems - This form of educational delivery is by far the most common and the most traditional type of educational delivery. We have most of our students in these degree or diploma granting systems.

Apprenticeship - This form of education is another common form of education and is geared mostly for the trade type work such as plumbers and electricians. Some professions offer forms of it through co-op programmes and self-study systems such as the RAIC Architectural Syllabus (the school that this Thesis is written for), Interior Design co-op and Journalism co-op programmes. Some professions also include, as part of their study, a formal and modified system of apprenticeship such as lawyers, architects and doctors.

Alternate Schools at the K-12 Levels - This form of educational delivery is virtually identical to the traditional public, private and separate systems except that the underlying concept behind the teachings is the inherent right of the parent and child to direct and guide their education autonomously (parent co-operative governance). In the United States, these are called Charter Schools.

Charter Schools - These are only found in Alberta, and are publicly funded open public schools in the K-12 levels that operate autonomously but within a strict provincially set group of guidelines. They are non-profit organisations and are very similar to traditional educational delivery except for the system of governance.

Home Learning - This is becoming a more common form of education particularly at the K-12 level. Although known at the PSE levels, the name gets changed to Distance Learning or Life Long Learning. Home Learning is mostly in response to parental concern over the type and apparent lack of learning by students in the more traditional K-12 systems. The thrust behind this form of learning has been the parent.

Business Partnerships - While businesses have always had an influence on schools (see History of Education Summary), only lately are we beginning to see an real push by big business to not only influence school curriculum, but in some instances to replace it. Examples such as McDonald's, AutoCAD and Microsoft evidence the push for big businesses to create their own form of school, geared specifically for their own "students." These are more than just training, they grant diplomas,

have physical settings that are schools, and prepare the student for specific functions and career related jobs. In one case, Canadian Pacific Railway, their employees / students can study in the office, at a specially designed video conferencing room that is connected to degree granting universities (University of Western Ontario in this case) and CP employees can take courses for business, management and so on.

A very controversial educational / business change, and perhaps the scariest of all, is happening in the United States (and to a much lesser degree in Canada) - the profit oriented school service. This includes: McDonald's and Burger King Restaurants who (in the United States) supply the actual school curriculum to some high schools; Dunkin' Donuts, Pizza Hut, Dairy Queen and Taco Bell who all have exclusive rights on school lunches and therefore advertise, in those schools (it is a 5 billion dollar a year industry); the Edison Project which is trying to create for-profit K-12 schools in the PUBLIC system of some American states (Wisconsin and Illinois); and the "infotainment" channels piped into the school systems of many American and Canadian Schools [5].

The infotainment channels would appear to be most controversial for they directly advertise to a captive and young audience. In the American system, the:

> *"... school contracts' state that 90% of the children in a school must watch the program* [sic] *90% of the time; each program must be watched in its entirety - a show cannot be interrupted - and the teacher does not have the right to turn it off."* [6]

Note that the teacher <u>does not</u> have the right to turn it off!

<u>Distance Learning</u> - Distance Learning has been around for over a hundred years in Canada and is most notable at the PSE level of schooling. Almost 50% of all PSE schools offer at least one full course through distance learning, [7] and some schools, like the University of Calgary, offer an extensive array. The most prevalent current push of these schools is to offer not just an individual accredited course, but to be able to offer full degrees through distance learning.

<u>Open University</u> - While the delivery of this form of education is virtually identical to Distance Learning, there is one major difference - the originating school is not a physical school with classrooms. This is the newest and most media friendly form of education we see today - the open university is the university without walls. In Canada, we have seen this type of school for years since Athabasca University in Alberta first established a presence in 1970. British Columbia and Québéc followed shortly after and now, throughout the world, there are a number of these types of schools.

The main media of these schools has traditionally been technologies such as television, videos, and cassette tapes, but recently the high technologies such as video conferencing, computer CD's, and the Internet have become the preferred delivery media. We will review in more depth later in this report.

<u>University Colleges</u> - This is a very new form of school which is very closely related to the more traditional PSE forms of educational delivery - classroom based pedagogy - but the underlying goal is to incorporate the values of both the university's liberal arts education and the college's traditional focus of vocational training in degree granting facilities. The first such University College was the University College of Cape Breton in Nova Scotia in the early 1980's. Today we see a handful of

these in each of the provinces (except for Alberta where community colleges are permitted, in restricted use, to apply for degree granting).

Three Current Technological Approaches to Educational Delivery

It would seem that popular opinion, at least an informal "sense" of the popular media, would indicate that most people feel there are major problems in the educational industry today. Everywhere we hear of educational chaos, despair, and a growing global competitiveness that is leaving Canada behind in the educational race. Sit in any pub, chat at any bus-stop, or listen at any water cooler at work and you are apt to be told that our young students cannot read as well as they used, are not as well educated as they used to be, are not as fluent in the core curriculum as they used to be, cannot do basic math the way they used to or are not able to think like they used to. In general we hear they are just not as good as they used to be. We are told by businesses that our college graduates are untrained for their work, our curriculums are not reality based, our schools produce graduates that can not even write a letter properly. And if this is not the actual reality, it would seem to be the predominant perception of our Western educational systems.

But do we really have a problem today in education? Based on the readings completed for this Thesis,[8] except for one dissenting vote,[9] the answer would appear to be yes. Based on informal discussions with friends, family, and with teachers the answer would also appear to be yes.

From the research readings three essential failures are evident:

1. the failure of our (North American) school system is our inability to teach "*high order reasoning and learning skills*" [10]

2. the failure of schools is that we do not address the needs of business and the market place.[11]

3. the failure of our schools is that we are too centred and concentrated on "input / output" theory (number of students "in" compared to number of students "out" - number of facts "in" versus number of facts "out" at test time) and therefore we don't spend enough time and effort on the cognitive nature of educational learning.[12]

A number of reasons and causes for these failures have been published:

1. Too many demands are put on the teacher's time and too few resources are offered for them to do their job.

   "*By the nature of the job, a teacher's attention must be divided between numerous students and responsibilities during any school day. There are few occasions when teachers are able to give more than a few minutes of individual attention to any one student.*" [13]

2. There is too much reliance on the school for things that the home should be doing:

   "Today we see three main reasons for the weak and tenable conditions of schools:

   1 - the house and the church, once stable and strong, are weak and or non-

existent;

2 - support of the school from the home is very poor; and

3 - schools now provide schooling, shelter, food, baby sitting etc. and they can't afford it." [14]

3. Schools are underfunded. Funding for schools is so low and the issue of funding is so critical that we have schools not able to afford the basic necessities of teaching. Text books, work books, basic science equipment and even basic computers are too few or non-existent.

4. Schools are over funded. Waste is endemic in school systems:

> *"As Canadians, we spend more on education than any country in the world, and we have less to show for it. The money is wasted on huge bureaucracies and overpaid teachers. Whatever our problems may be, they certainly can't be solved with more money."* [15]

5. Phenomenal growth in immigration and increased assortment of student backgrounds creates an environment of extremely diverse student needs which cannot be handled by our present system. English is the second language for an ever increasing number of students:

> *"... there is a litany of difficulties ... to literacy problems increasing numbers of immigrants who have English as a second language ..."* [16]

6. Teachers and educators alike do not get the respect from the students they deserve so how can they be expected to teach in such a violent climate?:

> *"The problem of* [Canadian] *youth violence has been reduced to how schools should cope, and perhaps how to provide students faced with assault with 'more skilled responses'."* [17]

> *"Firearms have outstripped traffic accidents as the leading cause of injury-related deaths among young American adults."* [18]

7. Today's school systems, especially the PSE levels, are not producing enough marketable graduates. Too many Baccalaureate degrees in the arts, general sciences, and liberal sciences have produced a highly educated, non employable emerging population of twenty to thirty-something year olds. Schools are not being effective in their education:

> *"American higher education must become more productive. That is, our universities and colleges must produce demonstrable more education, research and training for the resources requested ... "* [19]

Today many opinions have been put forward for the direction that education should be taking to solve these educational problems. Some are progressive and controversial (no more schools) and others are more benign and mainstream (just change the curriculum a little, add a few teachers and add a few computers). But all the solutions seem to involve one essential, central elemental theme: Engage the student. If we can engage the student we are told, we automatically teach higher

learning skills, we can more clearly inculcate basic business principles and business knowledge through general knowledge and we can nourish our young fertile, creative and cognitive minds to explore and discover:

> "*Students respond better in challenging, interesting environments.*"[20]
>
> "*Factors in Effective Teaching* [are]*: ... Flexibility ... Enthusiasm ...*"[21]
>
> "*We need thoughtful learning. We need schools that are full of thought, schools that focus not just on schooling memories but on schooling minds ... We need educational settings with thinking centered* [sic] *learning, where students learn by thinking through what they are learning about.*"[22]

Sounds pretty simple. All one needs to do is to make sure that each student is actively encouraged to explore, learn, test, expand, and challenge their own knowledge and creativity - to make sure that each student is actively engaged to explore and discover the world around him or her - and learning will naturally follow.

But in the day to day world of educational stresses and economic strains, this would appear to be very difficult if not practically impossible. Despite many years of hearing about the problems, it is only recently (relatively speaking) that traditional pedagogy has begun to be questioned and changes put into place. Only recently have deep rooted essential questions begun to be asked about the validity of traditional educational delivery.

From the historical review section of this report, we have seen that our traditional pedagogy - the (passive) student group sitting and absorbing what the (active) teacher is lecturing - has been with us from about 2000 BC in Mesopotamia. We have seen through the years that education has changed little. The traditional method of educational delivery was only being supported and not replaced by other forms of educational delivery such as: familiar teaching (arguably the original pedagogy); apprenticing: practical training (the Guilds); day care centres; and a general evolution from Latin grammar and ecclesiastical schools to more commonly used languages, secular schools and the option between practical training and liberal thinking educations-all along, the traditional classroom form of education has existed and flourished. The material, the language and even the technology of teaching may have changed (only very little) but the underlying principle of the passive student / active teacher has been around for a very long time.

It was around the end of the nineteenth century and the beginning of the twentieth century, that with the growing evolution of the machine age and its manifestation and drive to the Modern Era, probing questions were being asked. It was Educational Psychology, the central theoretical premise of many of the learning psychologies, that was the driving force behind the questions and was first formulated (in the late 1800's) through the work by Wilhelm Wundt (1832-1920), William James (1842-1910), Edward Throndike (1874-1949) and John Dewey (1859-1952).[23] Essentially what Educational Psychology asked was: How do we learn? and How can we learn better? From this simple start, tremendous research had been and is continuing to be completed in this field. Theories such as: Cognitive Learning; Gestalt Psychology; and Field Theory;[24] look at how we learn, how we remember, how we recall, how we use what we remember and so on. But still, in my simple, layman's uneducated terms, the research readings that I have completed for this Thesis, which

include: Educational Psychology, (1990); Smart Schools - From Training Memories to Educating Minds, (1992); Academic Productivity: The Case for Instructional Software, (1996); Peak Learning, (1991); Making the Grade, (1989); Academic Libraries -The Changing Knowledge Centres of Colleges and Universities, (1984); School's Out - HyperLearning, The New Technology, and the End of Education, (1992); and Back to the Future: Tests, Competitiveness, Performance, (1993) all point to that one simple and clear message - Engage The Student.

The difficulty would seem to be: How?

Three basic strategies being adopted by schools appear to be: (1) schools trying to be more responsive to the student but more or less status quo in traditional pedagogy; (2) schools adopting a more progressive approach to learning through new learning theories, use of new materiel, different teacher roles and creative student focuses; and (3) schools starting completely from scratch and embracing higher technologies as the educational delivery panacea.

These approaches are manifested in different ways: lower student/teacher ratios; higher standards requirements; attempts to increase the severity of punishment because of bad or violent behaviours; increased integration and student diversity (physically and mentally challenged, cultures; colours, religions); attempts to maintain a more focused curriculum of "back to basics"; a renewed attempt to provide creative and new approaches to the learning techniques and increased access to current computer technologies. These all work variously together or against each other.[25]

One of the most newsworthy changes we see occurring today is the push for the use of high technology to assist in educational delivery. Looking at the issue of high technology, from the three basic philosophical approaches noted above, three technological strategies emerge: (1) schools taking an additive approach to technology -(the "I know everyone else is getting them so I know we've got to get them too" syndrome); (2) schools taking an adoptive approach to technology to suit their modified version of traditional pedagogy -(the "computers are great and we can do lots of good, intelligent work with them" philosophy); and (3) schools taking a replacement approach through technology allowing technology to replace the school -(the "a computer can replace the burdensome vestiges of the needs of a physical presence and allow teachers to teach hundreds of students at a time" approach).

We will look at these three approaches as they apply to today's educational delivery systems.

Schools Taking an Additive Approach to Technology

"Schools Taking an Additive Approach to Technology" refers to those schools that either currently exist or are being built to accommodate conventional and traditional educational delivery methods (the Mesopotamian Ideal). These traditional methods, include: (1) classroom settings with passive students and an active / lecturing teacher; (2) social setting of 20 - 40 students (at secondary) and upward of 100 (at PSE levels); and (3) standardized delivery techniques delivering an autonomously created curriculum.

In schools that are using this technology approach, we see that in the K-12 levels of school there is a large number of computers, but not a large number of changes to pedagogy. Anecdotal evidence would suggest that most existing schools in the lower levels fall within the "Additive Approach to

Technology." It is assumed that schools who are within this category constitute the majority of schools because this describes virtually every school now in existence. Schools have been told for years to use technology and use computers because that is way that the schools are going. But this kind of adopting of technology is seeing little affect in most schools. Even today, when changes in computers and educational delivery are spoken of frequently, most schools are only purchasing computers so that the students can learn to *use* them as opposed to learn *through* them. This is changing now, but the dominant use of the computer is still how to use them. While this would echo what we have heard for fifteen or twenty years or so, it is still a valid critique today. The main reason for a computer in the classroom, still is to teach students how to use them.

Schools Taking an Adoptive Approach To Technology

"Schools Taking an Adoptive Approach To Technology" refers to those schools who are using high technologies as a tool in an attempt to ensure creative and challenging environments for students. While this group of schools does not make up the bulk of the educational facilities, it would appear that this group is fast becoming a major goal for many educators and so the number of these schools is greatly increasing.

In Canada the first major use of computers in a school came in 1968 in the Faculty of Education at the University of Alberta (an IBM 1500 experimental instructional system).[26] There the computer was used to assist in the development and teaching of educational material by running faculty created programmes that factorially quizzed and tutored students. The system was successful and soon twenty such systems were installed throughout the country. By the year 1983, provincial ministries were fully endorsing the use of computer technologies in the classrooms and subsidising the cost of school purchased PC's and mini-mainframes . Later (and more recently) the provinces of British Columbia, Alberta, Saskatchewan and Manitoba have even gone so far as to design and programme seven high school mathematics courses which are distributed on CD-ROMs that can be used by any student with access to a computer.

From this early growth, and with the support of provincial ministers, today we see computer use in school settings using three distinct approaches: (1) Computers used as tools; (2) Computers assisting in instruction; and (3) Computers used managing instruction.[27]

Computers As Tools: This is the use of the computer as a writing, researching, graphic generating, media handling, mathematical and data storage tool. This is by far the most common form of computer use as most commercially available computer programmes specifically address this type of use. Many thousands of programmes fall under this category and include: Coreldraw®, WordPerfect®, Lotus®, dBASE®, and AutoCAD®. This category also describes many elementary and learning type computer programmes such as Mrs. Math, Edutainment Kid's Cube and The Magic School Bus. Included too, in this area are data and learning resource tools such as The Canadian Encyclopaedia Plus and Expert Software.

Common in this category is the unchanging form of delivery. WordPerfect may assist in writing by having a thesaurus, use of graphics, text, spelling and grammatical suggestions, but it does not suggest a methodology in learning, nor does it critique content or mark progress. Similarly, an encyclopaedia offers a great wealth of data, but it does not disseminate, organise or suggest appropriate material based on a specific course or learners requirements.

Computer Assisted Instruction: This has been called "learning through computers" [28] and refers to the use of computers as part of the process of learning and not just a thing to be taught. Computer assisted instruction includes the use of computer programmes designed specifically for a course or level of student ability which questions, quizzes and drills students in the course material through the use of simulation, tutorials, gaming and Socratic type questions:

> *"Achilles: Haven't you ever wondered why we are here, or who invented us?*
> *Tortoise: We are inventions of Zeno and the reason we are here is to have a footrace.*
> *Achilles: A footrace?* [What is the] *point to such a race?"* [29]

The computer can stress new and reinforce previous concepts and instruction. It has the benefit of never tiring, always being consistent in answers and being as neutral and unbiased as any teacher could ever hope to be. One problem is that it takes enormous amounts of time and money to create the programmes and teachers and school systems do not generally have the knowledge or ability to create such a course programmes. Teachers tend not to use commercially or even provincially created programmes because most teachers prefer to (and do) create their own course materials autonomously and therefore do not tend to rely on a course created by someone else. Computer assisted instruction courses are not seen as being specific enough and are only used, when used, as add-on supports to existing course loads. Computer programmes have met with only a modicum of acceptance. (See Appendix C - A Series of Support Research Notes, Section 13.1 - Academic Productivity - The Case for Instructional Software - An Excerpt for an interesting critique on the problems associated with teacher created computer programmes.)

Computers in this category are also used as a general educational conduit. Access to information, access to people, access to other ideas and access to other methodologies is available through the computer. This is accomplished primarily through the Internet. The Internet is now being used quite extensively as a communication tool between students and schools around the world as well as a research tool. According to the Mr. Gary Mar, the Minister of Education - over 97% of Alberta K-12 schools are connected to the internet. A simple example of how much the Internet is being used is the number of schools that are connected and who have set up a chat or discussion forums between themselves. In this manner, students from one school can discuss ideas, concepts and learn about each other, regardless of where the school is:

> *"... my grade six students at Marshview Middle School* [in New Brunswick] *have been involved in ... the Canadian Geography Game, which is run by the Alberta Teacher's Computer Council. It is a game in which each player is given a code name. Every player gives eight clues and based on these clues others try to guess the location of the player in Canada. The clues are about climate, land formation ... The students get very involved in the research and have a lot of fun guessing where the others are located. It is a great way to learn about Canadian geography."* [30]

> *"Each year as part of the Science program* [sic] *the students log on to NASA and get up to date reports about shuttle launches, planned missions and various other things."*[31]

> *"... in the project, "Increasing Awareness Among Youth Through Telecommunication"* [the] *Internet was used to link up class 6A with other grade six students in Costa Rica, Belgium, and United States."* [32]

"Jason and Marie are working on a class project with Guy and Samantha. What is interesting is that the first two are in New Brunswick, while the others are in B.C. Their teachers are in the classroom, but they also learn from part-time mentors in Central America, at NASA and across Canada." [33]

Computers are therefore becoming much more used even in the traditional school as communication tools and as learning resources. The use is becoming so common that the Internet can act as an access to schools and school information. While completing the research for this Thesis Design Project, the Internet was used for data searches, general information, research into Virtual Universities (which will be looked at in the next segment) and to get a general understanding of what's being done "out there". In performing this research, searches would invariable produce many references to schools of all levels (K-12 and PSE). It was quite easy to locate many schools. To help with my research, many schools were sent E-Mails in the hope of obtaining data. Although very unscientific, this method of research produced some startling results (startling at least to me):

1. The first surprise was the number of schools connected to the internet. While it is impossible to be exact, the approximate number of K-12 schools with Web pages on the Internet, at the time of the report, was staggering. In a small sampling, schools from three different countries were counted who had Web Pages on the Internet:

Canada	Total Count: 697	Elementary Schools: 351	High Schools: 346
United States	Total Count: +9 700	Elementary Schools: +3 100	High Schools: +6 600
Australia	Total Count: 668	Elementary Schools: 286	High Schools: 382[34]

(Note that every PSE level school appeared to have a Web Page.)

The United States appears to have the lowest ratio of schools who are actively connected to the Internet by population. Australia, which has about 75% Canada's population base has almost the same ratio as the United States. These ratios are:

Canada	1 : 39,000	(One K-12 school connected per every 39,000 people)
United States	1 : 26,000	(One K-12 school connected per every 26,000 people)
Australia	1 : 28,000	(One K-12 school connected per every 28,000 people)

It is surprising how much Australia comes up on the Internet when searching for school information. Australia, as with the United States, seems to be highly aware and highly motivated to maintain a high presence "on the Web." The quality, graphic appeal and inventiveness, as well as the kind of information included on the various Web Pages is all very comparable though, regardless of the school, language or country of origin;

2. Another area of surprise was that E-Mails were not as good as they appear to be. Responses to E-Mail correspondence requesting information for this Thesis Design Project generally were received from the PSE level. Only a few elementary and secondary schools even responded to queries whereas replies to a number of E-Mails sent to PSE level schools were received from such sources as presidents, vice presidents and professors of different colleges and universities. The most consistent responses appeared to come from American sources. Three authors who had written on the subject of computer technology were forwarded E-Mails. None responded.

Many of the PSE responses were perfunctory "See Our Web Page" type answers, but a number (and it must be noted even one president of an American College) did respond in some great detail. It is said that E-mails make communication asynchronous (not needing to talk to each other at the same time), yet we still have a need for synchronous communication (face to face).

One conclusion I draw from this Internet use is that the E-Mail system, which is tremendously lauded by most educators, would appear to be only a little bit more successful than the regular mail. It would appear that E-Mails can be as easily ignored as regular mail. Phone calls were the best way to get in touch with people;

3. The lack of response from non-english schools was surprising even given that most publications indicate that English is the universal language of the Internet. Even given that many foreign schools have bilingual Web Pages (English and their mother tongue), not one E-Mail was answered by a non-English based school;

4. Another surprise was that although the Web pages are graphically interesting, they are surprisingly devoid of any real information. A typical web page from a school reads like any promotional brochure available at any school office. The typical elementary and secondary school web page includes a few pictures, references to curriculum and some general information all in a nice, neat and usually visually interesting package. But these pages generally appear to be created and then left alone - rarely updated. The information given is so general as to be of no interest other than just a very superficial overview. This may not be surprising to the reader of this report, but it certainly was to the writer. I expected to be able to obtain real information, real data from the Internet (isn't that what we are told it is useful for - to access information?).

   (See Appendix C - A Series of Support Research Notes, Section 13.2 - A Sample of a School Web Page for an interesting copy of a typical school Web Page); and

5. A final surprise finding is how schools on the Internet laud their computer systems and how the computer is being heralded as a "must have" piece of equipment. Virtually ever school "boasted" a computer lab or a computer network with Pentiums or Windows NT or Internet access or multi-media tower stations or some number of seemingly impressive computer set-ups. But by looking at many of the school pictures (but certainly not evident in all of them) one sees a string of computers sitting along a string of tables in a very traditional classroom setting in a very traditional looking (non-computer) environment. One can imagine hours sitting in front of one of those computers trying to finish a report - listening to the ever present whine of thirty computers, listening to keyboards being banged and waiting for the printer to print out that one page, in the queue of forty. I wonder if we have progressed from the computer rooms of twenty years ago? Even the University of Calgary, who is very justifiably proud of their Distance Learning centre, has a group of ten computers sitting in a basement room for use by students. The computers are stacked in the centre of a small room, grouped into two rows. They sit atop small tables with wires and printers and modems and keyboards and everything else floating all around the place. Nothing could be more uncomfortable than being shunted down to a small claustrophobic basement room with the heat, smell and noise of a bunch of computers for a study mate (for a more detailed and less severe look at

computer offerings by the University of Calgary, refer to the AMEE Case Study section of this report).

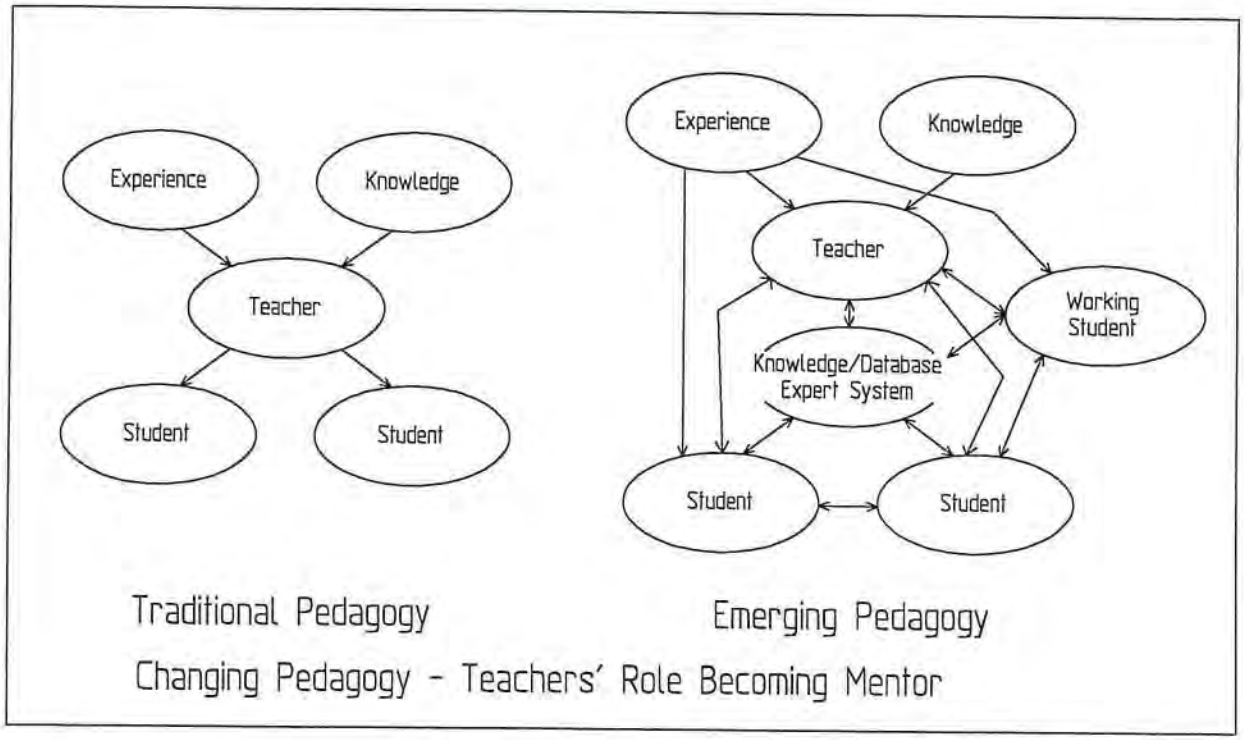
Notwithstanding my impressions of the use of computers and the Internet, in Canada there are a growing number of successful and intelligent educational applications of computers. One such school is Huron Street Public School in Toronto. In the early 1990's, the school brought on a computer assisted learning programme they called CSILE (Computer Supported Intentional Learning Environment). The programme is very simple, it offers computers to students such that the computers provide essentially two functions: (1) a storage of student input; and (2) communicates with other students.

In the first function, CSILE computers store any information the students input - it is a data base of knowledge - which can be given, loaned, referenced, printed or used at any time. In this way, "learned" information is continually used to "learn" new information, and becomes a foundation for further learning.

In the second function, CSILE computers are a communication tool that allows students to review and discuss topics of interest to them with other students. This applies to students in the same or different schools. The computer then allows knowledge to be shared, and again, because the information is available to all students, the information forms a foundation for additional learning. The people involved in the project suggest that CSILE helps students learn higher learning skills through better argument and rationalisation skills rather than through fact regurgitating and good writing techniques:

> *"This is an intriguing educational experiment because it reverses the traditional roles of writing and thinking. We typically think that producing better writers is the way to produce better thinkers and learners; CSILE reverses the cause and the effect in this assumption. Do better learning and better reasoning, - after all, that is what knowledge transforming consists of - lead to better writing? The early data coming out of Huron Street School suggest that the answer is "Yes!"*

In this way, the traditional linear hierarchy of knowledge / experience → teacher → student is changing. In the graphic below,[35] the traditional pedagogical approach is compared to the newly forming pedagogy:



For a full text of the Huron school, see Appendix C - A Series of Support Research Notes, Section 1.3 Huron Street Public School for an interesting overview.)

Computer Managed Instruction: This is the third method in which computers are being used in the classroom and almost describes a method of replacing the classroom. In this approach, the computer manages the student's educational activity. The computer is used to allocate resources and learning material, schedule materials and lab work, create tests and assignments, avail previous tests and assignment to students and grade and assess tests and assignments. The computer also, based on an assessment of the student's test and assignment results, prescribes and modifies the remaining course material to suit the weaknesses and strengths of the student. The computer provides the record keeping function of the student's work and acts as a mediator between the teacher/educational facility and the student. This is virtually allowing the computer to teach the student.

Creating computer programmes to do all this is very difficult, costly and problematic on four counts: (1) teachers see it as a replacement of their role and therefore most educators do not strongly endorse it; (2) it is costly to produce; (3) educators do not generally have the computer where-with-all to design and create these types of programmes and therefore commercial applications must be found; and (4) commercial school applications, while being accepted in the States, are very poorly received in Canada and generally not well respected. In the Appendix - A Series of Support Research Notes, Section 13.1 - Academic Productivity - The Case for Instructional Software - An Excerpt, a short excerpt lists some of the concerns and difficulties the Americans are experience in trying to develop this type of software.

While it may appear that Computer Managed Instruction would require the most intense use of the computer, this is not the case. Computer programming is the backbone of this method of educational delivery, but the computer is not the only media of learning:

> "*Students using CMI* [Computer Managed Instruction] *generally only need occasional access to a computer since it is possible that most of the learning materials are available offline. The instructional sequences in CMI are accomplished through a variety of traditional noncomputer techniques such as regular classroom instruction, self-instructional materials, laboratory work, seminars and workshops.*" [36]

Schools that fall within this category also include those schools that offer Distance Learning and "Correspondence Courses." These numbers are increasing tremendously with well over half of the PSE level schools offering some form of Distance Learning course curriculum. For an in-depth review of what one school is offering through its Distance Learning department, and how a progressive school is augmenting those curricular activities that depend of educational delivery with high technology, refer to the Section Six - Case Studies, Adaptive Multimedia Education Enabler (AMEE) with the University of Calgary.

Schools Taking a Replacement Approach Through Technology

This is the third major approach schools are taking using technologies. This is by far the least used but is gaining some market share and much news coverage. It is based on the premise that some feel the computer can and should completely replace the school. Recalling a quote from this Thesis Design Project's proposal:

> "*If* [Information Technology] *learning is in everything, everywhere, how do we confine learning to the box of a classroom? We can't. Then what's the point of having schools at all? There isn't any.*" [37]

Many people feel that educational delivery technology, called "Information Technology", is the only way for the future of education.

> "*We* [can] *take as a starting point the supposition that information technology has the potential to be part of the solution to higher education's productivity problem (rather than being part of the problem as a contributor to increased costs.) More specifically, Educom believes that the existence of a substantial body of instructional software is a key component of that solution (and, conversely, that its absence is a key contributor to the problem.)*" [38]

> "*...IT* [Information Technology] *will change teaching and learning profoundly, no matter what the response of traditional higher education institutions. Just as the development of the printing press forever changed the teaching enterprise, IT represents a fundamental change in the basic technology of teaching and learning. ... If traditional colleges and universities do not exploit the new technologies, other nontraditional providers of education will be quick to do so.*" [39]

Both of these views manifest themselves in the application of technology as a replacement for traditional educational delivery. Both concern themselves with the school without walls.

The school without walls is a rather recent application of an old concept - the Correspondence Course which is now called Distance Learning. Since its beginnings in Canada in 1889 at McGill University, distance learning has had a slow but steady growth from about 10,000 students in the 1940's to somewhere near 500,000 today. With the proliferation of high technologies and Information Technologies, which appear to be a major factor in this rapid growth, a little over seven percent (7.37%) of all Canadian students are enrolled in some form of distance learning course. And it is growing to be big business in Canada. Based on $55.3 billion in total educational spending, distance learning is costing / producing somewhere around $4.0 billion (based on 7% of the students). Even accounting for this gross oversimplification and rounding off, the amount of money spent for distance learning is tremendous.

But distance learning is taking on a different meaning and manifestation compared to traditional correspondence courses. Traditional correspondence courses were and are directly affiliated with an actual school. Recent trends in Distance Leaning have directed distance learning to become autonomous from the traditional school building. There is no longer an originating classroom. These courses are offered entirely separately from any class.

With the diversely aging population we have, with the increased cost of education, with students' growing desire for distance learning, with the dwindling resources of governments and educational boards, with the increasing use of high technology and with the growing computer competency in the general student body, some governments are looking to Information Technology as the strategy to help solve their educational problems. The school without walls is their answer-the virtual school.

There are a number of these schools currently in existence at the PSE (university) level and the number is growing:

British Open University in England	Established in 1969 in England;
Athabasca University	Established in 1970 in Canada;
City University	Established in the Late 1970's in the United States;
British Columbia Open University	Canada;
Télé-University	Canada;
Western Governor's University	United States;
Globewide Network Academy	United States;
Education Network Australia	Australia;
The Graduate School of America	United States;
Open Learning Virtual University	Australia;
Open University	United States;
Online Education	Hong Kong;
Magellan University	United States;
Virtual Online University	United States;
National Technological University	United States;
Intec College	South Africa;
Phoenix University Online Campus	United States; and
Mind Extension University	United States;

There are much fewer virtual schools at the lower K-12 levels:

Distance Education Centre Victoria	Established in 1908 in Australia - on the Internet since 1990's;
CyberHigh	Established in 1995/6 in Canada (Alberta); and
Virtual Academy High	United States.

(While every effort was made to ensure this list of schools was comprehensive, I do not represent it to be complete. Both at the PSE and at the K-12 levels, the number of virtual schools is ever expanding world wide, so much so that it seems that every day there is a new school.)

At the PSE levels, these "virtual schools" find their genesis at two starting points: (1) an extension of an existing PSE school's distance education; and (2) a completely newly created PSE level school where none existed before. (The list above are those schools that do not have originating real universities.) The first category of school has the benefit of being able to offer accredited degree and diploma courses from an existing cache of accredited courses. There is a tremendous number of these types of schools on the Internet - "virtually" every university or college by the year 2000 will offer courses in the Internet.[40] The second category - the completely new schools- cannot use any existing courseware (because none existed) and therefore they offer two different types of courses: (1) on-line or correspondence courses that are available from many different schools, all of which, when grouped together form a degree or diploma accredited course; or (2) courses that were created by the school's own forces specifically for the school. As an example, taking an engineering degree from one virtual university may mean you take your courses from many different universities (all distance education classes). Regardless of origin of the course material there exists, at the time of writing, in the range of under twenty schools world wide that are completely new schools that do not have an actual building anywhere - true "virtual" schools. Between the two types of courses offered - a number of different courses from different schools making up one course of study versus all specially designed courses for a specific school course of study - the amalgamation course strategy is found in every school. Not one school that was reviewed offered exclusive courses to their students. Many, but not all, offered some courses of study that were entirely of their own making, but most used an amalgamation of many schools' Internet distance courses:

> "*This university offers college-credited courses through affiliated schools.*" [41] - *Mind Extension University*
>
> "*Online education, or learning via your computer, is presented here by* [a] *consortium of educational and research organisations ...* "[42] - National Technical University.
>
> *"At the moment, it is offering 1300 courses from nearly 50 US engineering schools ...* "[43] - Globewide Network Academy.

Progressing a little bit deeper, it appears that one of the barriers to the acceptance of these types of schools and their course offerings is the lack of accreditation. Even those schools that are directly affiliated with and are an extension of an existing university, have only a few courses that directly offer degrees. The problem seems to be even more pronounced for those completely virtual and autonomous schools that are not supported by an existing school facility:

"... [this is a] *university that runs distance learning courses using the Internet, cable television and video tapes. As regards the pressing issue of accreditation: no decision ...* " [44] - International University Collage.

" *... however, accreditation is not mentioned ...*" [45] - Magellan University.

" *... this university, which has applied for* [but not received] *accreditation, has a Missouri mailing address but exists only in cyberspace.*" [46] - Virtual On-line University.

" *... the courses however do not give college credit toward a Masters or Undergraduate degree ...*" [47] - Virtual School.

This is not to say that degree courses are not offered, they are just rather hard to find. Generally the types of courses offered run the range from the self help and general information diploma courses such as: Business; Tourism; Hotel Management; and Electronics Technician up to the (perhaps) more demanding BA and Masters degree programmes such as: Anthropology; Physics; Mathematics; Chemistry; and Astronomy.

A Brief Word About Educom

One of the most visible and perhaps the strongest proponents of computer assisted educational delivery - a group called Educom out of the United States- is worthy of a short note. Educom is a group who are looking specifically at increasing mediated education. From its beginnings in a presidential proposal (Clinton-Gore) to aggressively pursue quality and cost effective delivery of higher education, Educom has manifested itself through published reports, research and conferences. Educom as a group of professionals, pursues the link between technology and education as well as reviews how cost effective quality post-secondary education can be brought about. Educom's has one major sub-group called the National Learning Infrastructure Initiative (NLII). The NLII was set up in 1994 to support, explore and implement Educom's findings and they interested in pursuing private enterprise partnerships. These two groups publish an enormous amount of literature on the opportunities and challenges inherent in changing pedagogy in the United States. Their influence, though, is seen in more than just that one country. Educom is constantly referenced in the literature and research undertaken by the author and is constantly referenced by educators and teachers alike in general conversations. Educom publishes articles and studies pertaining to the changes in pedagogy brought on by technology and they are at the forefront of virtually every conference on mediated education and information technology.

"*Educom ...* [and the] *National Learning Infrastructure Initiative* [NLII] *seek to create a shared understanding of how information technology can transform the collegiate learning environment to improve quality, contain costs and increase access. We believe the high quality instructional software is a necessary ingredient for creating more productive learning environments. We also believe that software development strategies depending on the efforts of individual faculty members will not result in a sustainable, scalable body of materials, even when such efforts are generously supported by corporations, government agencies and private foundations. Instead a robust commercial market for interactive learning material is needed.*

Higher education institutions want and need high-quality solutions to the cost, access and quality problems they face; various commercial entities have an interest in providing those solution. But we have not yet seen the emergence of a viable market for interactive learning materials in higher education as we are beginning to see in the K-12 setting. While many agree about the desirability of creating such a market, there is neither agreement about the impediments to its creation nor consensus as to how to accomplish it."[48]

Educom argues for technology by supporting: more efficient use of educational teaching delivery systems; more productive use of educational facilities; more productive use of teachers; increased access for remote students; and increased access for mature students.

During the research for this Thesis Design Project, many of the people I spoke to suggested reviewing the Educom literature available on the Internet. There is a great deal of information that is available on the Internet through the publishing Web Sites of Educom and NLII. Their Web Pages, at Educom.edu and nlii@Educom.edu offer a wealth of information regarding seminars, conferences, on-going research, strategies and methodologies in the adoption and use of high technologies in higher education. As an example, some of the articles reviewed for this Thesis Design Project published by Educom include:

A Little Classroom Magic: Jack Child Interview - An American professor argues that computing and teaching are highly compatible and offer much more than word processing.

Why Technology? - A round table discussion addressing fundamental questions about technology in PSE level schools: cost; programming; commercialisation; training; up-keep; and so on.

Transforming and Preserving Education: Traditional Values in Question - A discussion by six "authorities" on how technology may create a new educational system.

Letter from Canada - A review of The Follow Us project where students were able to "follow" in real-time an expedition in the Arctic through the Internet connections.

A Matter of Degrees: Roy Romer Interview - An interview with one of the founding governors in the Western United States who was instrumental in establishing the Western Governor's "Virtual University." This is a university Romer cites as having "no walls or parking problems."

Credits by Cable: The Mind Extension University - An article about The Mind Extension University.

2005: A Virtual Classroom Odyssey - Canadian author Crawford Kilian looks into the future of education.

The Changing Definition of Learning - A discussion about society's and student's expectations of education.

Navigating the Transition - To quote Educom directly: "*High-tech approaches to education that are "as good as" the face-to-face classroom model are not good enough. But can sexy (and costly) new technologies actually improve the quality of teaching and learning?*" A discussion of this issue is the main feature of this article.

It's the Student, Stupid - A review of what commercial software developers need to focus on for successful educational software programmes.

Distance Learning for Continuous Education, Bringing the Virtual Classroom to the Global Workforce - A review of how businesses are using distance learning in their own offices.

Through Educom we see a great push for using of high technology to assist in educational delivery techniques. The main push Educom says is not to replace the school in a physical sense, but rather to augment the delivery of education with technology. However this, in most articles, seems to inadvertently lead to a school with "no walls or parking problems."

A Note About the Royal Architectural Institute of Canada Syllabus Programme

This course of study, of which the author is a student, is a very traditional apprenticeship / co-op type programme and supports students who wish to study architecture. The student is required to be a working person employed in the practice of architecture, under the direct tutelage of a registered architect. The student is then able to obtain credits by completing a series of correspondence courses, or local university equivalent courses as well as completing his/her practicum. The course is a national programme coordinated through the Royal Architectural Institute of Canada and is recognised by all provincial architectural associations in Canada except Quebec. Through reciprocity with the United States and the international NCARB exams, the Syllabus programme also allows its students to apply for licensing in the United States.

The overall course of study is created by and is run nationally while each specific course is designed and "taught" by a recognized university professor. In this way the RAIC Syllabus programme is a programme that incorporates curriculum from every architectural university in Canada. As an example, the Theory of Design courses (a series of three courses) are taught by a professor from The University of Manitoba - Professor Carl Nelson Jr.. From his Winnipeg location, he oversees the three courses assigned him - he fields questions through his E-mail address, via phone (infrequently) and through the mail. Course hand-ins and reports are either mailed or E-mailed to him and final exams are written by the student at the nearest exam centre (usually a university) then marked by Professor Nelson in Winnipeg and returned to the student via the national office in Vancouver. At any given time, there are a number of students, anywhere from Vancouver to Halifax, each of them taking the same course, submitting the reports for the same topics and writing the same exam in their own cities. A truly national school.

A Word About Alberta

At the time of this Thesis Design Project, the Alberta government was thick in the throws of heated debates between the Calgary Teachers Association and the Alberta Teachers Association. The Calgary teachers were threatening to strike (demanding a promised reinstatement of their wage roll-backs be honoured) while the Alberta government was continuing with their "see if I blink" attitude. This heavy tension and the resultant media frenzy, I believe, was the reason that my request for an interview with the Minister of Education, The Honourable Gary Mar, took three months to organise. Refer to Section Five - A Review of the Project Interviews for the interview with the Minister of Education. A special Thank you is given to Mr. Mar for his time.

Alberta education is facing the same challenges that the rest of Canada, and probably the rest of the world is facing: shifting demographics; increased business focus; diminishing budgets; increasing costs; increased distances to be covered; increased number of students in some areas and reduced in others; increased autonomy in some areas and reduced in others; increased expectations; increased complexity in teaching; and a fast moving high tech train ramming itself into a slow changing traditional pedagogy.

The Alberta educational system, though, has been responsive to this shifting pedagogy. Initiatives and changes in direction are not only being looked at, but are being incorporated. According to the Alberta Government:

> *"Albertans have said that providing modern computer technology, appropriate software and access to the information highway for both students and teachers, should be the first of priorities in technology integration. They believe that technology can improve education and increase access to education opportunities, especially for rural students. Courses should be available to remote and small schools through affordable distance delivery and telecommunications so that rural students have the same level of access as urban student. By setting minimum standards, equal access can be achieved across Alberta.*
>
> *Albertans have also expressed the view that those schools which have already invested in technology should receive funding to expand their efforts in technology integration."* [49]

As noted previously, most Canadian provinces are fairly similar in what and how education is provided and Alberta does not appear to vary much from the norm. We offer more or less the same kind of schools with the same kind of educational opportunities and the same kind of education. In addition to our traditional educational delivery systems though, we offer two forms of educational delivery that are of interest specifically to this Thesis Design Project: distance education; and virtual education.

The first of these, Distance education, is well established here. Based on the author's research for this Thesis Design Project, distance education in Alberta appears to be quite advanced.[50] At both the K-12 and at the PSE levels, Alberta seems well poised to (continue to?) develop a strong technology assisted learning system. We highlight a few important developments:

> AMEE - The Adaptive Multi-Media Education Enabler: this is a pilot project involving a number of schools and business sources in the Province of Alberta. The project is designed to avail students and businesses access to school curriculum and programmes designed specifically for the business market. This pilot project is innovative in that it is targeting the business and school programmes that are in demand by students while using high technology as the medium. The programme offers computers, software and courses of study that support businesses and the community at large. It is based in the PSE levels.
>
> CTS - Career and Technology Studies - an Alberta initiative launched in 1997 that:
>
> *"... expands business education, home economics and industrial arts programs* [sic] *in Alberta schools with programs providing employability and learning skills in 22 occupational areas."* [51]

This programme offers 22 different courses of study that are all geared around developing business skills of the higher level K-12 students. What is unique, is that it is a provincial initiative and is offered to any school or student (rather than at just one school.) The curriculum is therefore created at one central centre and offered throughout the province. Any school can opt for any number of courses to offer to its students. The programmes are, therefore, very much like what Educom in the United States are supporting: commercially viable, large scale (and scalable) curriculums geared for multiple sites and many orders of magnitude more students than any one professor can teach. The Alberta government, through the Honourable Mr. Gary Mar, Minister of Education, says of this programme:

"*The CTS program* [sic] *encourages students to explore a range of career options and to prepare for both post-secondary education and employment. It fits well with the government's People and Prosperity strategy by helping to prepare young Albertans for the future. It also creates opportunities for businesses and the community to partner with schools in providing career preparation.*"

The courses include: Agriculture; Career Transitions,; Communication Technologies; Community Health; Construction Technologies; Cosmetology; Design Studies; Electro-technologies and others. One of the central critical assets of the CTS programme is that community input is part of the curriculum development process. Professionals in related occupations work with teachers and Alberta Education to develop the learning expectations for each course "strand." In this way, the programme meets the expectations of the business and community people and gives students the skills they need to move onto post secondary education or to employment in one of the related fields.

Once again, while high technology may be the media of CTS educational delivery, it is not the mediator. The programmes ("strands" as they are called), are based not around technology (ie what can we teach with this type of technology?) but rather they are based on the currently understood needs of Alberta students and the business community at large (this is what we want to teach, how do we get the technology to do it?).

The University of Calgary Distance Learning Centre - this facility is in the basement of the Sciences Building and houses a number of multi-media classrooms and facilities for student computers and course resource materials. It also houses a broadcast facility with a recording studio. There are five smaller (± 10 students) and two larger (± 40 students) multi-media classrooms. The technology in each of them is similar, although not exactly the same. Most use video conferencing as their means of communication but the larger ones also use computer integrated software with computer camera setups. The larger of the six rooms houses the most interesting and up-to-the-minute equipment.

The larger classroom is roughly square and contains arched and tiered rows of desks and seats for the students. It is approximately 25 metres by 25 metres. The Professor is either a real professor (physically in the room) or a computer image (from a remote site.) If the class has a real professor, then this class is being broadcast across the system to a number of remote sites that are hooked up, via a Wide Area Network (WAN), with this main facility. If the professor is a computer image, then the professor is remote. Whether the professor is in the room or at a remote site, the running of the class is similar. The professor uses his

computer monitor (situated in front of him/her) to both project an image to the local students and project the same image to the remote students. Anything that is said or projected or written down is done through the computer so that the remote students, as well as the local students can view it. Should either a local student or a remote student wish to ask a question, the student presses a button at their seat. A light registers on the professor's computer monitor signifying who is asking the question and the light will remain lit until the professor addresses the questioner and queues the light off.

Through this setup, technology, and multiple sites, many students at remote locations can be taught at once and in real time.

Real time is the important thing here. This is traditional pedagogy making use of current technologies availing education to a wide spectrum of students in widely dispersed locations. Neither the technology nor the teacher need the student to be an eighteen year old first year on-campus student. The course will work just as well with that eighteen year old on-campus student as it will with a thirty-six year old part-time student in Edmonton taking an afternoon off from work as it will with a sixty-seven year old retiree from Lethbridge going after a degree. It is real-time education over wide distances. Therefore the school is becoming an amorphous, timeless, and ageless Place.

The same technology and room can and is used to teach remote students who have only access to a computer (and not a media room). This is very similar to the typical class illustrated above and, depending on the computer equipment available to the student, the remote student will hear and see exactly what everyone else does, but only through his/her computer monitor. The remote student's question (a metaphorically raised hand via a question light) is displayed in the classroom via the professor's monitor and responded in turn when acknowledged by the professor. Marking, testing and grading is completed in the conventional way through E-mail hand ins, mail-in reports and exams at remote educational facilities. The computers use a software programme called First Class which simulates the metaphor of a classroom by requiring students to "raise their hands to answer questions" (turn on a desk switch), to go for a chat with other students (use the computer chat facilities) and to go to class itself for the lesson (log onto the network and click on the classroom icon).

Business and Education Alliances: many businesses are creating alliances with universities so they can offer business courses to their employees. And example of one of these alliances is between The University of Western Ontario and The Canadian Pacific Railway. Through this affiliation with U.W.O., CPR employees can literally just go down stairs and take a credit course, while never leaving the office tower in Calgary. The courses offered are directly relevant to the CPR's needs with courses like business, safety, economics, Canadian History and the like, but are nothing more than standard courses available through the university. In this way an employee can get a degree (or credit toward a degree) part-time while working. In CPR's case, the employee is given some time off for actual course work. This is not exclusively an Albertan or even a Canadian initiative but does speak to Alberta business' willingness to adopt business related educational opportunities.

The second form of educational delivery that is specifically relevant to this Thesis Design Project is virtual education. On the virtual education front, Alberta was one of the first to offer a truly distant

education through Athabasca University. Athabasca University is one of Canada's leading "open universities" specialising in individualised distance education. It offers eleven undergraduate degrees and ten university certificates in the areas such as Science, Arts, Social Sciences and Business and offers two masters programmes through the Master of Business Administration and a Master of Distance Education courses. Accordingly, as technology grows:

> *"Courses are taught through a variety of means including traditional methods such as home study and classroom instruction. More recently, through an ongoing exploration of technology, AU has expanded opportunities for students to access courses through tele-conferencing, video-conferencing and electronic means, including computer-mediated communications, the Internet and the World Wide Web (http://www.athabascau.ca)."* [52]

It is through this forward thinking mentality (Athabasca was started in 1970), that Alberta has created a good base, if not an excellent foundation, for distance and virtual educations.

Another good example of Alberta using virtual education is the virtual high school - CyberHigh. CyberHigh is a high school that offers classes throughout Alberta strictly through the computer:

> *"CyberHigh is a community of learners in a virtual school. It uses a computer based wide-area network to link students with other students and with certified teachers who teach them from the approved Alberta curriculum. Teachers send their study assignments out over the wide area network, lead group discussions, evaluate students; assignments, and engage in most of the same teacher-students interactions that occur in regular classrooms. Students complete their assigned work using print material and software provided with their computers. Completed assignments are sent back to teachers for marking and then returned to the students, with copies to their parents - all by E-mail."* [53]

Cyberhigh is based on a home education model and a distance learning model. It is offered to grade 7 to 12 students. As of 1996 (the most current published information), there are a little over 150 students enrolled. CyberHigh started in 1994 and, because it is modelled after home based learning, heavily involves the parents as well as the students and educators.

As with other forms of virtual schools, CyberHigh is based around a series of computer programmes, designed by educators and professional computer programmers that are geared to individualised instruction. Individualised instruction means that each student is taught at their own speed and at their own level of knowledge based on the common goal of the course outline. Should one student be weak in integers, the mathematics programme would concentrate on that portion of the curriculum that explains and teaches that best. Other areas would still be taught, but integers would get a little more concerted effort from the computer programme. And the speed at which the computer runs through the material would depend on the student's ability. The faster he learns, the faster the course runs and the more challenging the problems become.

One very important aspect of virtual schools is the twenty-four nature of the school (24 x 7 in the jargon meaning 24 hours a day, seven days a week.) At any time of the day or night, weekday or weekend, a student can access the course, run the material and go to school. E-mails can be forwarded at any time of the day or night, to be responded to by the teacher at any time of the day or night again. Study materials are available through the computer system or from the local libraries

or forwarded to the student at home.

See Appendix C - A Series of Support Research Notes, Section 13.4 - CyberHigh - An Internet Information Package for the published data relevant to CyberHigh.

OUR CURRENT ENDEAVOURS - TECHNOLOGY

SECTION THREE-C

"I shall sit in that room and see if its atmosphere brings me inspiration. I'm a believer, my dear Watson, in the genius loci."
Sherlock Holmes in The Valley of Fear

3.4 CURRENT EDUCATIONAL TECHNOLOGY

This section of the report concentrates on current high technologies. Not so much what technologies are coming on stream in a global sense, but what technologies are being used that directly affect the delivery of education. We start with a general look at technology today.

Technology Today - Speed, Communication, Data

Today's technology is about one thing: Money. This manifests itself into three essential elements: speed, communication and data. How fast we can communicate with outside resources to gather more data seems to be just about the most important thing in technology. Advertisements abound about the latest and fastest Pentium (Dell computer), the latest and fasted access to the Internet (Shaw Cable), the best way to get the specific and individualised data one needs (NBC / Time Warner Internet News), the latest and fastest way to send an e-mail, receive an e-mail or down-load a programme (Java and Netscape), print a report (Shaw Cable) and on and on and on. We are told we can be wired to the world, have access to virtually any bit of information, have chats with friends across the continent or around the world. Everywhere we turn in the popular media we see "fast faster fastest". It's so ubiquitous that a neophyte like myself senses a tremendous feeling that the world is just whizzing by - whizzing along a super-fast fibre optic cable and never bothering to stop and say hello.

Speed is the most startling. Our computers now communicate across vast distances at "virtually" the speed of light on a growing infrastructure of fibre optic cables. They compute faster and faster every day. No longer do we see people turning their computer on, going for a coffee while it loads a drawing and returning ready to start working until the next "REGEN." (For those who were not around ten years ago in the architecture business, turning a computer on and loading a small drawing was a ten minute to fifteen minute process, plotting a drawing was an hour process). It is reported that computing power doubles every two years and that this has been true every year since the early 1980's. At the rate computers are currently computing, "conservative predictions" indicate that by 2010, the typical computer (in whatever form the computer will be) will be 1,000 times faster than computers of today. Loading an encyclopaedia sized book onto your computer will seem instantaneous. A very large drawing will blink onto the screen before you have the chance to finish typing a first command. One of the first personal computers that reached wide usage was the IBM PC. This utilitarian workhorse ran at a blistering 4.77 megahertz with 218 kilobytes of RAM. We now have Pentium computer processors that run at 300 megahertz with 256 megabytes of RAM - while the jargon may mean little to some and much to others, what is important is the acknowledgement of the increase in speed - a tremendous 6 300 times increase in computing speed in eleven years!

One may wonder if this is enough. If writing this report can be used as a gauge the answer would definitely be no. While writing this report I typically had the following programmes running concurrently on my computer:

Windows 3.1	- as the operating system;
WordPerfect 6.1	- for word processing;
Lotus 123	- for the number calculations;
Clock	- a clock indicating the real time;
1997 Canadian Encyclopaedia	- for factual references and definitions;

WordPerfect Thesaurus	- for word checking;
Ensemble CD	- to listen to my CD's while working; and
Spell Checker	- for spelling errors.

When I would try to load the Clipboard viewer to check and see what had been copied last or try to load Coreldraw to check a graphic, I would get an "Out of Memory" error. This would frustrate me because I could not do what I wanted to do - it seemed that I always needed more computing power or more speed or both.

A recent article explaining some of the computer programmes available for the Internet noted that:

> "... *Netscape took more than 30 seconds to load – an eternity in computer time ...*" [1]

While time is important, is 30 seconds really an eternity? It appears that in the computer world, it is.

Speed is not only important in how quickly a computer can manipulate data within itself, but also how fast it can push or pull that data to and from other sources. Computer modems (modem from the two words: modulator; and demodulator) connect one computer to another computer along a telephone or other line to allow computer communication. The "baud" rate is the rate at which the computer can send and receive information through its modem. Initially, baud rates in the range of 9 600 bps (9 600 bits per second) were astounding. We were able to send or receive about four pages of printed matter each and every second along our computer modem lines. Sounds pretty fast. But with high resolution graphics, the amount of information that 9 600 bps actually translates is extremely low. This is because of the high overhead of needing to send lots of data. For the graphics (the graphics are used as the interface which is the part of the screen that we interact with - the part we see). Baud rates now in the range of 56 600 bps are common place (6 times as fast or 24 pages of information per second). Ultimately baud rates in the range of 1 million bps (one encyclopaedia per second) are capable along copper wire and 1 trillion bps (1 million encyclopaedias per second!) are capable along glass fibre optics cables and 1 million bps along wireless connections.[2]

Communication is the second defining attribute and is equally important to computer users. It would seem that we are addicted to it: we must be able to communicate with anyone, anywhere, anytime - always. One particular client of my office's gets very annoyed when I am not available. He phones my cell phone ("why aren't you on your cell phone?") then calls the office voice mail ("I left a message on your cell phone"), then calls our secretary ("where is he, I can't find him?"). We are supposed to be always available. ("Linus, when the hell are you going to use your E-mail? We've been on Lotus Notes for a year already.") Why is it that we <u>must</u> be available? Why is it that we must always be in constant communication with our office? Why is it that we must be connected? It is because it is expected. It is because our clients expect it, our employers expect it and society expects it. It is because we can - that is why we are expected. I don't think this is funny.

When one family member of mine (who lives in Newfoundland) found out I had an Internet E-mail address she rushed over to her computer and promptly sent me an E-mail. She explained how great it was now that we could communicate through the computer. I was very confused by this. Trying to be nice, I phoned her and explained that since I had never really talked to her before I got E-mail, why the hell would I bother talking to her now? Why would she assume that just because I have an E-mail address that I would necessarily want to "communicate" with her? And why the bloody hell

do I need to talk to someone over the computer when a phone call is that much more personal, direct and immediate? There is no reason. At least not to me. But to many, there is a reason, and that reason would be to "chat".

Chat rooms are computer programmes on the Internet that create computer metaphorical areas that allow many people to type and have what they typed appear on the computer screens of all who are connected to that chat room programme. In this way, people can "chat" to one another through the computer. Chat rooms are very common on the Internet. They exist for general use but started as programmes allowing interactive discussion between educators, professionals and scientists. Chat times are "real-time" discussions meaning that people can virtually carry on a conversation. Because of these chat rooms, the need for face to face discussions is lessened and therefore the immediacy and intimacy of a face to face conversation is eroded as we allow the computer to mediate our conversations.

E-mails are very impersonal and are asynchronous. But I am willing to bet that this was also said many times about the telephone. I have to admit that when I first started to use E-Mail, I thought it was a wonderfully direct method of correspondence. I was getting messages back from many of the people to whom I sent letters and was happy to see that I was being read by many "important" people at the university level. Eventually though, when I finally recognised a pattern in the answers I was getting, E-mail very quickly lost its appeal. Upon receiving my E-mail most people would add a single sentence and then click their "reply" button on their computer screen automatically resending my own message back to me with their comment appended. So I was getting my own E-mail letter sent right back to me with a perfunctory "see our Web Page" response. One time, I even had the occasion to get an E-mail from a source I did not send an E-mail to and, true to form, this person also responded eloquently with the standard "see our Web Page" note. The interesting thing in this case, aside from the obvious time and effort it took him to respond, was that my original E-mail was redirected along the ethereal Internet cables from the original person I sent the message to, to various other people, all ostensibly going to give me the answers to my questions. So in the end I was able to trace my E-mail's historic journey from the computer of my original addressee in Australia to a second person in Australia to a third person in the United States to a fourth person at McMaster University here in Canada and then back to its final destination - my computer. I originally wanted information about Australia's Open Training and Education Network, but what I got was a "go see our Web Page" reply from a Canadian university. Oh well, the wonders of communication - I should have phoned!

The third essential and defining attribute of technology today is data.

Data is what data was - factual information. But the ability to produce it now in vast quantities is absolutely astonishing. Continuing to use my own research as an example, when searching the Internet for "school design" information I would find literally thousands of sites (a site is a reference to a Web Page that contains the specified key words). When searching for "technology in education" tens of thousands more sites would be found. Even on my own "1997 Canadian Encyclopaedia", a Boolean search for "technology and schools" turns up 132 articles and references. To help manage this glut of data, many computer programmes are available that have the ability to sort and manage the information for you (see Intelligent Agents below).[3] But even with these data managers, the amount of data that we can receive from outside sources is unbelievable - there is so much of it , that it is virtually impossible to review or read it all.

Data management is important politically too. The Canadian Government, indeed practically every major government in the world (the United States, Japan, Germany, Britain and the European Community)[4] are involved in promoting the spread and controlling the influences of the information that is available through our computers. The Canadian Encyclopaedia states:

> "Information has become very significant in the economies of Canada and other technologically advanced countries. The first half of the 20th century was characterized by a shift in the dominant economic activity from agricultural to industrial production. The second half has been characterized by a shift toward the production, processing, storage, retrieval and consumption of information: not only the familiar press, radio, television, film and library information, but also specialized computer banks of data (ie, information) that are sold to subscribers over telecommunications lines." [5]

This information push has changed and will continue to change the way we live and the way we do business:

> "*Industry and government have concluded that the Information Highway will be the driving force behind economic growth of the next century through new services delivered to home and business and through the transformation of existing services. Success in the new regime will require that each of the traditional information and communications industries re-evaluates how they do business and how they interact with consumers – or in the case of government, how it interacts with the public. All the traditional media producers, from television and film to book publishing, will have to re-invent themselves.*"

But technology is now beyond just bringing us hundreds of millions of bits of information in seconds. It is now about individualising the information. Nicholas Negreponte, in his watershed book Being Digital, (Alfred A. Knoph, New York, 1995) says that we have passed from the information age into:

> "*... the post information age* [where] *we often have an audience the size of one. Everything is made to order.*" [6]

No longer do we need to rifle through a whole newspaper only to find the three articles that interest us, we can log onto our computer and read every article written and published on the Internet that regards our topic of interest. We can be more specific than we have ever been. But two concerns are raised by this: (1) the loss of sovereignty over information because of the strong centralised nature of the media delivery; and (2) the loss of lateral or spontaneous interest from unexpected sources.

The loss of sovereignty is particularly prevalent and of concern to Canadians:

> "*The Canadian government has adopted a policy of promoting rapid adjustment to the information society, with its potential improvements in economic efficiency. This policy is not without problems. Information technologies often promote centralization, and since much Canadian information is already stored outside Canada, the Canadian economy could become even more dependent on the US and multinational corporations ... Information that used to be generally available, eg, in libraries, may have to be purchased from* [American] *databanks ...*" [7]

One can easily imagine, because it exists now, that our school texts will be generated by American business (notice not American schools) and controlled through a central American facility. I am willing to bet that the historic importance of the American Revolution will not play second fiddle to the immense impact the Riel Rebellion had on Canada. Our ('forever in jeopardy') cultural heritage will be that much further eroded.

I have seen this first hand last year when my wife and I were confronted with an assignment my son had brought home from school. It was essentially a page for colouring and adding of a few basic numbers for grade one students. The picture included the caption:

> "*Color the circles yellow. Color the squares red. Count the yellow ... "*

The drawing was of a number of shapes in the foreground with a school in the background (picture a "little red school house"). The flag on the school was the American Flag and the spelling of the word "colour" was American. I brought this to the teacher and asked for her comments. (How is my son supposed to learn Canadian spelling? Why is the flag American? Did you tell him this flag belonged to a foreign country? How will you spell "flavour" when teaching my son - with or without a "u"?) Her answer to me, which I paraphrase below, spoke volumes to the state of educational funding in Alberta and Calgary, and to the flood of (centralised) American information sources available to educators using the Internet (and it put me in my place). The teacher told me that this particular page, and other take-home assignments like it was from an American source. This source provides faster service than Canadian sources, costs less and, because she was paying for these assignments herself, out of her own pocket, she wanted to make sure that it was as inexpensive as possible. Boy did I feel dumb.

But the message is there: it is a very sad day when our teachers have to pay from their own money for supplies for our students. It is also a very sad day when the quickest and cheapest source of material (especially educational material) is from another country.

The second concern raised from the flood and availability of user specific information is the loss of spontaneity. By specifying a specific and certain type of news (or education or entertainment), one only receives that specific information. By checking only the hockey news, I loose the chance to see a cricket match result and perhaps become interested in a new sport. By looking only at North American business news, I may miss a business opportunity in Asia. And so on. Bill Gates, founder of Microsoft, has been quoted as saying that he regularly reads magazines that he normally dislikes, and reads them from cover to cover, just to get a broader or a newer perspective on issues outside of his immediate area of interest.[8] In this way he opens his interests up to new opportunities. By being so focused only on our specific areas of interest, we risk loosing a more broad-minded view of issues. Although we hear today of the Renaissance Man, the ability of the computer to individualise everything down to an "*audience the size of one*" runs the risk of loosing more global perspective.

The main link in all of this information is the Internet. Every bit of information we are speaking of here "virtually" exists, it will be delivered, is available or can be used over the Internet. So a brief overview of the phenomena called the Internet is in order.

Connectivity - A Word About The Internet

> *"The Internet is an ever-expanding aggregation of hierarchically interconnected networks that allows easy transfer of information between millions of computers spread across the whole world. On the Internet, "host" computers communicate to one another using the standard TCP/IP protocol over dedicated Telecommunications lines."*[9]

The Internet is a phenomena. It is a series of millions of computers hooked up along phone or cable lines that connect one computer to another. Millions of computers and billions of users are connected and more are coming on-line every day. Each computer is hooked up, via a communication line (ie telephone) to a central Internet Service Provider (ie host computer) and the service provider acts as the central clearing house for access to and from the Internet system.

The Internet began with ARPANet, which was developed in the 1970's by the US defence department's Advanced Research Projects Agency. ARPANet connected computers involved in research from different universities with the government. Later, the American National Science Foundation started in the 1980's, to mould the system which was to become the Internet. This system was also used for research and education and allowed lay people to connect to it. Additional networks have been connected to this originating one and eventually the Internet that we know today was born.

In each country, there is generally one central structural system for the Internet. In Canada this structure is called CA*net. This network was developed in conjunction with universities and business and serves as a main network connecting to separate regional networks around the country and in turn is connected to the main system in the United States and through this connection, to other networks around the world. Each province, in turn, also has a network into which the local Internet service providers connects.

The Internet allows the transfer of computer files from one computer to another, anywhere in the world. E-Mail, the transfer of "electronic mail" is just one example of file transfer. Software, data, programming, entertainment and other information and files can be transferred.

Because of bandwidth restrictions through local telephone lines (bandwidth is the measure of the number of simultaneous connections through a medium which can be exchanged in a unit of time), the use of voice and moving pictures is very restricted. But with advanced compression techniques and the use of cable TV lines and the increased use of fibre optic cable, the transfer of extremely good graphics, moving pictures and voice is becoming as common place as text and Windows 95. Many homes now are wired with very superior quality computer systems. However:

> *" ... the achievement of the full potential of the Internet and the widespread realization of an Information Superhighway require totally new distribution networks. These networks will likely use fibre optics and purely digital transmission. They will also encompass both television and telephony, and will thereby radically change the long-established national policy of separating those 2 technologies."*[10]

The Internet gives the opportunity for people to create a personalized or business "Web Page". A Web Page is a unique "page" or series of "pages" that resides in a local service provider which

allows other people on the Internet to view. Businesses, schools, governments, councils, tourist boards, individual families or individuals - anyone can have a Web Page. And that Web Page can be anything from a Shop at home listing of books or materials to buy, a brochure like information package for schools or tourism, general data and research information or just a picture of a family with a history of who they are. Anyone on the Internet, by logging onto the Internet, can view any one of billions of Web Pages world wide.

One of the newest of past-times spawned by the Internet is "Surfing." Surfing the Net is the process of logging onto the Internet, through a local service provider, and then, through one of the many programmes designed to go out into the nether world of the Internet and get information, one can search for information, The search is performed through a "Search Engine" which is a programme that looks at the data you have typed (say "school technology") and searches through the Internet for sites where a reference with those words exists. Literally tens of thousands of sites is not uncommon for a broad and common search like "schools" or "technology". A more specific search (ie I searched for my own name "Linus Murphy" and turned up only five sites) can be much more specific and more pertinent.

Virtually any kind of information is available on the Internet. From the obvious like book stores, to the more obscure like a review of the homes that Mozart lived in. But explicit sexual, anti-social propaganda, deviant and pornographic or bigoted information is also equally easily accessible. Anyone who can type on a computer can post and access this information.

Hypertext is another phenomena used extensively on the Internet. Hypertext is a key word or phrase in a document that, if clicked or selected, leads to another document or additional information on the keyword. In this way, a document can have many levels of meaning from the simple (no Hypertext references to the very complex (where each reference is checked and used as additional information). Pictures are also now being used as Hypertext references. As an example, if one was viewing a document about Africa and a picture of lion was in the Web Page - clicking the picture might bring you to a list of tours highlighting the lion, or a list of local zoos that have lions on view.

One interesting element on the Internet in Canada is SchoolNet:

> " ... *recognising the immense potential for enhancing education generally, governments, industry and educators in Canada have created SchoolNet. This is not a network itself, but a project aimed at having all 16 500 schools and 3500 libraries in the country connected to the Internet, and at helping them exploit it. It includes federal finance to have all First Nations schools equipped and connected, but otherwise is simply a facilitator.* "[11]

The Internet is growing. The number of local and low level networks more than doubles each year. The number of computer addresses connected at the local service provider level and the volume of traffic virtually doubles every 3 months. In 1988, under 60 service providers were registered with CA*net and by 1996 over 7 500 were registered. In 1995 upwards of 3.5 million Canadians accessed the Internet, but the number changes so quickly, it is impossible to even reasonably nearly calculate.[12]

World wide, by the year 2000 the number of users is estimated to be in the billions.[13] After that growth is projected to slow down, but only because the population of the world is not larger.

Educational Technology - An Explosion of Opportunity

But technology is more than just the Internet and educational technology and it is more than just a computer in the corner of classroom. Throughout the research completed for this Thesis Design Project, I have seen and read about many different kinds of educational technology and many different applications for that technology. We still see the ubiquitous blackboard and textbook but these are slowly being supplanted by (high) technologies. A brief summary of hardware, software and conceptual applications for high technologies used in education today follows. It must be stressed, though, that with the ever changing dynamic nature of technology, each and every school's offering will be different, and each and every teacher's use will vary and change with ability, access, budget and other relevant issues that impact on access to technology.

Intelligent Tutoring Systems

Intelligent Tutoring Systems (ITS) are software programmes that use artificial intelligence techniques and parameters to help determine the learning speed and level of knowledge of a student. The computer programme then adjusts the speed, workload and assignments of a course of study in order to maximise that student's learning.

ITS rely heavily on formal reasoning and are primarily used in developing problem solving skills such as logic problems, structural analysis problems and medical diagnosis problems. This area is expanding into pattern recognition and contextual associative learning[14] (the understanding of a new concepts or situations through understanding similarities between them and other examples) and will therefore be applicable to a much wider series of courses of study. The software is used in normal or networked computer systems and is becoming more widely available. There is very little of this software in use, although some pilot projects are being studied.

Connected Group Software

This is probably one of the fastest growing forms of software currently available. This is software designed to allow multiple users, over multiple computers, over multiple sites to connect and communicate and perform file transfers. The difference between this and regular Internet chat rooms is this software is for connected groups and allows and controls the provision for formalised E-Mail, data sharing and "white boarding." White boarding is the ability to create a virtual whiteboard on each person's computer screen that can be remotely or locally modified. Each modification made, regardless of which computer it is made from, shows on every other connected computer screen. In this way, the face to face interaction of writing and scribbling ideas on a whiteboard is simulated. In this way too, group interaction is heightened and enhanced.[15] The basic premise underlying the usefulness of connected group software, according to Terry Winograd, one of the leading researches in the field of artificial intelligence, is that at the heart of successfully achieving goals is collaboration and communications (rather than deductive reasoning and decision making)[16] and collective communication tools heighten the opportunities for both collaboration and increased communication.

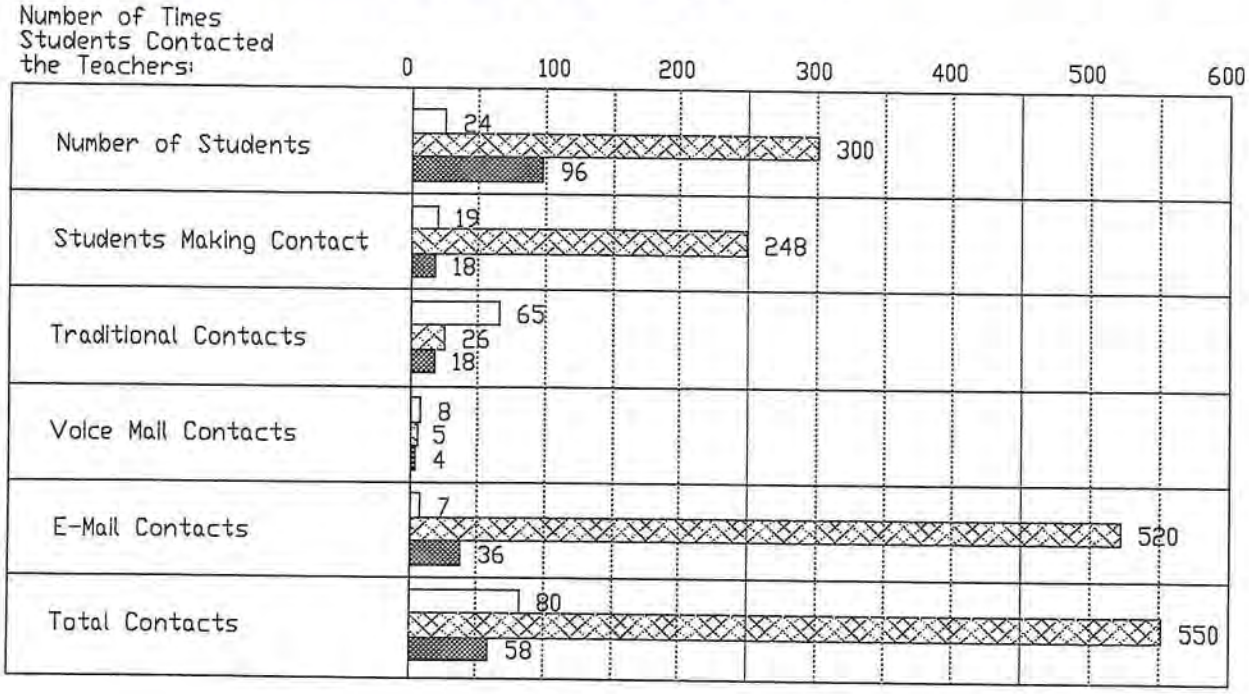
This type of software is particularly appropriate for educational settings where teachers and students can "communicate" on a virtual whiteboard during real-time teaching classes.

Computer Mediated Communications

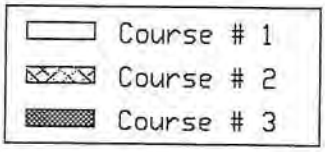
Connected Group Software is but one form of computer mediated communications. In the guise of many more common technologies (television / telephone) we are now speaking to and through computers at an every increasing rate. Computer Mediated Communications employs the computer as the intermediary between people communicating with people.

Electronic E-mail is probably the most known form where messages are typed on a computer and then "sent" to the addressee. The addressee can read and respond to the message at whatever time and from whatever place he or she wishes.

E-mails are said to make computer discussions timeless in the sense that it is not important to be able to communicate at the same time - E-mail can be checked and responded to at any time of the day and night. Similarly, whenever one logs onto a computer, one can access one's E-mail. An interesting university survey[17] was conducted on the use of educational E-mail versus voice mail versus traditional verbal communication. The survey was done at Mississippi State University between a number of classes and professors. The idea was to offer the three modes of communication and see which the students preferred. The students did not know that their mode of communication with the professor was being surveyed however the professors did. Each type of communication was offered equally and it is interesting to compare:



Preferred Mode of Communication
Survey from Mississippi State University



From this graph, it would appear that, overall, the preferred mode of communication between the students and the professors, for the three courses surveyed, was E-mail. But the study also looked at many other factors and one of these was the grade of the student and their preferred mode of communication:

> *"The results showed that students with an A or B ... had more office visits than expected while those making a C or less made fewer. The better students used electronic mail messages less than expected, and usage by students making a C or less was just as expected."* [18]

Another Computer Mediated Communications example is the use of educational courses. Educational courses mean courses that are offered through the computer only. Students can log on:

> *"... for new assignments, lectures, and interactive discussions at both a time and place of their choosing ...."* [19]

As part of the research for this course, the author logged onto a classroom chat line just to see what they were like. I was disappointed because I thought the interaction between the students and the teacher would have been much more intimate, closer to real-time and more direct. In the Appendix C - A Series of Support Research Notes, Section 13.5 - A Sample of a Student / Teacher Chat Session - October 8, 1997, a sampling of one school chat line is given. It is an excerpt from a session of the University of Waterloo Chat Line from one of their technical English writing courses. The chat line session was choppy, verbose, non-focused and generally rather un-school centred. If this chat session is typical of school chat lines in general, then there is a tremendous amount of maturing of the technology that must be done before any real meaningful use can be gotten out of them.

Multi-Media Technologies

Multi-Media Technologies commonly refers to a collection of technologies that offers interaction between technologies through text, very high resolution graphics, moving pictures, sounds and animation. Multi-media combines visual, audio, graphics and textual information through simple technologies. Multimedia ranges from still or real time motion video to music and speech and includes:

> "*computers, scanners, hyper media authoring programs* [sic], *audio and video digitizers, videodiscs and CD-ROM players, barcode readers and probeware ... a toolbox of various technologies ...* "[20]

As an explanation of this type of application, an example is best offered. The Voyager company, who programme learning type software, created the combination of text information, music scores, music in stereo sound and photographic quality graphics for their multimedia CD-ROM disc, Beethoven: The Ninth Symphony. While reading about the life of the composer, one can "Hypertext" double click on a picture of a sheet of music and hear the actual notes being played or click on a reference to his final home and then see a picture of it. Another example is The Canadian Encyclopaedia Plus by McClelland & Stewart Inc. Throughout this Canadian encyclopaedia, pictures and sound can be heard by clicking on the appropriate text or photo. When reading about Mackenzie King, one can

click on his picture in the main body of the text and then see and hear a film roll about him with Roosevelt and Churchill at the Quebec Conference in August of 1943 when discussions about unifying an Allied force were being convened. The film brings the world war and the importance of the event a little bit closer to reality.

Multi-media then is the mixing of different medias together in a single presentation.

Video Conferencing

Video Conferencing is the process of transmitting and receiving video from one location to another, from one personal computer to another personal computer. This is one of the fastest growing technologies for educational and business use.[21]

Two areas that are helping along with the acceptance of this technology are: (1) its dropping cost: and (2) new data compression strategies. Traditionally the cost of these systems was high because of the dedicated transmit lines and hardware required to make the systems work. This stalled the advancement of video conferencing for a long time. But to compensate for the low amount of data that regular phone lines could handle, compression software was developed. Cornell University then developed software which compressed and transmitted and then received and decompressed large amounts of data, in real time, sufficiently quick enough to make the video image acceptably legible over regular telephone lines. The software, called CU-See-Me, compresses the data so that up to 4 times the data can be sent and received through conventional methods. This software, and others more recently developed like it, do away with the additional costly overhead of hardware and cable line changes. The cost therefore of equipping a computer with the accessories to offer video conferencing (camera, speakers and microphone plus the associated cards and software) is way down - under the $1,000.00 range. This is very affordable in today's market.[22]

In Canada, an existing basic and more costly infrastructure for video conferencing is in place through satellite and microwave transmissions but access through the less expensive telephone lines and the Internet is coming on stream very quickly:

> *"Knowledge Network of the West Communications Authority was established in 1980 after a highly successful initiative of the federal and provincial governments with the ANIK B satellite. Other telecommunications authorities, TVOntario, Radio-Québec, the Saskatchewan Communications Network, Northern Canada Television and ACCESS Alberta use broadcast television and, in some cases, other technologies to provide educational programming for learners of all ages.*
>
> *In 1987 Contact North/Nord was set up by the Ontario government to facilitate access to all formal levels of education to northern Ontario residents. It does this through an audiographic network that serves numerous community learning centres. Other networks have since been established in Nova Scotia, New Brunswick, Manitoba, the Franco-Ontarian Network in Ontario, CANAL in Quebec and SCN. These vary in infrastructure from the use of satellite or microwave to broadcast video programming in Saskatchewan and Manitoba to the use of telephone lines for audio, audiographic and video-conferencing in New Brunswick and Nova Scotia. All of the networks have adopted a flexible approach to technology that is consistent with learner needs and financial resources."*[23]

The impact on education from video conferencing technology is predicted to be tremendous:

> "*The educational potential for live video in instruction is almost too staggering to contemplate. However, one thing seems certain, almost any conventional class can and will be taught using video-conferencing technology. Imagine the impact such exchanges* [of students] *will have on the quality of courses like international finance, East\West philosophy, and history, to name just a few.*"[24]

Video-On-Demand

This is a technology that is being implemented mostly through television for big business' employee home use and has seen some limited use in the United States at the educational PSE levels. This technology allows the remote selection and interactive playing, pausing, rewinding or replaying of a video, movie or training video even though the video is located remotely in a centralised facility. This is particularly useful for home viewing of a training video. AT&T, IBM, DEC and HP have or are currently developing many technologies in this area.[25]

Video-on-demand has the disadvantage of no interaction between the professor and the student because it is simply a method of video-taping a professor (or series of lecturers or labs) and then replaying them over and over again. This technology has the advantage though, of being able to video "master instructors" teaching virtually any topic. In this way remote "students" are at least able to see a course or lecture by a renowned professor:

> " ... *in fact, Ted Turner, founder of CNN, is planning to open an electronic university based entirely around video-on-demand technology.*" [26]

Computer Generated Publishing

Computer generated publishing is exactly what it says, the ability to publish journals and books through the ubiquitous availability of computers. This facet of computer technology has two components to it: (1) the ability of people to create work that is almost as good as or in some cases as good as professionally published materials at much lower cost; and (2) the creation, sales and distribution of published work through electronic means.

In the first instance, (the ability to create high quality published works), desktop publishing programmes abound thanks in very large measure to earlier pioneering work by Macintosh and Apple Computers. Many integrated programmes (integrated meaning the ability of one software programme to easily communicate and share data with a second software programme) and very sophisticated autonomous programmes (such as Coreldraw®) make creating highly graphic documents quite easy. Scanners for photos, Hypertext graphic and audio links for references and a myriad software programme features make the job of creating very good looking graphics and texts inexpensive. Very high quality printers and photocopiers are able to produce great looking graphics with colour in high quantities such as only the very best of equipment from years ago would be able to produce. In this manner, any person (a home businessperson, a housewife, a househusband, a student) can create and "publish" a book, pamphlet, journal, newsletter or newspaper. The quality of many of these cannot be distinguished from the quality of material issued by professional printers and publishers.

The second instance, (the ability to electronically publish work), is becoming very important with traditional publishers and printers. The owners of Simon & Schuster, Paramount Publishing who are one of the biggest and most influential publishers in the world, recently (1994) started a complete electronic publishing division to publish new material solely through the Internet. Random House have been working to establish a computer based delivery system for their published work and they expect by the year 1999 that proceeds from their electronic reference division (ie. encyclopaedias) will exceed revenue from their comparable printed works division.[27]

In regards education, traditional textbook publishers such as John Wiley & Sons, Addison-Wesley Publishing Company and Benjamin-Cummings have all developed "learning packages" that are modified course forms which are somewhat similar to versions of standard paper "Coles Notes" versions of traditional paper text versions.[28] Newspapers (Dow Jones, Washington Post, Globe and Mail and the Tribune Company) have established versions of themselves on the Internet, as well as the traditional radio and television companies of CBC, CTV, NBC, ABC and others [29] each publish through the Internet. It is quite easy to log onto the Internet, and listen to CBC news or CKUA music and it is just as easy to read a current article written for the NBC network or USA Today. The reality of this came home to me in a macabre way when I noticed that well within 24 hours of Princess Diana of Wales' death, full family and life history stories, (hundreds of pages of print), were available through the Microsoft/NBC news network's Web Page on the Internet - I could read about the whole story and her life and times within one day of her death.

Electronic publishing also includes a newer version of the traditional school text book in the form of CD's or Internet data files with text books in them. These read like normal books, but have all the added features that the computer world offers. Cyberbooks (coined by the science-fiction writer Ben Bova) are easier to deliver, cheaper to produce, quicker to update and have the added benefit of being able to interactively (through multi-media and Hypertext) animate the course study and the topics. These books can and do also "Link" to other sites to offer the reader even more information about the topic.

Through the Internet there is a large and growing forum for the viewing of many of these published works, however the quality of these deliverables is questionable. Referring to anecdotal evidence from my researches on the Internet, I have come to a few conclusions concerning publishing on the Internet: (1) the quality of the graphics is usually very high; (2) the quality of the information is usually very superficial; (3) the credibility of the sources is very suspect; and (4) the quality of the publishing (ie. the material) is marginal.

The quality of the graphics, as has been noted previously, is very high. Web Pages and other Internet related computer items are very handsome and visually appealing and this high quality of graphics goes a long way to making the data seem equally good.

The quality of the information is superficial. As noted in the article on school Web Pages and as is evidenced in many other Internet Web Page sites, the information is usually no more than that which is available from typical promotional brochures. At times, there is more, however it is only marginally so and usually still very superficial. A good example of this is the Canadian Unity Web Page. This Web Page is a site with "Really Cool Links" which promises to provide lots of additional and relevant information on good Canadian Web sites. The links bring you to the Census of Canada, Statistics Canada and other similar and easily accessible Web Pages. But the information that is available

here is much less than can be obtained through a ten minute review of many of the census books at the local Calgary Public Library. So while the graphic quality may be very high, the real informative quality is generally much less.

The credibility of sources is suspect. This one caught me more than once in my research. I was fooled by the very superior graphics and impressive Hypertext links into believing the sources were credible. The problem is that even though the information is presented graphically well, the information may not necessarily be well thought out or reasonable. I was fooled at one Web Page into thinking that the originating source of a Web Page was one thing (I thought I was reviewing a library) but it turned out to be another thing (a book store). This Web Page was linked from a school under the heading of access to literature and because of that, I went searching looking for a book to "read." but was suddenly asked for my credit card number. I did not continue but felt slighted at being suckered. Other credibility issues abound when referring to the chat lines. Anyone can publish virtually anything on the Internet with no control on quality, content or truthfulness. (See Appendix C - A Series of Support Research Notes, Section 13.6 - A Print Copy of This Thesis Design Project's Web Page - to view a sample of the Web Page which was posted on the Internet for this Thesis Design Project.)

The fourth issue I found regards the poor quality of the published material both on the Internet and in the (self published) book form. Because the computer can spell check documents, because the computer can cheaply allow publishing work and because the computer can permit easy and very quick creation of publications and journals, there is a lot of self-published work available both on the Internet and in the book stores. While this may, in a lot of instances, be fine for someone to post their Greek holiday trip on the Internet (yes, there is one of these), there is a lot of more reputable sources that are publishing their own documents. The problems are typographical errors, improper usage of words, and American English spelling. A few examples:

"*... information technology frees us from the constraints of time ad space ...*" this is a spelling error and should read and (from Teaching and Learning, published by Educom / NLII.)

"*Another young man significantly older than my son ask if he could join him ...*" this is a grammatical error and should read asked (from T.H.E. Journal, Educational Journal published on the Internet by the Berkshire Union Free School District in New York.)

"*due to ... the demise of traditional industries their is appearing in many of the communities ...*" this is a grammatical error and should read there (from the New Brunswick Distance Education Network newsletter, May 1997.)

"*Goal: Alberta's learning network be capable of delivering multi-media programs that use audio ...*" this is not Canadian spelling and should read programmes (from Access to Technology and the Information Highway, Technology in Alberta Education.)

The reader may wonder why this rather mundane and pedantic issue is of any importance. These spelling errors represent a watering down of expectations and growing reliance on computers. If the computer completes a spell check and indicates that the document is okay, then we believe it must be so. When we spell check a document and the spell checker does not register a word as an error, there is a chance that the error will not be found. Out of 29 documents from Educom Review that

I reviewed for this Thesis Design Project, I found four spelling or grammatical errors. (Others may yet still exist.) While this may not seem like many, at an average of 300 words per page and at an average of 5 pages per article, I have found an error rate of 0.0092%. This again may seem minuscule, but if applied to a dictionary, this error ratio would amount to 10 misspelled words in the Webster's Ninth New Collegiate Dictionary excluding the definitions. If every word, including the definitions, are counted then upwards of 228 misspelled words would be found. If one looks to literature, Gone With the Wind would have 30 errors, the Bible would have 66 errors and the annotated works of Shakespeare would have 74 errors - "Me thinks thou doth protest two much" would absolutely ruin a good rub. Why do we have this falling level of quality? I do not believe that we would accept this from traditionally published books, so why do we accept it in electronic form? I believe it is because people have come to regard the computer as always right - so much so that we believe what it produces, even when we should know it to be otherwise. Additionally, the traditional layers and layers of checking and professional reviews inherent in book publishing are being supplanted by the easy, quick and cheaper publishing of information through our use of the personal computers. We are seeing, in my view, a levelling off of standards. Those things that were once in the realm of student and home created work are looking much more professional than ever before, but those published works that were once in the realm of very high professionalism and near perfection (I found 1 spelling error in the 60 or so books read for this Thesis Design Project), are now loosing their extremely high standard. This, I believe, is because of a need to compete on a cost basis with those publications that can now produce much faster and much cheaper through the personal computer.

When considering education, it is a very great challenge to make sure that our students are cognisant and knowledgable enough to be able to filter out the mountains of garbage from the many sources that are available, and to be able to get down to the important information and also to see and understand errors when they come across them. I will read and re-read and spell check and review this report to attempt to find every grammatical and typographical error that exists, but I know that this report, because it is self published, will undoubtedly suffer from the very same problem of grammatical and spelling errors of which I have criticized the Internet.

Intelligent Agents

Intelligent Agents are software programmes that mediate the data to which one is exposed. The programmes use heuristic logic to follow and record a person's computer usage preferences. In this way, information that is usually sourced by the user then becomes the primary reference for the computer programme's search routines. Preference is given to these data references in future search sessions. An example of this is if one usually logs onto the Internet and always opens the USA Today Web Page and looks at sports information from Italy. The Intelligent Agent programme would begin to not only automatically recall the current information each time the user logs on, but when the person is looking for sports information later in the Internet session (say the user is checking the number of world class skiers), the Intelligent Agent would make sure that relevant data from Italy is given preference in the data search. In addition, Intelligent Agents will search through personal information (ie E-mails, news feeds and the like) to retrieve data that has shown preferences by the user. An Intelligent Agent therefore is:

> *"... a character, enacted by the computer, who acts on behalf of the user in a virtual (computer-based) environment. Interface [Intelligent] agents draw their strength from the*

naturalness of the living-organism metaphor in terms of both cognitive accessibility and communication style. Their usefulness can range from managing mundane tasks like scheduling, to handling customised information searches that combine both filtering and the productions (or retrieval) of alternative representations, to providing companionship, advice and help throughout the spectrum of known and yet-to-be-invented contexts"[30]

Virtual Reality

Virtual Reality (VR) is a computer generated interactive environment created within the computer and experienced by the user through visual, auditory and in some instances, tactile senses. The usual apparatus used for virtual reality based computer graphics is a head mounted display (HMD) unit. This is essentially a set of very small computer monitors that are attached to a complicated pair of eyeglasses. The HMD recognises the location, movement and direction of the glasses as they rest on the person's head and adjusts the computer image accordingly. In this way, by slowly moving your head to the right, the computer image simulates that movement, in real-time, to replicate what the person's eyes should be seeing. The implications of this type of technology are enormous. Shades of creating virtual environments, akin to science-fiction writers of yesteryear, are appearing to be able to come true. The images now are generally rudimentary and of obviously computer generated quality but with the on-coming speed and processing power of computers, the ability to discern between reality and virtual reality will be gone. The computer will soon be able to generate moving images that are as close to reality as our eyes and mind can understand. We can create and go on a holiday in the sunny south while sitting in our snow ravaged Calgary office building eating our lunch.

Virtual reality has tremendous implications for education:

"These devices combine to produce such a powerful illusion that those immersed in the environment are able to 'suspend disbelief' and become full participants in the computer generated world. For example, researchers at Dartmouth Medical School's Interactive Media Lab developed an interactive multi-media virtual reality so that medical officers can experience and learn how to react to various battlefield hospital situations. Participants are presented with live-action video and computer graphics to simulate a medical crisis and then are able to choose a course of action and view the results of the decision."[31]

While there is much talk about virtual reality, the research that was completed for this Thesis Design Project did not indicate that an overwhelming amount of VR is being used at all levels of education. The most predominant though, is in the sciences at the PSE level. As a sampling, in America:

University of Houston: the physics lab uses VR to visualise the effects of physical forces;

NASA and the Johnson's Space Centre: use VR to study gravity on space objects and to train pilots;

University of North Carolina: the chemistry labs use VR to study molecular docking systems;

Michigan State University: study the rain forests through VR learning environments; and

University of Central Florida: use VR in their sociopolitical studies.

Other examples exist.

Notwithstanding Virtual Reality's impact on the sciences, architecture is another course of study that is meeting with many VR environments. Building walk through's, aerials fly-by's of unbuilt images and photographic quality promotional and visual study materials are commonplace. Students and architectural practices are pushing the limit of what the computer graphics world and VR can do.

In a very interesting and thought provoking book written in 1995 titled The War of the Worlds, author Mark Slouka prophesies the direction that society is going because of our willingness to accept the computer's version of reality, the "virtual reality" rather than real reality:

> "*We are increasingly apt to accept the copy as the original (poster art, T.V. events, computer disk pictures) and in this way, we accept someone else's version of reality ... a kind of re-representation or re-presentation of reality and events.*"[32]

> " *... the problem simply put,* [is] *that Cyberspace would distract us from the job at hand ... that we would wander through the virtual forest while the real one burned down ...*" [33]

Slouka writes a full chapter on people creating personalities on the Internet as an example of VR affecting reality. In a chapter titled "*Springtime for Schizophrenia: The Assault on Identity*" Slouka describes an experience he had during his research on the Internet. He went to a friend's house and, for a few hours, assumed the friend's Internet personality (many people do not use their real identity on the Internet when using Chat Rooms). While chatting to a person in one of the friend's oft-frequented chat rooms, the friend became extremely agitated and eventually became aggressive ultimately cutting Slouka off the computer. The reason, it turns out, is that Slouka was talking with a personality in the Chat Room that the friend's personality didn't like. Slouka's friend became enraged because Slouka was altering the reality of the friend's virtual personality. Slouka goes on to muse about people who allow their created world on the Internet to affect their real world at home and work. The reason this issue is important, Slouka argues, is because while there are only an estimated one hundred thousand created personalities "living" on the Internet now that number is projected to reach 1 billion by 2000. With this kind of shifting priorities (to a non-real reality), we will lose sight of what real reality should be he says.[34]

A Comment About Bandwidth

Bandwidth is a measure of the number of concurrent transmissions of data that a media can carry for a certain unit of time. For example, the greater the number of computer transmissions a wire can hold in a second, the greater the bandwidth is said to be with the number of bits per second that a media can carry usually the standard of measure:

traditional telephone wire	- wires will carry about 56 600 bps (bits per second)
traditional television cable (copper)	- wires will carry about 1 million bps
glass fibre optics	- wires will carry about 1 trillion bps.
satellite communication (microwave)	- wireless will carry about 28 800 different "channels" and is every increasing.

Wires will continue to be the media of delivery of computers into the foreseeable future, even though the most intriguing area of communication today seems to be satellite communication. The thought of being able to go anywhere and connect a computer via wireless to a world wide network is tantalising - but impractical. The number of channels and data that can be transmitted via satellite is much restricted compared to fibre optics and is in the range of 24 channels and 1200 telecommunications links. This restriction is simply because of physics. There just is not enough radio and microwave frequencies to move the tremendous amount of data that is now being used by computers.

As it turns out, with the existing infrastructure of wires extending into homes (television cables, telephone wires and, in some areas, fibre optic cables) and the limited number of radio and microwaves frequencies available, the media of choice for the present and the future for computers will remain the wire - most definitely cable (copper) and undoubtedly also fibre optic.

The idea of the wireless society, connected everywhere is probably not going to happen on a global scale and certainly is not happening now. What is happening now, though, are local area transponders (receivers and transmitters). These local transponders are installed at larger office complexes and act as wireless connections to the local area networks. The transponders work only within a restricted area so that interference with identical frequencies will not occur. A typical use is the wireless (not cell) phones. One may call forward one's office phone to a remote, hand held phone unit that is connected wherever you go within the complex. No need to ever be "away from her desk at the moment" again.

In Conclusion - A Thought About Technology

Educational technology is the technology of the world. That is that much of the technology used throughout the globe is finding its way into education: personal computers; video and audio conferencing; multi-media; virtual reality; and computer mediated communications are all being used in education today and will continue to be used.

While looking at the current ever-present and almost omnipotent place computers hold in our lives, this section concludes with an interesting look at technology through the eyes of one of the most important architects of today's contemporary architectural scene - Peter Eisenman.

Eisenman speaks, lectures, teaches and writes about architecture in a very esoteric, wordy and often confusing way but he is continually looking at and pushing the bounds of architectural understanding and application. He was, for the first part of his career, a writer, a theoretician and a scholar, frequently designing but rarely building. Now, in the middle of his career, he is a very popular and successful architect. He is outspoken and often cited for what he says, muses and writes. The following is an excerpt from an RAIC Syllabus Design Theory 4 - Contemporary Architecture report written by the author titled "Contemporary Architectural Thought and Experimental Architecture". It speaks to Eisenman's understanding of the impact of technology on architecture, but also, in the latter half, questions the impact of technology on society:

"*Technology plays a big part in Eisenman's architecture. Even though he started out his career primarily as an educator and a theoretician and even though he is seen as one of the most intellectual contemporary architects, he has used the computer as a growing tool in his architectural*

philosophies. He has become enamoured with the use and practicality of technology which has now become central to much of Eisenman's thinking and approach to architecture.

From this interest in technology, two central themes regarding technology seem to be dominant in Peter Eisenman's designs - the computer as a concept generator, and technology as a mediator between man, reality and design.

The first element of this technological approach can be seen in his use of the computer as a concept generator. In an article by Annette LeCuyer called Design on the Computer (1992), Eisenman states simply that he uses the computer not as a tool to display or draft his designs, but as a conceptual starting point. He uses the computer to generate shapes and forms which, he states, cannot be conceived or realized without the computer. He uses natural phenomena such as sine and cosine mathematical waves, "quasi-crystals and slime moulds" and other elements of nature coupled with standard computer graphic software to generate new building forms and spatial experiences. This manner of conceptual approach is drastically different than the traditional approach of allowing a client's programme or function to create, mould and form the spaces. This unconventional approach illustrates one of the central devices of Eisenman's design philosophy, and that is the dehumanization of his buildings. The "decentring" of his designs, the mediative concept (in the sense of the word media and television) of his designs.

The second and by far most significant impact finding its genesis in technology is Eisenman's understanding of the direction of the media and technology and what it is doing to our society on a ... philosophical level. This seems to be the main reason that he is so cognisant of and so consistent in his attempts at dehumanising buildings - to move away from an anthropocentric architecture. In a very telling article he wrote for Theory and Experimentation - Architectural Ideas For Today and Tommorrow [sic] (Dr. Papadakis ed. 1992) Eisenman tells of our daily lives and how they are being mediated and shaped by technology. He tells of going to a baseball game and watching more of the big screen action than of the real action on the field. He tells of lecturing in a foreign country and having to use translational headphones. As he looks out at a sea of people with headphones on, he can only presume that they are actually listening to a translation of what he is saying. He also assumes that the translation of his concepts by an (non-architecturally trained) translator is close to what he wants and that it is accurate to his ideals. So technology has taken away the intimacy of speaking to people and even mediates what is being said, even when face to face. He tells of his son, a Disk Jockey, scraping records on the turntable to get the sound he wants, and knows that this sound is obtainable only by technology. He tells of a recent kick-off of American football's Super Bowl game and when the cameras weren't ready, the referee called the ball back only to have it re-kicked. Eisenman ponders what has become of a society that cannot function, nor can it experience life without technology. Not only that, but a society that ***must*** *experience life through technology. He tells of the story of one bride coming down the steps of a church only to be told to go back because the camera wasn't ready. Do we lose the validity and reality of the marriage if it is not captured on film?*

He writes:

> *"I remember one night at home before dinner two years ago when I was suddenly watching the bombardment of Bagdad. This action was interspersed with soft drink and travel*

> *commercials. I remember the grotesque paradox of watching people being annihilated live, as if for television, only to be interrupted by 'normal' life: buy a car; have a beer. Sitting in front of the CNN television news, one is practically anaesthetised to an affect. Does one believe the commercials or the live bombing?*[35]

This is truly profound. When one cannot experience or cannot truly discern what is reality, what is media hype, what is mediated life and what is technology taking over, we are, as Eisenman sees it, at the cusp of a very "slippery slope". And to Eisenman, this is central to his approach to architecture:

> *". . . Thus, it is difficult to know what reality is, the reality as the former notion of reality, as the scientific, the organic, the anthropocentric notion of reality that existed in the mechanical paradigm. But it can be said that if only by virtue of the relationship of media to reality that reality is no longer homogeneous but rather heterogeneous, then there are possibilities for conceptualising architecture."*[35]

Through the computer, we see Peter Eisneman changing the way in which some architects design their buildings; with less and less consideration of the user and the intended purpopse of the buidling and its function. Spaces are being created because they have aestetic value rather than function value.

WHAT THE FUTURE MIGHT BARE

SECTION FOUR

"When I look into the future, it's so bright it burns my eyes."
Oprah Winfrey

4.1 INTRODUCTION - WHAT THE FUTURE MIGHT BARE

This Section of the report will be somewhat different from the previous Historical and Current Endeavours Sections as this Section will address all three topic areas interchangeably and concurrently.

4.2 A POSSIBILITY

We have seen that while changes do occur in education, they do not generally occur quickly, easily or without a great deal of influence from exterior sources. Are we in for another pedagogical change? Is there really a need for change? Are there so many problems that we must have change? All we seem to hear about today are the problems education has today - is all this hype?

Everywhere we turn we are assaulted by a barrage of educational woes. Locally, at the time of writing this report, the Calgary Board of Education is anticipating a public school teacher strike. Provincially we are told our system cannot afford to teach our children. Nationally we appear unable to stop the apparent overspending in some jurisdictions and underspending in others. Internationally, everyone is competing in a global market and complaining that their children are illiterate. Globally we are inundated with the growth of the Internet which is being hailed by some as the saviour of education and shunned by others as a voyeur's dream.

Is this all true?

Clearly the answer would appear to be "sort of." As an example of this sort of answer, we look to illiteracy. In media reports we are told that the number of functionally illiterate students entering the job market by the year 2000 will be a staggering "one million" [1] but on the other hand, according to Statistics Canada, we are told that in 1989 only three percent of all sixteen to twenty-four year olds had "literacy problems." [2] So while the media reports that one million students will be graduating functionally illiterate, Statistics Canada is saying a mere 3% of all our young people have literacy problems. So who's right? The answer is probably both. So what's going on? In this case, the issue would appear to be semantics - the difference between "functionally literate" and "literacy problems," While both seem to mean that people cannot read, neither actually says that. Both refer to more nebulous and subjective terms like "functionally" and "problems".

So what is the point?

The point would appear to be that perception is everything. It does not matter that the glass is filled to 50% of its capacity with a clear liquid, or that it contains 200 ml of H^2O. If faced with this proverbial question of whether the glass is half empty or half full, our media headlines could easily read either:

> "Warning - Glass Half Empty - Where Did Our Water Go?;"
>
> or alternately:
>
> "Eureka - Glass Half Full - Abundant Water Available for Use."

The issue for this Thesis report is not the way we look at education, but how our viewpoint impacts our schools. We see some people "in the know" who say its all hell in a hand basket, others indicate opportunities have never been better, others still believe that the direction of education merely needs to be re-aligned because we are not making use of our technological resources.

To highlight just a very few of these opinions:

School's Out - suggests schools are not addressing the needs of business and the market place and will not continue. A complete destruction of historic and current pedagogy is in the works. There is no need for schools anymore.[3]

Being Digital - indicates that information technologies are so pervasive and expanding that the only way to stay current in education is to throw away current pedagogy in favour of a computer based, Internet delivered, individualised training regime.[4]

Schools for Thought - claims the failure of the (American) school system is their inability to teach "high order reasoning and learning skills." This failure requires a gross rethinking of educational delivery which may or may not benefit from computer technologies. Schools must remain and expand to educate our young.[5]

War of the Worlds - predicts technology will mediate everything we do and this will create a "schizophrenia" in society. Reality will transfer to the computer and therefore the validity of social structures (like education) will be destroyed, we must maintain reality as a basis for human endeavours.[6]

Academic Libraries, The Changing Knowledge Centres of Colleges and Universities - maintains that the cost to provide real services for the students (real books, real desks, real classrooms, real schools) will become increasing too much to bear by governments and therefore technology will need to be pursued on every level as an alternative to current educational delivery systems.[7]

Class Warfare - offers statistically reviews to debunk many of the myths of educational malaise in Canada including the number of illiterate students, lack of student skill levels, big business student skill level requirements. They contend that we are doing pretty well thank you very much![8]

A Place Called School - Prospects for the Future - complains that too much is being asked of the school systems (shelter, day care, baby sitting, morality education, general education, sports awareness, physical and mental fitness) and too little is offered to believe that schools can deliver these requirements. A major shift in focus from "input / output" theory to "engaging the student" through both technology and teacher interaction is mandated, but this should be done in the confines of the classroom. The teacher is mentor, not teacher.[9]

Publications of Educom / NLII - Educom are pursuing the link between technology and education and reviewing how cost effective quality post-secondary education can be brought to the general population. Through many various publications and reports, they suggest that computer based K-12 education is mandated and that post secondary virtual universities are, if not a necessity, then at least a probability. The NLII (National Learning Infrastructure Initiative) was set up in 1994 to support, explore and implement Educom's findings in private enterprise partnerships.[10]

AMEE (Adaptive Multimedia Education Enabler) - is a pilot project in progress with Alberta Education to study the benefits accessible computer technologies. The programme believes that limited mediated education is the future of educational delivery systems in Alberta and the biggest barrier is access to technology.[11]

Instructional Technology, Past Present and Future - Instructional technology will become an integral part of educational delivery, but remain an adjunct and a tool, rather than as a replacement panacea.[12]

Computers for All Students - Technology can serve as a catalyst for change from teacher centred education to "learner centred" education in either the classroom or the individualised environment.[13]

A Vision Worth Working Toward - Information technology is widely recognised as a significant cause and a significant vehicle for the changes in educational delivery and every student must integrate technology "into their lives." This is not seen today.[14]

Throughout the readings, two common threads weaving through the differing views can be discerned: (1) schools need to change but can remain as physical entities; and (2) schools need to change and should be replaced by interactive multi-media computerised individualised learning programmes.

These books all seem to suggest that we need to make a change in the pedagogy of educational delivery. They suggest that issues are not being addressed to compensate for our evolving technology trends, globalization, increased competitiveness and decreasing job market opportunities. The trends that we have seen historically would indicate that profound changes in education and in educational spaces must and do occur when many disparate predisposing factors come together:

-A need from business;

-An opportunity presenting itself;

-A financially rewarding reason for change;

-A change in peoples philosophy or outlook on life; and

-A number of influential people pushing the change.

A need from business has been seen to have been a major catalyst during the Late Middle Ages. Then, the push for business was to produce people that would be educated in how to manage and run business. This changed the then sole religious teachings to allow education of men and hops for both the clergy and other, more vocational pursuits. Guilds also started at this time because the opportunity existed that would require learning outside the tight reigns of the clergy. These Guilds were not something that the church suggested, rather they were thrust on the churches. Even the location of the schools (previously only at the monasteries) were affected by business needs such that churches began being built, with their associated Cathedral School, on major business arteries and crossroads. No longer were the people going to the schools - the schools were going to the people.

Today, as we have read, many sources are directly stating that schools are not addressing the needs of business. EDUCOM, NLII, School's Out, School for Thought, all note deficiencies in our school systems to produce employable, literate and business oriented graduates. Even companies like the Canadian Pacific Railway, in their adoption and building of a small satellite classroom on their premises, seem to be saying that their needs are not being met. We therefore see a decided push on the part of business to direct, if not outright control, the type of learning our graduates receive.

But the impact from big business is not only the benign looking, subtle suggestions to revise curricula to suit business's needs. Big business is today also directly getting involved in the delivery of education.

From Disney, Coca-Cola, McDonald's and Microsoft, all of whom have created their own schools and educational institutes, to Pepsi and Wendy's who provide advertisements and television sets to Apple computer, and Dell providing computers and software to schools. Big business is irrevocably intertwined into the delivery of education. As with other areas of life today, the line between big business and education is becoming somewhat blurred.

Our second predisposing factor is an opportunity presenting itself. Historically, we have seen that change did not happen because it wanted to happen but because there were forces that pushed along that change. But it is equally true that the changed happened where the opportunity best presented itself.

This was seen in the creation of many of the more seminal pedagogical changes, but two most notable ones being the Cathedral schools and Burgher schools. Even though big business was needing and demanding changes to education, and even though there was a growing rift between church and state and people, and even though there was a lessening of ecclesiastical control because of the Guilds, it was exactly those forces that brought about the Cathedral Schools. Yet the schools never would have happened were it not for the opportunity that all these forces coalesced at the same time that Guilds (stone masons) were in abundance and able to help create these Cathedral Schools. The Guilds also taught, learned, evolved and borrowed building technologies that directly allowed the building of the Gothic jewels that were created. Again, were it not for the opportunity of these happening while the Guilds existed, one could wonder if Gothic would have happened at all.

Secondly, the Burgher schools, which were the first suburban schools, were a result of the push of the population initially from the fields into the city and then back again to the country in smaller villages. Were it not for the opportunity of German bureaucracy, agricultural strength, growing population and strong economy, the initial creation of the Burgher schools, which grew to be the first school "system" may not have happened.

But one of the most interesting "opportunities" that presented itself was the growth of technology, at just that right moment. The Gutenburg Press allowed printing quickly and efficiently which allowed schools to adopt a very global and standard curriculum (this remains the hallmark of most school systems today).

Today we again see the coming together of many influences (cost, money, time ability, business) all being presented with the opportunity of technology. We have the technology that can allow great changes in educational delivery now and great pressure from many groups.

Another major factor in traditional epoch educational changes is financial. It was the wealth of the first priests in Mesopotamian temples that spawned the first written language and then the first classroom. It was the promise of riches that widened the rift between church and state allowing the creation of Guilds and later colleges. And it was the threat of lack of money that drove education back to the family in early North American Settlements.

Two major financial influences today are: (1) the lack of funds at the public / state / personal level; and (2) the availability of funds at the business / private level.

Even though education today is largely funded by public (ie government) money - the high push to save, cut and slash budgets is pushing educators to look for cost effective and meaningful change to offset these budget cuts. In addition business is waving a financial carrot by not only offering to help consult on the types of necessary educations, but also by helping to create and deliver ever increasing quantities of education.

Yet another influential factor that has contributed to change in the educational past is people's shifting philosophies. During the Late Middle ages, the schism between state and church resulted in a division in education. In the earliest stages of man's educational growth - in Mesopotamia - the global acceptance of religion gave the clergy more might and control than they ever had and this faith ultimately resulted in people giving all education and learning over to the church until about the 15th Century.

Today, even though there are still religious influences on education, the biggest and most profound philosophical change we are seeing today is people's acceptance of a mediated life. People do not at all reject computers, televisions, phones, cars and our other technologies. Today, we exalt in the fact that we live through the television or the Internet. We do not even want to live without our ever present technical interloper. As Peter Eisenman said:

> *". . . Thus, it is difficult to know what reality is, the reality as the former notion of reality, as the scientific, the organic, the anthropocentric notion of reality that existed in the mechanical paradigm. But it can be said that if only by virtue of the relationship of media to reality that reality is no longer homogeneous but rather heterogeneous ..."* [15]

We are more apt to accept a copy as a work of art just as much as the original, and we are more apt to gladly accept, in an Orwellian Big Brother fashion, technology as our life's mediator. This is as big as, if not much bigger a philosophical life style change than that which was seen with initial adoption of religion or the later partial rejection of it two thousand years later.

Finally, a number of very influential people have also been present when major changes in educational delivery have taken place. In years past, Martin Luther wrote his treatises that helped to secularise schools. Charlie Mayne wrote and proffered reasons for change which culminated in new school systems. And today, from people like Microsoft's Bill Gates, American Vice President Al Gore and others who are consciously directing education to the Internet, we see hugely influential people attempting to push the trend of education to technology. Clearly then, as we look back on history and compare it with today, we see many consistent and similar influences that existed at major educational shifts to be able to safely say that education will undoubtably go through some major changes in the future if they haven't been going on for some years already.

So now we have seen how historically we can expect some very drastic in education. But what are those changes going to be?

If we look to history again, we see that generally the status quo is preferred rather than change. Is the onslaught of technology now being accepted on a wide scale by teachers - I think it is beginning to but not fully. One quote rather nicely sums up many of the references and quotes used in this report that involve the idea that teachers / educators don't want to change through technology:

> *"Seymarr Papert tells the story of the 18th Century surgeon magically transported through time into a modern operating theatre. That doctor would not recognize a thing, would not know what to do or how to help,. modern technology would have totally transformed the practice of surgical medicine beyond recognition. If a mid 18th century school teacher were carried by the same time machine into a present day classroom, except for minor subject details, that teacher could pick-up where his or her late 20th century peer left off. There is little fundamental difference between the way we teach today and the way we did one hundred and fifty years ago. The use of technology is almost at the same level, in fact, according to a recent study by the US Department of education, 84% of America's teachers consider only one type of information technology "essential": is a photocopier with an adequate paper supply."* [16]

Is this then the way it is going to be - everyone just accepting the status quo? Most would not believe that:

> *"In the same way that hyper-text removes limitations of the printed page, the post-information age will remove the limitation of geography. Digital Living will include less and less dependance upon being given a specific place at a time, and the transmission of place itself will start to become possible."* [17]

Not surprisingly we are seeing very different views on the subject of change - some say no change, most say some change - few say major change. From our historical look, it is obvious that change is coming. What has been obvious, again from the research, is that there are two very differing opinions as to the manifestation that pedagogical change is going to realize: (1) small delivery

changes; and (2) major and profound pedagogical changes.

Minor Delivery Changes

"Minor delivery changes" really addresses those people that support maintaining the status quo while still attempting to change the basic tenets of their educational delivery. One local school that has been a progressive leader in this regard is Lester B. Pearson High School. The course content, the classroom format and the basic education format does not appear to be dramatically different from other schools of a more traditional format, but the basic underlying pedagogy is different and is founded generally on the "Open Education" philosophy.

Small changes are seen on many levels in these schools. Most see changes through the integration of some technology, others in the "open education" philosophy manifesting itself in classroom redesign and others still in evolving roles of teachers into mentors and coaches.

The following is a brief review of some schools that are evolving through small delivery changes. The list looks specifically at the physical impact of these changes. The information has been obtained through the publication and education departments of the Organisation for Economic Co-operation and Development (OECD). In these publications, various countries participate in studies of education throughout the world. From two recent publications that looked at innovation in school building designs titled Redefining the Place to Learn, (1995) and Schools for Today and Tomorrow, An International Compendium of Exemplary Educational Facilities, (1996), the following schools are highlighted:

School:	River Oaks Public School, Oakville, Ontario
Architect:	Mekinda Snyder Partnership Inc. Architects / Planners
Levels Supported:	K-8
Number of Students:	650

River Oaks is a school that supports the "Open Classroom" and "Open Education" concepts. That is to say that the students are very much central and in control of that which they learn. The curriculum is centred around the development of four essential skills (Literacy, Life Skills, Arts and Creative Applications) which are taught through three main strands (Human Relations, Science and Technology and Global Awareness). Students report to "work" in the morning and remain mostly in one home room "class". Teachers work with the same home room for three-year cycles such that each student is mentorred by one teacher for three years at a time.

The building planning is simply: it is a series of home rooms encompassing a central resource centre bounded by other support wings. The resource centre is the focal point of the plan and the focus point of the school teaching methodology and curriculum. The resource centre provides library, multi-media computer equipment, broadcast facilities and technological resources while also providing teaching centred learning seminars, team study areas and computer testing facilities. It also is the main vertical circulation route between the first and second floors. In this way it is truly a busy hub of the school.

The school's other resources, like the arts wing, gymnasium, science laboratories and others are secondary in plan to the resource centre, but support the open concept and business like

atmosphere of the school by being situated along an internal "street." This street becomes the organising element for the large building blocks of the school (arts wing, sports wing, resources and home room block and administrative and other support services).

The home rooms are traditional in that they are rectangular, but non-traditional in that they can by doubled in size by the use of flexible walls and are non-linear - they not to have a teacher at the head of the classroom. Rather they have a series of teachers that support the students' general needs by coming and going as needed, all of which evolves around the home room as the student's base.

The school is fully equipped with computers (240 Macintosh), wired for an Ethernet LAN and connected to the Internet.

School: Ueno Elementary School, Taito-ku, Tokyo, Japan
Architect: Shozo Uchii
Levels Supported: K-6
Number of Students: 321

Ueno Elementary School is a beautiful school which is located in a very densely populated neighbourhood in central Tokyo. The school is notable for its co-operative learning approach (students working in teams), its student directed learning and its social impact as a community educational centre providing continuing education, elementary education and employment and cultural educational courses and as well, community access to technology and sports facilities.

The school's design is very tight for the site is small. The planning is suggestive of small village "street." with the building bisected by two essential functional blocks: classroom; and sport. Access to information technology, which forms the back-bone of the media delivered course load, is from the library, the computer labs and within each classroom. Computers are at almost a one to one ratio throughout the school.

The most interesting design element of this school is its physical manifestation of co-operative learning approach (student teams). To address this, the classrooms are based on what the school calls an "Open Classroom Suite" concept. This means that the classrooms provide the traditional group seating arrangements, but also break-out and team grouping suites which are separated from but contained within the classroom. The students can either study in a typical desk arrangement or can break away and work on computers, assignments and other study related material. Walls are constructed from demountable wall systems with modular ceiling and furniture systems that support flexible re-arranging of the work and study areas. The school has a central multi-purpose area that is a double-height hall housing the library, art gallery and is the central gathering place for formal and informal assemblies.

School: Kuokkala Lower Secondary Education Centre, Jyväskylä, Finland
Architect: Arkkitehtitoimisto Kauko Lahti
Levels Supported: 6-9
Number of Students: 400

This school is interesting for two main reasons: (1) the school brings nature in as much as Finland's harsh climate will allow; and (2) the extreme flexibility of the classroom layouts.

From a pedagogical point of view, this school, like many of the others that we have looked at in this section, offer students a student-directed, open education type curriculum. But unlike other schools, this school took the manifestation of that ideal, the flexible classroom, to almost extreme measures. Each classroom is equipped with "non-directional" furniture which virtually allows any layout or configuration possible. This planning, however, does not easily support the use of technology (ie computers), but does allow the flexible adoption of the physical elements of the classrooms (ie walls and furniture) to computers. The walls are foldable partitions and virtually everything in the school is demountable, moveable or relocatable. The layouts and the class sizes are based on student and curriculum needs. The classrooms have been reported by the teachers and principle alike as resembling a "home-like" atmosphere because of the relatively small size, changeability and non-classroom traditional layout of the interiors. Hierarchy, tenure and one-up-manship does not seem to exist in this school.

Once again we see the planning concept organised around a "street," but in this instance, the street is purposefully wide and inviting enough, and furnished with the appropriate furniture, to allow students and faculty to chance to sit, chat or work, right in the street.

The number of computers is quite low, one per classroom and somewhat more in the library, but the school is fully wired for future needs of up to a one-to-one ratio, central file servers and all the usual PC based solution architecture issues.

The second element of interest in this school is its attempt to incorporate as much nature as possible, tending to make the school appear interesting and inviting, especially during those very long winters. A small conservatorium is housed in the school and is run and managed by the students as part of their school curriculum. Classrooms open up into a central outdoor courtyard and natural lighting and materials are in abundance throughout.

During the design process, the school design committee came up with seven essential principles for the design of the school, most of these touch upon items discussed in this report: "*(1) ease in understanding the building organisation; (2) functionality; (3) flexibility and adaptability; (4) impact on the motivation of students; (5) natural lighting; (6) security; and (7) anticipation of future needs.*" [18]

School:	Thomas Telford School, Telford, England
Architect:	Barnsley, Hewett & Mallinson
Levels Supported:	9 - 12
Number of Students:	1,000

This school is a very large school. It again is based on a student directed curriculum, but what is interesting in this school, is the strong anticipated use of student teams. The architects again based the overall school planning on a "street" design, but rather than group classrooms off the street, the classes are grouped around what the principle of the school calls Learning Bases. These learning bases are essentially enclaves that are virtually self-contained groupings of small class areas, technology support facilities, and an office for the mentor (teacher). The use of these learning bases is flexible. In one instance, the teacher may have the students organised in small teams, each relegated to a corner of the base. In another base, the teacher may have the students all sitting in the centre in a more traditional classroom plan. In a third, each student may have his or her own

work area with the teacher managing by walking around.

The school, as might be expected, is fully wired for computer use but it also supports both the delivery of mediated multi-media educational course-wares and the broadcast as well. This means that this is a strongly centralised community school that not only supports students that come to the school, but also supports distance and life-long learners.

School: Methodist Ladies' College, Kew, Victoria, Australia
Architect: Daryl Jackson Pty. Ltd.
Levels Supported: 5 - 12
Number of Students: 2,200

This school project was a large renovation. It is not exceptionally notable for its architectural nor educational approach to technological learning. What is exceptional, though, is its extremely simple solution for technology access. Where many schools are aggressively re-wiring or fully outfitting their schools with multiple computer labs and a one-to-one computer to student ratio, the Methodist Ladies' College of Kew simply saved most of the capital cost of computer infrastructure and gave each student a lap-top computer. The laptops are supported by technology centres (not computer labs) where the student can connect and load up or down load various course information, data or e-mails. The students are expected to carry around their computer and connect at the technology centres daily. This saved massive amounts of initial capital costs, but cost great amounts in the initial purchase of the computers. The principle argues that the ongoing costs of computer maintenance is less than or at least comparable to similar, desk bound school systems without the initial capital outlay for the system infrastructure and therefore overall less expensive.

School: Blackstock Junior High School, Port Hueneme, California, USA
Architect: Scott Ellinwood & Associates
Levels Supported: 7-9
Number of Students: 807

This school is interesting in its use of "Smart Classrooms." This school project was another renovation which, in this case, decided to outfit the classrooms with as much technology as was financially possible. a 10m x 10m classroom grid existed from the original building and this was left intact. Each classroom, however, was completely renovated and updated to become what the School District Officer coined as Smart Classrooms.

Each of the smart classrooms is furnished with multi-media computer and presentation equipment, is fully networked and Internet connected, has a physical layout that looks more like a command centre for a large business than a classroom. The smart classrooms offer teachers a workstation instead of a desk and each student sits at his or her own workstation replete with computer, work surface, pedestal storage unit and stenographer's type caster chair. The classrooms are organised into clusters of five or six students with the teacher's workstation at the entrance. From these clusters, the students can either work individually, in pairs or in teams of up to six. Each cluster has its own computer network, its own VCR and television and its own hard-drive storage unit. All the computers are networked with the teacher who has software allowing him or her to "view" the monitor of any student to determine progress, skill and current work assignment. Through a series of prototypes, the classroom clusters have evolved from enclosed and somewhat secluded work

areas to, in the most current version, open pods of semi-elliptical tables each housing up to six students.

School: Cherrybrook Technology High School, Sydney, Australia
Architect: Public Works of Australia
Levels Supported: 9-12
Number of Students: 1,100

This school, like the others noted above, has adopted the "open education" approach to student self directed education. They have also adopted a very flexible and mobile internal planning system very similar to Kuokkala Lower Secondary Education Centre in Finland. But unlike some of the other schools, Cherrybrook Technology High School is truly a community centre. It has designed its school facilities to support not only the academic needs of the students, but also the social and economic needs of its community.

The planning strategy is a crescent shaped circulation route onto which building "Pavilions" are attached. These pavilions, of which there are four, are constructed of deep webbed steel trusses which provide clear span below allowing maximum flexible use of the space. Each pavilion is purpose built for educational functions, but does double duty as shared facilities for community use. The most impressive shared functional use is that the school acts as the conference centre for the whole of the community. Businesses and organisations can rent out the auditorium, laboratories or multi-purpose pavilions for their conference needs while, when not rented, students get the benefit of the rooms and facilities for drama, assemblies, exhibits and the like. The school is also notable for its partnerships with business in that in addition to the shared conference facility, the school partners with IBM Australia to promote, learn and beta test instructional technology courses while offering the students the use of the computers. Local manufacturing plants also use the technology as training for their own workforces, while supporting the school through the purchase of computers and meeting other technological hardware needs.

School: Oldham Sixth Form College, Oldham, England
Architect: Cruickshank and Seward
Levels Supported: 10-12
Number of Students: 1,000

Oldham Sixth Form College is a school that has approached student self-directed learning and open education from the resource centre out. The library has become the main focal point and the main delivery location of education. While classrooms exist, the main location for teaming, resource needs and individualised learning curriculum studies is the library. In the words of the school's principal "...[the] *library could be considered a model for the information centre of the future.*"

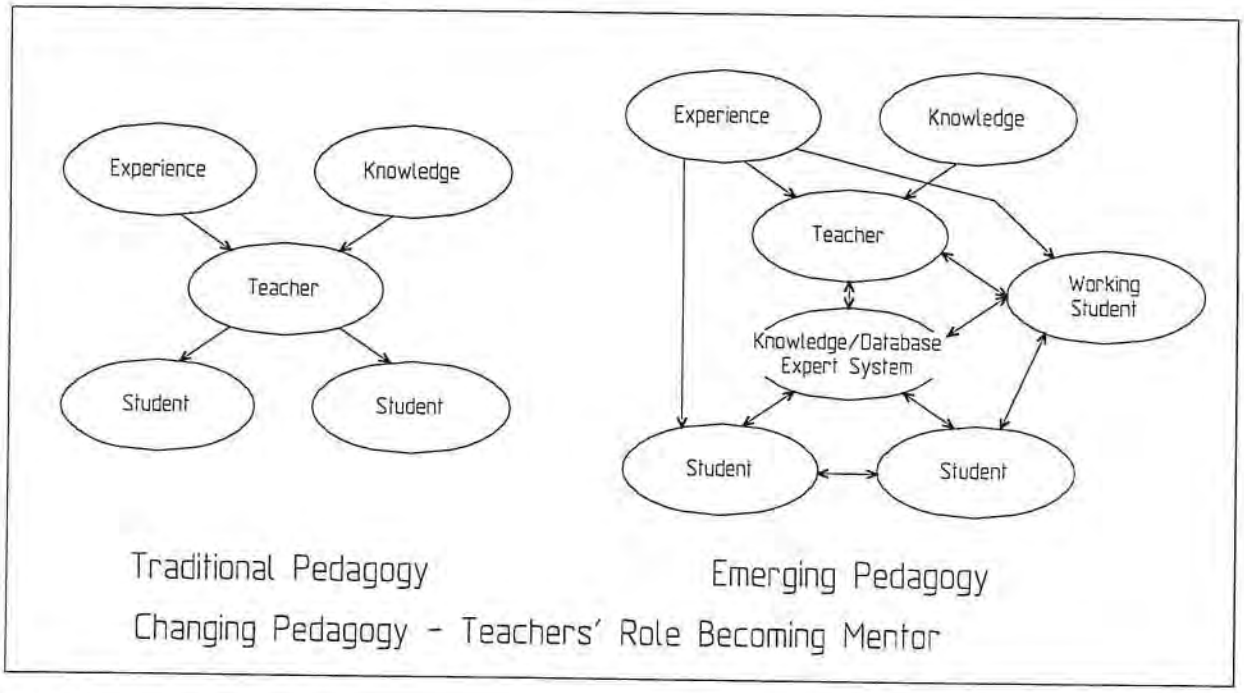
The library not only stores paper (real) books, but also stores computer disks, CD's, videos, and is completely Internet connected. The space is not only laid out with tables and chairs at which students may sit and read, but completely shared workstations that offer computers, printers, video and multi-media hardware needs. The library is not only a place for the students to sit and quietly chat about their school projects, but it offers interactive technologies and teaming areas where students can work, interact, research and study with other students and teachers. The library is even connected to the city's central library through the computer so that ordering a book from another

remote location is virtually seamless to the student. And finally the library is open after hours for students and the public at large to come and use the facilities.

Central pods of computer stations act as the norm for the classrooms. Where teachers would traditionally face the student face-on, here the students face the computer with their back to the teacher who therefore needs to wander around to mentor the students.

School:	OTEN The Open training and Education Network, New South Wales, Australia
Architect:	Philip Cox Richardson Taylor and Partners
Levels Supported:	9 - PSE
Number of Students:	28,000

This, the final school looked at in this subsection, is a school designed specifically for distance learning. This school offers what the school call a "mixed mode" approach to educational delivery which includes a combination of face-to-face instruction, self-study, including satellite broadcasts, videotape and printed course materials. This mixed mode of delivery offers the maximum opportunities for the maximum number of students. The facility houses a sophisticated broadcast facility, open learning centres instead of classrooms, meeting rooms for small team teaching sessions and multi-media classrooms. The planning of the building is again based on the ubiquitous street concept with the main facility wings connected at main circulation nodes. The building design is very modern in its use of materials and is a completely wired facility providing a more than one-to-one computer to student ratio. This facility is a one of a kind school which found its genesis not in the classroom, but in the application and delivery of distance learning. Where traditional schools usually turn distance learning facilities after having well established traditional classrooms, OTEN's initial premise was to provide broadcast and distance learning facilities, but grew to incorporate open classroom and other multi-media delivered education.



Open Education, like open classrooms, has been with us for a few decades, at least since the start of Modern philosophies and Modern thinking (ie Gestalt theory and others). The meaning, in part, of open education is the timing over of save of the control of the classroom from the teacher to the student. The learning process is therefore becoming somewhat less hierarchal and flatter. One of the earlier graphics regarding this evolutionary change is appropriate.

From this graphic we see that the student is beginning to learn from multiple sources - not just the teacher. One school that we have looked at that is shifting to this newer approach is the Huron Street School.

Huron Street School uses a computer system called CSILE to assist the teacher in mentoring the students. This system, while not radically altering the way the school traditionally teacher - does change some of the elements and is a good example of a school making a small change.

Huron School is also a good example, not only of technology assisting with change, but also of the changing roles of the teacher from sole giver of education to more a coach / mentor role.

Major Delivery Changes

So the first magnitude of change that people see are somewhat minor delivery changes. But many sources are predicting much greater change than just minor deliverables:

> *". . . the same technological revolution that has disconnected the environment of the traditional classroom from the experience of the modern workplace and home also offers the systems to replace conventional schools with effective, relevant learning . . . school will not be identified with any distinct building or location, but rather with a brand or franchise of media through which services are accessed. Home technology - video, audio, computer, telephone - is far more adroit at meeting diverse life cycle needs for entertainment, information, work and learning than is the technology of conventional academic structures."*
> - quote from Lewis J. Perelman, School's Out, 1992.

Mr. Perelman and others, obviously seem to feel that technology will replace the need for schools in the physical sense. This would mean that our use of computers would need to drop dramatically. It does appear reasonable to assume that computer use will grow.

Educom, and others have suggested that the computer's role will be two fold: (1) medium of delivery; and (2) the teachers' / mentors' assistant.

As we have seen, the computer is being used to deliver education (video conferencing, audio conferencing and the Internet). With the aging student body (and the resultant need to take courses when convenient or when work permits), and with the push from big business to use computers and with the need to streamline costs, computer use will continue to grow.

In regards being a teacher's assistant, we have seen a growing use of intelligent agents and actual course givers. That is to say that the computer now is actually providing the course material, the course format, giving and marking tests and finetuning the speed and format of the class material. Educom has studied the economics of the issue of software and have suggested that private

businesses need to put these together rather than teachers (see appendix Section 13.1-A case for Instructional Technology).

We will therefore see a growing use of computers assisting with both the delivery and the teaching of courses and in the use of the Internet, audio and video conferencing and Instructional Technologies.

We have seen that some schools now do entirely exist in "Cyberspace" and have no true and real address. Universities like:

British Open University in England
Athabasca University in Canada
City University in the United States
British Columbia Open University in Canada
Western Governor's University in the United States.

The physical aspects of these schools have become virtual, distant and metaphoric as we have seen earlier in this report. Is this computer / ethereal computer hack's utopia really what we can expect fully for all schools in the future? Based on our historical review, the indication is that rather than reducing the educational delivery choice down to only the computer, reality for the future of schools will probably be selection - lots and lots of selection.

As Individualised learning is growing and gaining support, so too would and should its philosophy apply on the macro scale of education. Individualised computer learning is not for everybody. As Educom themselves have published:

> " *Apart from the usual value of sending away 18-year-olds to allow them to grow socially while allowing their parents some relief, universities have much to offer the new learning environments. The oft-expressed fears that the one great teacher of economics, psychology or physics will teach all the classes in the respective discipline or that a Web site could somehow replace an education professor, profoundly misunderstands the was people learn. Learning is about a "conversation" amongst resources. Distributed cognition of the World Wide Web will provide unprecedented access to resources on a network where every student and every instructor is an important resource."* - a quote from Wilson, Jack M., Distance Learning for Continuous Education, Educom Review, April 1997.

This quote not only means that education on the Internet avails students new learning resources, it also notes value in the "Place" of school as a physical environment for the student to go. It implies that even though a school may use Instructional Technologies in their delivery regime, the need for a physical place is valid.

We can therefore see that while some sources indicate that there is no need for a physical building and real physical schools (the Internet is the place), there are also those that feel that a physical Place is valid even from those in the "technology camp".

Schools then are looking at either smaller delivery changes or more radical changes. Clearly, with the number of opposing views and extreme options, reality will end up being somewhere in the

middle. Schools will not only be going through a change in the way they teach, but also in the use of their buildings.

We have seen that a number of the predisposing factors to pedagogical change involves financial and business matters. With the ongoing push for more cost effective school delivery systems there is an increasing push for governments and communities to share resources to reduce cost impact. Business is also pushing cost effective solutions for their work and any kind of symbiotic shared use is a benefit. We are starting to see this a little in Canada, more so in the States, but very much in Europe.

The following list indicates a number of shared functions that schools and communities are and can provide which help to reduce the cost of providing school resources:

Sharing Schools with Very Young Children: sharing elementary and other school resources with day-care, nursery school and play group services is a natural. While the age difference between the children and the students does not always suit play between the two groups, the facilities required by each are similar. The many shared resources could offset the capital cost of providing both functions in different (not shared) facilities.

> *"Aside from the practicalities, the most important thing is the purpose of these services for parents and the spirit in which they are delivered. Nursery schools must not be reduced to being just short or long-stay "parking facilities". Broadening the provision for young children is obviously intended to help parents but it has another, more important, purpose and that is for school to become a real place of education and a forum for dialogue and exchange between families and teachers."* [19]

Activities for Young People Outside School Hours: sharing schools with young people's non-school needs is another natural for sharing school facilities.

> *"Young people and teenagers have a large amount of free time, outside school and after allowing for sleeping and eating. Parents do not always have the time or the means, nor the inclination, to supervise this free time. Left to their own devices, youngsters are exposed to idleness or activities that may be harmful to themselves and to society."* [20]

While not all facility functions would be appropriate for shared use, some of the more common include:

- the provision of technology, books and a proper environment for "latchkey kids" in which to do homework. In France's underprivileged areas, special schools districts called Zones of Educational Priority, have very highly organized, supervised teacher and volunteer led study groups for those underachieving school children of two working parent families. These study groups provide access to technology, transportation to and from school and learned supervisors in a suitable environment for homework;

- the provision of cultural, sporting and leisure facilities for activities needed outside the school. An example of this is the need for community groups to organise teams sports such as indoor soccer, hockey, gymnastics, outdoor football and many other sports. Also included

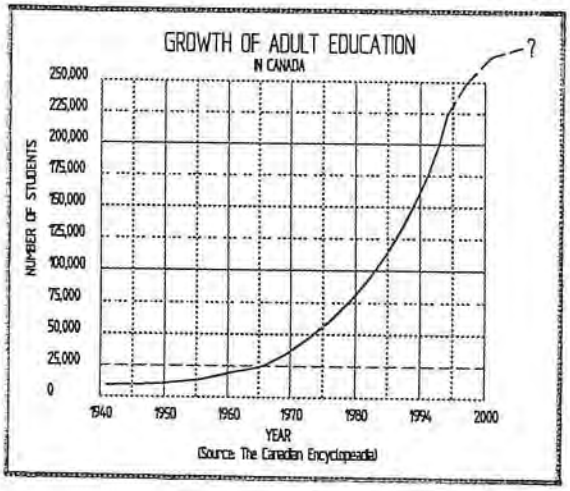
in this area are services like art, crafts and the like:

"Of particular note in this respect is the ... 'All-day schools" scheme launched in Greece in 560 Nursery and primary schools. Lessons are given in the mornings from 08:00 to 12:00 and pupils are offered a wide range of further activities from 07:00 to 08:00 in the morning and from 12:00 to 16:00, or 16:30, in the afternoon, designed to develop their imagination, creativity, sensitivity, initiative and communication skills. These activities are supervised by teachers who are from the school or specially recruited for this job. The scheme is funded by the State local authorities and parent's associations." [21]

- schools can also be used for young children outside regular school hours for those families that cannot afford or are unable to provide something for the student to do during holidays. Again in France, in June 1991, the Ministry of Education instigated what they call the Open School. The open school is an "... *operation designed for secondary schools ... a programme of educational, cultural, school, sporting and leisure activities. The operation was designed to combat both marginalization and educational failure. The youngsters are directly involved in the design, preparation and overall management of the programme of activities, which is a key to its success.*"

Thus the school is not only a school during traditional school months, but also a centre for activities during the normally dormant times. This opportunity is somewhat lessened by the push for year round schooling that has been in the news much lately, and is in normal practice in some countries (Japan for instance).

Adult Continuing Education: This particular use, like many noted here, have in fact been in use for many years. Adult Education is more prevalent in the secondary and most prevalent in the PSE level schools than in the elementary and middle level schools. The push to make use of educational facilities at the Elementary and Middle School levels is becoming more pronounced lately with the advent of higher technology. This is because even the simplest of computers now-a-days, is a very complex and powerful tool and can be quite easily adopted for use of adults. Notwithstanding the higher technology sharing ability, sheer numbers of students show that while the number of elementary and middle school students may be only slightly on the rise, the growth of adult education is tremendous (we have seen in the Current Endeavours Section that student numbers have grown from 10,000 in 1941 and 27,000 in the 1960's to 225,000 in 1994). But even with this phenomenal growth in continuing education, there is still a large capacity in existing school systems to accommodate even large increases in this area. Therefore the need for elementary schools and middle schools to provide this function, on a large or global scale, is not seen as imminently needed. However, with the increasing life expectancy, increasing need for continual training and with the increasing amount of leisure time, there will continue to be a push to afford more schools the ability to support adult



continuing education. In a 1995 seminar organised in Lyon France, Ministers of Education from twenty different countries concluded five main pushes are evident for the use of Adult Continuing Education:

> " - *Initiative for the elderly: keep-fit classes, social and leisure clubs, artistic activities / day centre for older people . . . university classes of the third age ...*";
>
> " - *Language course for international travel and business;*
>
> - *Computer courses for the beginner;*
>
> - *Distance Learning; and*
>
> - *Initiatives targeted at parents, grandparents and other adults concerned to help them to understand and support children in their school work ...*" [22]

Continuing Vocational Training: Combining the affects of rapid technological change, globalization of markets demanding higher degrees of competitiveness and changes in methods of producing goods and services, there is a continually growing need to provide on-going and continual training to the average employee. Technology and innovative engineering and production techniques are brought into the schools by business to assist schools in their ability to offer business learning environments. Schools and business both benefit. In Europe, some countries have gone so far as to make laws that require businesses to set aside a percentage of a person's salary for that person's on-going vocational training.

Unemployment Training Centres: A number of schools, especially in Great Britain and France, provide centres for the (re)training of unemployed people. These schools are designed to assist and facilitate the unemployed's re-introduction into the workplace. A school called the Dukeries Complex in England is a centre, located in a school, which is run by the unemployed for the unemployed and offers opportunities for adults to exchange knowledge and employments tips, support, and interview and job search techniques. In Florida, "Full-Service Schools" offer people on welfare job placement services and a forum to work with people in the Department of Labour and Employment. In France, "Qualification contracts" are offered to unemployed youngsters who quit school early. These contracts allow youngsters to complete high school part-time while working with myriad firms on a part-time salaried basis. Both the learning and the work are completed inside the school. Business benefits because they get very inexpensive (albeit inexperienced) part-time help and students benefit because they get paid to come to school.

Technology Dissemination Centres: This is an intriguing shared alternate use for schools. While somewhat discussed in the sharing of technology for adult and continuing education, this use really refers to the use of technology by business: firms and craftsman alike. This is particularly useful in less populated areas where access to technology is typically more problematic. Schools become, if not the sole possessor of technology, then certainly one of the few. Farmers, small businesses, and even tradespeople can access somewhat more sophisticated technologies. In Quebec ... "*the vocational education centres are designed as 'technology showcases' for the business community. Some provide industry-oriented facilities, such as assay and test laboratories.*" [23] In France and Germany, the school is used as a forum to instruct and inform managers and employees alike in the

developments of new(er) technologies and techniques. ". . . *this partnership goes beyond mere demonstration or provision of the school's most sophisticated equipment and leads to genuine co-operation. At firms' requests, pupils, assisted by their teachers, plan and produce studies, projects and prototypes* ... [thus the high school is] *providing a role similar to that of the university or private laboratories which the enterprise would approach if it were not so remote."* [24]

The Last School: In rural depopulated areas, the school is often the last remaining publicly funded and maintained building. In many of these severe instances, the school is most desired by the remaining people in the village and creative solutions tend to be the result. Shared school facilities become the mayor's office, the centre of contact for all things governmental and the like. In one instance, in Quebec's Samuel de Champlain school board district of Batiscan, "*... the municipality decided to move the municipal library into the empty space in the school, thus reducing some of the costs borne by the school board* ... " and the municipality's library. [25]

Integrated Community Centres: This shared use of schools is not new being the norm for many small communities and in fact has been formally sanctioned and financially supported by the English government for over fifty years. Centres in the Netherlands particularly have adopted this community centred philosophy such that many of their rural and smaller village schools provide ". . . *child care facilities and youth leisure activities* . . . [such that these schools] . . . *are being designed from the outset to bring together, accommodate and operate the widest variety of services on the same site in purpose-built and equipped buildings. Whilst priority is given to educational services and meeting social needs, the presence of services of an administration (local authority) or quasi-administration (post office, bank) nature and even of shops, cafes, restaurants or accommodation facilities are not ruled out."* [26]

According to Michael Hacker, in a white paper titled Two Decades of School and Community Collaboration in the United Kingdom, (Organisation for Economic Co-operation and Development, 1995), there are three main principles inculcated in a school which acts as a community centre:

> "- *Education is a continuous lifelong process and is not confined to the childhood years of compulsory education.*
>
> - *Educational attaintment is closely related to the support and understanding of parents and the wider community. This indicates a need to remove the walls, both physical and institutional, that tend to separate schools from the societies they serve.*
>
> - *There are significant economic advantages to be gained from the joint provision and more intensive use of school and community facilities."* [27]

Three examples of schools providing many of the shared facilities noted above are highlighted below:

Full Service Schools in Florida: These schools address more social and unemployment needs in the American state of Florida rather than address small village needs, but never-the-less they provide many of the shared facilities reviewed here.

Full-service schools refer to those schools that serve as a central point of delivery (a community hub) for education, health, social, human and employment services needed by a community in an integrated school building. The school is used because it is one of the few places in many of these communities that most of the children in the area are exposed to. Services provided at these schools include:

"- *parenting programmes;*

- *adult education;*

- *employment services;*

- *housing assistance and access to government programmes;*

- *health care;*

- *child-care programmes;*

- *delinquency prevention; and*

- *substance abuse prevention and council.*" [28]

Golden Grove Complex in South Australia: This is a new community outside Adelaide in South Australia began in the early 1990's. In 1998, the population of this community will reach 30,000. The resolution by the community founders to provide a suburb that delivered a "*full range of human services*" was the genesis of the Golden Grove Secondary School Complex. This complex is sited centrally on a 25 hectare site and contains, among other buildings, three secondary schools, (one public, one Catholic, one Protestant), an adult education centre, a cultural centre and a leisure centre. Each of the schools have their own discrete buildings, yet all three share some facilities. Shared facilities include: computer technology (WAN), central library, on-line library, technical workshops (auto, woodwork), technology workshops (computers, laboratories), drama facilities, home economics, science labs, information technology hardware and other specialty class requirements. Not only are the facilities shared, but in some instances, teachers are also shared.

In addition to the drive of the community to provide a full range of human services, the founders had three objectives specifically for the school complex:

1 To achieve savings in capital and on-going costs;

2 To give the community a physical and psychological heart; and

3 To change the traditional relationship between school and community to be more integrated.

They believe that they have attained these goals and created a community heart as well.

The Dukeries Complex in England: This complex grew from the need to maintain a school even through declining student enrolment. The complex is located in the economically declining mining

village of Ollerton near Nottinghamshire. The Dukeries Comprehensive School was originally built in 1964 and had all of the traditional play, sports and educational facilities that are typical to most schools. When the decline started in the mining industry in the early 1980's, the people of the village put together a report titled A Place for the Family which essentially was a blueprint for changing the use of over 4,000 sq.m. of unused school facilities to community required functions. The change in use immediately saved £80,000 per year in school maintenance costs associated with the unused spaces, but also afforded savings in other areas of the community.

> *"The complex now embraces a community college, a recreation centre, a 25-bed residential centre, an under-5's centre, a purpose-built youth centre, a public/school library, an information centre, an agency centre (mini town hall), a school/public cafeteria, a day centre for the elderly, an adult training centre for adults with learning difficulties, an adult unemployed centre and a Fire Brigade Training Centre."* [29]

With the great push for cost effective governments, and with the blurring of lines of demarkation between education and business. This sort of shared school facility appears very likely to continue to grow, if not dominate school buildings of the future.

The age of the student, and the specific needs of the student are evolving along with education in general. It has been shown that upwards of one quarter of all Canadians are currently enrolled in some form of educational facility. Given this staggering statistic, it is not difficult to envision what has been called "Life Long Learning". From day care, to ECS, to K-12, to PSE and beyond to business and personal help classes, we are seeing Canadians that are continually being affected by or taking one course or another. In a recent multi-national conference on Education:

> *"The schools of tomorrow should become 'community learning centres', offering individualised and accredited programmes for learner of all ages, according to education ministers from OECD member states. Ministers representing the 25 OECD countries said in a statement after a Paris meeting last January on lifelong Learning: "Schools are a major social asset and should be community learning centres offering a variety of programmes and learning methods to a diverse range of students, and remain open for longer hours throughout the year. The statement called for a major re-think of the way education is organised. Instead of rigid curricula, grading students by age, and an emphasis on rot learning - the norm in many OECD countries - "lifelong learning would benefit from more supple frameworks which encourage self-directed learning and permit a more flexible response to the diverse aptitudes and backgrounds of students." It also called for schools and colleges to provide a greater diversity of skills and to develop cross-curricular activities. The statement recognised that with up to one in three adults in many OECD countries leaving school with only minimum standards of literacy and numeracy, new pathways for learning must be found to accommodated all ages of pupils."* [30]

Self directed Learning & Life Long Learning speak to a life of continuous learning and continuous change. We will continue to see this push for a broader range of student ages and educational needs.

In addition to changes in the age of the students their educational needs will also be changing. Traditional degree and diploma courses will need also to support ongoing upgrades to business knowledge bases. In other words, a course, say in Geology, will not only need to offer the basic B.Sc., but will also need to provide upgrades to Geologists that are out in the marketplace and need only upgrade their skills. This is being seen in many instances, and for many number of years. Canadian Pacific Railway's University of Waterloo room and programme is a good example.

Technology, too is changing. As we have seen, the only constant we can expect from technology is change. But more specifically, our schools will be moving away from the more traditional blackboard and projector screen to computers, video, Intelligent Agents, Virtual Reality, television, Instructional Technology and Software, and different forms of conferencing technologies. In fact, this evolution is almost complete right now. We also see the computer being suggested not only as the medium of delivery, but also the actual teacher. In looking at the current technology section of this report, we see that many different types of technologies and approaches being used:

-Intelligent Tutoring Systems;

-Connected Groups Software;

-Computer Mediated Communications;

-Multi-Media Technologies;

-Video Conferencing;

-Audio Conferencing;

-Video on demand;

-Intelligent Agents; and

-Virtual Reality.

While the future will be paved with the use of all of these forms of technology, the most prominent appears to be virtual reality. With the ever expanding speed of computers and complexity of programming, VR promises to be the most interesting application of technology.

Another evolution in education that appears likely to occur is the ever increasing impact from business. As we have seen in this report, business currently is impacting education in many areas by;

-offering "free" software and hardware (Apple, Microsoft, IBM);

-creating their own colleges / universities (Disney, Macdonald's);

-assisting in curricula programme creation (Wendy's, Coca-Cola);

-providing food services (Pizza Hut);

-offer business specific co-op programmes (Disney, CPR); and

-direct types of school courses (Fording Coal, CPR).

With this impact from business, the future will undoubtably continue to see an increasing impact.

The final and perhaps the most profound change that is not only currently happening, but will continue to happen is the individuality of the teaching. We have seen that the teacher is becoming a mentor and we have seen that computer programmes are now being used to "teach" students at their own speed. The future promises to combine these two aspects into what has been called "Individualised Learning".

It is fair to support many of the research findings that have been previously referred to in this report that indicate the proliferation of individualised learning. From Open Education, to teacher / mentor, to Life Long Learning, to virtual reality, all these changes necessarily lead to a high use of individual learning. But we have also seen that optimum learning occurs variously in teams, groups, or alone and therefore we see individualised learning as one of many approaches to educational delivery.

4.3 SUMMARY

In summary then, our school and our school spaces will:

- see continual and evolutionary changes in education;

- see teachers becoming more like mentors and coaches;

- see the use of the computers continue to grow in importance, ultimately replacing some trends of course content teaching is the form of Instructional Technology;

- see the computers' importance grow in the delivery of education as the medium of choice;

- see a growing push to reduce costs and adopt cost effective delivery solutions;

- see technology as a means to and end, not an end in and of itself (ie. computers are not the message);

- no longer see deficit increasing budget approvals from years past;

- see that education, as with most other areas of life, business and commerce, will be taking a more global view through an acceptance of global educational influences;

- see a change from uni-functional (solely educational) buildings to shared functional spaces;

- see continued evolution to more flexible, more scalable spaces and buildings;

- see an increase in professional advancement and upgrade courses (doctors, accountants, lawyers, architects, engineers) and vocational courses (ie. computers, technical);

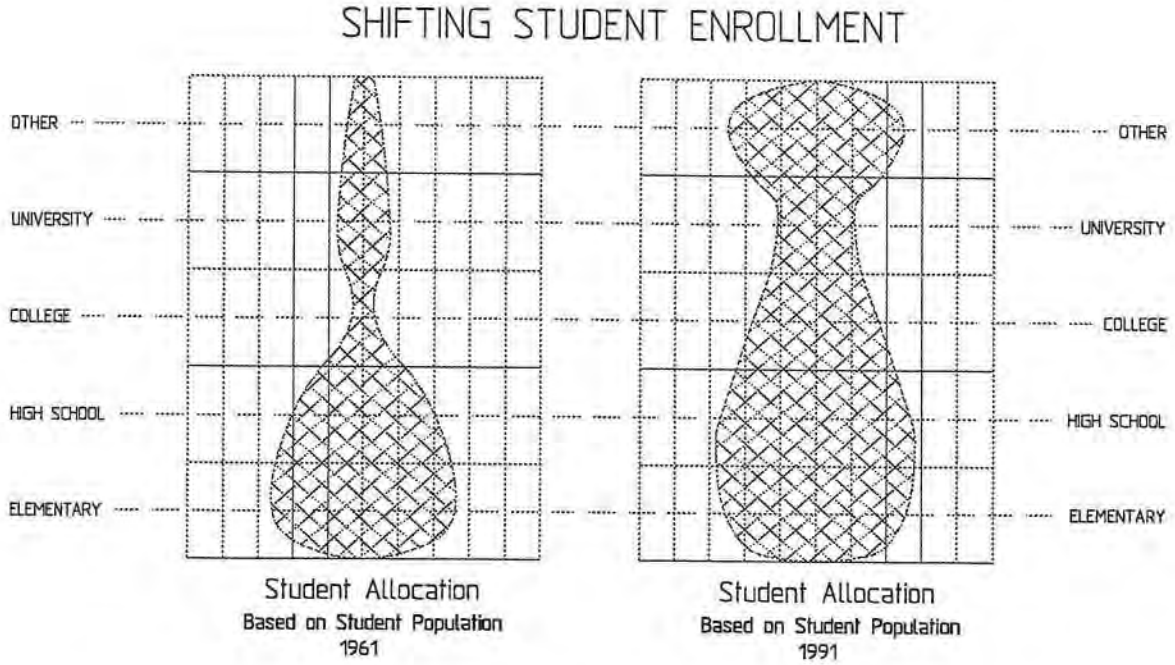
- see more use of higher technologies for communicating in course delivery and with instructional technology;

- see an increasing use of PC's for inter-school and inter-student communication and the storage of data and student information;

- see a continually expanding role of business in educational pedagogy;

- see an increase emphasis on individualised, pair, team and classroom learning; and

- see a continuing trend to Lifelong Learning and a flattening our of the educational pyramid. This is see in the following graph indicating the shifting emphasis of student enrollment;



4.3 DO WE NEED SCHOOLS ANYMORE?

Wow ... what a question.

While not the essential issue in this Thesis Design Project, - after all this is an architectural Thesis and as such does not suggest the need for a building, merely the rationale for a design solution - this question is a central issue facing educators today.

Mr. Lewis J. Perelman, in his book School's Out, speaks aggressively about the need to embrace technology in education to the exclusion of built forms:

> *". . . the same technological revolution that has disconnected the environment of the traditional classroom from the experience of the modern workplace and home also offers the systems to replace conventional schools with effective, relevant learning . . . school will not be identified with any distinct building or location, but rather with a brand or franchise of media through which services are accessed. Home technology - video, audio, computer, telephone - is far more adroit at meeting diverse life cycle needs for entertainment, information, work and learning than is the technology of conventional academic structures."*
>
> "*If* [instructional technology] *learning is in everything, everywhere, how do we confine learning to the box of a classroom? We can't. Then what's the point of having schools at all? There isn't any.*"
>
> "*Going to school is clearly one of the most broadly shared of American social experiences. It powerfully frames the public's idea of what learning environments should look like - whether in a seventh-grade classroom, a college lecture hall, an adult literacy course, or a corporate training seminar. . . . . In reality, these widely shared stereotypes of effective schools routinely and profoundly violate what scientists have come to know about how people learn most effectively, and the conditions under which people apply their knowledge best in new situations.*"[31]

It would appear that in reality, at least for the foreseeable future, we will continue to see education rooted in a physical Place. We have seen that engaging the student is one of the most important elements in the gestalt of cognitive learning. What Mr. Perelman and others seem to be saying is that engaging the student, because it is not (usually) successfully delivered in the traditional physical form of the school, it therefore cannot be delivered from a physical form of a school in the future. This is quite obviously not the case as the Huron Street Public School's CSILE project in Toronto has shown. We have further seen that Instructional Technology, Intelligent agents and other forms of technology mediated instruction are based on the premise of individualised learning and less so on the essential issue of engaging the student. Thus the instructional technology that we see coming on-stream today does not, in and of itself, support a more engaged student. We have further seen that these instructional technology courses are best delivered individually but under the guidance of a mentor (i.e. teacher).

In addition, during one of the interviews completed for this Thesis Design Project, the coordinator of the University of Calgary Distance Learning Centre stated that one of the biggest barriers to the success of Distance Learning Centres here in Alberta is access to the technology - even in today's age of the ubiquitous computer and Internet she states that students do not have the computers they need. We therefore are seeing that, while technology supports new approaches to education, it does not do so at the exclusion of the school building. This is not to say that there is not a need for the Virtual University, there is a need and will continue to be a need, but this need will not replace the need for a physical Place to educate society.

It is clear that although technology may promise an educational utopia wrapped up in the iconography of the lone student with his or her computer, sitting quietly in a beautiful green meadow

studying with the computer talking to the screen with professors and students from around the world, I believe reality is that we will continue to see real physical schools for many, many years to come.

Through the research for this Thesis Design Project, a number of social needs which require the need to have physical buildings have been articulated. While the manifestation of these will be examined later in this report, they are noted here in general terns and include, (in no specific order of importance):

1. Society is now seeing change in manifesting in the weakening of the family unit, a weakening of the role of the church, an increase in families with two working parents and an increase in single-parent homes. This has meant that infants, young children, latchkey kids and even the elderly are receiving less and less attention and support. Simply put, and rightly or wrongly, schools look after our children and they are increasingly looking after our aging adults. Even just looking at the sheer numbers of single parent and two working parent families points to a continuing need for schools to safely looking after our children when their parents are out working or away from the home. The Canadian Encyclopaedia records that in most (over 55%) two parent families, both parents work and combined with the growing numbers of single family homes the tremendous need for schools will continue;

2. In our ever increasingly culturally diverse nations, schools are a forum for learning and teaching language, culture and social mores. While this is sometimes attempted explicitly in courses like English as a Second Language (ESL), it is more successfully implicity taught in the normal real world of day to day interaction between children, teachers and others;

3. Both the delayed results of the industrial revolution, which are now being seen in the technological revolution as it creates emerging developed countries, and our continued suburban sprawl with its attendant weakening of a city's traditional "social fabric" are necessitating the need to recreate the heart of the community. With the combined pressure of shared resources for cost savings, schools are re-evolving as the centre of suburban life - a city centre in microcosm;

4. Increased complexity of our children's lives has meant that parents increasing want to stay up-to-date with current trends, technology and general issues and the method of choice is increasingly a return to education;

5. Rapid advances in knowledge and methods of production have necessitated the continuing growth of learning of professional skills meaning that there is a need to keep learning long past the K-12 and PSE levels. To "get away from the office" and study has its appeal and certainly a need;

6. Although computers are apparently very common and much less expensive than in recent years, front line educators are seeing access to technology as a continuing and growing deterrent in distance and instructional learning. As long as students and parents have difficulty outfitting and continually upgrading their technology to suit the growing and expanding needs of educational facilities and delivery systems, there will continue to be a need for the Place of a school to house and access these technologies.

7. In some instances, the school is the only place where many children get any kind of structure or role modelling (also hardships, evil and bad manners) in regards how to act and behave properly in society. Without the influence of the school, without the teachers' guidance or without the social interaction with other children, many children would never learn normal societal behaviours;

8. Higher standards of living and increased life expectancy have created an increased need for learning throughout life. This is traditionally and frequently best realised through schools;

9. A universal system of Canadian educational delivery in which we all meet and are afforded the same kind of education is very consistent with our Canadian society in that we laud our social net support systems as egalitarian in nature. Through home learning and distance learning, the personal wealth of people - in the form of type of technology, one parent or two working parent homes and latchkey kids - would have a great impact on the universality and success of the education a child. In other words, the people with the means and the money would afford better technology, more attention at home for home learning and a greater range of access to locations that were traditionally equally available to any student, regardless of socio-economic status; and

10. The continuing and growing economic cyclical boom / bust nature and the increased reliance of today's economy on the use of data through the use of technology has increased the importance of formalised and continuing education. For those students who work best in individualised learning environments, for those students who are highly motivated to study on their own and for those students that do not need a Place to go in the day because they have a stay at home parent, having no schools to go to is not an issue. But, based on my own experience and based on anecdotal evidence, the vast majority of students need structure, discipline, need clearly set goals, and need to be looked after during the day. Because of these students, a physical Place - a school - will continue to be a necessity.

Beyond the educational and pedagogical reviews that have formed part of this research, this report has looked at the physical side of being somewhere, in "Place". Place has been shown to exist wherever physical and virtual elements present themselves however through the research presented here, we have seen that we Sense better and understand better when we experience the place in reality - when more of our senses are engaged - when we engage the observer. Similar to the educational adage that has been reinforced many times within this report (namely that "engaging the student"), engaging the observer and affording the observer the opportunity to understand and Sense a Place's codes, cultural biases, its textures, it ambiance, its history and everything about the Place, lends itself to an enriched experience and better understanding of Place. In this manner, a Place, because it is experienced with all our senses and emotions both viscerally and physiologically, benefits the learning process. In other words, physically being there, to look at and feel how a beaker heats up in the science laboratory, or to sense the nuances of how fellow students work together in teams, cannot be replaced by a computer screen or a virtual head set with monitors and stereo sound. That is not to say that the traditional image of a child in a classroom placidly listening to a teacher review the importance of Samuel de Champlain's voyages through Canada is better than a computer. What is needed is a balance that derives the benefits, both financially and educationally, from educational technology while availing students the access to the social, technological, learning and cultural elements that make a physical educational presence so important.

As a final comment, we again note two previously referenced quotes. The first from Mr. Jack Wilson's 1997 Educom Review Paper called Distance Learning for Continuous Education where he speaks to the fears of Instructional Technology:

> *"Apart from the usual value of sending away 18-year-olds to allow them to grow socially while allowing their parents some relief, universities have much to offer the new learning environments. The oft-expressed fears that the one great teacher of economics, psychology or physics will teach all the classes in the respective discipline or that a Web site could somehow replace an education professor, profoundly misunderstands the way people learn. Learning is about a "conversation" amidst resources. Distributed cognition on the World Wide Web will provide unprecedented access to resources on a network where every student and every instructor is an important resource. "*

The second quote is from E.M. Forster's 1928 book, The Machine Stops. This quote addresses our mediated world in that the book chronicles a future world which is so dependant on technology that the essence of humanism is lost. The following quote is spoken by the book's hero as he is trying to explain that man's world was very different before the "Machine" started to mediate life:

> *"You know that we have lost the sense of space. We say 'space is annihilated,' but we have annihilated not space, but the sense thereof. We have lost a part of ourselves. I determined to recover it and I began by walking up and down the platform of the railway outside my room. Up and down, until I was tired, and so did recapture the meaning of 'Near' and 'Far.' 'Near' is a place to which I can get quickly on my feet, not a place to which the train or the air-ship will take me quickly,. 'Far' is a place to which I cannot get quickly on my feet; the vomitory is 'Far', though I could be there in thirty eight seconds by summoning the train. Man is the measure. That was my first lesson. Man's feet are the measure for distance, his hands are the measure for ownership, his body is the measure . . ."*

In our world, we cannot afford to lose the "*Sense of Space.*"

4.4 THE SPACES OF A STUDENT

In this Section of the report, we have looked at schools that are incorporating some of the more contemporary approaches to education. What many of them do not specifically refer to are the space that are created for the use of the student. While functional spaces have been created in these schools, the Places that students create for themselves is not mentioned - although they undoubtedly do exist. In previous Sections we have seen that like Places can and do mean different things to different people, even when considering similar upbringing, culture, and heritage. So too do students have their own spaces - their own Places within a school.

Historically, education evolved from nomadic peoples who taught their young through the family, to the first classroom around 2000 BC in Mesopotamia, through the middle ages and the scribes up to the present, there has always been personal and private spaces for students. In the earliest sense, that may have been the small circle of children listening to their parents teach, later, the actual classroom bench, the tablets and the table used to writing and leaning on would become the dominion of the student.

Today, the student still has dominion over spaces to the point that these controlled spaces create Places for the student. The most obvious is the student's locker.

Nothing could be more personal than a locker. Virtually no-one goes into another person's locker, personal and private information and things can be stored (usually safely) within a locker. When opening a locker door, one can easily picture a student who huddles over the door, essentially putting him/herself into the private physical space of the locker - as if trying to be in the locker would enhance the experience and personal feeling that the locker may give the student.

Places can be sensed, experienced and understood on many different levels. Spaces exist that are very private (an individual) to the personal (two lovers) to the shared (a group of people in a room) to very public (a street with strangers). These levels of spaces exist for the student as well. A student's desk or locker is a very private space - only open and visible to a very small group of people. Personal spaces exist between students who may have lockers beside each other, or who are best friends and sit beside each other - encroach on this space and one feels that one is an interloper. Shared spaces are clearly the classroom while public spaces are the corridors and the library.

Consideration and understanding of the very private and personal spaces that students create and need must be brought into use in the design of our schools. Without personal spaces, without private places that are solely a student's own domain, a disenfranchised sense of loss is very likely. Picture a young child at home who cannot even call a closet his or her own. Each of us need a space that is totally our own, even if just for a school year, we all need to have control of our space. In our previous reviews in the History of Place Section, we have seen that Heightening the Experience of Place is achieved though Ownership and Pride, Security, Understanding the Space and others. It is from this general understanding of heightening the experience of Place that we see the connection and the importance for the need for private and personal spaces for students. This of- course would also apply to teachers and others using and servicing the school facility.

It is interesting even to consider the lack of personal or private Places on the Computer. The Internet is one of the most open and democratized creations of man. Nothing is sacred, hidden or private unless great amounts of security and precautions are put into place. This, we hear, is not always successful and we are constantly told of security breaches and personal information getting "out." The only personal space that one can truly "feel" when using the computer is the physical space that one has when sitting in front of the computer screen. The invisible yet tangible space that exists between one's face and the computer monitor is truly a real and generally very private space - to test this, put your hand in front of person's computer monitor and see the kind of reaction you get.

This Section of the report concludes with the comment that students need their own spaces to be able to create their own Places. A school environment must support a student's need to have personal and private space. In addition, shared and public spaces necessarily need to be created, however, by virtue of the function of many of the spaces to be created in a school environment, these more public spaces will naturally evolve.

A REVIEW OF PROJECT INTERVIEWS

SECTION FIVE

"There is a validity in our schools that is innately human and innately real."

Gary Mar, Minister of Education

5.1 INTRODUCTION - PROJECT INTERVIEWS

Section Five of this report highlights three of the interviews that were completed for this Thesis. The three interviewees were:

The Alberta Provincial Minister of Education, Mr. Gary Mar.
Professional Education Consultant for public and private boards, Ms. Sharon McKinnon;
Coordinator of the Distance Learning Centre at the University of Calgary, Ms. Irene Kirek.

The interviews are not listed in the order that they occurred, they do not represent all the interviews which were completed for this Thesis Design Project, nor do they represent the full range of topics, questions or the order in which the questions were discussed. All the answers are paraphrased by me and are not to be considered direct quotes unless placed in quotation marks. While much effort was made to accurately write down what the interviewees were saying, no recording device was used and therefore any errors which may be present in the retelling of these interviews are entirely my own and, should any exist, I offer my apologies in advance.

Each of the people interviewed were selected to expose to me to a range of opinions about technology in education and about the future growth of education, educational technology and our schools in general. The questions that I asked changed depending on who I was interviewing.

I would like to express my grateful appreciation to each of the people who took time out of their busy schedules to answer my questions, including those that are and are not listed here and those that answered my E-mail queries. I thank you all for your time and opinions.

5.2 THE ALBERTA PROVINCIAL MINISTER OF EDUCATION - MR. GARY MAR

Mr. Mar was interviewed at his constituency office in North East Calgary. We spoke for a little over two hours. My questions generally concerned how education was changing and if and how the provincial government was supporting educational technology.

On the topic of: Future Use of Schools.

Mr. Mar believes future schools will see a diminishing role for the traditional school coupled with a diminishing in the building of the traditional type of school. Mr. Mar believes we will see less and less of the lone Catholic elementary or lone Public elementary K-6 school which opens at 7:30 in the morning and closes at 3:30 in the afternoon. The model of our traditional schools, Mr. Mar states, will change to integrate many of the new approaches to facility use.

Mr. Mar believes that our schools will start to become more integrated with the community in which they reside, they will remain open longer to accommodate night, ESL and other similar student needs and the schools will need to share their resources such as gyms, pools, classrooms, assembly spaces and technology with their community. This will mean that the traditional look of our schools will start to change. Mr. Mar said that " *... people have to break their mind set of what a school looks like."*

Mr. Mar further notes that because of the changes we are seeing in the student population, a shift from the younger students to the older students, we will see a slow decrease in the demand for schools in the lower K-12 range and a growing demand for educational accommodation for distance, life-long learning and PSE level learning. According to Mr. Mar, we will see less use for our traditional schools.

Notwithstanding the shifting student age, Mr. Mar stated that we are seeing very real changes in the ways schools run their business. Mr. Mar noted that year round schooling is now a reality in some locations in Alberta and will continue to be an influence on our schools. Mr. Mar also sees the possibility of two shifts a day in school where there is an early morning and an early afternoon school day. He further sees the possibility of a Copernican type of course delivery system, one in which a student will take over the year the same number of courses as they do now, only the courses will be restricted to only one term. In other words with year round schooling, with double shifts and with the Copernican delivery system, a student's school year would be broken into quarters, each quarter having only two classes and each class lasting half a morning or half an afternoon. So, as an example, a student will take math and English for his first quarter, then french and science in the second quarter and so on. In this way, students will benefit from concentrated study of one subject, shorter school days, parents will benefit from longer school years, and schools will benefit from sharing resources between a morning and an afternoon school shift. Mr. Mar cites Forest Lawn High School as a local example of a school that may move in this direction.

In addition, there may even be, Mr. Mar suggests, that with the dwindling need for many of the existing schools that we now have, a need to start to change them over to non-related, but needed facilities such as maybe converting old schools to residences for seniors. With the somewhat dwindling need for the number of schools we have in the inner city, and the increasing need for senior housing in the inner city and near the major hospitals, a shift like this may solve many of the possible problems we see in our provincial budget discussions today.

On this topic, Mr. Mar finally and very eloquently noted that we must make sure that the basic function and therefore the essential and intrinsic value of our schools as a meeting and gathering place - a function that we as humans have forever needed and have forever maintained - must be continued if not focused on and exalted. "*There is a validity in our schools,*" he said, "*that is innately human and innately real.*"

On the topic of: <u>Sharing Spaces</u>

Mr. Mar believes that our schools will need to continue to share resources, but not only with the community, as noted above, but also with each other. Mr. Mar cites one possible example of a pair of schools needing to share resources like a gym, cafeteria or other similar service. One of these schools may be from the separate board, the other from the public. In this way, Mr. Mar states, both the Catholic and the Public schools can realise capital and operational savings in their budget by the sharing of resources.

Sharing of spaces will mean also that schools will be sharing their spaces for similar uses, but with a wider range of students. Distance and Life-long learners, with their ever increasing numbers, will continue to need educational facilities, laboratories and the like. Therefore we will see that schools will be needing to be designed not just for the one level of student (ie K-6 schools now frequently

only have small traditional school desks) but for many levels of students and many ages of students.

On the topic of: Influence From American Schools and Sources

Mr. Mar states simply that he sees some, but not a great deal of influence from American schools. When pressed for a more elaborate answer when I offered some anecdotal data from my own experience regarding American influence on Canadian school texts and material, Mr. Mar shrugged his shoulders and again stated he sees little influence.

On the topic of: Changing Roles for Teachers

Mr. Mar sees what he calls "*super teachers*" as the future of the teaching profession. While not using the title of mentor, Mr. Mar describes the new breed of teacher as fulfilling the model and function of mentor. Teachers will coach, support, guide and finesse a child through our educational systems and our resources. But Mr. Mar states that mentoring (which is largely based on the pedagogy of individualised learning) works best with motivated and dedicated students and therefore is not appropriate for all students nor all teachers and so we will see a mix of traditional and non-traditional teacher roles for many years to come.

Teachers, Mr. Mar believes, will remain the prime source of knowledge for students, but unlike in the traditional pedagogical model where the teacher is the sole purveyor of knowledge, in the future, the teacher will now be one of many sources. But according to Mr. Mar, the teacher will maintain their place as the primary and most important knowledge and experience source for students.

One of the challenges of the near future, Mr. Mar believes, is the shifting of attitudes of many teachers toward technology. He said that some teachers do not like, nor do they adjust well to the use of technologies within their classrooms. Over time this will diminish, but for the near future this is still an issue that is being dealt with on every level. Mr. Mar stated that a great many, certainly the vast majority of Alberta teachers, look with increasing interest at technology to help them deliver their course loads. What is happening at this level then is a reluctance to accept the change that is a result of technology - not a reluctance to accept technology - just a reluctance to accept the change that accompanies the technology. During the research for this Thesis Design Project, I spoke to a number of teachers and one common concern that I kept hearing echoed what Mr. Mar was saying here. One teacher's comment regarding technology was typical when he stated that his school had just received a number of computers and two of them had been delivered to his classroom. He and his fellow teachers' biggest challenge, he said, was to figure out what to do with them now that they had them.

On the topic of: Technology

Mr. Mar sees a continuing and growing integration of technology in Alberta schools. Citing many of the examples referenced in this report (AMEE - Adaptive Multimedia Education Enabler, CTS - The Career and Technology Studies, Lester B. Pearson Hight School and others), Mr. Mar believes that technology will continue to be an influence. When asked, Mr. Mar noted that the Alberta Government supports technology through the approval process of new and renovated school projects. When a school proposes the high use of and the innovative integration of technologies, funding approval is somewhat more favourably received. Funding for renovations that do not integrate technologies

where such integration could be accommodated, are given great amounts of scrutiny. The message is that technology is an important element in the evolution in Alberta schools.

Mr. Mar states that there are various funding models that can be used for new schools, but all of these models now include consideration for the integration of technology. Notwithstanding the need to outfit schools with various types of technology, the overwhelmingly preferred technology is the Personal computer. In this, Mr. Mar would like to see the mind set of many of the levels of bureaucracies within the school system look to computers as a "*consumable*" as opposed to "*capital expenditures.*" In this way, Mr. Mar argues, the funding model of the traditional school will take a great shift, from capital intensive to consumable intensive and at the same time manifest a shift from seeing computers as a one-time purchase, to a continuing need for upgrade and updating of the technologies. Mr. Mar states that computers are so out of date within five years of their initial purchase, and because the industry is changing and creating itself so quickly, that this concept of consumable technology is almost mandatory, otherwise, we run the risk of falling behind.

The idea of laptops came up in the conversation and Mr. Mar said that the cost of laptops is so out of proportion with its deliverables compared to a comparable cost for a desktop personal computer that he does not see that schools will be able to afford to give laptops out to the students. For less than half the cost of outfitting students with laptop computers, schools can get more power and more options on the desktop. And with the still ever present need for sharing of computers, laptops are not probable in the near future.

Mr. Mar did state that a 5 to 1 ratio of students to computers for every school in Alberta is an ideal that may be attainable in the near future, cost being the biggest issue. In addition, Mr. Mar stated that our schools are also adopting a computer delivered educational system to some small extent in that one of the science text books at the high school level has been committed to CD-ROM: the Nelson Science Book.

On the issue of the Internet, Mr. Mar notes that up to 97% of Alberta schools are currently connected on the Internet through an agreement with Telus such that Telus have given free access to all Alberta schools to the Internet and provide on-going hook-up and connections. He sees this percentage increasing and the use of the Internet increasing as a forum for students not only to talk to other students in the province, but also with other students, educators and people around the globe.

When asked about virtual reality, Mr. Mar answered that he does not see a great use for it in schools. In fact, he dismisses the question with a short "*very little, if any*" answer.

Mr. Mar spoke very well about the need and reason for technology in schools. Many of the reasons included cost savings, effectiveness in educational delivery, better distance learning deliverables, scalable solutions and the like. But one of the most important reasons, according to Mr. Mar, and certainly the one he spoke most effectively on, was that which is at the heart of what education is all about. Mr. Mar said that the purpose of education was to prepare young students for life, and real life in our world and in the future, will be wrapped up in technology. Therefore education too must be involved in technology.

5.3 EDUCATION CONSULTANT - MS. SHARON MCKINNON

Ms. McKinnon was an elementary and high school teacher, a university professor, is a mother of two school aged children, is active with the local (Toronto) school board and has been involved in many facets of developing learning courses. This experience well positions her for being an education consultant. I met with Ms. McKinnon while in Toronto and later spoke with her over the phone.

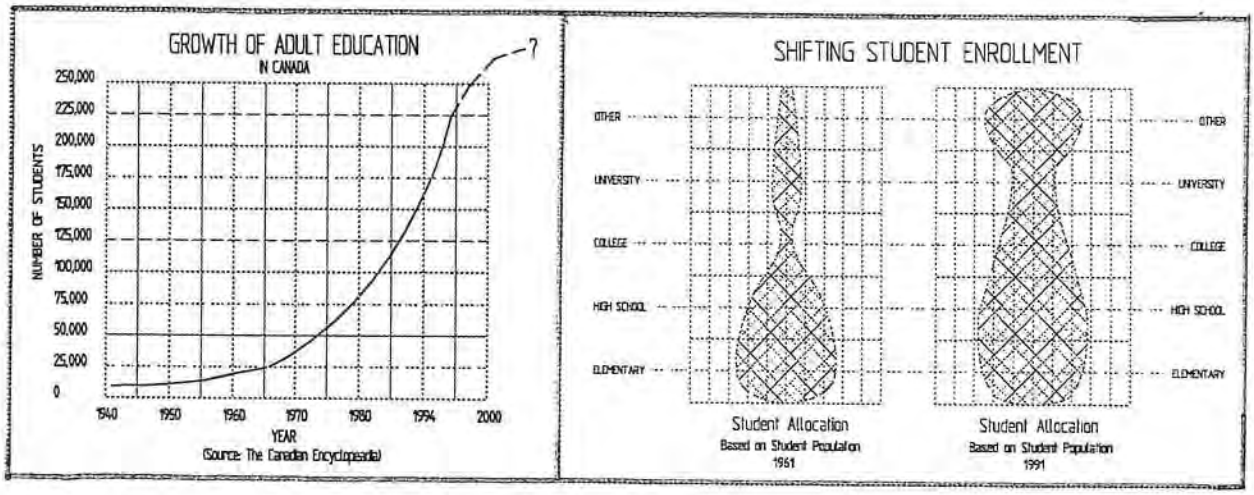
5.4 DISTANCE LEARNING COORDINATOR - MS. IRENE KIREK

I met with Ms. Kirek who is the Coordinator for the Distance Learning Centre at the University of Calgary, at her office at the university. Ms. Kirek was very gracious in speaking with me for a little under four hours and allowed me to tour the whole of the Distance Learning facility. Ms. Kirek even allowed me to look at some of the software while it was in use and view one of the video conferencing classrooms while in use.

Our conversation concerned primarily what is being done with technology, as opposed to what will be done, but we did discuss the future of educational technology to some extent.

On the topic of: Distance Learning

Ms. Kirek stated that the Distance Learning Centre at the University of Calgary, which she notes is one of the most advanced in the Province, has grown tremendously in the last few years. Although always seeing a steady growth since its inception in 1966, Distance Learning at the university more recently is seeing a boom like none before. The research completed for this Thesis Design Project would bear this out in that we see virtually an exponential growth in adult, continuing and distance education. Two of the graphs already used for this Thesis Design Project speak to this growth:



Ms. Kirek sees a continuing growth in this area such that the impact will be that the already cramped space in the basement of the Sciences Building needs to be expanded, virtually doubled. Currently there exists two very large video conferencing classrooms seating approximately 50 to 80 students each and four smaller rooms of approximately 20 to 30 students and a number of smaller still rooms for about 10 students. The total area designated to the Distance Learning Centre is about 2,200

sq.m. (24,000 sq.ft.). Expansion, according to PP, is needed to accommodate the increased load on the broadcast and recording facility, and the increased demand for video conferencing classrooms.

The video conferencing classrooms do not look like any traditional classroom in that they more closely resemble a typical office meeting room. The room aspect ratio is somewhat rectangular but closer to square than to very long, the monitors and cameras are mounted at the head of the room while the students and/or professor sits around an elliptical or flattened egg shaped table. The students have microphones, computers and other necessary technology mounted at each of the stations.

On the topic of: Teachers' Acceptance of Technology

Ms. Kirek stated that the general acceptance of the technology and the system's deliverables were variously well or poorly received, depending on the teacher. Some, Ms. Kirek stated, jumped right into the technology, changing their course load and method of delivery to suit the technologies. Some have had to be dragged (metaphorically speaking), screaming and yelling into the video conferencing lecture halls, only to admit later that the technology does allow a greater range of students access to their teaching and course material without any real denigration of the material and manner of teaching. Others still, have come screaming and yelling and have left vowing never to return. It would seem, though, that the vast majority of those professors that are using the Distance Learning Centre are supportive and appreciative of the amount of work and the results that come from the education gained through the centre.

Generally, the professors seem to want to use the technology, but need to take time to understand what they need to do, and what the technology can do for them.

One aspect of technology that Ms. Kirek noted was very well received by students and by professors (especially those who are not jumping into the world of technology) was video recordings of lectures. Many of the lectures that are given for any of the Distance Learning courses are video taped and students may book out or look at the Centre, the past lectures of the professors. This, Ms. Kirek noted, was very well used by many students.

On the topic of: Designing Course Material

Ms. Kirek showed me the broadcast and recording facility which looks like a radio broadcast facility, only perhaps somewhat smaller. All the course materials generated by the University which are delivered through the Distance Learning Centre are produced and recorded here. Ms. Kirek stated that the system is well received by students and professors alike, especially on the international scene. Ms. Kirek stated that some of their courses were being purchased abroad by other educational institutions (ie in Taiwan) to be used for international students and therefore the Distance Learning Centre sees itself as becoming, if not a leader, then certainly a large player in the world's need for PSE level course materials. The programmes are designed using industry standard educational software platforms and as such Ms. Kirek sees the courses being able to be delivered to a wide range of students and institutions.

The courses are prepared and designed by the professors who teach the courses with input and

guidance from the computer and technical experts from the various university departments.

On the topic of: Influence From American Schools and Sources

Ms. Kirek sees the influence from American schools as growing in some areas, but not in all areas. Certainly, Ms. Kirek states with an amount of well deserved pride, the Distance Learning Centre at the University of Calgary can and does compare favourably with other institutions around the world in respect to distance education deliverables. Ms. Kirek notes that with the growing global influence of the University of Calgary's course wares (ie in the international purchase of some of the courses offered by the university) Calgary will be a strong player and will be able to maintain not only a share of the Canadian educational market, but also the international market.

On the topic of: Student Access to Technology

One of the most interesting elements that Ms. Kirek noted was, in her opinion, that one of the greatest deterrents to more globalized education, more robust educational technology and more universal use of technologies is the lack of student access to the technology. This was somewhat surprising because in this day and age of the ever present computer, one would think that virtually every PSE level student, and certainly virtually every household where a Distance Learning student resided, there would be a computer setup. Ms. Kirek did not give reasons for the lack of technology availability, she only stated her observation in that when students (regardless of age) need to access the centre, having the computer or the technology to do it was, it seemed, frequently an issue.

This could in some way be a result of the every growing complexity of software and hardware needs for the educational software. It seems that even as recently as just a year ago, the absolute need for a camera and microphone mounted to a student's computer would have seemed absurd. But now, it is not only a nice to have, some classes almost mandate computer conferencing such that the teacher can see or at least hear the student. Because of the continuing growth of the software, a student's own hardware could be abysmally out of date the minute it's brought home. Not only that, students' access to money does not always allow the purchase of a $5,000.00 computer setup.

Ms. Kirek therefore stated that one of the biggest issues facing Distance Learning Centres today is student access to the technology. That is why programmes such as AMEE, which are designed to avail students access to any type of technology needed, are being tried out.

Ms. Kirek noted that the use of the Internet to deliver educational material, specifically Instructional Technologies and Distance Learning materials is on the rise and will continue. However, Ms. Kirek notes that the Internet delivered courses that are available now generally are very good and capable in the speed of the deliverables, but fall short in the quality end.

On the topic of: AMEE - The Adaptive Multimedia Education Enabler

The University of Calgary and the Distance Learning Centre are very heavily involved in the pilot project called AMEE (see Section Six - Case Studies for a full description of the rooms and system) in which course materials are made available to a wide range of students delivered from a wide range of institutions and allowing as much access to technology as needed by the students and the originating institutions. Ms. Kirek sees this pilot project as an indicator of the future of education

where Learning Centres are located either centrally or remotely which offer the ever changing technology and the ever needed paper and administrative resources to students.

Ms. Kirek did state that, even though in only the extremely early stages of implementation, the numbers of students making use of the computer access was less than expected. The basement level room which houses the computers is a very antiseptic and computer user un-friendly environment. This may be in part why the technology is not better used. In addition, the University has many other locations for computer access and so this is not the sole location that a student might use a computer. In more remote cities or rural communities, these facilities might be better used. Or simply, the system might just be too new and needs time for students to learn to use it.

One of the real benefits of the AMEE, one-to-many approach to computer delivered education is the real-time aspect of it. Not only do professors get to deal with the students and the students get to deal with the professor in real-time (which is not traditionally seen in most Distance Learning), but students, through their computers, can chat real-time. In this manner, the computer becomes the medium of communication for the student.

On the topic of: Influence from Business

Ms. Kirek sees an increasing role for business, but not to the extent that it will take over or replace traditional educational facilities like the University of Calgary. Business' role will primarily be in the assistance of educational delivery, rather than in the control of educational delivery. In other words, business may have a place in the hardware design and in the software design but the content of the courses and the actual teaching of the courses should and will remain in the control of educational institutions.

A good example of this is the software programme that the Distance Learning Centre uses for their computer conferencing courses (ie AMEE) called First Class. First Class is a software programme developed in the United States which was refined at the University. The programme offers educational facilities, at a reduced price, software which does not actually teach a course but allows courses to be taught through it. It is merely the conduit through which a professor will design his or her own course material for a particular course. Ms. Kirek implies that the sales of courseware will remain in the realm of educational institutions (like the University of Calgary selling some of its courses to Taiwan) rather than businesses selling actual courses.

On the topic of: Future Needs

As noted earlier, Ms. Kirek believes one of the biggest deterrents to Distance Learning growth is student access to technology. Ms. Kirek sees availing students this access in Community Access Centres. These centres, Ms. Kirek states, should house the updated technologies needed to support the Distance Learning needs of the originating institutions. Ms. Kirek also states that one of the important elements in this is that these centres become a location for peer support. Not only would students gain access to the school technologies and resources at these centres, but also be able to learn from and interact on a social level, other students in the same situation.

These centres also support the administrative, software and hardware and resources support that the students may need in remote locations.

Ms. Kirek also believes that professors will not diminish in stature, numbers or importance with the growing integration of technology into education. Rather their roles will be changing and expanding to suit and make use of the opportunities availing themselves. Ms. Kirek also noted that with the growing acceptance of technology in our every day world, and with the every increasing ability of the younger children to learn and use newer technologies, schools that do not offer or only minimally use technologies in their educational delivery, will be left in the proverbial dust.

CASE STUDIES

SECTION SIX

"If the designers are enamoured with the technology, the software will sit on the shelf. The different styles of learning need to be remembered, as everyone will not be willing to sit in front of a computer for two to three hours at a time. Advocates of learning through the computer should be clear that it is not a panacea and should focus on what the computer, as a tool, can do well. If the benefits are oversold, disappointed users will be alienated."

Eric Freitag

6.1 INTRODUCTION

This Section of the report briefly looks at two provincial initiatives that are currently being tested and implemented in an attempt to address the issue of using technology for educational delivery with both initiatives dealing directly with distance learning. The first initiative, in New Brunswick, deals directly with the issue of providing current, topical, cost effective and high quality education to students in distant and lower populated areas. The second, in Alberta, addresses the issue of the life-long learner's and other student's ability to access the technology. These two initiatives are: respectively: New Brunswick Distance Education Network (NBDEN); and the Adaptive Multi-media Education Enabler (AMEE).

6.2 NBDEN - NEW BRUNSWICK DISTANCE EDUCATION NETWORK

The New Brunswick Distance Education Network is a provincial initiative for the New Brunswick Cooperation Agreement on Entrepreneurship and Human Resources Development Committee through The Department of Advanced Education and Labour in the Province of New Brunswick. The programme is here referred to as NBDEN and was started on March 31, 1993. According to the Executive Director, Mr. Rory McGreal, the project is a five year initiative aimed at:

> *". . . increasing the educational training opportunities of citizens living in the more isolated regions of the province ... "*[1] and the project will *". . . form part of the province's strategic agenda for economic independence which is dependant on raising the general level of education of the province particularly in the rural areas."*[2]

The project budget for five years is $10.4 million with the cost allocation being $6.0 million for the establishment and operational maintenance of the network and $4.4 million for the initial programming and software development.

A total of 18 sites have been setup which amounts to approximately $577,000.00 per site. Each of the sites is staffed by a part-time site facilitator while the main project office is staffed by 5 people including the computer and software specialists. Each of the sites variously use: personal computers; printers; videocassette and audio cassette players; television monitors; VCR players; fax machines; and assorted printers, copiers and the like. The technology systems are networked into an "*audiographic tele-conferencing network*" which forms the basic backbone integrating the whole system. Each student and each site has access to E-Mail, the Internet and computer conferencing. Each site can therefore communicate with any other site as well as the main office site.

Business is a major player in NBDEN to the extent that a Cooperation Agreement initiative has been implemented between institutions, private companies and the provincial government departments. Each has committed to setting up and maintaining a video conferencing network node. Some of the players include Charlotte County, the University of New Brunswick, Universit, de Moncton, Healthcare Association, Department of Economic Developments, Tourism, NBTel and more. Each has invested an average of $60,000.00 for one video conferencing technology site with the remaining set-up, replete with seating, walls, acoustic considerations and other physical elements costing in the range of $250,000.00.

Each of the players in the cooperative are expected to contribute not only the cost of their own

equipment, but also are expected to contribute to the cost of the project superstructure and courseware through cash contributions and donations of staff allocations and expertise. The NBDEN is an open distance learning system in that it is open to any institution wishing to use the facilities to deliver a course. Any institution wishing to use the NBDEN to connect to and to delivery a course through must also contribute to the system. Somewhat akin to a user pay system. Should a school deem a need to deliver a course to certain remote areas that are connected to the NBDEN, then that institution can, through the existing infrastructure, and with certain monetary support agreements.

In this way, the system has been set up and is made available anyone needing to deliver education or course material directly. Government, business and educational facilities make use of the system.

One of the most important elements in the pedagogical philosophy of the NBDEN is that of the creation of an infrastructure that is implemented and left open, for hire, by whomever needs it. Traditionally, a university, or a school or a larger business would be financially responsible for total costs of such a system, but with NBDEN, reduced costs are realised because of the sharing of the initial capital, the sharing of expertise and the sharing of the facilities themselves:

> "*Institutions planning on delivering course on the distance education network will be expected to contribute to its support . . . furthermore, the institutions will be providing the room and facilities for both delivery and receiving courses ...* [and are] *expected to allow others to use them.*"[3]

Thus sharing of the physical classroom is, if not required, then strongly suggested. This tends to avail more of the technology not only to more students, but also to more institutions who delivery courses, making the full range of the infrastructure more accessible. Additionally, NBDEN provides the basic computer software, in which the individual institutions design their course material. NBDEN software professionals also provide ongoing support, training and maintenance of the courseware and software. In this manner, additional savings are realised by the originating institutions in that they do not need computer expertise.

The essential goal of the NBDEN then is to:

> ". . . [provide a] *network to support collaboration among the different delivering institutions for the most cost-effective sharing of resources, and the most imaginative use of the limited resources available within the province.*" [4]

As with many of the distance learning centres reviewed for this Thesis Design Project, the remote sites, located in rural communities, are called Learning Centres. These Learning Centres provide a fully bilingual environment which is designed to deliver any of the courses offered by any of the institutions. Types of courses being delivered on the network include forestry and mining technician upgrade certificates and nurses' course re-certifications. Professional and technical upgrade courses are also available.

Physically, the Learning Centres are located in many different types of locations - essentially wherever they were needed and was possible to put them including: basement levels; empty school classrooms; and business offices. Each Learning Centre is a series of small rooms comprising: coffee/coats; seating; office; storage/computer room; and the classroom. Because the Centres are

rather small, needing to accommodate only up to about 10 to 12 students (on average), no Learning Centre has its own building. All Learning Centres are either a single classroom or a series of small classrooms that are purpose-built interior renovations for the audio and video conferencing technology. Each is designed to suit the students sitting and communicating with their counter-parts of the professor. The technology delivers both recorded and live courses and therefore the seating is generally around a semi-circular table or in a series of raised rows. Generally there are computers and microphones mounted in front of the student's chair, but not always.

The NBDEN deals with the delivery of course material to a group of students requiring access to identical courseware. In other words, a number of students taking the same course. What this means is that the New Brunswick Distance Education Network has cost-effectively created a strong infrastructure that is designed to deliver educational course material from a wide and varying range of institutions to a wide and varying range of students, covering a wide and varying range of topics. It has created a forum for business, educational facilities and public and private sector interests to share resources to achieve a user specific educational training.

It is not clear whether, at the end of 1998, the NBDEN will be continued.

NBDEN therefore is a programme designed to allow small classrooms to be taught by distant professors.

6.3 AMEE - ADAPTIVE MULTI-MEDIA EDUCATION ENABLER

The Adaptive Multi-Media Education Enabler, called AMEE, is similar to New Brunswick's initiative in that it is a programme designed to deliver course material using current high technologies. But AMEE is somewhat more than just a bunch of courses available through audio and video cassettes - it is an opportunity to provide access to educational technologies and courseware. In the words of the Alberta Vocational College, the central player in AMEE, this initiative is:

> *"The Adaptive Multimedia Education Enabler, or AMEE ... a family of computer products designed to provide universal access to distance learning opportunities."*[5]

AMEE is a pilot project began in the fall of 1996. The first course was provided in the fall of 1997. The project is designed to run for an indefinite period of time and its success will depend on the number of students and number of education providers signing up to use the system. To date, eighteen companies, universities, schools and organisations from Alberta are at the heart of AMEE. TELUS leads the project and others like: the University of Calgary; TR Labs; Alberta Vocational College; and ISA Corporation have also been heavily involved.

According to AMEE, the reason why AMEE is needed is to bridge a technology gap:

> *"At the present time, no single interface can provide a common bridge between course providers of distance education and the many types of computers in community learning centres and people's homes. AMEE will fill that gap. In rising to meet that need, the members of the AMEE consortium want to ensure that Albertans remain at the expanding frontier of community access to distance education."*[6]

In this manner, AMEE is a series of computer programmes designed to allow many disparate courseware providers to deliver their education through a wide range of technologies.

> "*This project will allow learner, course providers and community access centres to take advantage of video, audio, print and visual learning aids, using the creative applications of technology to enhance the interactive quality of learning. In addition, it will open doors for learning from our excellent regional providers and international centres.*"[7]

At the heart of AMEE is the opportunity to provide students with access to education providers (including private, local, provincial, national and international education providers), and access to technology and resources (including personal computers, video and conferencing equipment, broadcast equipment, and all manner of other technology needed to assure access to educational technology). The Coordinator of Distance Learning at the University of Calgary, in an interview for this Thesis Design Project, stated that the most important element AMEE provided and the biggest deterrent to a universally delivered education was student access to technology. This is the central and most important ingredient that the University of Calgary are contributing to AMEE.

AMEE's software is a series of computer programmes designed to allow virtually any of the traditional education delivery systems to work seamlessly through the one medium of the computer. Each computer that is connected to AMEE has a microphone, camera, monitor, keyboard, mouse and hard drive. The microphones and cameras, and the software, allow interactive and real time "desktop video conferencing" to be used for course delivery. The hardware system I viewed during the research for this Thesis Design Project, at the University of Calgary, were very impressive. The systems were located in the Distance Learning Centre in a myriad of rooms. Each computer's setup was almost identical. The microphones and cameras are particularly interesting in that they were virtually indistinguishable from the rest of the monitor. The microphones were two tiny, almost invisible pin hole microphones mounted on the side of the monitor and the camera was a tiny (one centimetre) wide rounded bulge at the top and its lens was almost invisible. It was odd for me to imagine sitting there during one of the courses, literally talking to the computer monitor and knowing that your image and voice were being transmitted to a remote professor, in a remote location and to many remote students in real time. It is easy to suggest that one can quite readily think that one is "there" in the classroom with the professor. It made me feel like I could "suspend disbelief."

The AMEE software allows interactive discussions with others on the system, in real time and offers the ability to watch, real-time, a class being taught. This is similar to many other educational delivery systems which use video or audio conferencing, but is more robust in that the students are also being viewed through their own computers and can speak through the microphones to the class and professor (desktop video conferencing). As was previously described in the Current Endeavours - Technology Section of this report, software of this type allow the students and professors to interact, to question and talk back and forth. Through a series of software commands, a student may "raise" his or her hand by striking a key on their computer system (wherever it may be). It is then up to the professor to acknowledge that student by striking a key on his or her system, which is mounted usually in a large, flat topped, and computer monitored lectern. The student's image, voice and computer keyboard strokes are then assigned a location on the large monitor in the professor's classroom and on the lectern's monitors. The student asks the question, the professor responds, everyone hears and sees both and the lesson continues. The student and the classroom may be thousands of kilometres apart, but the interaction is instantaneous and immediate.

The University of Calgary's AMEE set-up is located in the lower level of their Sciences Building, in the Distance Learning Centre. This is a series of rooms, video conferencing classrooms, computer rooms, and broadcast rooms which used to be exclusively for distance education needs and course delivery but, with the coming of AMEE, these areas now also provide access for AMEE students as well. Here AMEE students gain access to the technology and other educational facilities like books, social interaction, professor individual chats, laboratory work and the like. The AMEE dedicated Learning Centre is a small room of about 30 sq.m. which houses 10 computers. Each computer is hooked up the network and the Internet, has a camera, a microphone, printer, mouse, and other standard peripherals. Each student is individually dealing with their education or their course. In other words, a student at one computer can be studying philosophy, while at the next computer is a student studying french, while the one is doing research on the Internet. The physical space looks like a typical computer lab from hell. Aside from the computers and the light switch at the door, there is no physical element in the room that would support computer usage. Items like privacy carrels, sound absorbing wall panels, low level ambient lighting and the like have not been included in the room. This is due to the fact that this is quite obviously a very new initiative and the computers were just allocated to the project. When the project continues along, the room will be upgraded to more suitably accommodate the needs of the students and the computers.

The area dedicated to AMEE at the University of Calgary and others like it are called Community Access Centres. Typically, a community access centre, according to AMEE, will:

> *"... serve the needs of many students ... provide the required technology ... create copies of learning materials in hard copy, video tape, audio tape and to other mediums ... manage local storage space ... "*[18]

Through the AMEE software, students and administrators are able to register, pay, change, study, e-mail, down load course materials and modules and virtually any other form of student / school interaction is accommodated through the lens of the camera and the monitor. (Of course not all work is done using the camera and microphones, only certain classroom systems.) In this manner, the education provider can make use of many forms of education technology while the student, likewise, can make use of all of the opportunities that high technology can offer education providers.

AMEE, then is a series of software programmes designed to provide seamless connections of different educational providers' courseware while, through the Community Learning Centres, provide student access to required technologies.

AMEE and NBDEN are similar in the sense that they both use technology to deliver course material to distant students. Both also provide interactive connections between the professor and the students and both provide access to a wide range of providers and course material. AMEE and NBDEN are different however, in one very essential way: AMEE provides technology to individuals and allows them to be connected via technology to others while NBDEN provides technology to groups (10 - 12 students at a time). AMEE is looking to education as a more "open educational" format in an "individualised educational" concept.

ANALYSIS AND EVALUATION

SECTION SEVEN

"An infrastructure for the delivery of student support services is critical to the success of the Western Virtual University. While distance education often occurs in isolation, the actual learning that occurs is the result of various interactions - interactions with the learning materials, the faculty, the school environment, other students, and the support systems that provide information and guidance at different steps along the way."

Western Cooperative for Educational Telecommunications

7.1 INTRODUCTION - ANALYSIS AND EVALUATION

The goals of this section are:

1. To establish the Thesis Design Project's general design criteria and scope by describing the needs which school buildings must accommodate; and

2. To establish the project sites.

To achieve these goals, the historic, current and future trends of education and educational technology are summarised with the focus on establishing a series of needs.

7.2 DESIGN CRITERIA

From the research, the following five categories of needs have evolved:

1. The need for our schools (read education and the physical building) to address changes in pedagogy;

2. The need for our schools to address the growing use of technology;

3. The need for our schools to address the shifting basis of educational governance;

4. The need for our schools to address the increased impact from business; and

5. The need for our schools and our educational delivery systems to be cost and budget efficient.

These will variously affect the physical design of our school buildings. This physical manifestation of these design criteria will be looked at briefly in the Summary portion of this Section and will be fully explored in the design portion of the building solution.

The Need to Address Changing Pedagogy

We have seen that traditional pedagogy is changing in a number of ways:

1. The teacher is becoming a mentor;
2. The student is becoming more central in the direction of the course curriculum (self directed and open classroom);
3. The teacher is increasingly relying on computer software - instructional technologies - to teach and is losing his/her role as the expert;
4. Individualised learning is becoming more accepted; and
5. Increased use of team / paired and group learning.

Individually, each of the changes noted above are rather major changes and collectively, they represent a very great change to our schools. Our traditional classroom (Mesopotamia c2000 BC)

is being radically updated to accommodated these pedagogical changes.

The "Teacher becoming mentor" really decentralizes the classroom. No longer does the student need to sit in a rows of desks looking at the teacher. Now, a much less linear plan is called for. Outside the immediacy of the classroom, the mentor's role of guiding and coaching will necessarily mean that hierarchial barriers outside the classroom could or should also be removed.

With the student becoming much more involved in the specific direction of his or her own education, this will further reduce the omnipotent role the teachers have traditionally held - further breaking down the hierarchial barriers and"flattening" the look of the classroom.

The reliance of educators to rely more and more on computes not only as the medium of deliver, but also of the controllers of the message - instructional technology will really change the way the classrooms and schools function.

And finally, with the very strong push for individualised learning and supportive team and group learning, the classroom's hierarchal plan is further weakened. But even beyond this, increases in individualised learning means a decrease in the numbers of students coming to schools - especially at the higher than K-12 levels, at the PSE levels. At the PSE level, there is a great need for distance learning, which in part is a by product (or a precursor) to individualised learning.

The Need to Address Growing Use of HigherTechnology

The use of technology, we have seen, is widespread and growing. Technology impacts education on many levels and with varying degrees of influence: instructional technology (IT) which represents the full redeployment of teachers and professors away from their traditional roles; televisions and mandatory viewing by students and teachers; simple use of computers as typing tools and communication devices; and a host of many in between.

We see new school buildings needing to address these current and growing future needs. Four major technological needs present themselves in our study of educational trends:

1. Increase in distance learning;
2. The use of virtual reality;
3. Technology used by students; and
4. The need for flexibility and changeability.

The increase in distance learning means that not only is there a decrease in the number of students in the classroom, but also means an increased need for facilities from which to broadcast and from which to run the distance learning courses. An excellent example of how this manifests itself is seen in the Case Study Section where the AMEE project is reviewed at the University of Calgary. There we see that distance learning impacts the school building very directly by the needs of broadcast centres, technical classrooms, computer conferencing, technologically connected schools and mixed-age classrooms.

We also see a need for schools to accommodate virtual reality technologies. We see the ability to experiment and produce information on demand growing because of higher technologies. This does

not mean Star Trek's Holo-deck, at least not for now, but refers to the need to accommodate both the HMD (Head Mounted Display) units and the large sections of multiple and large screen walls and could mean 360 degrees of monitors. We have seen that Virtual Reality is now used in the science classroom, but its use will grow into other course work and other avenues including social studies, geography, social courses and the arts.

The technology used by students is very broad and includes the laptop or the personal computer at the student's home as well as the laptops and personal computers in the school. A student's technology also includes the audio, video and computer conferencing technologies that, while very frequently in the realm of Distance Learning, are becoming more and more mainstream for normal class to class and school to school communication. We have seen that students in Alberta communicate regularly through the Internet with students in Ontario (and across the world for that matter) and it is not a far stretch to imagine the two classes sitting together and talking to one another through the medium of video conferencing. One of the previous examples of a pair of social study classes each studying one another from across the globe is very appealing.

The need for flexibility and change has been seen many times and in many ways throughout this report. A school building needs to accommodate the changing needs of the technology (wires, fibre optics cables, transmitters and transceivers, hardware and software platform changes and more. But even past the immediacy of the day to day technology, flexibility is needed in the manner in which a school delivers technology to the students and to the distance learners. We see changes in audio, video, virtual reality and computer conferencing meaning that classrooms no longer just need a bunch of computers or a television screen in the corner, but need larger viewing surfaces, better sound systems and other technology needs. Additionally, the changing "open classroom" needs and the evolving role of technology in the open classroom means that the technology, the pedagogy and the physical environment must be able to accommodate individual, pair, team and classroom learning.

The Need to Address a Shifting Basis of and Focus From Governance

Throughout this Thesis Design Project, we have heard that the only thing that makes for major change in the educational world is major forces acting upon it - change rarely seems to come from within. To this end, we are seeing a phenomenal push from many sources to change the overall basic system of governance in our western school systems. Currently, the control of our schools lies in the hands of the provincial government. Here we see funding, training, monitoring, goal and needs setting, bureaucratic control and safety control all managed by the provincial government. A hundred years ago this was not the case, but recently, certainly from the early 20th century, our traditional governance has come from this provincial government source. Recently, with the coming of Charter schools, with the increased desire of business to become involved in education, with the increased dissatisfaction of parents with schools, with the decreased funding from federal transfer payments and provincial coffers, and with the push for "open education" and "individualised learning" we are seeing a shift away from sole government control to a more broadly distributed series of systems of governance. We see three essential and major changes that impact the needs of schools:

1. The increased involvement from business;
2. The push for less costly government governance; and
3. The increased reliance on individuals.

The increased involvement from business we have seen starts in the classroom with viewing of television programmes designed by business and using computers supplied and programmed by business. But more than this, business is moulding curriculums to support business interests, it is setting up shared resources and joint ventures for advanced laboratory and research work and it is creating its own colleges and universities. Schools will therefore need to provide for a shared business interest and focus in some aspects of education.

The push of all levels of government to save money and reduce on-going maintenance and capital costs has meant that government has accepted funding from sources outside the public domain of taxes. Business, individual communities and groups have all banded variously together to create and support their own schools system. The charter school in Alberta, home education, CTS and others all address the dwindling ability of the provincial government to not only fund all forms of education, but co-ordinate and manage them.

Finally, and in many instances, most importantly, we are seeing a great shift in pedagogy and in governance in education away from the public domain and into the hands of the individual. This is seen in many ways: the changing "open education" and "individualised learning" programmes; the life-long learner - the corporate learner; and others, all evidence the push to allow the individual govern his or her own education. This manifestation evolves to a more individualised and flexible space.

The Need to Address the Increased Impact From Business

Notwithstanding the impact from business on governance, we also see the impact of business having an impact on education in two other key areas:

1. A push for more job specific training course wares; and
2. A push for more "input / output" results and definable goals.

The push for job specific training comes right into the classroom where the specifics of a course in many instances are directed by business. The type of software used, the type of software programming, the goal of the course research and many others. In physical terms, this kind of need manifests itself in the creation of special function spaces that not only can be used for research study by the students, but also by business. Business can come in as share the resources to do their own research. In this manner, we see many of the physical attributes of these spaces take on a very business oriented look.

The push for "input / output" has been shown to mean a push by business to produce tangible, quantifiable and definable results from students. The specifics of course material therefore is modified to suit, in many instances, the desires of business, instead of the needs of the education. This again manifests itself in a decidedly business and corporate use of space.

The Need to Be Cost and Budget Efficient

As we have already stated, the need to address cost savings in schools has and will continue to greatly impact our school designs. Not only do reductions in costs impact on the governance of our

educational systems but also these cost influences:
1. Create an increased reliance on sharing educational resources;
2. Expand the reliance on business to offset costs; and
3. Create an increased need for sharing educational buildings.

The need for schools to share educational resources means the need to share, between schools of the same level, between schools of different language, between schools from different boards and between schools of different levels facilities that are used by students. Sharing of gyms, computer laboratories, science labs, libraries and other capital intense, widely used educational resources will continue to see its need to share increase.

The reliance on business to offset costs we have already seen can mean the sharing of specialty rooms, sharing of results and research and the sharing of facilities.

The third item is the sharing of the building. This means that sharing of the building with the community, the city, business, and others that are not directly involved in the delivery of education but share a need to use facilities similar or identical to schools.

In summary, the needs that must be addressed by our schools can be seen as an amalgam of many different forces: pedagogical changes; technological changes; governance changes; increased business influence; and a growing impact from cost considerations.

7.3 BLUEPRINT FOR A THESIS DESIGN PROJECT

The research completed thus far has helped give me the basis of a better understanding of many elements in educational delivery. This research has given me:

- a better understanding of what is Place. What it means to say a Place has significance, and how we impact and how we in turn are impacted by the Places in which we find ourselves;

- a better understanding of where and how education began and how it has historically been affected by major human changes;

- a better understanding of the great length of time that the icon of the traditional classroom has been with us and what that has meant and how hard it has been to break that mould as each new pedagogical generation came along;

- a better understanding of the massive and epoch influences from many sectors that are needed to affect change in education;

- a better understanding of how technology, both electronic and non-electronic, has evolved historically and how that historic evolution is so closely and irrevocably intertwined with advancements in education, business and other fields and how similarly those changes have affected education;

- a better understanding of the evolution of historical Places in education and how we have only very recently, in the Modern Era, started to see pedagogical change having a major impact on the physical spaces of education;

- a better understanding of our current educational delivery methods and how they are integrated into our educational system and how they impact educational spaces;

- a better understanding of our current educational technologies and how they impact not only the delivery of education, but the spaces required to deliver that education;

- a better understanding of our current educational governance and budget changes and how these impact educational spaces;

- a better understanding of the radically different opinions being proffered regards the future trends of education and educational technology; and

- a better understanding of the continued importance of Place in education.

A CASN / CEF Combination

It is from this basis of understanding, it is from the original hypothesis, it is from the researched data and it is from the interviews that the architectural component of this Thesis evolves.

The original Thesis proposal was:

> *"... the examination for the potential of a series of provincially distributed community access nodes which are supported by and* [are] *in affiliation with a central educational facility fashioned to deliver current and anticipated educational courses in a manner which makes use of growing trends in higher technology and education."* [1]

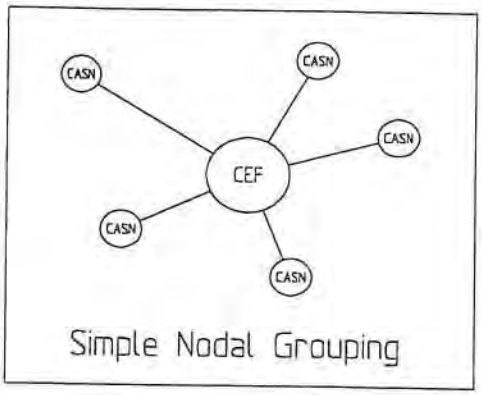
This statement can be divided into two related yet physically separated building components: (1) the community access nodes; and (2) the central educational facility. In the first instance are the community nodes, or more accurately, satellite schools - which I call Community Access Satellite Nodes (CASN's for short). In the second instance is the Central Educational Facility which forms the heart of the programme and which I have abbreviated to CEF.

I believe the combination of CASN's and CEF's, which is the essence of this Thesis design solution, addresses the growing needs of education both today and for those needs that can be reasonably predicted in the future. By creating a series of smaller node schools which are associated with a

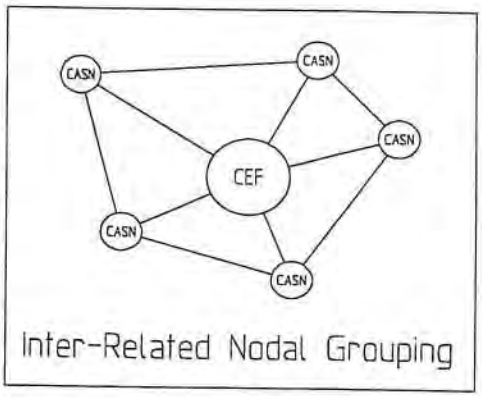
larger central facility, not only will the pedagogical, technological, governance, business and cost issues be addressed, but also the need for Place, the physical, social, community needs and (hopefully especially) the student needs will also be addressed.

The design of these buildings will form the architectural design component of this Thesis Design Project and in keeping with the hypothetical nature of the Thesis requirements, the design of only one each of the buildings - one CASN and one CEF - will be completed.

Before the detail of each of the two buildings is reviewed, a general overview is in order.



Simple Nodal Grouping

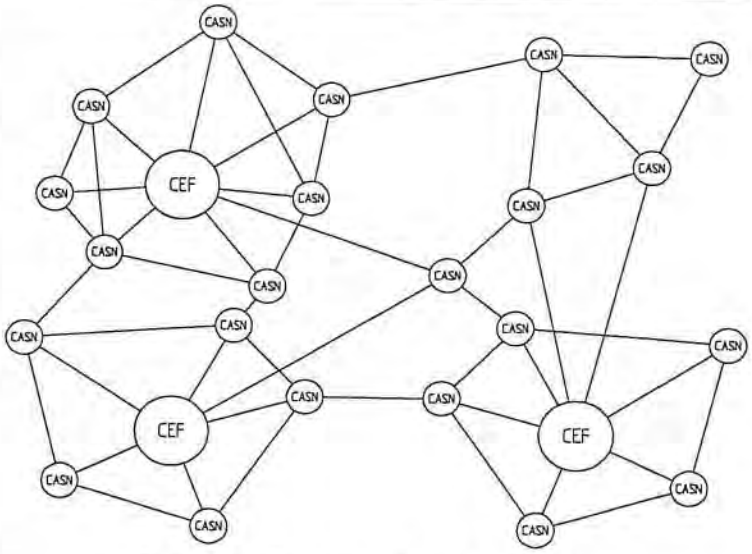


Inter-Related Nodal Grouping

General Description

Broadly speaking, a number of CASN's and a CEF will work together and form part of a team of school buildings focused on delivering all and various forms of K-12, adult education, professional business courses and PSE education to a particular geographical region. This basic relationship I have called a "Simple Nodal Grouping." This grouping would resemble a radial plan with a central main school building surrounded by a series of distant nodal school buildings. This manifests into any number of CASN's grouped around one CEF all of which would be variously located throughout the province. In the graphic example shown on the right, each of the CASN's are supported and governed directly by the CEF. This simple planning approach would, at the heart of the solution, satisfy many of the requirements of today.

However with the complexity of urban design, geographic regional requirements, distances, student needs and school deliverables, reality deems that not only would the CASN's be supported by a CEF, but would in fact also be supported by each other. In this



Complex Regional Nodal Grouping

way, a series of CASN's would actually be supported by a CEF and other CASN's manifesting into what I call a more detailed "Inter-Related Nodal Grouping."

Beyond the single nodal grouping, and as CASN's and CEF's would grow in numbers, a very complex system of relationships would naturally occur. These would form a number of groupings of provincially distributed Inter-Related Nodal Groupings to become a "Complex Regional Nodal Grouping." This very broad and robust system of educational delivery would be based on the principals of resource sharing, technology use and budget and cost efficiencies.

I would like to note that, although it is very obvious that this form of broad educational solution is well beyond the scope of this thesis and well outside the scope of any architectural thesis at all, it is highlighted here only to more clearly show the basic underlying planning structure of a CASN / CEF relationship - that is of one of strong interrelationships and shared resources.

The design solution highlights a solution of remote CASN's supported by a main CEF which is unlike our current and predominant system of many traditional and similar school buildings each running essentially autonomously and each serving a specific and essentially non-changing age group (ie a K-6 elementary school). While advancements are being made that begin to suggest this Thesis' form of school building (ie both the New Brunswick and the Alberta initiatives called NBDEN and AMEE respectively contain a central educational facility and offer remote community access schools) we still see a large number of traditional school buildings servicing most of our student needs. I believe that this traditional image is being replaced (but will not entirely be replaced) by a more direct and a more individualised system and that this trend is satisfied by this Thesis's CASN / CEF combination.

The programme description required for each of the buildings is given here only in a general manner. This is to offer an overview of and a description for the general manifestation of the pedagogical changes that are brought into this hypothetical design solution. In the next Section titled Development of the Programme, a detailed review of the actual programme, the specific needs, the actual shared facilities and the manner in which all these work together will be included.

The image of these broadly based groupings should not be interpreted as a series of like and purpose built buildings interspersed around the province. The image of Alberta's Prototypical Hospital projects is not the direction that the design solution will take. The importance of Place, the absolute importance of locale, relevance, functionality and becoming the essence of a Place specific to the geography, socio and economic factors within a region all will be taken into account in the final design solution. The model described above is seen as the basic blueprint - the final application of the design solutions will vary according to the locale and these solutions will explore fashioning the Place of the designs to suit the specific site.

A Metaphor

One interesting observation that has come about from the CASN / CEF model described above is the connection that this model has with many other models that are currently evolving within the world of education and technology today. Some of the more seminal are:

- The CASN / CEF model very closely parallels the way the Internet and the World Wide Web

are connected and setup. That is to say that the Internet is a combination of many different nodes that are all interconnected such that the whole is truly more than just the individual parts. The whole of the Web is a hugely amorphous and evolving structure that is almost without structure - this is what the CASN / CEF model strives for as well;

- The CASN / CEF model also very closely parallels the manner in which teachers and educators today are approaching educational - the changing pedagogy. That is that the teacher (read mentor) and the student are merely a part of the educational process - each bringing different skills and abilities to the learning process. The teacher may be near the middle of a student's learning, but he or she is no longer the sole or central figure. The CASN / CEF model again follows this principle;

- The CASN / CEF model also is seen in the way that government and the private sector are approaching education and learning - from many different support, governance and financial locations. All these disparate support elements all work in concert to assist in the development and delivery of education but none on their own truly can any longer support and run an educational system - the whole is more than the parts again for without the whole, the parts might not be able to function as an educational delivery system; and finally

- The CASN / CEF model very closely emulates the way that a student now goes about getting an education - from many disparate, yet connected sources. The Internet courses, university courses, high school courses, personal development courses all can be variously connected and interplayed off each other to produce the degree or diploma or the education that the student wants and needs.

7.4 CEF - A CENTRAL EDUCATIONAL FACILITY

The CEF is the hub school of this hypothetical localised / regional educational delivery system. From an infrastructure point of view, one CEF will serve a large base of students and community needs while the CASN's will remotely serve the more direct needs of that localised area. The CEF will act as the main location for broadcasting, creating and designing courseware and will also be a larger scaled version of the CASN's in that courses will be taught here and facilities and resources will be shared. Each of the CEF's will work in affiliation with other CEF's but only a handful of the CEF's at most will need to support the broadcast and taping facilities. This hypothetical solution will assume that this building design will be the location for these broadcast facilities.

Depending on the needs of the community and the locale or remoteness of the CEF, each CEF will service multiple levels of schooling - the more remote, the more levels of school the CEF will serve. In each case, the CEF will serve any level of school needed. In this solution, the site selected for the CEF is very well suited for the need of a basic K-12 level school. As such, the CEF will be designed primarily as a (using the traditional naming convention) a K-12. But in keeping with the overall shared facility and life-long learning, business and adult educational needs of the school, the actual school levels will vary from ECS, K-12, PSE and beyond depending on time of year, time of day and needs. So the CEF will be generally a K-12 school, but will more actually serve the needs of all level and all manner of students.

The CEF will share its site, physical plant and some of its more costly resource facilities with the community and local businesses. It will be a shared Board school - that is that it will not be a strictly Public or a strictly Separate school - it will share its resources equally between both a Public and a Separate school. It is through this sharing that the heart of this CEF will become the heart of the community and will reflect the needs of both major school boards (both the CEF and the CASN sites currently contain both Separate and Public schools).

In regards the broadcast facility, and as noted previously, this thesis will not design a broadcast facility in all the CEF's. This is mainly because, at this time, it is not considered a high enough requirement for each CEF needing to support a facility such as that. Therefore it is noted that not all the CEF's would necessarily require the full facility and service capabilities of a distance educational delivery, broadcast and recording facility. This hypothetical design solution, however, will be include these services, including: recording; broadcasting; taping; storage; and computer and technology facilities.

The CEF will be planned around year-round schooling based in four essential focus areas: (1) the public school; (2) the separate school; (3) the community centre; and (4) the distance learning students. All these programme elements will variously be shared, leased or used by different groups, schools, level of student and businesses as the need arises. In addition, as the central hub of a regional community educational delivery system supporting all levels of schooling, the following basic programmatic facilities and functions will be provided (see the Development of the Programme Section for a detailed view and rationale for the programme):

- Classrooms designed specifically for the evolving pedagogies (individualised, pair, team, and group learning);
- library / resource centre specifically designed to support the technology and information study needs of the students through access to technology and access to books and other resource materials in both the atoms (real) and bits (computer) formats;
- science and other laboratories consistent with junior and senior high school needs;
- distance broadcast and recording facilities;
- computer, video and distance conferencing classrooms;
- technology centres specifically designed for the life-long and distance students who need access to resources and technologies (ie AMEE, Life-Long learners or CTS students);
- Gymnasium(s), pool, auditorium and sports facilities;
- outdoor play areas for all levels of students;
- day care facilities;
- areas for business involvement including technology access, some forms of retail (ie. a book store, coffee shop or similar) and access to classrooms for leasing (ie like CPR);

- washroom, corridor and other basic functional spaces;
- cafeteria for the public, students and staff;
- teacher and organisational offices, meeting rooms and other similar administrative functions;
- meeting and conversational spaces.
- area for bus and other traffic drop off and parking facilities; and
- ancillary physical plant requirements such as boiler, mechanical, janitorial and storage rooms;

7.5 CASN - COMMUNITY ACCESS SATELLITE NODES

CASN's represent the "ground floor" design component of this Thesis Design Project. It is primarily here that the elementary and the lower levels of education will be delivered. This is because the number of the CASN's and their general locality being near the smaller and bedroom communities will generally mean, although not exclusively mean, a younger age group of students. But also evident and expected at this CEF would be many business, life-long learners, university and other students needing the facilities offered at these locations.

CASN's are a series of smaller purpose built school nodes which will be variously located throughout an educational district or region. CASN's do not necessarily become stand-alone buildings. As each CASN is sited, and depending on the locale, the actual site, the community's needs and the local available educational and community amenities, a new building or a renovation to an existing building might be warranted. For the purposes of this Thesis Design Project, a new CASN building will be designed on the site chosen.

The community selected for the CEF site is in Sundance which is a very young neighbourhood, one with many first time home-buyers and young families. As such this CASN will be designed primarily around elementary levels K-6. But again, as with the CEF, the full range of school levels can and will be supported through the use of the technology, design of spaces, classrooms and resource centres, design of work and resource rooms and the availability of support services.

Sharing of the some of the more purpose built resources (ie gymnasium) will depend on school bus transportation to and from the CEF and as such, good transportation facilities will be needed. Other direct educational facilities will be included as follows:

- Classrooms designed specifically for the evolving pedagogies (individualised, pair, team, and group learning);
- library / resource centre specifically designed to support the technology and student needs;

- technology centres specifically for the life-long and distance student needing access to the resources and technologies (ie AMEE or CTS students);
- outdoor play areas for all levels of students;
- day care facilities;
- availability for retail as may be required;
- cafeteria for students, public and staff;
- teacher and organisational offices, meeting rooms and other similar administrative functions;
- meeting and conversational spaces.
- ancillary physical plant requirements such as boiler, mechanical, janitorial and storage rooms; and
- area for bus and other traffic drop off and parking facilities;

7.6 A PROGRAMME AND DESIGN CRITERIA SUMMARY

The preceding programme overview summarises the general programme of both the CEF and the CASN. In this final part of the Analysis and Evaluation Section, the design solution's programme needs will be looked at specifically as they each address the design criteria.

The Need to Address Changing Pedagogy

1. The teacher is becoming the mentor.

   Through the integration of technology directly into the classroom and through the design of classrooms to be flexible, open, fluid and non-directional, the opportunity for both traditional pedagogy and open education approaches exist. This, coupled with the distance learning technology and individualised learning services (see below) will provide an environment supportive of the teacher becoming the mentor.

2. The student is becoming more central in the direction of the course curriculum (self directed and open classroom).

   This goes hand in hand with item 1 above, but in addition, through the integration of life-long learners, adult education, the open classroom and technology connections (CTS, AMEE and others), self-directed education is supported for all levels of students. It will be here that the home-schooling student or the distance learner or the business class can gain access to technologies which are new and necessary for their course of study. The home student will be able to study and take courses on their own, at their own pace and based on their own

course loads. They will have available to them the technology and the social atmosphere so critical to education. In other words, any student (adult, life-long learner, PSE, business, or K-12) will be allowed to use the technology and the facilities.

3. The teacher is increasingly relying on computer software - instructional technologies - to teach.

   With the use of open classroom, open education, individualised learning and with the provision of and support for the broadcast, recording and receiving facilities for distance education and other educational technologies (ie video and computer conferencing), there is a great opportunity, if not a requirement to at least support, if not completely adopt instructional technologies for at least some of a student's educational needs. With the connection along the Internet, through system connections like School Net, Western Governor's University, Athabasca University, Open Technology Educational Network and many others, the educational world will be at the fingertips of the teachers to make use of virtually any training / courseware / educational resource globally available. And because the CEF will be provided with expertise to run and organise the broadcast facilities, and because the CASN's will be directly connected and affiliated with the CEF, the expertise to train and teach the teachers to access and use the technology will be there.

4. Individualised learning is becoming more accepted.

   Through the integration of open and flexible classrooms, resource centres and with the provision of facilities for individual research, study and computer access, individualised learning is offered a social milieu.

5. Increased use of team / paired and group learning.

   As has been noted in earlier Sections, engaging the student appears to be the most important element in the gestalt of learning. But we have also seen that each learner brings different skills to learning. Some learn better individually, others in pairs, others yet in small teams or groups. The provision of flexible open classrooms affords the greatest degree and ability for a teacher's response to a student's specific needs. Based on the provision of Instructional Technology, the teacher's role of mentor supports more the opportunity to assist, direct and guide the student through the course at the student's own speed and ability, rather than concentrating on the overall course load. Students then have the opportunity to learn in whatever mode (individually, teams, pairs and so on) that is most appropriate to the course, the material and to the student.

The Need to Address Growing Use of Technology

1. Increase in distance learning.

   While most of the distance learning is completed in the home and most of it is being done by adults or life-long learners, we have seen a small but growing push for the lower levels of schooling being completed through distance education. Programmes like CTS, AMEE and others suggest there is a growing need for students of all ages to learn on their own, from

distant educational facilities. Through the use of the technology, the access to the technology, the opportunities for students to learn individually in a social educational environment, distance learning is supported. It could be, then, that as a student of the RAIC Syllabus, I could go to a CASN and use the individual learning computer conferencing setups to take a courses taught by a professor from Winnipeg. Course material could be obtained through the resource centre, computer or mail and school or computer support could be available through the CEF itself. With the proliferation of CEF's and CASN's, I could be studying with other RAIC students, even with the students in the professor's Winnipeg classroom itself through the technology.

2. The use of virtual reality.
Through the provision of the technology, virtual reality could become a normal, ubiquitous tool in any pedagogy. In addition, the addition of flexible technology solutions in the form of computers, computer conferencing and the like will offer front-line opportunities for accessing virtual reality softwares.

3. Technology used by students.

Students who need the technology will be able to get it at one of the CEF or CASN's. Students who have the technology, can access the resources of the system, as it is broadcast and governed by the CEF. Students who wish to make use of technologies outside the realm of a personal computer, can do so at the CEF or the CASN, as all students (distance, life-long learners, home learning and others) will be connected through the CEF or the CASN as their needs may arise. The technology will be there for the use of any registered student.

4. The need for flexibility and changeability.

We have seen that this need applies not only to the spatial aspects of education, but also the pedagogical and the technological. In regards to technical flexibility, the CEF's and the CASN's will be designed based on a fibre-optic, Local Area and Wide Area Networks. With the mass availability of computer Internet fast access, technological solutions now make good use of flexible solutions within their own architecture. Notwithstanding the normal upgrades, the space of the classrooms, the broadcast and recording studios and the general computer set-up will be based on not only current technologies, but "open architecture" (meaning the ability to connect different systems to different components as needed). A Personal Computer based solution is consistent with the cost needs of the school and the maximum flexibility of the computer architecture.

The Need to Address a Shifting Basis of and Focus From Governance

1. The increased involvement from business.

The CEF will be located near business. This will allow a close connection to local businesses. Business will be able, through the encouragement of the school administration and the students, use the facilities either after hours for work related elements, or, say in the case of computers and CADD drafting, may use the computer and technology resources for

their own use (at a nominal cost). This form of relationship would only work with the assistance ans support of the school administration. But even outside renting some of the school's equipment, we have seen the provision of television sets, computers, software and other essential technologies to schools at little or no charge. These come with a price attached, (in the United States that price in one instance is in the form of making students watch advertisements), but the benefits are also there.

One element that may also work its way into the schools, and one that this CEF will be designed to accommodate is retail in the school. This may not be well received during the normal hours of work, however for the night and business use of the school, a nice hot coffee and a croissant from Starbucks or Seattle's Best would be very welcome. We see this much at the university and college level, and with the public day and night access to the school, retail of at least this form seems appropriate.

2. The push for less costly government governance.

With the pressure to save money, and the access of businesses to school, the CEF will naturally be able to benefit from cost savings from business in the form of donated or shared technologies, software and from rental income from space and retail. With the push for this cost savings comes a natural change in ownership - in governance. Should the government continue to push to reduce educational spending on all levels (federal, provincial, municipal) we will continue to see a relinquishing of governance over to business. CEF's and CASN's, through their need for technologies and approach to cost effective educational delivery, support this governance change.

3. The increased reliance on individuals.

We have already seen that the CEF's and the CASN's support individualised learning, distance education, CTS, AMEE, and other forms of individualised educational learning.

The Need to Address the Increased Impact From Business

1. A push for more job specific training course wares.

Through the connection with local business, and through the support of a school administration, with the availability of technology and the intendant training and use of those systems and with the support of learner centred (and therefore learner designed) courses, students will most likely have an excellent atmosphere to learn and understand the needs of normal day to day living (and therefore business thinking aplomb). Students who have spent their whole educational upbringing and their whole educational courseware in and around computers, research, data and other business related elements generally should be more apt to be able to adopt to the business world. In addition, should the administration look to develop a more structured business workload, and through the guidance of the teachers (read mentors), then this business aplomb would only be that much more strengthened.

2. A push for more "input / output" results and definable goals.

The ability, confidence and self discipline needed to and taught in self-directed learning, even with the support of the administration and the teachers, still suggests that more skilled students are the product. These students, while not necessarily more in tune with the results of tests and the "input / output" theories, would be better suited for the work world because of attitude, approach and self-motivation that is a likely result of self-directed learning.

This is not to say that all students are so inclined to self-directed and highly motivational tasks. Many students we have seen are and will always need structure, direction and external goal setting. But for the majority of students who would benefit from self-directed learning, the CEF and CASN environments would strongly support these students.

The Need to Be Cost and Budget Efficient

1. Create an increased reliance on sharing educational resources.

   Sharing the physical plant and the more costly high maintenance facilities like the gymnasium, pool, mechanical systems, resource centre and technology laboratories and centres between the Public and the Separate school systems, cost sharing of resources is realised. Sharing the site with the community centre (in the case of our CEF design solution) or other community centred facilities offsets not only the cost to the school, but also to the local taxpayer and community association suggesting either cost savings to the taxpayers or additional funds available for much needed programmes. Sharing (in rentals) the facilities to local groups and communities also suggests costs savings.

   This also applies to the sharing of the building between more than the normal and traditional levels of an elementary or junior high or senior high school. The CEF's and CASN's will support all levels of schooling through the use of open classrooms and individualised learning techniques, technologies and spaces.

2. Expand the reliance on business to offset costs.

   We have seen the push for school and business synergies and we have noted how a few of these may work. One thing a CEF would need to do, again with the support of its administration, is to avail the services of the school (say an auditorium) to local business and groups during the day and not only at night. This would mean a great convenience to the business (scheduling meetings and lectures after business is not always convenient), but would also expose students to business people and their needs. A close inter-relationship cannot be a terrible thing, especially when the overall impact is cost savings to both the business and the school.

3. Create an increased need for sharing educational buildings.

   As noted in number 1 above, sharing building components between school boards, the community and local business, through the design elements discussed previously, support increased shared educational buildings.

We can see that there is change coming in education and that change will not be the destruction of

our schools. The change will rather be the re-alignment of our schools' size, function, location, importance to the community and exclusivity over purpose built schools. The CEF's and CASN's address this change by suggesting a new alternative to school designs based on a new "paradigm."

7.8 THE SITES

The Thesis statement indicates that a component of the design solution is a provincially distributed set of CASN's and a CEF. For the purposes of this hypothetical design solution, a set of regionally local sites have been selected. In the final design solution description and summary Section titled Summary and Conclusions, the provincial benefits of this CEF / CASN combination will be discussed.

The Calgary Board of Education publishes many and sundry documents on the design of school sites, however, much less information is published on the actual selection of a site. Generally school sites are assigned by a developer, the municipality, the local School Board and the Planning Commission during the Development stages based on current and anticipated populations and student loads. Most of the Calgary Board of Education's published material concerns the design of the site services and building placement as opposed to the site selection. For the purposes of this Thesis Design Project, the site selection for both of buildings (the CEF and the CASN) were selected within the Calgary area. For the purposes of brevity and speed, the Calgary Board of Education site planning manuals will be used for both sites. There are a number of advantages in selecting a regionally local sites:

- Firstly, because the sites are in the Calgary region, access to the site's and the area's information will be fairly easy to obtain;

- Secondly, the sites can be easily located within a centrally located growing and young community (to benefit from accessibility to younger students). The communities selected are of average educational needs (K-12, PSE and adult students needs), and are accessible to outdoor areas (for natural connectedness / excursions) and are in an area that can be supported by a strong and general population base;

- The sites are in communities which needed a community centre (large communities) and near a source of business needs and these are relatively easy to find in Calgary;

- Calgary sites are generally serviceable by a well established road system (to support both public transport and school bus access) and are generally serviceable by water, hydro, sewer and other typical services;

- Calgary sites generally could be found that would have enough land to support the type of facility; and

- the sites could be more easily researched to ensure that the sites selected were in need, in my view, of a community heart, a centre or a focal point.

The site selected for the CEF as well as the site selected for the CASN both contain existing

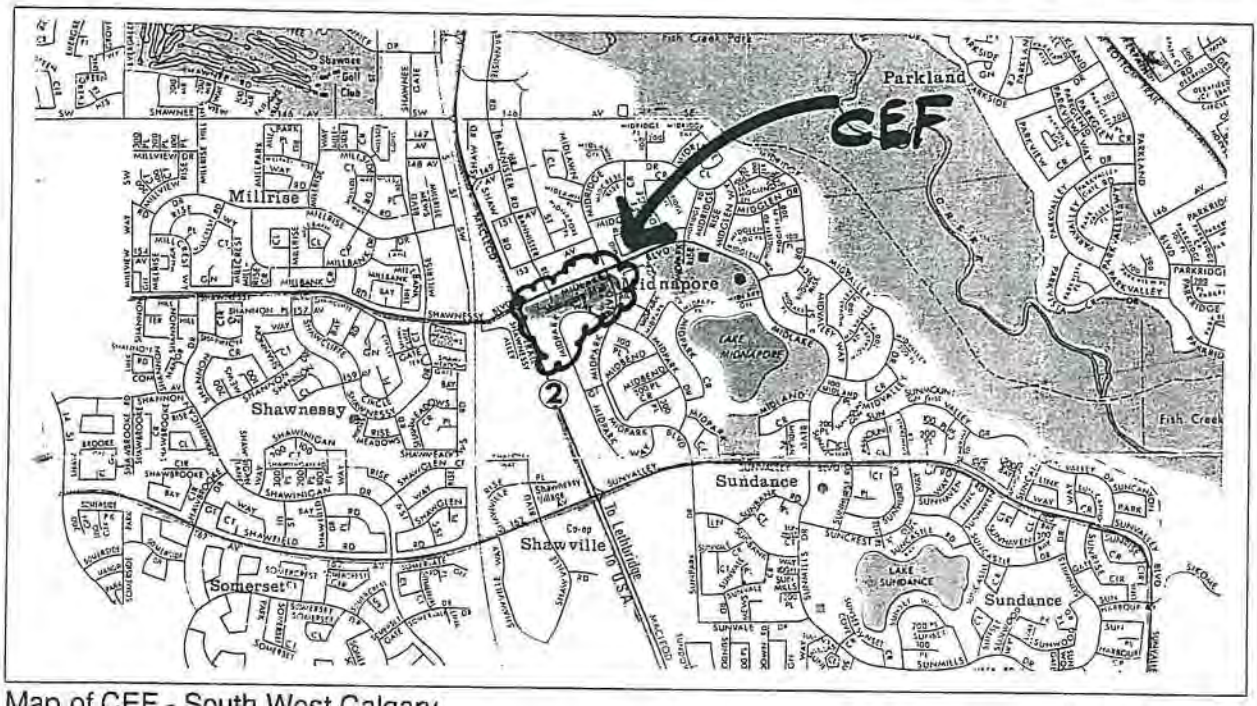
schools. The rationale in using an existing school site is two-fold: (1) existing data on student and neighbourhood populations will be relatively easy to obtain through the Calgary Board of Education and projections and growth trends will likewise be relatively easy to obtain; and (2) a "before and after" view of the site will assist in assessing the success of this hypothetical solution.

The sites selected are in Banff (CASN) and in South-West Calgary (CEF). Specifically, the CEF site is in the heart of the community of Midnapore on Midlake Boulevard and the CASN is at the edge of Banff at the Banff School of Fine Arts.

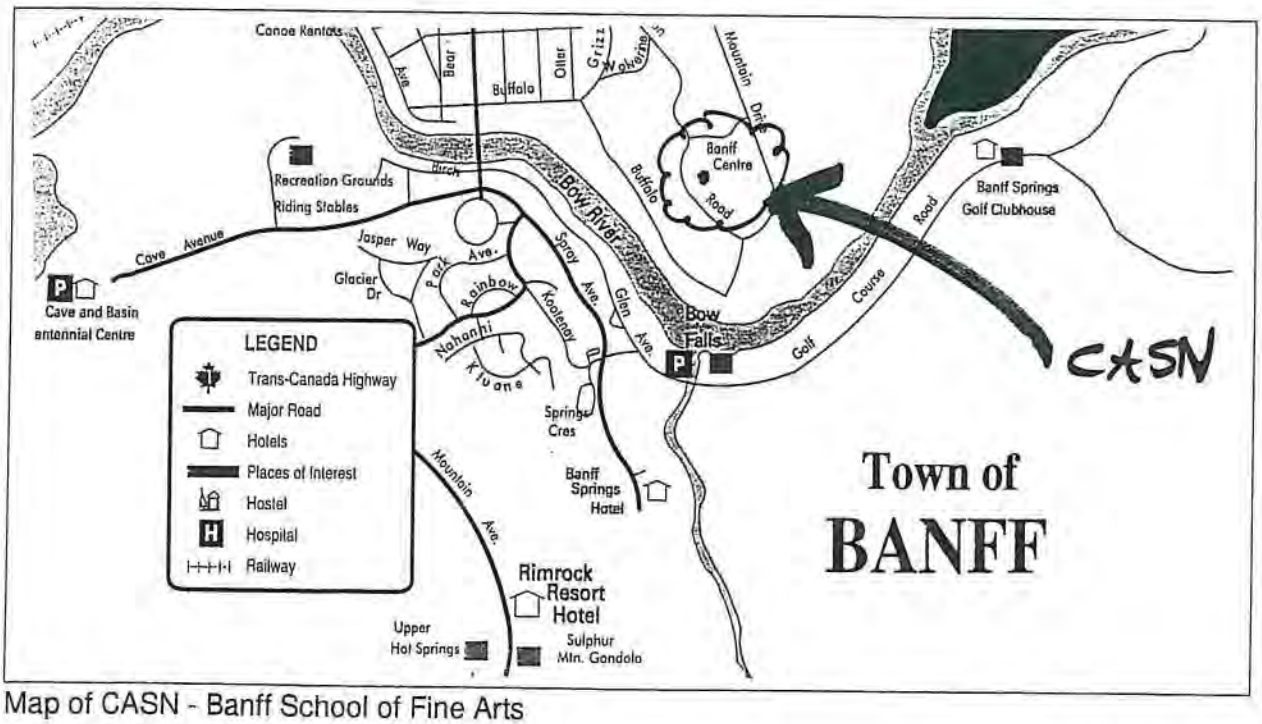
The CEF site in Midnapore is bounded by Midpark Boulevard on the west, Midpark Glenn on the east, Lake Midnapore and Midpark Place on the south and Midridge Road on the north. It is two blocks east of Macleod Trail South and abuts both residential and recreational areas. The site is the existing location of the Midnapore Community Centre, Midnapore Elementary School (Public system) and Mother Theresa's Elementary School (Separate system) and, as shown on the map, it is centrally located. It is convenient to public transport and it is supported by sufficient street systems for major access of school buses. The site is adjacent to the heavily trafficked arterial road system of Macleod Trail and is located in a heavily populated young area and, with the growth of Mackenzie, Shawville, Shawnessy, Sundance and areas south of the Marquis of Lorne Trail (Highway 22x), it will continue to be in the hub of the residential action. With the adjacent Fish Creek Park area, which is less than a ten minute walk north of the site, excursions to natural settings, babbling brooks and other natural elements is almost immediate. Almost immediately adjacent to the site is a small business park of professional businesses (medical / engineering / construction head offices and the like). With the existing population and service infrastructure, and the never ending growth further down south, this is a natural location for a hub school.

In addition and very importantly, Midnapore, like many if not most suburban communities, does not seem to have a heart of the community. When driving around the area, Midnapore tends to define itself by its main access point (off Macleod is Midnapore Mall) and its edge of residential homes. The sense is one non-focused boundless streets and parks.

The CASN site is in Banff and is located just off the centre of the heart of the Banff School of Fine Arts. It is bounded on all sides by the school and by the mountains.



Map of CEF - South West Calgary



Map of CASN - Banff School of Fine Arts

DEVELOPMENT OF THE PROGRAMME

SECTION EIGHT

"What is surprising about schools ... is not the differences from previous generations, but the similarities. We should therefore not be over-optimistic about those changes which can be expected to occur during the next generation. Most of the teachers who will be teaching at the end of this century and into the next are already teaching. Most of the schools which will be providing educational facilities are already built ... the architectural challenge therefore is to retrieve intelligence from obsolescence."

Sam Cassels

8.1 INTRODUCTION - DEVELOPMENT OF THE PROGRAMME

This Section of the report will very briefly describe the programme. Greater detail such as number of rooms, size of spaces, interfunctional relationships and the like will be articulated in the design component of this Thesis Design Project.

8.2 CEF - A CENTRAL EDUCATIONAL FACILITY

The CEF is the hub school of this hypothetical localised / regional educational delivery system. From an infrastructure point of view, one CEF will serve a large base of students and community needs while the CASN's will remotely serve the more direct needs of that localised area. The CEF will act as the main location for broadcasting, creating and designing courseware and will also be a larger scaled version of the CASN's in that courses will be taught here and facilities and resources will be shared. Each of the CEF's will work in affiliation with other CEF's but only a handful of the CEF's at most will need to support the broadcast and taping facilities. This hypothetical solution will assume that this building design will be the location for these broadcast facilities.

Depending on the needs of the community and the locale or remoteness of the CEF, each CEF will service multiple levels of schooling - the more remote, the more levels of school the CEF will serve. In each case, the CEF will serve any level of school needed. In this solution, the site selected for the CEF is very well suited for the need of a basic Junior High level school. As such, the CEF will be designed primarily as a (using the traditional naming convention) a Junior High of levels 7, 8 and 9. But in keeping with the overall shared facility and life-long learning, business and adult educational needs of the school, the actual school levels will vary from K-12, PSE and beyond depending on time of year, time of day and needs. So the CEF will be generally a junior high school, but will more actually serve the needs of all levels of students.

The CEF will share its site, physical plant and some of its more costly resource facilities with the community and local businesses. It will be a shared Board school - that is that it will not be a strictly Public or a strictly Separate school - it will share its resources equally between both a Public and a Separate school. It is through this sharing that the heart of this CEF will become the heart of the community and will reflect the needs of both major school boards (both the CEF and the CASN sites currently contain both Separate and Public schools).

In regards the broadcast facility, and as noted previously, not all the CEF's would require the full facility and service capabilities of a distance educational delivery, broadcast and recording facility. This hypothetical design solution, however, will be include these services, including: recording; broadcasting; taping; storage; and computer and technology facilities.

The CEF will be planned around year-round schooling based in four essential focus areas: (1) the public school; (2) the separate school; (3) the community centre; and (4) the distance learning students. All these programme elements will variously be shared, leased or used by different groups, schools, level of student and businesses as the need arises. In addition, as the central hub of a regional community educational delivery system supporting all levels of schooling, the following basic programmatic facilities and functions will be provided (see the Development of the Programme Section for a detailed view and rationale for the programme):

- Classrooms designed specifically for the evolving pedagogies (individualised, pair, team, and group learning);
- library / resource centre specifically designed to support the technology and information study needs of the students through access to technology and access to books and other resource materials in both the atoms (real) and bits (computer) formats;
- science and other laboratories consistent with junior and senior high school needs;
- distance broadcast and recording facilities;
- computer, video and distance conferencing classrooms;
- technology centres specifically designed for the life-long and distance students who need access to resources and technologies (ie AMEE, Life-Long learners or CTS students);
- Gymnasium(s), pool and sports facilities;
- outdoor play areas for all levels of students;
- day care facilities;
- areas for business involvement including technology access, some forms of retail (ie. a book store, coffee shop or similar) and access to classrooms for leasing (ie like CPR);
- auditorium with drama, theatrical and other related dramatic arts facilities;
- cafeteria for the public, students and staff;
- teacher and organisational offices, meeting rooms and other similar administrative functions;
- meeting and conversational spaces.
- area for bus and other traffic drop off and parking facilities; and
- ancillary physical plant requirements such as boiler, mechanical, janitorial and storage rooms;

8.3 CASN - COMMUNITY ACCESS SATELLITE NODES

CASN's represent the "ground floor" design component of this Thesis Design Project. It is primarily here that the elementary and the lower levels of education will be delivered.

CASN's are a series of smaller purpose built school nodes which will be variously located throughout an educational district or region. CASN's do not necessarily become stand-alone buildings. As each CASN is sited, and depending on the locale, the actual site, the community's needs and the local available educational and community amenities, a new building or a renovation to an existing building might be warranted. For the purposes of this Thesis Design Project, a new CASN building will be designed on the site chosen.

The community selected for the CEF site is in Banff which is a very defined neighbourhood. As such this CASN will be designed primarily around higher levels of schooling. But again, as with the CEF, the full range of school levels can and will be supported through the use of the technology, design of spaces, classrooms and resource centres, design of work and resource rooms and the availability of support services.

Sharing of the some of the more purpose built resources will depend on school bus transportation to and from the CEF and as such, good transportation facilities will be needed. Other direct educational facilities will be included as follows:

- Classrooms designed specifically for the evolving pedagogies (individualised, pair, team, and group learning);
- library / resource centre specifically designed to support the technology and student needs;
- technology centres specifically for the life-long and distance student needing access to the resources and technologies (ie AMEE or CTS students);
- outdoor play areas for all levels of students;
- day care facilities;
- availability for retail as may be required;
- cafeteria for students, public and staff;
- teacher and organisational offices, meeting rooms and other similar administrative functions;
- meeting and conversational spaces.
- ancillary physical plant requirements such as boiler, mechanical, janitorial and storage rooms; and

- area for bus and other traffic drop off and parking facilities;

Programme Areas - CEF and CASN

CEF - Central Educational Facility

Description	Number of Students (Note 1)	Traditional Area (Note 2)		Thesis Area (Note 3)		Quantity (Note 4)	Total Area Req'd (Note 5)	
Total CEF Facility	1000	The number of students includes for the total of the complex. It will be assumed that the number of students will be divided equally between the separate and the public school components of the complex (500 each). Therefore the number of classrooms, laboratories and the like will similarily be subdivided.						
School Facility								
Classrooms		80	sq. m.	120	sq. m.	37	4,440	sq. m.
Library \ Resource Centre		630	sq. m.	560	sq. m.	1	560	sq. m.
Science \ Laboratories		120	sq. m.	120	sq. m.	6	720	sq. m.
Distance Broadcast and Recording Facility		N/A	sq. m.	120	sq. m.	1	120	sq. m.
Technology Centre		N/A	sq. m.	200	sq. m.	1	200	sq. m.
Gymnasium		1,675	sq. m.	1,675	sq. m.	1	1,675	sq. m.
Dressing / Shower Area		200	sq. m.	200	sq. m.	1	200	sq. m.
Gymnasium Storage		100	sq. m.	100	sq. m.	1	100	sq. m.
Physical Education Office		40	sq. m.	40	sq. m.	1	40	sq. m.
Pool		750	sq. m.	1,000	sq. m.	1	1,000	sq. m.
Pool Storage Area		100	sq. m.	100	sq. m.	1	100	sq. m.
Dressing / Shower Area		200	sq. m.	200	sq. m.	1	200	sq. m.
Pool Office		40	sq. m.	40	sq. m.	1	40	sq. m.
Sport Facility		N/A	sq. m.	120	sq. m.	1	120	sq. m.
Day Care Facility		N/A	sq. m.	350	sq. m.	1	350	sq. m.
Retail Shops		N/A	sq. m.	100	sq. m.	3	300	sq. m.
Auditorium (for 550)		593	sq. m.	593	sq. m.	1	593	sq. m.
Theatre Storage		100	sq. m.	100	sq. m.	1	100	sq. m.
Cafeteria - Public \ Students (for 550)		660	sq. m.	660	sq. m.	1	660	sq. m.
Administration Offices								
Principal's Office		15	sq. m.	15	sq. m.	1	15	sq. m.
Vice Principal's Office		12	sq. m.	12	sq. m.	1	12	sq. m.
Counselling Office		10	sq. m.	20	sq. m.	1	20	sq. m.
General Administration		70	sq. m.	70	sq. m.	1	70	sq. m.
Conference Room		40	sq. m.	40	sq. m.	4	160	sq. m.
Staff Room		65	sq. m.	65	sq. m.	1	65	sq. m.
Staff Work Room		90	sq. m.	90	sq. m.	1	90	sq. m.
Men's Washroom		16	sq. m.	16	sq. m.	1	16	sq. m.
Women's Washroom		24	sq. m.	24	sq. m.	1	24	sq. m.
Infirmary		40	sq. m.	40	sq. m.	1	40	sq. m.
Kitchen Area		30	sq. m.	30	sq. m.	1	30	sq. m.
Video Conferencing Classrooms - Large		N/A	sq. m.	80	sq. m.	2	160	sq. m.
Video Conferencing Classrooms - Small		N/A	sq. m.	40	sq. m.	2	80	sq. m.
Self Contained Study Rooms		N/A	sq. m.	10	sq. m.	10	100	sq. m.
Washrooms - Male		105	sq. m.	105	sq. m.	1	105	sq. m.
Washrooms - Female		126	sq. m.	126	sq. m.	1	126	sq. m.
Conversational Spaces \ Teaming Areas		N/A	sq. m.	20	sq. m.	3	60	sq. m.
Mechanical and Physical Plant		160	sq. m.	160	sq. m.	1	160	sq. m.
Ancillary (Art / Music etc.)		90	sq. m.	90	sq. m.	6	540	sq. m.
Community Centre Facility								
Office and Administration		240	sq. m.	240	sq. m.	1	240	sq. m.
General Storage		150	sq. m.	150	sq. m.	1	150	sq. m.
Exterior Complex								
Parking		200						
Loading		2						
Sporting Areas (Baseball / Football / Track)		1						
Bus Loading and Unloading Area		1						
Outdoor General Play Area		1						
Outdoor Children's Play Area		1						

Subtotal	13,781 sq. m.
Circulation at 40%	5,512 sq. m.
Total Estimated Area	**19,293 sq. m.**

Programme Areas - CEF and CASN

CASN - Community Access Satellite Node

Description	Number of Students (Note 1)	Traditional Area (Note 2)	Thesis Area (Note 3)	Quantity (Note 4)	Total Area Req'd (Note 5)
Total CEF Facility	340				
School Facility					
Classrooms		80 sq. m.	120 sq. m.	17	2,040 sq. m.
Library \ Resource Centre		435 sq. m.	120 sq. m.	1	120 sq. m.
Science \ Laboratories		120 sq. m.	120 sq. m.	2	240 sq. m.
Technology Centre		N/A sq. m.	200 sq. m.	1	200 sq. m.
Day Care Facility		N/A sq. m.	150 sq. m.	1	150 sq. m.
Retail Shops		N/A sq. m.	100 sq. m.	3	300 sq. m.
Cafeteria - Public \ Students		400 sq. m.	400 sq. m.	1	400 sq. m.
Administration Offices					
Principal's Office		15 sq. m.	15 sq. m.	1	15 sq. m.
Vice Principal's Office		12 sq. m.	12 sq. m.	1	12 sq. m.
Counselling Office		10 sq. m.	10 sq. m.	1	10 sq. m.
General Administration		30 sq. m.	30 sq. m.	1	30 sq. m.
Conference Room		40 sq. m.	40 sq. m.	4	160 sq. m.
Staff Room		35 sq. m.	35 sq. m.	1	35 sq. m.
Staff Work Room		30 sq. m.	30 sq. m.	1	30 sq. m.
Men's Washroom		4 sq. m.	4 sq. m.	1	4 sq. m.
Women's Washroom		6 sq. m.	6 sq. m.	1	6 sq. m.
Infirmary		30 sq. m.	30 sq. m.	1	30 sq. m.
Kitchen Area		15 sq. m.	15 sq. m.	1	15 sq. m.
Video Conferencing Classrooms - Large		N/A sq. m.	80 sq. m.	2	160 sq. m.
Video Conferencing Classrooms - Small		N/A sq. m.	40 sq. m.	2	80 sq. m.
Self Contained Study Rooms		N/A sq. m.	10 sq. m.	10	100 sq. m.
Washrooms - Male		26 sq. m.	26 sq. m.	1	26 sq. m.
Washrooms - Female		31 sq. m.	31 sq. m.	1	31 sq. m.
Conversational Spaces \ Teaming Areas		N/A sq. m.	20 sq. m.	3	60 sq. m.
Mechanical and Physical Plant		60 sq. m.	60 sq. m.	1	60 sq. m.
Ancillary (Art / Music etc.)		90 sq. m.	90 sq. m.	3	270 sq. m.
Exterior Complex					
Parking		68			
Loading		1			
Sporting Areas (Baseball / Football / Track)		1			
Bus Loading and Unloading Area		1			
Outdoor General Play Area		1			
Outdoor Children's Play Area		1			

Subtotal	4,583 sq. m.
Circulation at 40%	1,833 sq. m.
Total Estimated Area	**6,416 sq. m.**

Note 1: The number of students is based on the existing population of students for the selected site. In the case of the CEF, the two schools which currently occupy the site, namely Midnapore and Mother Theresa's schools, currently have the populations indicated. Similarly, in Banff, the current school population is 340 students for the Banff School. This does not take into account the overlap anticipated from the Banff Centre, however the number of rooms does account for some anticipated influx from the Centre.

The number of students represents the full-time student population based on a year-round curriculum. The number of students in total will vary depending on need and the involvement of the business community.

Note 2: The listing of the traditional area represents the actual areas that are currently posted by the Calgary Board of Education. These areas, in some cases, apply to this Thesis Design Project. In some cases, however, the areas need be revised to suit the newly evolving area functions and uses (i.e. classrooms are no longer the traditional classrooms size so that individualised learning, team and pair learning and the technologies can be incorporated).

Note 3: As noted above in note 2, the areas that are traditionally posted for use by the Calgary Board of Education do not necessarily apply exactly for this Thesis Design Project. In the instances where new areas are needed, the areas have been revised and are as indicated in this column.

Note 4: The quantity of the programme area noted is also based on the Calgary Board of Education's posted Area Guidelines. Note that the number of some of the areas (i.e. teaming areas) will be a function of the space design and therefore the final quantities may vary from the brief indicated here.

Note 5: The total area required is the sum of multiplying the Thesis Area Column by the Quantity Column and does not include circulation.

DESIGN PROPOSAL

SECTION NINE

9.1 INTRODUCTION - DESIGN PROPOSAL

This section of the report itemizes the development of the programme and the presentation of the design proposal.

9.2 DEVELOPMENT OF THE CONCEPT

The evolution of the building design was predicated by a number of factors, each having a varying amount of importance.

The primary focus of the design concept was the programme and the actual use of the space combined with the historical, current and future understanding of the manner of delivering education. This manifested itself in the "pods" design of the building. The building evolved in "pods" design to address the need for students to "learn" in their environment. That meant that the pods were designed to address the ages of the students as opposed to the grade of the student. No longer will grades 1 and 2 and 3 (etc.) be housed in a school. In the future, our schools will be designed to address the needs of the learning student, at whatever age and level he or she is at. The design of the building proposal answers this concept by designing "age based pods" for the learning resource centres as opposed to grade based classrooms. The learning resource centres are grouped as follows:

Age:
- toddler to 4 (daycare);
- 4 to 8;
- 9 to 12;
- 13 +; and
- University or life long learning.

This is shown in the design by the addition of pods of grouped aged students as noted above.

A second design element that was very important to the design of the building was the actual site. This was seen in the location of the pods cascading off a central axis dictated by an existing spring creek. The building evolved around this physical site element. Additionally, the site dictated a number of practical form evolutions such as:

- the location of the entrance at the lower level because of ease of traffic flow;
- the location of the cafeteria at the upper level because of the ease of loading;
- the simplified circulation because of the centrally located spring run-off creek;
- the tiering of the building because of the topography of the site;
- the axis of the public space based on the view to the city centre of Banff; and
- the pod splaying to accommodate the topography and the curvature of the site.

As indicated above, many of the physical site conditions helped to direct the design concept of the pods. This was instrumental in the final form of the building design.

One of the overriding design concepts that led to the design of the form of the building was the site, and the context of the design, and Banff as a centre itself. That is to say that a number of predisposing design criteria existed that helped to shape the design of the building. These included:

- the need to be humane in the design - this translated into the use of indigenous materials and humane scaled elements;

- the need to accommodate higher technologies -this translated into the use of curtain wall glazing and refined equipment such as the video phones, Internet computer library / resource desks, big screen TVS / Computers raised access flooring; and

- the use of very modern materials (at least at the time of writing) such as glazing, computer bandwidth use and others.

It is interesting to look at the design of the final building and realize that the building sits proudly among the rocks and tress, yet is of itself and of the future in that it is ripe with computer technologies.

In so far as design principles are concerned, the needs articulated in the previous Section Seven of this report are likewise included and addressed. In this section, the actual and perceived needs of future schools are noted. The germaine issue for this section of the report is that the programme and the design concept address those "needs" that are previously articulated.

In addition to the actual programme and design concept issues noted previously, the design interests of the writer are included in the design solution. These include the juxtaposition between disparate materials like curtain wall and rundle stone, high technology and indigenous materials, forms that are at once natural, yet men-made and so on.

9.3 THE PROGRAMME SUMMARY AND COMPARISON WITH DESIGN

The original was based an assumed general CASN in a general location. As noted earlier, upon resolution to design the CASN in Banff, the programme then was reviewed in light of the exact location in which it was to reside. The programme then was revised and amended to reflect the actual location.

The following chart indicates the original programme areas, the revised programme areas and the final provided design areas. As can be seen by the attached chart, there is a 1.21% increase over the programme areas. This is rationalized on the basis of the tiered nature of the site necessitating increased circulation to accommodate the vertical circulation of the final design.

Programme Areas - Community Access Satellite Node

CASN - Community Access Satellite Node

Description	Number of Students (Note 1)	Traditional Area (Note 2)		Thesis Area (Note 3)		Quantity (Note 4)	Total Area Req'd (Note 5)		Total Area Provided	
Total CEF Facility	340									
School Facility										
Classrooms		80	sq. m.	120	sq. m.	17	2,040	sq. m.	2,010	sq. m.
Library \ Resource Centre		435	sq. m.	240	sq. m.	1	240	sq. m.	728	sq. m.
Science \ Laboratories		120	sq. m.	120	sq. m.	3	360	sq. m.	327	sq. m.
Technology Centre		N/A	sq. m.	200	sq. m.	1	200	sq. m.	180	sq. m.
Day Care Facility		N/A	sq. m.	300	sq. m.	1	300	sq. m.	344	sq. m.
Retail Shops		N/A	sq. m.	100	sq. m.	3	300	sq. m.	280	sq. m.
Cafeteria - Public \ Students		400	sq. m.	600	sq. m.	1	600	sq. m.	800	sq. m.
Administration Offices										
Principal's Office		15	sq. m.	15	sq. m.	1	15	sq. m.	15	sq. m.
Vice Principal's Office		12	sq. m.	12	sq. m.	1		sq. m.		sq. m.
Counselling Office		10	sq. m.	10	sq. m.	1		sq. m.		sq. m.
General Administration		30	sq. m.	30	sq. m.	1	30	sq. m.	31	sq. m.
Conference Room		40	sq. m.	40	sq. m.	4	160	sq. m.	158	sq. m.
Staff Room		35	sq. m.	35	sq. m.	1	35	sq. m.	36	sq. m.
Staff Work Room		30	sq. m.	30	sq. m.	1	30	sq. m.	31	sq. m.
Men's Washroom		4	sq. m.	4	sq. m.	1	4	sq. m.	4	sq. m.
Women's Washroom		6	sq. m.	6	sq. m.	1	6	sq. m.	6	sq. m.
Infirmary		30	sq. m.	30	sq. m.	1	30	sq. m.	21	sq. m.
Kitchen Area		15	sq. m.	15	sq. m.	1	15	sq. m.	5	sq. m.
						Subtotal	325	sq. m.	307	sq. m.
Video Conferencing Classrooms - Large		N/A	sq. m.	80	sq. m.	2	160	sq. m.	152	sq. m.
Video Conferencing Classrooms - Small		N/A	sq. m.	40	sq. m.	2	80	sq. m.	82	sq. m.
Conference Room - New Requirement for Banff Centre							440	sq. m.	435	sq. m.
						Subtotal	680	sq. m.	669	sq. m.
Self Contained Study Rooms		N/A	sq. m.	10	sq. m.	10	100	sq. m.	Included in Res. Area	
Washrooms - Male		26	sq. m.	35	sq. m.	2	70	sq. m.	104	sq. m.
Washrooms - Female		31	sq. m.	45	sq. m.	2	90	sq. m.	104	sq. m.
Conversational Spaces \ Teaming Areas		N/A	sq. m.	20	sq. m.	3	60	sq. m.	163	sq. m.
Mechanical and Physical Plant		60	sq. m.	60	sq. m.	1	60	sq. m.	163	sq. m.
Ancillary (Art / Music etc.)		90	sq. m.	90	sq. m.	6	540	sq. m.	Shared with Banff Centre	
Exterior Complex										
Parking		68							65	
Loading		1							1	
Sporting Areas (Baseball / Football / Track)		1	Shared with the Banff Centre							
Bus Loading and Unloading Area		1							1	
Outdoor General Play Area		1	Shared with the Banff Centre							
Outdoor Children's Play Area		1							1	

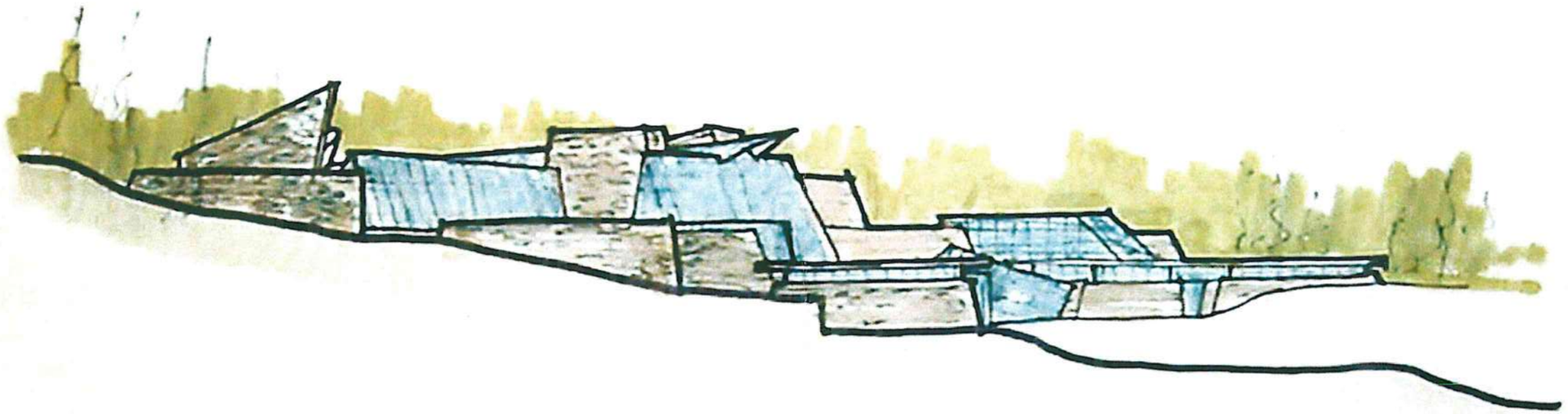
Subtotal	5,965	sq. m.	6,178	sq. m.
Net to Gross at 30%	1,790	sq. m.	1,670	sq. m.
Total Estimated Area	7,755	sq. m.	7,848	sq. m.

Variance from Programme:	94	Over
Percentage Variance from Programme:	1.21%	Over

9.4 DESIGN SKETCHES AND PROPOSAL

The following pages illustrate the evolution of the design in sketch form. Included also are photos of the site and photos of the Banff Centre itself and typical Banff architecture.

The final design solution is included in sketch and drawing form in Section Twelve of this report.



RAIC SYLLABUS
SITE IMAGE

COMMUNITY ACCESS SATELITE NODE

LINUS MURPHY

RAIC SYLLABUS

COMMUNITY ACCESS SATELLITE MODE

THE BANFF CENTRE

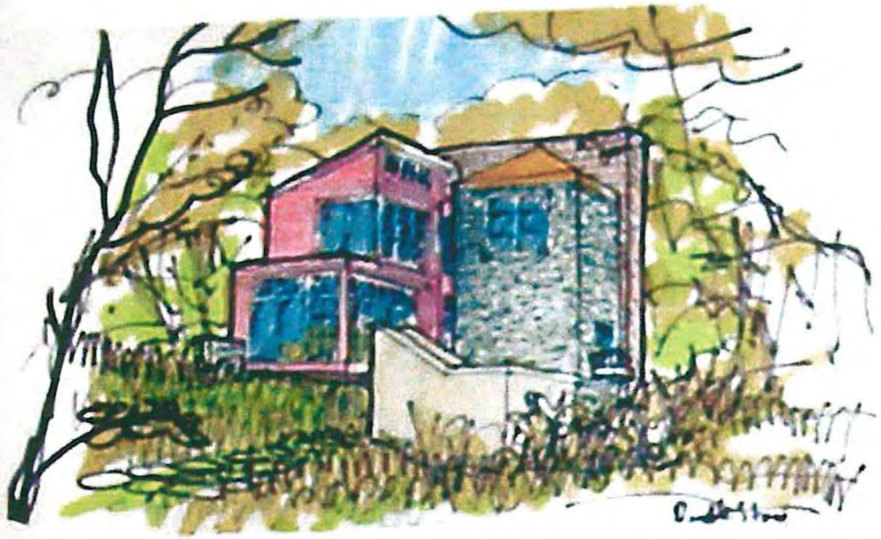
LINUS MURPHY

RAIC SYLLABUS

COMMUNITY ACCESS SATELLITE NODE

THE BANFF CENTRE

LINUS MURPHY

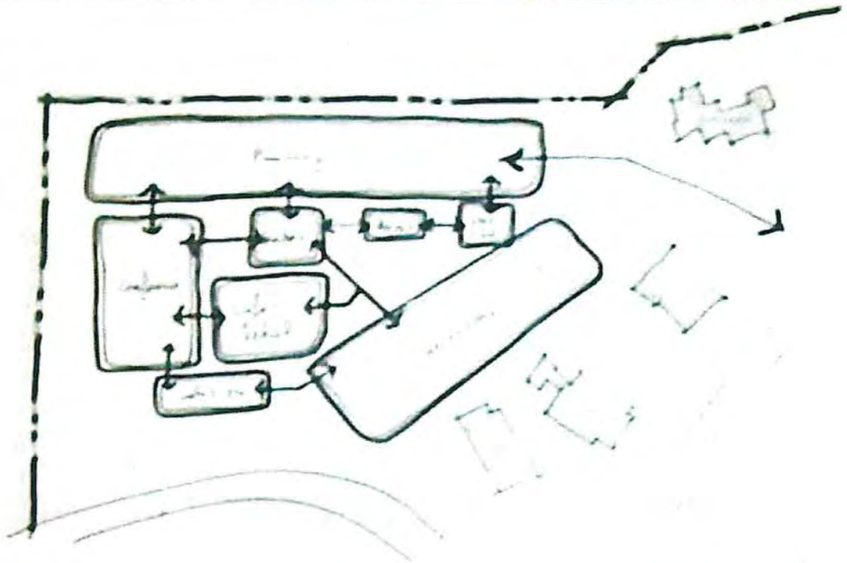


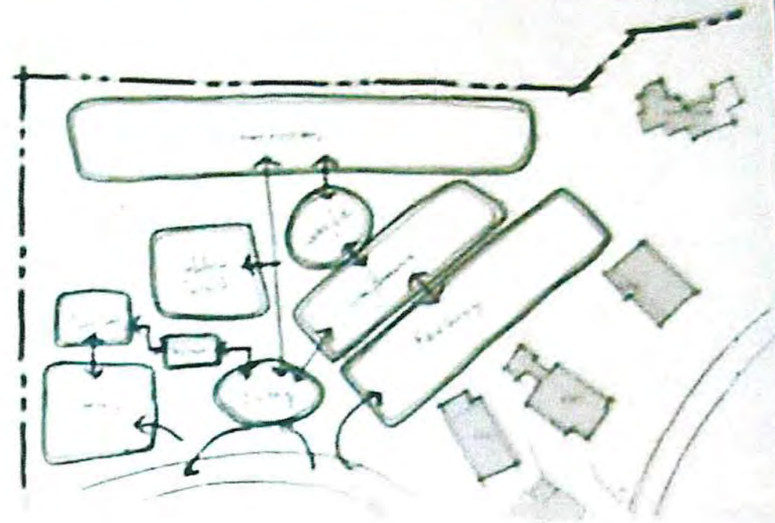
RAIC SYLLABUS

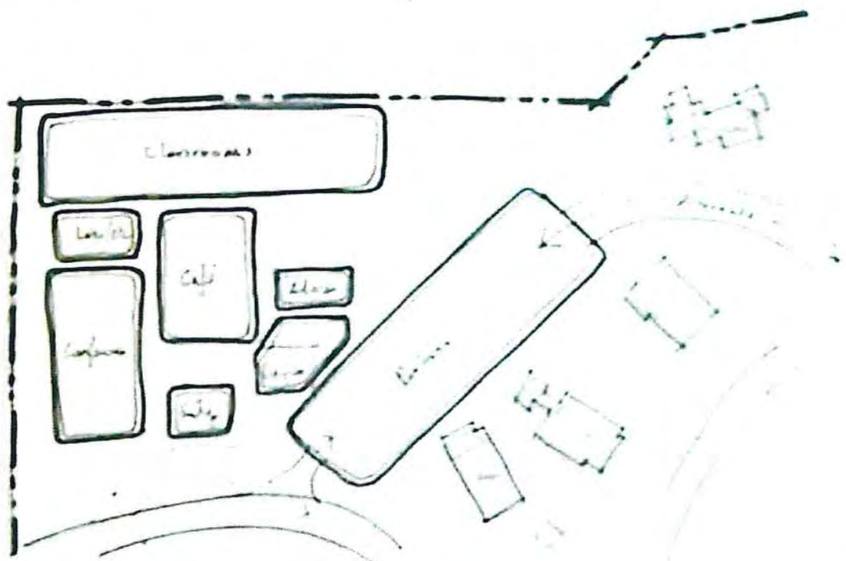
IMAGE EXPLORATION SKETCHES

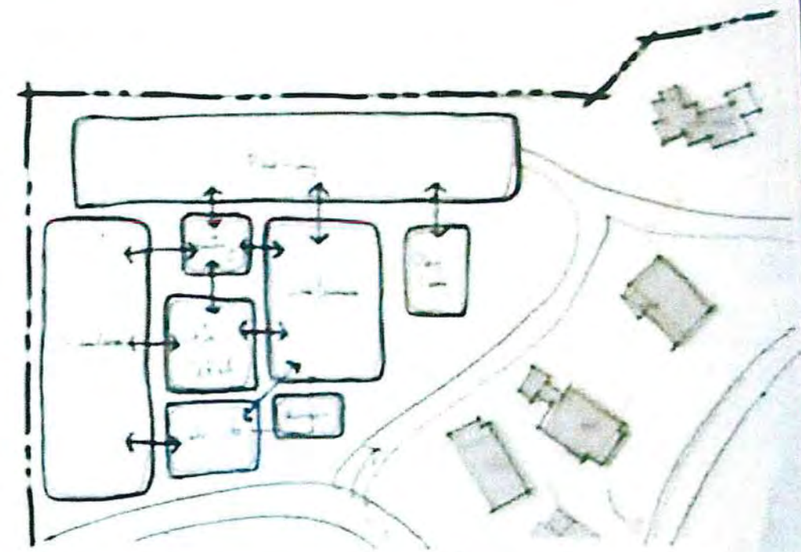
COMMUNITY ACCESS SATELITE MODE

LINUS MURPHY







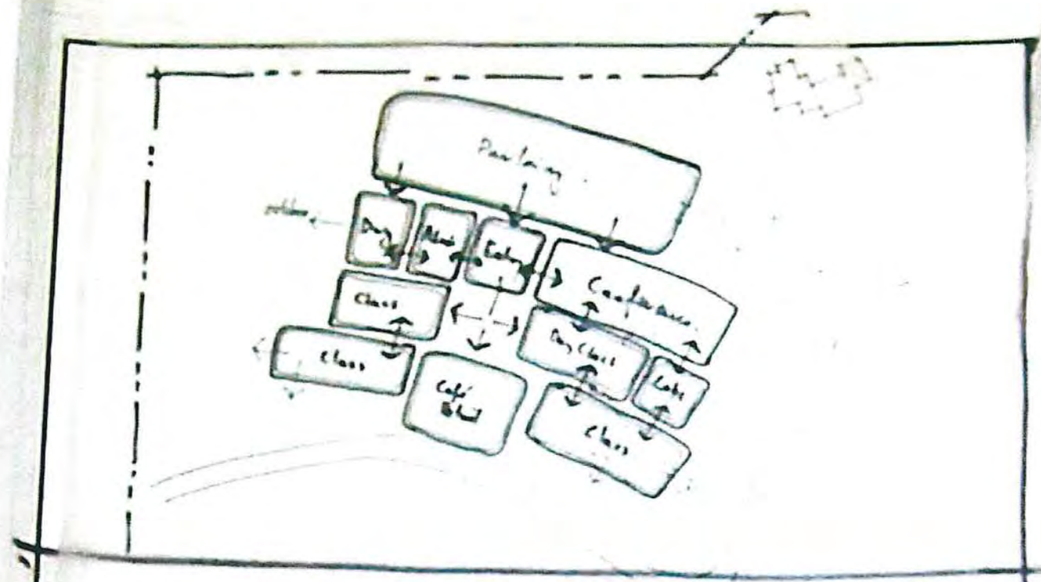


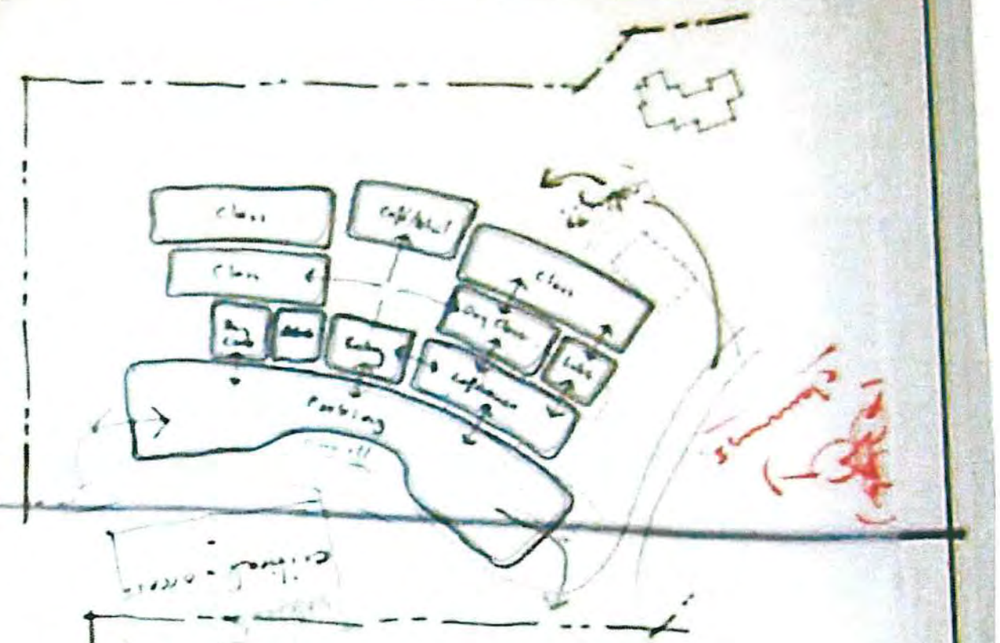
Site Plan Analysis

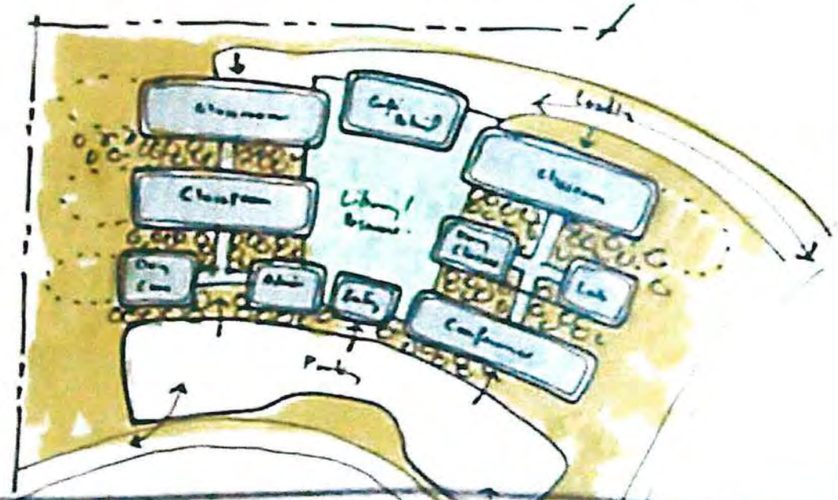
RAIC Syllabus
Thesis Level Design
Student No. AB 830004

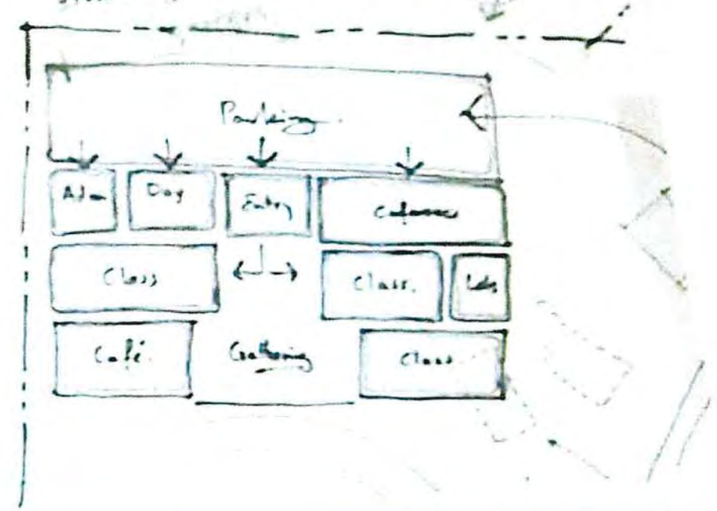
Community Access Satelite Node
-- The Banff Centre --

Linus Murphy







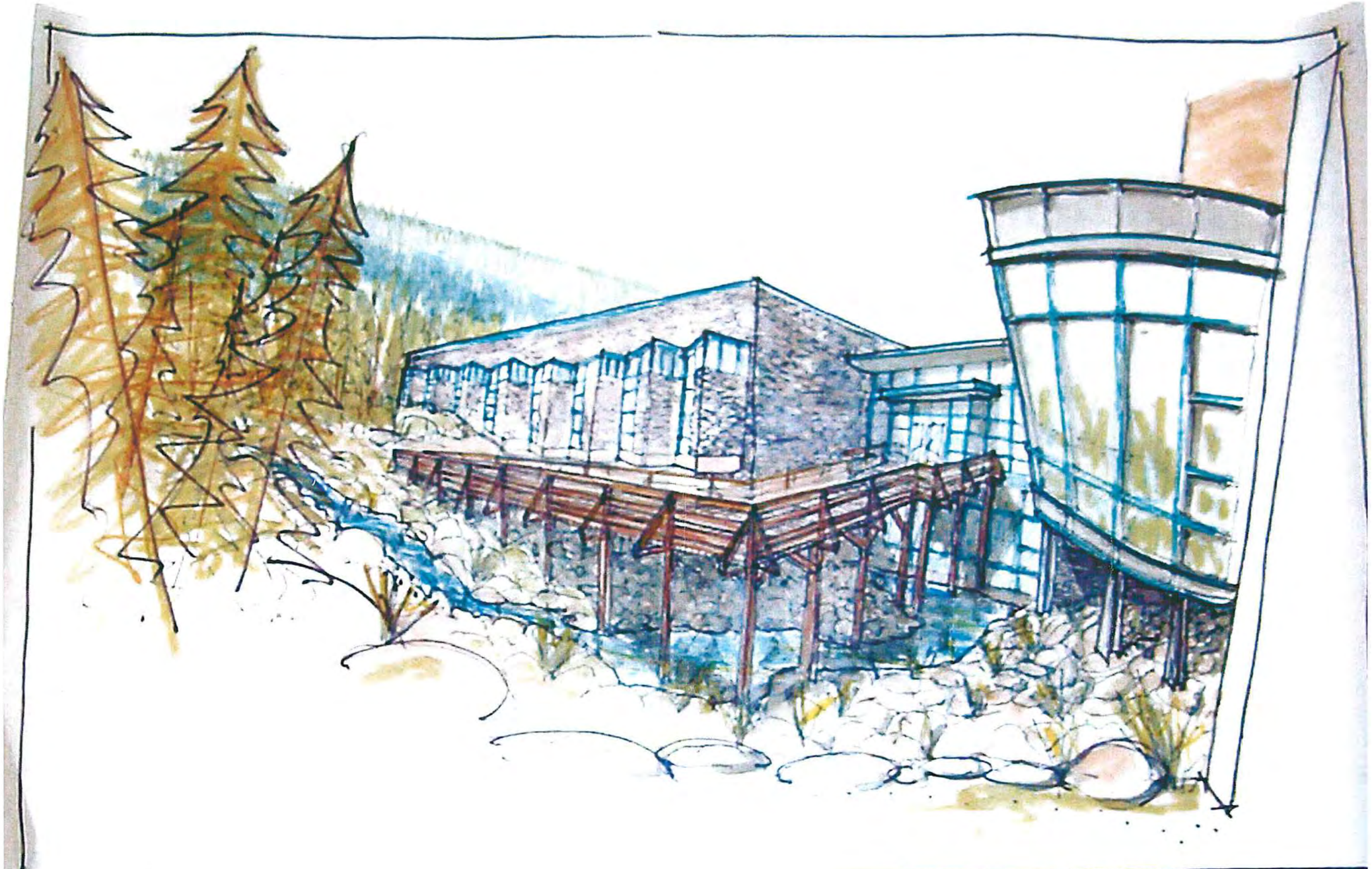


CLASSROOM ANALYSIS

RAIC SYLLABUS
THESIS LEVEL DESIGN
STUDENT NO. AB 830004

COMMUNITY ACCESS SATELITE NODE
-- THE BANFF CENTRE --

LINUS MURPHY



RAIC SYLLABUS
NORTH ENTRANCE

COMMUNITY ACCESS SATELITE MODE

LINUS MURPHY

SUMMARY AND CONCLUSIONS

SECTION TEN

10.1 INTRODUCTION - SUMMARY AND CONCLUSIONS

The following is a comparison and validation of the final Thesis Design Project. The needs and design criteria against which the design solution is based and compared is directly taken from Section Seven - Analysis and Evaluation. The listing is also in the same order and numbered identically to Section Seven for clarity and ease of back reference.

10.2 DESIGN PROPOSAL CRITERIA COMPARISON AND VALIDATION

Design Need 1 **The Need to Address Changing Pedagogy**

1. The teacher is becoming the mentor.

The design of the open classroom, multi-aged learning resource pods, flexible and changeable learning areas with raised access flooring, moveable furniture and personalized pedestal lockers all support the idea that the teacher is becoming a mentor. The pods of learning do not have a front or back as in a traditional classroom. They are large open spaces designed to support social and formal communication between students and mentors alike.

2. The student is becoming more central in the direction of the course curriculum (self directed and open classroom).

The main issue with the student becoming more central in his or her own education is the idea of self-directed education. This manifests itself in the design of theThesis Design Project in the design of the overall pods. Being that the pods are designed for multi-aged learners, as opposed to single or at most two aged graded classrooms, the ability of the student to learn at their own pace, and to interact with other students older and younger than themselves is enhanced.

3. The teacher is increasingly relying on computer software - instructional technologies - to teach.

Throughout the design of the Thesis Design Project, the use and expectation of use of higher technologies is prevalent. This is seen in the wide ranging use of the computer in the pod learning centres. Teach student is given, not a desk, but a computer desk that is movable, changeable and sharable - between day and night students.

The computer desks are also adjustable with height and are based on computer delivered educational course wares. Therefore the computer desk used for an eight year old in the morning can be used by a university student in the evening with no change in the physical properties of the desk. This means that the teacher / mentor, is free to roam and assist students as needed.

Also, the fact that self-directed individualized learning is being used, the mentor is not mandated to stand up in front of the classroom (because there isn't one) and teach to the students. They are free to wander around (management by wandering around). This directly means that the teacher

is increasingly relying on computer delivered course wares to be the basis of a student's education.

4. Individualised learning is becoming more accepted.

The increasing use of individualized learning pods in the Thesis Design Project directly addresses this need. The individual pods are connected and attached to the main pods and as the age of the learning centres' students increases, the number of individualized pods increases specifically addressing the knowledge that as students grow up, their need for quality sole learning increases.

In addition to the individualized pods, a number of virtual reality booths are placed within natural settings within each of the pods. These also directly address the individualized nature of an older student's learning needs.

5. Increased use of team / paired and group learning.

The design of the flexible and movable computer desks, the design of the resource centre (read library) as a central circulation space, and the design of the public quiet areas as natural spaces for informal interaction and communication all lend themselves to the idea of team / paired / group learning. Not only do the various learning pods allow the grouping of large or small learning students, but the public spaces of the CASN promote this by availing the students with free-use computers, sitting areas, technology centres and typical day classrooms and conference areas where multiple students can group and learn together.

Notwithstanding the availability of the technologies, and the physical spaces that support communication, the natural and humane design of the building is though to support a feeling of comfort and good will which in turn will enhance the idea of learning.

Design Need 2 **The Need to Address Growing Use of Technology**

1. Increase in distance learning.

The Thesis Design Project provides excellent traditional services like the large and small video conferencing rooms, the major and minor conferencing rooms and the science and technology labs. In addition to these physical attributes of the building design, the use of technology itself, through the design of the shared computer desks and virtual reality booths, all support the idea of distance learning by availing local students the possibility to deal with and speak to remote students. The use of the CEF's central computer and technology centres also supports the need for distance learning.

The mere fact that the CASN is situated at the Banff Centre supports the idea of Distance Learning in that a large number of very superior sabbatical people study at the Centre, and I see them using the CASN's facilities to teach as part of their agreement to use the Centre. This would also, I believe, be used for international (i.e. distance learning) students.

2. The use of virtual reality.

The design of the virtual reality booths, centrally located in the learning pods, supports directly the need to address the growing use of virtual reality.

The use and design of the technology pods and laboratories also supports the need to use virtual reality by providing a large cache of senior technologically minded students to support virtual reality.

3. Technology used by students.

We have seen that the use of the computer desks directly avails the student a hands on and constant access to technology. In addition to the desk design, the use of various technologies at the very young age level is also given in the design of the Thesis Design Project. This is seen in the Day Care where computer Internet stations are situated available for even the youngest of students to use the technology.

The direct connection of the various learning pods to the main circulation space, and the connection of the central circulation space to the technology wing and the higher aged learning pods, all supports the availability of the technology to students of all ages.

But availability of students to the technology is not the only thing supported in this school. The possibility of the public coming into the building and using the resource centre (previously the library) is manifested in the design. Each and every person that comes to use the facilities can in turn use one of the resource desks, which is itself a computer desk, therefore availing even the public to the technology.

One must remember that the design of the building is very much a building of the mountains and of Banff and as such is wrought with nature and comfortable and humane spaces.

4. The need for flexibility and changeability.

Throughout the design of the Thesis Design Project, flexibility and changeability is the norm. Raised access flooring, remote bandwidth computer connections, large open malleable spaces, shared public and school spaces and functions, shared public functions in the technology and conference pods and the large and public use of the central circulation space all speaks to the flexibility of the spaces.

Each learning pod and space can be changed and moulded to suit the needs of the learners within the space. Each public space can be changed to suit the needs of the changing public.

And through the use of demountable and folding partitions, even the spaces themselves can be changed in size to suit new functions that they may be called upon to support.

Design Need 3 **The Need to Address a Shifting Basis of and Focus From Governance**

1. The increased involvement from business.

The Banff Centre is not a business venture by and of itself, but it is a profit making venture that its' goal is necessarily to produce enough revenue to sustain itself. In this vein, the CASN supports some of the missing functions at the Centre. Namely a technology centre and a conference centre. Both these are direct needs that are currently not supported within the Centre. In this way, the CASN directly addresses the "business" end of education by providing facilities that can not only provide a learning environment for the students, but also a profit centre for the Centre.

In addition to the obvious conference facilities, the CASN provides a tremendous opportunity for local or international business to provide technology. Much as Apple Computer and Microsoft does today provide software and hardware to the schools, so too can the CASN support the use of shared and loaned technology simply by virtue of its size and need for superior and current technologies.

Also, the public spaces within the CASN provide for large computer Internet and TV screens (which I believe will be one in the same in the near future).

Retail is also a strong component in the design of the , in that public and private enterprise can make use of the facilities to promote their product. In the design presented to the jury of thisThesis Design Project, a Bagel shop and a Coffee shop were designed in the public areas to support the Cafeteria needs. In other words, a retail component was used to augment the needs of the actual school provided facilities - in this case, the cafeteria.

2. The push for less costly government governance.

In the design of this Thesis Design Project, the idea of shared and flexible and public spaces was a constant design consideration. That is to say that at the heart of the design of this is the idea that spaces must be flexible and shared. Not specifically noted is the push for the design to be of itself and for itself and the community. This translates to a building design that needs little of major governmental support for it is more self supporting than the traditional school in Calgary's current school boards. While this is a "soft" approach to the depletion of government support, it does manifest itself in a more localized and (perhaps) community based governance system for the school. In this case, Banff can be seen to the central support and central control of the CASN.

3. The increased reliance on individuals.

This has been articulated and explained in item 1-2 above. In summary, the school avails the individual comfortable and friendly spaces in which to study by oneself.

Design Need 4 **The Need to Address the Increased Impact From Business**

1. A push for more job specific training course wares.

This will be and is seen in the actual course wares and does not necessarily translate directly to a built form. However, the spatial design noted above, namely the flexibility and changeability of the various spaces, lends itself to the use of computer programmes as the delivery method of choice for students. This in turn leads to the ability of these computer programmes to be designed to be training specific to specific jobs and training.

2. A push for more "input / output" results and definable goals.

As noted above, this is a "soft" type of manifestation into the built form of the building. That is to say that the design of the building to support technology and flexibility and the teacher as the mentor, all speak to the ability of technology to become more central to the education and learning of students. This in turn lends itself to a more quantifiable type of education, i.e. through the computer, and therefor, a mor "input / output" oriented education system based on computers.

Design Need 5 **The Need to Be Cost and Budget Efficient**

1. Create an increased reliance on sharing educational resources.

The prime issue with sharing of resources is the need to share computer and hardware usage. At least this is the state of :"sharing" today in our schools. We see this in the use of computers from one school board to another, and much support from the private sector as in (as noted earlier) Apple and IBM computers.

This, though, is not the only manner of sharing resources. The truly main avenue for sharing of resources is the sharing of the actual facility itself. That is to say, the sharing of spaces with the public, with the school board, and with other school boards. I see the design of thisThesis Design Project as addressing this issue directly. This is through the availability of the conference facilities to be leased out or shared. This is through the use of the technology centre, and the resource computer desks and the like.

Notwithstanding the sharing of resources, and the leasing of various functions within the school, there is a definite availability of sharing resources in the Centre itself. The use of the various spaces throughout the Centre itself. In other words, the CASN does not provide a pool, or a theatre hall, or a gymnasium, or a major public space because these particular functions currently exist on the site of the Centre itself. The use of these shared facilities with the rest of the Centre certainly saves costs. No longer does the need to provide a gymnasium for each and every school exist. The shared facilities overall could save much money and resources in the running of the school systems.

In addition to this, the fact that the Thesis Design Project is designed to accommodated all the

student from K-12 ad beyond from Banff, saves money. This is seen in the fact that ONLY one physical plant, only one gymnasium (albeit shared) only one technology and conference shared facility is provided for all the students of Banff. This CASN actually replaces three existing schools in the township of Banff. This is a true savings of costs because not only are the actual functions that are required for a school shared in this Thesis Design Project, but also the various levels of schools and school boards. In other words, this CASN replaces three schools of various grade levels and various boards (separate and public) and over even the university and lower level grades are all shared within one complex. In addition to the shared educational levels, the public and local and international business also share the facilities. So while the initial capital cost of the building may appear to be high (see Order of Magnitude Budget Estimate) the overall impact on the educational system and the possible payback in revenue and saved operational costs, can realize major and significant cost savings.

2. Expand the reliance on business to offset costs.

For a more detailed explanation, see item 3.1 above. However, in summary, the building's availability of retail, the proximity to local business and the support of the local arts and support of the local Centre's functions all support the reliance for business. In addition, as was mentioned earlier, the continuing need for technology and communications mean that business is an integral cog in the on-going operations of the CASN.

3. Create an increased need for sharing educational buildings.

The mere fact that this building replaces four individual schools supports the idea of sharing of educational facilities. But in addition to the obvious sharing of public and separate K-12 and beyond schools, the various and sundry required typical school facilities are also shared. That is to say the facilities like the gymnasium, the pool, the outdoor play areas and the technology centre. All these lend themselves to (although not initially) a lower capital cost project, but also, overall the length of the life of the building, a less expensive operational cost to the building because of reduced buildings (they're shared) and the reduction in general operating costs (because there are less building functions that are separated and therefor savings are realized because of shared resources.).

10.3 SUMMARY

In its simplest form, the design of the Thesis Design Project inculcates the evolving pedagogy and technologies by virtue of its flexibility and its simplified form. This means that the building can be multi functional, flexible, malleable and changeable, all within the design as presented.

On a more specific and micro level, the school addresses the evolving pedagogies in the use of the single, large learning pods as opposed to the traditional classroom. But even in addition to this, is the division of the students into groupings of age, rather than groupings of grade. This, according to a number of educators whom I spoke with during the research and design portions of this , is

critical to the future of schools. There are a number of reasons for this and they are noted below. It is important to note, however, that this multi-aged classroom concept is not entirely new. It has been tried very successfully in the past on a much smaller scale. This Thesis Design Project suggests that the future of schools will mandate the multi-aged learning spaces (note not classrooms). The reasons for the success of multi-aged learning pods are:

1 Multi-aged classrooms provide a strong and consistent environment for younger students to act more mature from the influence of the older children and the older students to act more mature looking after the younger students;

2 Multi-aged classrooms provide an opportunity for older students to assist the teacher with helping out the younger students. This helps to develop leadership skills and a maturity that is not always possible in traditional same-age classrooms;

3 Shared resources are more easily shared in a large open facility compared to a more traditional classroom atmosphere where "kingdom building" is usually rampant; and

4 The division of the multi-aged learning pods supports the growth of children in that the pods are divided into groupings, and are based on learning "curves" as follows:

aged toddler to 4	this, the youngest age group is geared around almost exclusively socializing. As such, there are large indoor and outdoor play areas, the least amount of computer access, and smaller rooms for control and a sense of security;
aged 5 - 8	this age group is more social, and so the thrust of learning at this stage is the development of more social skills, but most importantly, the development of learning skills. These skills are taught in a team and group environment so that the student learns social learning;
aged 9 - 12	this age group is more specifically taught the learning facts, and is taught more how to learn. The skills at this stage are geared around the "learning to learn" approach. The pods in this level are therefore designed with more individual learning areas and virtual reality booths. But these too have large open flexible team, individual and group learning spaces;
aged 13 +	this is the oldest formal pod grouping in the Thesis Design Project. This group is taught with the emphasis on the ability of the student to learn entirely on their own, and to learn research skills. This manifests itself in the largest number of individual and virtual realty spaces in the complex.

It is felt that the design of this Thesis Design Project satisfies not only the programmatic requirements of the Thesis Design Project, but also the aesthetic, humane and social requirements of the Thesis Design Project.

11.1 INTRODUCTION - APPENDIX A - SITE ANALYSIS CRITERIA SHEET

From Section 7, Analysis and Evaluation, a number of site needs were summarised that generally described school site needs. These needs were very specifically focused on the site needs of this Thesis Design Project. The following page illustrates the site criteria sheet developed to assist in assessing the site location of either the CASN's or the CEF's.

Site Analysis Sheet

General Site Information:

Address: _____ Name: _____
Legal: _____ Phone: _____
Size of Site: _____ Fax/E-Mail: _____
Comments: _____

General Site Considerations:
Ratings: 1 - Poor, 5 - Excellent

	Rating		Rating
Proximity to Transportation		Proximity to Site Services	
Proximity to Business		Proximity to nearest CEF or CASN	
Proximity to Community Centre		Proximity to Gymnasium or Sports Fac.	
Proximity to Religious Centre(s)		Proximity to Elementary School(s)	
Proximity to Outdoor Playground(s)		Proximity to Junior High / High Schools	
Proximity to Outdoor Playing Fields		Proximity to College / University or Other	

General Site Needs:
Ratings: 1 - Low Need, 5 - Very High Need

Need for a Community Heart		Need for reduction in operational costs	
Need for a New School because of Popul.		Need for shared resources (ie sep. and public)	
Need for new school facilites		Need for new school due to student population	
Need for support school facilities (ie gym)		Need for local computer facilities	
Need for additional specialty facilities (ie art)		Need for multiple school shared facilities	

General School Considerations:
Ratings: 1 - Low Need, 5 - Very High Need

Does the Area Support Local Business		Does the area require additional schools	
Does the Area Support Local Schools		Does the area require support facilities for schools	
Does the Area Support National Business		Does the Area have a Strong Parent Group	
Does the Area Support Multi-Religion(s)		Will the area have a good population of students	

General Area Factors:
Ratings: 1 - Strongly Disagree, 5 Strongly Agree

Does the area contain much nature and avail. land		Is the zoning of the land appropriate	
Is the area available for renovation or develop.		Can the existing buildings be renovated or demo'd	

General Comments:
Ratings: 1 - Not Agree At All, 5 - Strongly Agree

Does this seem like a good location for a CASN		Does local community see change as favourable	
Does this seem like a good location for a CEF		Does the local government support change	
Are the local residences generally higher educated		Is the avarage salary high for the local residences	

Subtotal Count _____ **Subtotal Count** _____

Total Numberical Count _____

General Commnets and Notes:

_____

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SECTION ONE - INTRODUCTION

1) Jacobs, Jane. **The Economy of Cities**, 1969, chapter 2. Jacobs examines the history of how man moved from small tribal group clusters living on the savanna, to community clusters supported by farming lands and a central government.

2) Information Age is a ubiquitous term referring to the shifting focus of a developed nation's economy from a manufacturing based economy to a computer, data, information processing based economy. The originator of this reference is difficult to authenticate, however a more current term, "Information Highway" is attributed to American VP Al Gore. This term refers to the delivery of digital media over high-speed conveyances, more commonly known as the Internet / World Wide Web.

3) Slouka, Mark., **War of the Worlds**, Basic Books - A Division of Harper Collins Publishers, 1995, pgs 10-34. The author declares: "The movement to a computer world means re-interpreting the meaning of private and public, inside and outside, absence as presence, abstract spaces as Cartesian and 3-Dimensional."

4) Negreponte, Nicholas. **Being Digital**, Alfred A. Knoph, New York, 1995, pgs 163-171. Negreponte speaks of this as ". . . the post information age, [where] we often have an audience the size of one. Everything is made to order."

5) McLuhan, Marshall and Fiore, Quentin, **War and Peace in the Global Village**, 1968. This book has created one of the most known phrases in the English language in the "Global Village." The book describes life in an electronic world and the chaos and havoc that is brought about man's global thinking.

6) Perelman, Lewis J., **School's Out - HyperLearning, The New Technology, and the End of Education**, William Monroe and Company, 1992 pgs 54-65. Perelman writes "If [instructional technology] learning is in everything, everywhere, how do we confine learning to the box of a classroom? We can't. Then what's the point of having schools at all? There isn't any."

7) Anglin, Gary J. (ed.), **Instructional Technology**, Libraries Unlimited, Inc. 1991, pgs 54-87. The author writes "Instructional technology is today largely supplementary to the two primary media of instruction: the textbook and the teacher . . . Eliminate all of the technology, and education would go on with hardly a missed lesson."

8) Roxanne-Hiltz, Starr, **Teaching in a Virtual Classroom**, Reprinted from 1995 International Conference on Computer Assisted Instruction - National Chiao Tung University, Taiwan, 1995, pgs 1 - 8. (Virtual Classroom is a trademark of the New Jersey Institute of Technology).

9) For the purposes of brevity and consistency, this report shall refer to the higher and electronic technologies, meaning computers, videos, audio conferencing, telephones, cameras, video conferencing and the like under the general heading of "technology" rather than the more specific "higher technology" or "electronic technology". It is understood that technology truly refers to any kind of implement that assists man and includes things like a shovel, a text book, a blackboard and any other similar item. But with today's ubiquitous reference to "computers" as "technology", this report will use this more common vernacular (the single "technology") to mean all things of an electronic/computer type origin. Where reference is being made to non-electronic technology (such as a shovel or a text book), the reference shall read as "non-electronic technology".

10) The term "computer bug" came from the early days of the computer, when one of the first computers (a room filled with old vacuum tubes) was spewing out wrong answers to questions that it had previously answered correctly. An in depth analysis revealed that an insect had gotten inside and damaged one of the vacuum tubes, thus rendering it unusable. When a question required input from that particular vacuum tube, because it wasn't working, an incorrect answer was the result. Thus the first computer bug was found and the first ever "debugging" of a computer was completed upon the replacement of the vacuum tube.

SECTION TWO-A - AN HISTORICAL PERSPECTIVE - PLACE

1) A Pattern Language, while not specifically referencing a definition or a specific name moniker of Place, still recalls all that is included in any reasonably definition of Place. In the book, A Pattern Language, Christopher Alexander et.al. have, in beautifully simple language and images, given a shopping list of design issues for creating Place out of Space. The reader is encouraged to read through this volume.

2) The Vesica Piscis, meaning literally fishes bladder, means a materialisation of the spirit - where the essence of what makes a spirit unique is made real. It refers graphically to the area where two circles overlap and has roots in Christian iconography. Hale, Jonathon, **The Old Way of Seeing**, Houghton Mifflin, 1994, chapter 5.

3) **The Canadian Encyclopaedia Plus**, Copyright © 1996 by McClelland & Stewart Inc. Gage Canadian Dictionary. Copyright © 1983 by Gage Educational Publishing Company.

4) **The Canadian Encyclopaedia Plus**, Copyright © 1996 by McClelland & Stewart Inc. Gage Canadian Dictionary. Copyright © 1983 by Gage Educational Publishing Company.

5) Cullen, Gordon, **The Concise Townscape**, The Architectural Press, 1968, pg 11.

6) Hiss, Tony, **The Experience of Place**, Alfred A. Knopf, 1990, chapter 9.

7) Day, Christopher, **Places of the Soul**, Butler & Tanner Limited, 1990, pg 17.

8) Day, Christopher, **Places of the Soul**, Butler & Tanner Limited, 1990, pg 142.

9) Phenomenology is a term used by Christian Norberg-Schultz in his book **Architecture: Meaning and Place**, (New York, Electa/Rizzoli, 1988), but had its roots through philosophy. It refers to the "*the purely descriptive study of consciousness and the objects of consciousness (phenomena), without any attempt to explain causes, origins, etc.*" As quoted by The Canadian Encyclopaedia Plus, copyright © 1996 by McClelland & Stewart Inc. Gage Canadian Dictionary. Copyright © 1983 by Gage Educational Publishing Company.

10) Greene, Herb, **Mind and Image**, University Press of Kentucky, 1976, pg 51.

11) Rossi, Aldo, **The Architecture of the City**, The MIT Press, 1982, pg ____.

12) Rossi, Aldo, **The Architecture of the City**, The MIT Press, 1982, pg ____.

13) Preiser, Wolfgang F. E.; Vischer, Jacqueline C.; and White, Edward T. (eds.), **Design Intervention - Toward a More Humane Architecture**, Van Nostrand Reinhold, 1991, pg 3.

14) Rowe, Peter G., **Design Thinking**, The MIT Press, 1987, pg _____

15) Arnheim, Rudolf, **The Dynamics of Architectural Form**, University of California Press, 1977, chapter 2.

16) Canter, David, **Psychology for Architects**, Applied Sciences London, 1981, chapter 2.

17) Arnheim, Rudolf, **The Dynamics of Architectural Form**, University of California Press, 1977, chapter 1.

18) Hale, Jonathon, **The Old Way of Seeing**, Houghton Mifflin, 1994, chapter 4.

19) Arnheim, Rudolf, **The Dynamics of Architectural Form**, University of California Press, 1977, chapter 2.

20) Cullen, Gordon, **The Concise Townscape**, The Architectural Press, 1968, pg 22-7.

21) Hiss, Tony, **The Experience of Place**, Alfred A. Knopf, 1990, introduction.

22) Hester, Randolph T. Jr., **Neighborhood Space**, Dowden, Hutchinson & Ross, Inc. A Division of John Wiley & Sons, Inc. 1975, pg 20-5.

23) Hiss, Tony, **The Experience of Place**, Alfred A. Knopf, 1990, chapter 4.

24) Herbert J. Gans, People and Plans: Essays on Urban Problems and Solutions, Basic Books, Inc., 1968, p. ix as quoted by Hester, Randolph T. Jr., **Neighborhood Space**, Dowden, Hutchinson & Ross, Inc. A Division of John Wiley & Sons, Inc. 1975, pg 41.

25) Chandigarh was the seat of governmental power for a new democracy ostensibly by and for the people, yet the spaces created were for the buildings. Chandigarh has also been criticised for not accommodating the basic cultural biases of the Pakistani, Sikh and Indian peoples that populate the area. Bacon, Edmund, **The Design of Cities**, Viking Press, 1967, chapter 7.

26) While the space created by the buildings in Brasilia have been credited with creating beautiful and lyrical public Places, the buildings do not reflect the culture, climate or nature of Brazil. Bacon, Edmund, **The Design of Cities**, Viking Press, 1967, chapter 7.

27) Much has been written about Pruit-Igoe and about how poorly it accommodated the needs of the people it housed. The most important element for this report is that the buildings did not allow the residents / tenants to feel a sense of ownership. There was a decided lack of spaces set aside where people could sit and watch children play, there were no shielded play areas outside in direct contact with windows, a lack of tenant public secure areas, and a lack of environmental interest all exacerbated the feeling of non-ownership. One couldn't sit outside, chat with your neighbours and watch the kids, nor could one do the dishes and watch the people going by through the window. Culturally, most of the residents came from a very public and group oriented culture and so this building was very disjointing. This led to people not self policing or being visible to interlopers which led to problems with undesirables and so on.

28) Negreponte, Nicholas. **Being Digital**, Alfred A. Knoph, New York, 1995 states throughout his book that we will soon be able to "visit" the world through computer technology through the use of virtual realities. The time is here, but the cost is still high. Soon these headsets will be in every household.

29) Searles, Harold, F., **The Non Human Environment in Normal Development and in Schizophrenia**, New York International Universities Press, 1960, pg 25 as quoted in Hester, Randolph T. Jr., Neighborhood Space, Dowden, Hutchinson & Ross, Inc. A Division of John Wiley & Sons, Inc. 1975, pg 92-5.

30) As recorded by Roth, Alfred, **The New School House**, Frederick A. Praeger, New York, 1958, pg 293.

31) Roth, Alfred, **The New School House**, Frederick A. Praeger, New York, 1958, pg 293.

32) Preiser, Wolfgang F. E.; Vischer, Jacqueline C.; and White, Edward T. (eds.), **Design Intervention - Toward a More Humane Architecture**, Van Nostrand Reinhold, 1991, pg 326-9.

33) Canter, David, **Psychology for Architects**, Applied Sciences London, 1981, chapter 2.

34) Canter, David, **Psychology for Architects**, Applied Sciences London, 1981, chapter 3.

35) Bacon, Edmund, **The Design of Cities**, Viking Press, 1967, pg 93.

36) Cullen, Gordon, **The Concise Townscape**, The Architectural Press, 1968, pg 9.

37) Rowe, Colin and Koetter, D. **Collage City**, The MIT Press, 1979, chapter 4.

38) Canter, David, **Psychology for Architects**, Applied Sciences London, 1981, chapter 4.

39) Rowe, Peter G., **Design Thinking**, The MIT Press, 1987, pg _____

40) Jencks, Charles **The Language of Post Modern Architecture**, Rizzoli International, Yew York, 1977, chapter 2.

41) Goodlad, John I., **A Place Called School - Prospects for the Future**, The Institute for the Development of Educational Activities, 1984, pg 81.

42) The **Canadian Encyclopaedia Plus** Copyright © 1996 by McClelland & Stewart Inc. The Columbia Encyclopaedia, Fifth Edition Copyright © 1994, 1995 Columbia University Press. Licensed from and portions copyright © 1995 by INSO Corporation.

43) Lethaby, William, **Mysticism and Myth**, George Braziller Inc. 1975, originally published in 1891, chapter 1.

44) **The Canadian Encyclopaedia Plus** Copyright © 1996 by McClelland & Stewart Inc. The Columbia Encyclopaedia, Fifth Edition Copyright © 1994, 1995 Columbia University Press. Licensed from and portions copyright © 1995 by INSO Corporation.

45) Jordan, R. Furneaux, **A Concise History of Western Architecture**, Thames and Hudson, 1979, pg 11.

46) Jordan, R. Furneaux, **A Concise History of Western Architecture**, Thames and Hudson, 1979, pg 11.

47) **The Canadian Encyclopaedia Plus** Copyright © 1996 by McClelland & Stewart Inc. The Columbia Encyclopaedia, Fifth Edition Copyright © 1994, 1995 Columbia University Press. Licensed from and portions copyright © 1995 by INSO Corporation.

48) See Guild information in the History of Education and Technology sections of this report for references and Guild details.

49) The original buildings of Trinity College Dublin were built in 1592 and later rebuilt between 1712 and 1732. Source: **Trinity College Dublin Tourist Brochure**, 1992.

50) **The Canadian Encyclopaedia Plus** Copyright © 1996 by McClelland & Stewart Inc. The Columbia Encyclopaedia, Fifth Edition Copyright © 1994, 1995 Columbia University Press. Licensed from and portions copyright © 1995 by INSO Corporation.

51) Bowen, James, **A History of Western Education, Volume 2, Civilization of Europe**, St. Martin's Press, New York, 1975, pg 408.

52) Ball, A. R. (Trans.), ***Ratio Studiorum,XII***, pg 176, as recorded in A History of Western Education, Volume 2, Civilization of Europe, St. Martin's Press, New York, 1975, pg 426.

53) Roth, Alfred, **The New School House**, Frederick A. Praeger, New York, 1958, pg 28.

54) While the description of the architecture and space is from the book **Modern Architecture Since 1900**, (Englewood Cliffs / Prentice-Hall 1987) by William J. R. Curtis, chapter 20, the critique of the Place created by the buildings is the author's own opinion.

55) Bacon, Edmund, **The Design of Cities**, Viking Press, 1967, chapter 7.

56) Roth, Alfred, **The New School House**, Frederick A. Praeger, New York, 1958, pg 28.

SECTION TWO-B - AN HISTORICAL PERSPECTIVE - EDUCATION

1) **The Canadian Encyclopaedia Plus**, Copyright © 1996 by McClelland & Stewart Inc. Gage Canadian Dictionary. Copyright © 1983 by Gage Educational Publishing Company.

2) Patterson, R. S. and Kach, N., Revised: Peters, Frank, **Education**, Source: The Canadian Encyclopaedia Plus 1996 by McClelland & Stewart Inc. An important element of this definition of education is the significance of how humans use education as a means of maintaining and enhancing the knowledge, skills and values of a society through instruction and learning and includes family and formal organizational structures.

3) For ease and clarity in writing, the masculine tense will be used in this report when referring to humankind. However it should be understood that "man", "he" and "his", in the context of humankind and of humans, means both the masculine and the feminine tense and refers directly to all of humankind and of all of humanity.

4) Bowen, James, **A History of Western Education, Volume I, The Ancient World**, St. Martin's Press, New York, 1972, pg 1.

5) Pavlov, Ivan Petrovich was a Russian physiologist and experimental psychologist who used animals (and most famously dogs) to demonstrate that specific areas in the cerebral cortex are concerned with specific reflexes. This was principally shown through the conditioning of dogs to salivate upon hearing a bell which bell usually meant food was being served. Source: **The Canadian Encyclopaedia Plus** 1996 by McClelland & Stewart Inc. Licensed from The Columbia Encyclopaedia, Fifth Edition 1994.

6) Intelligence is defined as the ability to learn and know and have the ability to use that reason or intellect in a skilled way in dealing with new situations or in solving new problems. Source: **Webster's Ninth New Collegiate Dictionary**, 1983 by Merriam-Webster Inc. Springfield, Mass. USA.

7) Bowen, James, **A History of Western Education, Volume I, The Ancient World**, St. Martin's Press, New York, 1972, pg 29.

8) Antiquity refers to times long ago, in the early stages of history and is generally accepted as referring to that time between from about 5000 BC to the Middle Ages.

9) Bowen, James, **A History of Western Education, Volume I, The Ancient World**, St. Martin's Press, New York, 1972, pg 2-3

10) Source: **The Canadian Encyclopaedia Plus**, 1996 by McClelland & Stewart Inc.

11) Bowen, James, **A History of Western Education, Volume I, The Ancient World**, St. Martin's Press, New York, 1972, pg 5.

12) Bowen, James, **A History of Western Education, Volume I, The Ancient World**, St. Martin's Press, New York, 1972, pg 7.

13) Bowen, James, **A History of Western Education, Volume I, The Ancient World**, St. Martin's Press, New York, 1972, pg 12.

14) Bowen, James, **A History of Western Education, Volume I, The Ancient World**, St. Martin's Press, New York, 1972, pg 17.

15) The cuneiform writing format developed during the Mesopotamian period somewhere around 3000 BC, probably by the Sumerians and was widely used by the Mesopotamians. The characters were arrangements of wedge-like strokes generally made on wet clay tablets, which were then dried or baked. The history of the script is strikingly parallel to that of the Egyptian hieroglyphics. Source: **The Canadian Encyclopaedia Plus**, 1996 by McClelland & Stewart Inc. and The Columbia Encyclopaedia, Fifth Edition Copyright © 1994, 1995 Columbia University Press.

Licensed from and portions copyright © 1995 by INSO Corporation.

16) Bowen, James, **A History of Western Education, Volume I, The Ancient World**, St. Martin's Press, New York, 1972, pg 38.

17) Hieroglyphics were the type of writing used in ancient Egypt. The distinguishing feature of hieroglyphics is that they are conventionalized pictures used chiefly to represent meanings that seem arbitrary and are seldom obvious. Source: **The Canadian Encyclopaedia Plus** Copyright © 1996 by McClelland & Stewart Inc. and The Columbia Encyclopaedia, Fifth Edition Copyright © 1994, 1995 Columbia University Press. Licensed from and portions copyright © 1995 by INSO Corporation.

18) Bowen, James, **A History of Western Education, Volume I, The Ancient World**, St. Martin's Press, New York, 1972, pg 38.

19) The alphabet is a system of writing, theoretically having a one-for-one relation between character (or letter) and phoneme. Source: **The Canadian Encyclopaedia Plus** Copyright © 1996 by McClelland & Stewart Inc. and The Columbia Encyclopaedia, Fifth Edition Copyright © 1994, 1995 Columbia University Press. Licensed from and portions copyright © 1995 by INSO Corporation.

20) Bowen, James, **A History of Western Education, Volume I, The Ancient World**, St. Martin's Press, New York, 1972, pg 61.

21) Cordasco, Francesco, **A Brief History of Education**, Littlefield, Adams & Co., 1976, pgs 4-9.

22) The Greek word polis meant both city and city-state. Since the city-state was independent, different states - and the same state at different times - had a variety of governments, ranging from absolute monarchy to pure democracy. Only citizens participated in the government of the city-state, and citizenship was limited to those born of citizen parents. Source: **The Canadian Encyclopaedia Plus** Copyright © 1996 by McClelland & Stewart Inc. The Columbia Encyclopaedia, Fifth Edition Copyright © 1994, 1995 Columbia University Press. Licensed from and portions copyright © 1995 by INSO Corporation.

23) It is an interesting twist of this Thesis report that E.M. Forster, in his 1928 novel titled The Machine Stops a book about mediated life in the future, uses a very similar phrase to recall a time before the machine took over most of man's burdens:

"You know that we have lost the sense of space. We say 'space is annihilated,' but we have annihilated not space, but the sense thereof. We have lost a part of ourselves. I determined to recover it and I began by walking up and down the platform of the railway outside my room. Up and down, until I was tired, and so did recapture the meaning of 'Near' and 'Far.' 'Near' is a place to which I can get quickly on my feet, not a place to which the train or the air-ship will take me quickly,. 'Far' is a place to which I cannot get quickly on my feet; the vomitory is 'Far', though I could be there in thirty eight second by summoning the train. Man is the measure. That was my first lesson. Man's feet are the measurer for distance, his hands are the measurer for ownership, his body is the measurer for all that is lovable and desirable and strong. Then I went further: it was then that I called you . . ." pg 17 - 18.

This quote was used in the Thesis Proposal to emphasis the idea that mediated life takes us away from what is essential to human senses.

24) Cordasco, Francesco, **A Brief History of Education**, Littlefield, Adams & Co., 1976, pg 9.

25) The first universities that parallel our current definition of the institution began in early Medieval Times. The earliest universities include: Salerno (9th cent.), Bologna (1088), Oxford (12th cent.), Cambridge (12th cent.), Paris (12th cent.) and Salamanca (c.1230). Source: **The Canadian Encyclopaedia Plus** Copyright © 1996 by McClelland & Stewart Inc. The Columbia Encyclopaedia, Fifth Edition Copyright © 1994, 1995 Columbia University Press. Licensed from and portions copyright © 1995 by INSO Corporation.

26) Cordasco, Francesco, **A Brief History of Education**, Littlefield, Adams & Co., 1976, pg 10.

27) Bowen, James, **A History of Western Education, Volume I, The Ancient World**, St. Martin's Press, New York, 1972, pg 203.

28) Stoic is a member of a Greek school of philosophy founded by Zeno (336?-264? BC). The school's doctrine taught that virtue is the highest good and that human beings should be free from passion and unmoved by life's happenings. Source: **The Canadian Encyclopaedia Plus** Copyright © 1996 by McClelland & Stewart Inc. Gage Canadian Dictionary. Copyright © 1983 by Gage Educational Publishing Company.

29) Generally, most historians accept this picture of an intellectual wasteland for this period, but some, namely Homer Charles Haskins (1870–1937), believe that the name more aptly refers to the lack of historical records rather than a lack of inventiveness and growth. Source: **The Canadian Encyclopaedia Plus** Copyright © 1996 by McClelland & Stewart Inc. The Columbia Encyclopaedia, Fifth Edition Copyright © 1994, 1995 Columbia University Press. Licensed from and portions copyright © 1995 by INSO Corporation.

30) Bowen, James, **A History of Western Education, Volume 2, Civilization of Europe**, St. Martin's Press, New York, 1975, pg 29.

31) Cordasco, Francesco, **A Brief History of Education**, Littlefield, Adams & Co., 1976, pg 25.

32) Cordasco, Francesco, **A Brief History of Education**, Littlefield, Adams & Co., 1976, pg 27.

33) Charlemagne (Charles the Great or Charles I) 742?–814, emperor of the West (800–814) and Carolingian king of the Franks (768–814). Source: **The Canadian Encyclopaedia Plus** Copyright © 1996 by McClelland & Stewart Inc. The Columbia Encyclopaedia, Fifth Edition Copyright © 1994, 1995 Columbia University Press. Licensed from and portions copyright © 1995 by INSO Corporation.

34) Bowen, James, **A History of Western Education, Volume 2, Civilization of Europe**, St. Martin's Press, New York, 1975, pg 31.

35) Notre-Dame de Paris was the cathedral church of Paris, and was a great achievement of early French Gothic architecture. It stands upon the Île de la Cité, a small island in the Seine. Source: **The Canadian Encyclopaedia Plus** Copyright © 1996 by McClelland & Stewart Inc. The Columbia Encyclopaedia, Fifth Edition Copyright © 1994, 1995 Columbia University Press. Licensed from and portions copyright © 1995 by INSO Corporation.

36) Leach, A. F., **The Schools of Medieval England**, London: Methuen, 1915, as recorded in A History of Western Education, Volume 2, Civilization of Europe, St. Martin's Press, New York, 1975, pg 30.

37) The Order of Freemasons is thought to have arisen from the English fraternities of stonemasons and cathedral builders in the early Middle Ages. Some historians of Masonry claim that the order has roots in antiquity. Source: **The Canadian Encyclopaedia Plus** Copyright © 1996 by McClelland & Stewart Inc. The Columbia Encyclopaedia, Fifth Edition Copyright © 1994, 1995 Columbia University Press. Licensed from and portions copyright © 1995 by INSO Corporation.

38) The sources for the description of Guilds come from sources previously cited:

> **The Canadian Encyclopaedia Plus** Copyright © 1996 by McClelland & Stewart Inc.;
> Bowen, James, **A History of Western Education, Volume 2, Civilization of Europe**, St. Martin's Press, New York, 1975, pgs 42-7.; and
> Cordasco, Francesco, **A Brief History of Education**, Littlefield, Adams & Co., 1976, pg 32.

39) Cordasco, Francesco, **A Brief History of Education**, Littlefield, Adams & Co., 1976, pg 32.

40) Instances of out and out dog fights abound in this period. Cohersion in the murder of the Archbishop of Canterbury

by Henry II and the excommunication of Frederick II by Pope Innocent III for antagonism towards the papacy are two of many examples of tension between the papacy and the sovereign ruler seen throughout this period. The sources for these rifts come from sources previously cited:

The Canadian Encyclopaedia Plus Copyright © 1996 by McClelland & Stewart Inc.;
Bowen, James, **A History of Western Education, Volume 2, Civilization of Europe**, St. Martin's Press, New York, 1975, pgs 76-8.; and
Cordasco, Francesco, **A Brief History of Education**, Littlefield, Adams & Co.,1976, pg 31.

41) The Reformation was a religious revolution that took place in Western and Northern Europe in the 16th century. It fought against doctrines of the medieval church and led to Protestantism. Source: **Webster's Ninth New Collegiate Dictionary**, 1983 by Merriam-Webster Inc. Springfield, Mass. USA.

42) Vergerius, Paulus, **On Noble Character and Liberal Studies**, c.1390, as recorded in A Brief History of Education, by Francesco Cordasco, Littlefield, Adams & Co., 1976, pg 43.

43) Cordasco, Francesco, **A Brief History of Education**, Littlefield, Adams & Co., 1976, pgs 4-9.

44) Cordasco, Francesco, **A Brief History of Education**, Littlefield, Adams & Co., 1976, pg 46.

45) Bowen, James, **A History of Western Education, Volume 2, Civilization of Europe**, St. Martin's Press, New York, 1975, pg 395.

46) The Gutenberg press brought mass produced printed books to the general population and changed the face of the world forever. Johannes Gutenberg (c.1397–1468) was a German inventor and printer. Source: **The Canadian Encyclopaedia Plus** Copyright © 1996 by McClelland & Stewart Inc. The Columbia Encyclopaedia, Fifth Edition Copyright © 1994, 1995 Columbia University Press. Licensed from and portions copyright © 1995 by INSO Corporation.

47) Bowen, James, **A History of Western Education, Volume 2, Civilization of Europe**, St. Martin's Press, New York, 1975, pg 255.

48) Martin Luther's teachings are widely published and widely reported. Here, our primary reference is obtained from **A History of Western Education, Volume 2, Civilization of Europe**, St. Martin's Press, New York, 1975, pg 360-76, although an interesting summary of his influence is found in **A Concise History of Education to 1900 AD**, by Gwynne-Thomas, E.H..

49) Coulton, G.G., **Life in the Middle Ages**, 1954 as recorded in A History of Western Education, Volume 2, Civilization of Europe, St. Martin's Press, New York, 1975, pg 289.

50) This information is inferred from data from **The Canadian Encyclopaedia Plus** by dividing today's German population by today's world population and then multiplying that factor against the world population in the 1500's to determine an estimate of Germany's 1503 population. The number of 4,000 students was then applied against that calculated German population to determine the percentage.

51) All census data was obtained from **The Canadian Encyclopaedia Plus** Copyright © 1996 by McClelland & Stewart Inc. The Columbia Encyclopaedia, Fifth Edition Copyright © 1994, 1995 Columbia University Press. Licensed from and portions copyright © 1995 by INSO Corporation.

52) Gwynne-Thomas, E.H., **A Concise History of Education to 1900 AD**, University Press of America Inc., 1981, pg 115.

53) Comenius, John Amos (1592-1670), as recorded in **A Brief History of Education**, Littlefield, Adams & Co., 1976, pg 71.

54) The Industrial Revolution is a period marked by economic changes from an agricultural economy to an industrial society using complex machinery rather than tools. It generally refers to the period in British history from the middle of the 18th century to the middle of the 19th century. Source: **The Canadian Encyclopaedia Plus** Copyright © 1996 by McClelland & Stewart Inc. The Columbia Encyclopaedia, Fifth Edition Copyright © 1994, 1995 Columbia University Press. Licensed from and portions copyright © 1995 by INSO Corporation.

55) In depth reviews of American educational (read The United States) are found throughout all the reference books noted in the bibliography. Particularly, a short overview in **A Brief History of Education** is interesting and edifying.

56) Gwynne-Thomas, E.H., **A Concise History of Education to 1900 AD**, University Press of America Inc., 1981, pg 130.

57) Lalonde, André N. **Colonization Companies**, Source: The Canadian Encyclopaedia Plus Copyright © 1996 by McClelland & Stewart Inc.

58) Gaffield, Chad, **History of Education**, Source: The Canadian Encyclopaedia Plus Copyright © 1996 by McClelland & Stewart Inc. pgs 1-3.

59) The phrase 'separate and conquer' is the author's own opinion based on reports from many of the referenced materials. A sample follows:

"From the 1830s the churches, mainly the Roman Catholic and Anglican denominations, in co-operation with the colonial governments and later the federal government, began to establish residential (boarding) schools for native peoples. By 1900 there were 64 residential schools in Canada. Staffed by missionary teachers who gave vocational and manual as well as religious instruction, these schools were seen as the ideal system for educating native people because they removed children from the influences of traditional family life. They complemented the prevailing policy of assimilating native peoples into white society."

Source: **The Canadian Encyclopaedia Plus** Copyright © 1996 by McClelland & Stewart Inc.

60) Gaffield, Chad, **History of Education**, Source: The Canadian Encyclopaedia Plus Copyright © 1996 by McClelland & Stewart Inc. pgs 3-5.

61) The Quiet Revolution occurred in the 1960's in Quebec and was a period of rapid change against the out-of-synch Union Nationale Party. Under the leadership of Lesage the Québec Liberal Party developed a wide sweeping series of reforms which saw increases in public spending from $745 million to $2.1 billion and huge changes in educational sponsorship. Source: **The Canadian Encyclopaedia Plus** Copyright © 1996 by McClelland & Stewart Inc.

62) We compare with or exceed the world in many categories:

1- amount of money spent per student;
2- amount of money spent of education compared to GNP;
3- age of mandatory attendance;
4- availability of schools (no. per capita); and
5. student enrollment.

Source: **The Canadian Encyclopaedia Plus** Copyright © 1996 by McClelland & Stewart Inc.

SECTION TWO-C - AN HISTORICAL PERSPECTIVE - TECHNOLOGY

1) Source: **The Canadian Encyclopaedia Plus**, Copyright © 1996 by McClelland & Stewart Inc. Gage Canadian Dictionary. Copyright © 1983 by Gage Educational Publishing Company.

2) Source: **Webster's Ninth New Collegiate Dictionary**, 1983 by Merriam-Webster Inc. Springfield, Mass. USA.

3) Desmond, Kevin, **The Harwin Chronology of Inventions, Innovations Discoveries From Pre-History to the Present Day**, St. Edmumdsbury Press, 1987, Introduction.

4) Source: **The Canadian Encyclopaedia Plus**, copyright © 1996 by McClelland & Stewart Inc. Gage Canadian Dictionary. Copyright © 1983 by Gage Educational Publishing Company.

5) Source: **The Canadian Encyclopaedia Plus**, 1996 by McClelland & Stewart Inc. The Columbia Encyclopaedia, Fifth Edition Copyright © 1994, 1995 Columbia University Press.

6) Bowen, James, **A History of Western Education, Volume I, The Ancient World**, St. Martin's Press, New York, 1972, pg 6-9.

7) Desmond, Kevin, **The Harwin Chronology of Inventions, Innovations Discoveries From Pre-History to the Present** Day, St.. Edmumdsbury Press, 1987, pg title: 8050 BC.

8) Hodges, Henry, **Technology in the Ancient World**, The Penguin Press, 1970, pg 53.

9) It should be stressed that, while man's dominance of the earth is noted many times throughout this report, the idea of whether this dominance is a good thing or a bad thing, or whether man has done well by his control over the environment, is not considered. It is also assumed that man does dominate the earth as he alone is the only species that is able to entirely destroy the world. In this sense, he dominates the earth.

10) Hodges, Henry, **Technology in the Ancient World**, The Penguin Press, 1970, pg 72.

11) Hodges, Henry, **Technology in the Ancient World**, The Penguin Press, 1970, pg 87.

12) Slavery has been around since before recorded history. Slavery in the Ancient World extends back to the ancient Babylonian code of Hammurabi and was common in ancient Egypt where slave labour was used in building the temples and pyramids. Source: **The Canadian Encyclopaedia Plus** Copyright © 1996 by McClelland & Stewart Inc. The Columbia Encyclopaedia, Fifth Edition Copyright © 1994, 1995 Columbia University Press. Licensed from and portions copyright © 1995 by INSO Corporation.

13) Hodges, Henry, **Technology in the Ancient World**, The Penguin Press, 1970, pg 179.

14) Desmond, Kevin, **The Harwin Chronology of Inventions, Innovations Discoveries From Pre-History to the Present Day**, St. Edmumdsbury Press, 1987, pg title: 250 BC.

15) Hodges, Henry, **Technology in the Ancient World**, The Penguin Press, 1970, pg 166.

16) Hodges, Henry, **Technology in the Ancient World**, The Penguin Press, 1970, pg 182.

17) Hodges, Henry, **Technology in the Ancient World**, The Penguin Press, 1970, pg 177.

18) Desmond, Kevin, **The Harwin Chronology of Inventions, Innovations Discoveries From Pre-History to the Present Day**, St. Edmumdsbury Press, 1987, pg title: 124 AND- 800 AD.

19) Cardwell, D.S.L., **Turning Points in Western Technology**, Neale Watson Academic Publication, Inc., 1972, pg 7.

20) Source: **The Canadian Encyclopaedia Plus** Copyright © 1996 by McClelland & Stewart Inc. The Columbia Encyclopaedia, Fifth Edition Copyright © 1994, 1995 Columbia University Press. Licensed from and portions copyright © 1995 by INSO Corporation.

21) Cardwell, D.S.L., **Turning Points in Western Technology**, Neale Watson Academic Publication, Inc., 1972, pg 7.

22) Gwynne-Thomas, E.H., **A Concise History of Education to 1900 AD**, University Press of America Inc., 1981, pg 119.

23) Gwynne-Thomas, E.H., **A Concise History of Education to 1900 AD**, University Press of America Inc., 1981, pg 120.

24) Cordasco, Francesco, **A Brief History of Education**, Littlefield, Adams & Co., 1976, pgs 61-2.

25) Bowen, James, **A History of Western Education, Volume 2, Civilization of Europe**, St. Martin's Press, New York, 1975, pgs 260-90.

26) Cordasco, Francesco, **A Brief History of Education**, Littlefield, Adams & Co., 1976, pgs 124-6.

27) **The Canadian Encyclopaedia Plus** Copyright © 1996 by McClelland & Stewart Inc. The Columbia Encyclopaedia, Fifth Edition Copyright © 1994, 1995 Columbia University Press. Licensed from and portions copyright © 1995 by INSO Corporation.

28) Desmond, Kevin, **The Harwin Chronology of Inventions, Innovations Discoveries From Pre-History to the Present Day**, St. Edmumdsbury Press, 1987, pg title: 1805 AD.

29) Charles Babbage was an English inventor and mathematician. He theorized a mechanical calculating machine that foreshadowed present-day computers. Source: **The Canadian Encyclopaedia Plus** Copyright © 1996 by McClelland & Stewart Inc. The Columbia Encyclopaedia, Fifth Edition Copyright © 1994, 1995 Columbia University Press. Licensed from and portions copyright © 1995 by INSO Corporation.

30) Source: **The Canadian Encyclopaedia Plus** Copyright © 1996 by McClelland & Stewart Inc. The Columbia Encyclopaedia, Fifth Edition Copyright © 1994, 1995 Columbia University Press. Licensed from and portions copyright © 1995 by INSO Corporation. and Desmond, Kevin, **The Harwin Chronology of Inventions, Innovations Discoveries From Pre-History to the Present Day**, St. Edmumdsbury Press, 1987, pg title: 1946 AD.

31) Source: **The Canadian Encyclopaedia Plus** Copyright © 1996 by McClelland & Stewart Inc.

32) Cardwell, D.S.L., **Turning Points in Western Technology**, Neale Watson Academic Publication, Inc., 1972, pgs 62-85.

SECTION THREE-A - OUR CURRENT ENDEAVOURS - PLACE

1) Negreponte, Nicholas. **Being Digital**, Alfred A. Knoph, New York, 1995, Chapter 1 - The DNA of Information.

2) Slouka, Mark., **War of the Worlds**, Basic Books - A Division of Harper Collins Publishers, 1995, pgs 45-6.

3) Slouka, Mark., **War of the Worlds**, Basic Books - A Division of Harper Collins Publishers, 1995, pgs 155-9.

4) Slouka, Mark., **War of the Worlds**, Basic Books - A Division of Harper Collins Publishers, 1995, pgs 29.

5) **The Canadian Encyclopaedia Plus**, copyright © 1996 by McClelland & Stewart Inc. Gage Canadian Dictionary. Copyright © 1983 by Gage Educational Publishing Company.

6) Stuebing, Susan, **Redefining the Place to Learn**, OECD (Organisation for Economic Co-operation and Development), 1995, pg 16-25.

7) Sonnier, Isadore L. (ed.), **Methods and Techniques of Holistic Education**, Charles C. Thomas Publisher, 1984, chapter 1.

8) Sonnier, Isadore L. (ed.), **Methods and Techniques of Holistic Education**, Charles C. Thomas Publisher, 1984, pgs 36-41.

9) Sonnier, Isadore L. (ed.), **Methods and Techniques of Holistic Education**, Charles C. Thomas Publisher, 1984, pgs 36-41.

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11) Organisation for Economic Co-operation and Development (OECD), **Making Better Use of School Buildings**, OECD / PEB Publications, 1996, pg 10.

12) Organisation for Economic Co-operation and Development (OECD), **Making Better Use of School Buildings**, OECD / PEB Publications, 1996, pg 10.

SECTION THREE-B - OUR CURRENT ENDEAVOURS - EDUCATION

1) All data in this section regarding the number and percentages of students attending Canadian Schools were obtained from **The Canadian Encyclopaedia Plus** Copyright © 1996 by McClelland & Stewart Inc.

2) Anisef, P. and Lennards, J., **University**, source: The Canadian Encyclopaedia Plus Copyright © 1996 by McClelland & Stewart Inc.

3) Haughey, Margaret, **Distance Learning**, source: The Canadian Encyclopaedia Plus Copyright © 1996 by McClelland & Stewart Inc.

4) Gross, Ronald, **Peak Learning**, Jeremy P. Tarcher, Inc., 1991, pg 234.

5) Barlow, Maude and Robertson, Heather-Jane, **Class Warfare - The Assault on Canada's Schools**, Key Porter Books, 1994, pgs 180-3.

6) Barlow, Maude and Robertson, Heather-Jane, **Class Warfare - The Assault on Canada's Schools**, Key Porter Books, 1994, pg 182.

7) Across Canada, over 65% of colleges offer at least one distance education course with over 60,000 students enrolled and over 35 universities offer distance education programs. Many government departments and over 35% of large companies in Canada are already using some form of distance education. Commercial suppliers as well as industrial, trade and professional organizations are also providing distance learning courses and resources. Source: The Canadian Encyclopaedia Plus Copyright © 1996 by McClelland & Stewart Inc.

8) The readings for this Thesis include books, Internet research articles, published research papers and encyclopaedia references. These references are indicated throughout the Reference and Bibliographic sections of this report.

9) Barlow, Maude and Robertson, Heather-Jane, **Class Warfare - The Assault on Canada's Schools**, Key Porter Books, 1994.

10) Bruer, John T., **Schools for Thought - A Science of Learning in the Classroom**, A Bradford Book - The MIT Press, 1993.

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12) Anglin, Gary J. (ed.), **Instructional Technology**, Libraries Unlimited, Inc. 1991.

13) Black, Ginger E., **Making the Grade**, Carol Publishing Group, 1989, pg 139.

14) Goodlad, John I., **A Place Called School - Prospects for the Future**, The Institute for the Development of Educational Activities, 1984, pg. introduction.

15) Barlow, Maude and Robertson, Heather-Jane, **Class Warfare - The Assault on Canada's Schools**, Key Porter Books, 1994, pg 30. While the authors go on to debunk this quote, it is appropriate because it is a common statement of our governments about education.

16) Goodlad, John I., **A Place Called School - Prospects for the Future**, The Institute for the Development of Educational Activities, 1984, pgs 2-10.

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18) Barlow, Maude and Robertson, Heather-Jane, **Class Warfare - The Assault on Canada's Schools**, Key Porter Books, 1994, pg 174.

19) Twigg, Carol, **Academic Productivity: The Case for Instructional Software**, A Report from the Broadmoor Round table, Colorado Springs, Colorado, July 24-25, 1996, pg 3.

20) Goodlad, John I., **A Place Called School - Prospects for the Future**, The Institute for the Development of Educational Activities, 1984, pg 227.

21) This quote is from the 1960's Coleman Report which looked at successful teaching approaches. Rothstein, Pamela R., **Educational Psychology**, McGraw-Hill, Inc., 1990, pgs 16-7.

22) Perkins, David, **Smart Schools - From Training Memories to Educating Minds**, The Free Press, A Division of Macmillan, Inc. 1992, pg 7.

23) Rothstein, Pamela R., **Educational Psychology**, McGraw-Hill, Inc., 1990, pgs 2-5.

24) Rothstein, Pamela R., **Educational Psychology**, McGraw-Hill, Inc., 1990, pgs 110-15.

25) A recent parent/teacher interview between the myself and my son's grade two teacher is a good example of changing teaching techniques of the "status quo" type schools. The teacher was asked about a paper that was brought home by my son which was wrought with spelling and grammatical errors, none of which were corrected. When asked if this level of (in)competency in basic English and grammar is typical at this grade level the teacher replied that the students are encouraged to write rather than bother with spelling and grammar - spelling and grammar are not corrected at this stage. The teacher then offered that basic mathematical learning skills were similarly viewed in that the students are encouraged to use any method to satisfy the answer put before them. The teacher showed frustration by saying that "in my day," grade two students were expected to know that three and three is six, and not to have to count on their fingers to figure it out. Additionally, homework and home reading is not encouraged at this level in this school so we were not to expect any homework or reading assignments for our son.

26) Romaniuk, E. W., **Computer Assisted Learning**, Source: The Canadian Encyclopaedia Plus Copyright © 1996 by McClelland & Stewart Inc.

27) Romaniuk, E. W., **Computer Assisted Learning**, Source: The Canadian Encyclopaedia Plus Copyright © 1996 by McClelland & Stewart Inc.

28) Romaniuk, E. w., **Computer Assisted Learning**, Source: The Canadian Encyclopaedia Plus Copyright © 1996

by McClelland & Stewart Inc.

29) This quote is an example of a Socratic type question. Hofstadter, Douglas R., **Godel, Escher, Bach: An Eternal Golden Braid**, Vintage Books, A Division of Random House, 1979, pg 29.

30) Varma, Indu, **Reaching Out With Telecommunication**, J. Educational Technology Systems, Baywood Publishing Co., Inc., Vol 21(3), pg 371.

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33) Allen-Ikeson, Jean, **The World is a Textbook in the Internet Age**, The Computer Paper, pg C4.

34) Source: **The International WWW Schools Registry**, at Web66 on the Internet at address www.web66.com.

35) The graphic is "borrowed" and modified from CyberHigh's Internet Web Page. Hathaway, Rus and Hathaway, Warren, **CyberHigh: A Real School in a Virtual Community - The Future is Here**, CyberHigh Appendix 2 from CyberHigh Web Page, pg 3 of 9.

36) Romaniuk, E. W., **Computer Assisted Learning**, Source: The Canadian Encyclopaedia Plus Copyright © 1996 by McClelland & Stewart Inc.

37) Perelman, Lewis J., **School's Out - HyperLearning, The New Technology, and the End of Education**, William Monroe and Company, 1992 pgs 54-65.

38) Twigg, Carol, **Academic Productivity: The Case for Instructional Software**, A Report from the Broadmoor Round table, Colorado Springs, Colorado, July 24-25, 1996, pg 4.

39) Massey, William F. and Zemsky, Robert, **Using Information Technology to Enhance Academic Productivity**, Educom publication, 1995, pg 1.

40) Perelman, Lewis J., **School's Out - HyperLearning, The New Technology, and the End of Education**, William Monroe and Company, 1992 chapter 2.

41) Description for Mind Extension University. Source: **America On Line NetFind: Reviews: Distance Learning**, Internet search for Online Distance Learning Centres.

42) Description for National Technical University. Source: **America On Line NetFind: Reviews: Distance Learning**, Internet search for Online Distance Learning Centres.

43) Description for Globewide Network Academy. Source: **America On Line NetFind: Reviews: Distance Learning**, Internet search for Online Distance Learning Centres.

44) Description for International University College. Source: **America On Line NetFind: Reviews: Distance Learning**, Internet search for Online Distance Learning Centres.

45) Description for Magellan University. Source: **America On Line NetFind: Reviews: Distance Learning**, Internet search for Online Distance Learning Centres.

46) Description for Virtual Online University. Source: **America On Line NetFind: Reviews: Distance Learning**, Internet search for Online Distance Learning Centres.

47) Description for Virtual School. Source: **America On Line NetFind: Reviews: Distance Learning**, Internet search for Online Distance Learning Centres.

48) Twigg, Carol, **Academic Productivity: The Case for Instructional Software**, A Report from the Broadmoor Round table, Colorado Springs, Colorado, July 24-25, 1996, pg 1.

49) Source: Alberta Education Web Page: **Education in Alberta**, at assembly.ab.ca.

50) Although the United States generally is viewed as the leader in distance and virtual education (as seen through the eyes of Educom and NLII), my reviews on the Internet gave me the overwhelming impression that Australia and Canada are at least as advanced (perhaps though not as numerous) as our contemporaries in the United States. Web Pages, available curriculum and the apparent quality of the course load, all seem to be comparable. In some instances the Canadian and the Australian offerings actually appear to be more specific to the intended end user and therefore more in tune with the needs of the student - of Engaging the Student.

51) Source: Alberta Education Web Page: **Provincial Implementation of Career and Technology Studies Launched**, pg 30.

52) Opmeer, Melanie, **Athabasca University**, The Canadian Encyclopaedia Plus Copyright © 1996 by McClelland & Stewart Inc.

53) CyberHigh's Internet Web Page. Hathaway, Rus and Hathaway, Warren, **CyberHigh: A Real School in a Virtual Community - The Future is Here**, CyberHigh Appendix 2 from CyberHigh Web Page, pg 2 of 9.

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2) Negreponte, Nicholas. **Being Digital**, Alfred A. Knoph, New York, 1995, chapter 2 - Debugging Bandwidth.

3) One good example of this is the Internet programme manager from MS/NBC. One can change the front page of the browser to show user specific and desired information. So if one is interested in viewing only the hockey scores when one logs on, that is what is shown. Or only current news, or weather, or foreign news. It is all in the setup and is user definable.

4) The United States, through Vice President Mr. Al Gore, is promoting the Information Superhighway and has congressional programmes aimed at developing the US's role. Japan has committed $450 billion by the year 2015 to create the backbone for the Information superhighway. Canada has created the Information Highway Advisory Council to review the impact of information on our society. The UK has put aside $45 billion to review the economic hit from a developed Information Age. The European Committee has set aside $250 billion to counteract the American's $100 billion.

5) Melody, William H., **Information Society**, The Canadian Encyclopaedia Plus Copyright © 1996 by McClelland & Stewart Inc.

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8) This reference is from a City of Calgary Library flier promoting book reading.

9) Fenna, Donald, **Internet**, Source: The Canadian Encyclopaedia Plus Copyright © 1996 by McClelland & Stewart

Inc.

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20) Fabris, Marta E., **Using Multi-Media in the Multicultural Classroom**, Baywood Publishing Co., Inc., J. Educational Technology Systems, 1992-3 Vol. 21(2), pg 164.

21) Source: **The Canadian Encyclopaedia Plus** Copyright © 1996 by McClelland & Stewart Inc.

22) Local Calgary Radio Shack stores offer a video conferencing package for around $700.00.

23) Source: **The Canadian Encyclopaedia Plus** Copyright © 1996 by McClelland & Stewart Inc.

24) Barker, Donald I., **A Technological Revolution in Higher Education**, Baywood Publishing Co., Inc., J. Educational Technology Systems, 1994-5 Vol. 23(2), pg 164.

25) Barker, Donald I., **A Technological Revolution in Higher Education**, Baywood Publishing Co., Inc., J. Educational Technology Systems, 1994-5 Vol. 23(2), pg 164.

26) Barker, Donald I., **A Technological Revolution in Higher Education**, Baywood Publishing Co., Inc., J. Educational Technology Systems, 1994-5 Vol. 23(2), pg 164.

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(7) Alberta Vocational College AMEE Fact Sheet, **AMEE Facts**, 1996, pg 2.

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SECTION SEVEN - ANALYSIS AND EVALUATION

(1) Murphy, Linus, **Thesis Proposal for the RAIC Syllabus Programme**, May 1997.

SECTION EIGHT - DEVELOPMENT OF THE PROGRAMME

No references

SECTION NINE - DESIGN PROPOSAL

No references

SECTION TEN - SUMMARY AND CONCLUSIONS

No references

APPENDIX A - SITE ANALYSIS CRITERIA SHEET

No references

APPENDIX B - THESIS PROJECT DESIGN SOLUTION

No references

APPENDIX C - A SERIES OF SUPPORTIVE RESEARCH NOTES

No references

SITE ANALYSIS CRITERIA SHEET

APPENDIX-A

11.1 INTRODUCTION - APPENDIX A - SITE ANALYSIS CRITERIA SHEET

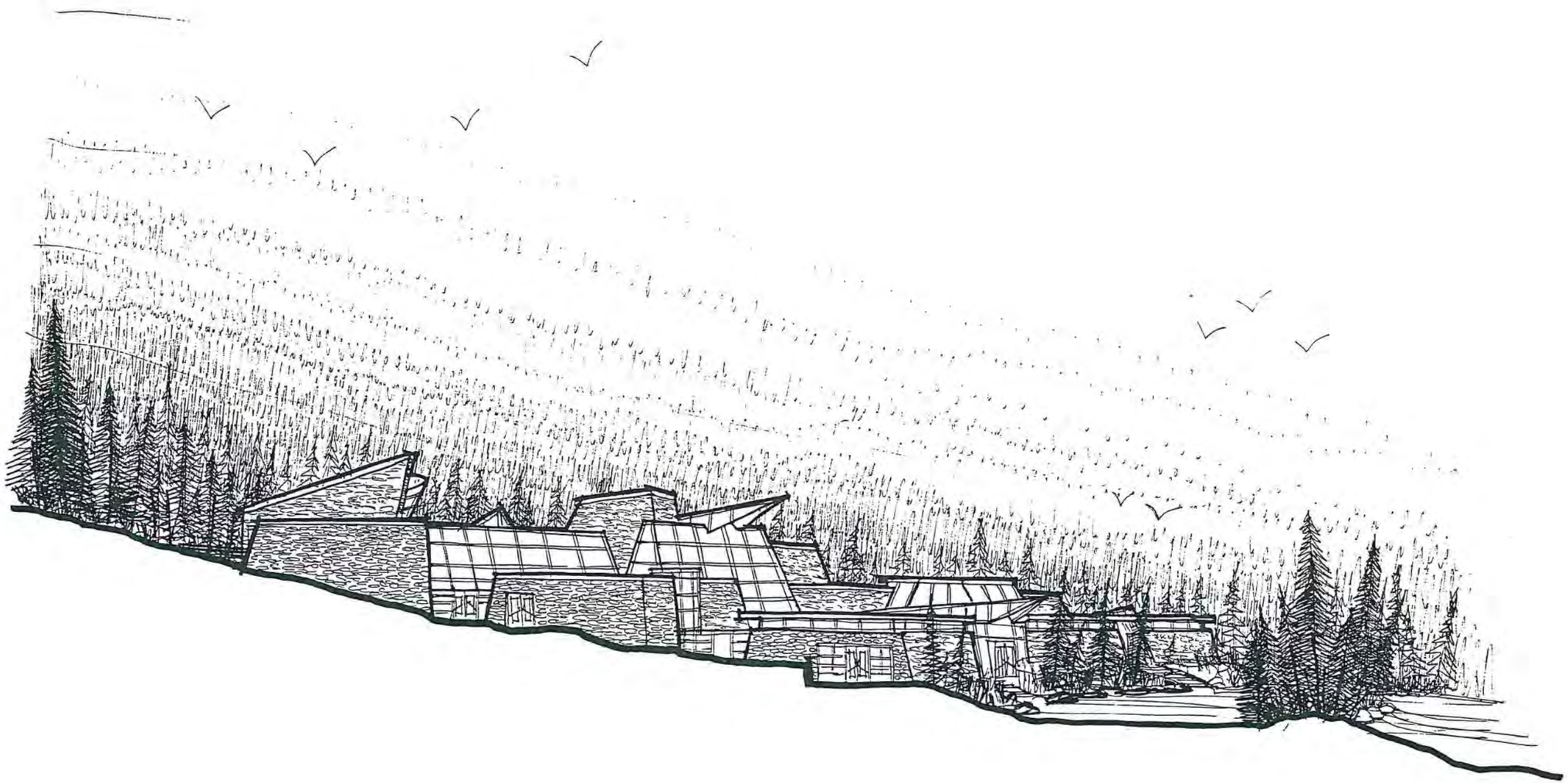
From Section 7, Analysis and Evaluation, a number of site needs were summarised that generally described school site needs. These needs were very specifically focused on the site needs of this Thesis Design Project. The following page illustrates the site criteria sheet developed to assist in assessing the site location of either the CASN's or the CEF's.

THESIS DESIGN
PROJECT DESIGN
SOLUTION

APPENDIX-B

12.1 INTRODUCTION - APPENDIX B - THESIS DESIGN PROJECT DESIGN SOLUTION

This section of the Thesis Design Project will be completed during the design stages of the project and will be included in the final submission of the Thesis Report.



WEST ELEVATION

RAIC SYLLABUS
THESIS LEVEL DESIGN
STUDENT NO. AB 830004

TRUE NORTH
DRAWING NORTH

COMMUNITY ACCESS SATELLITE NODE

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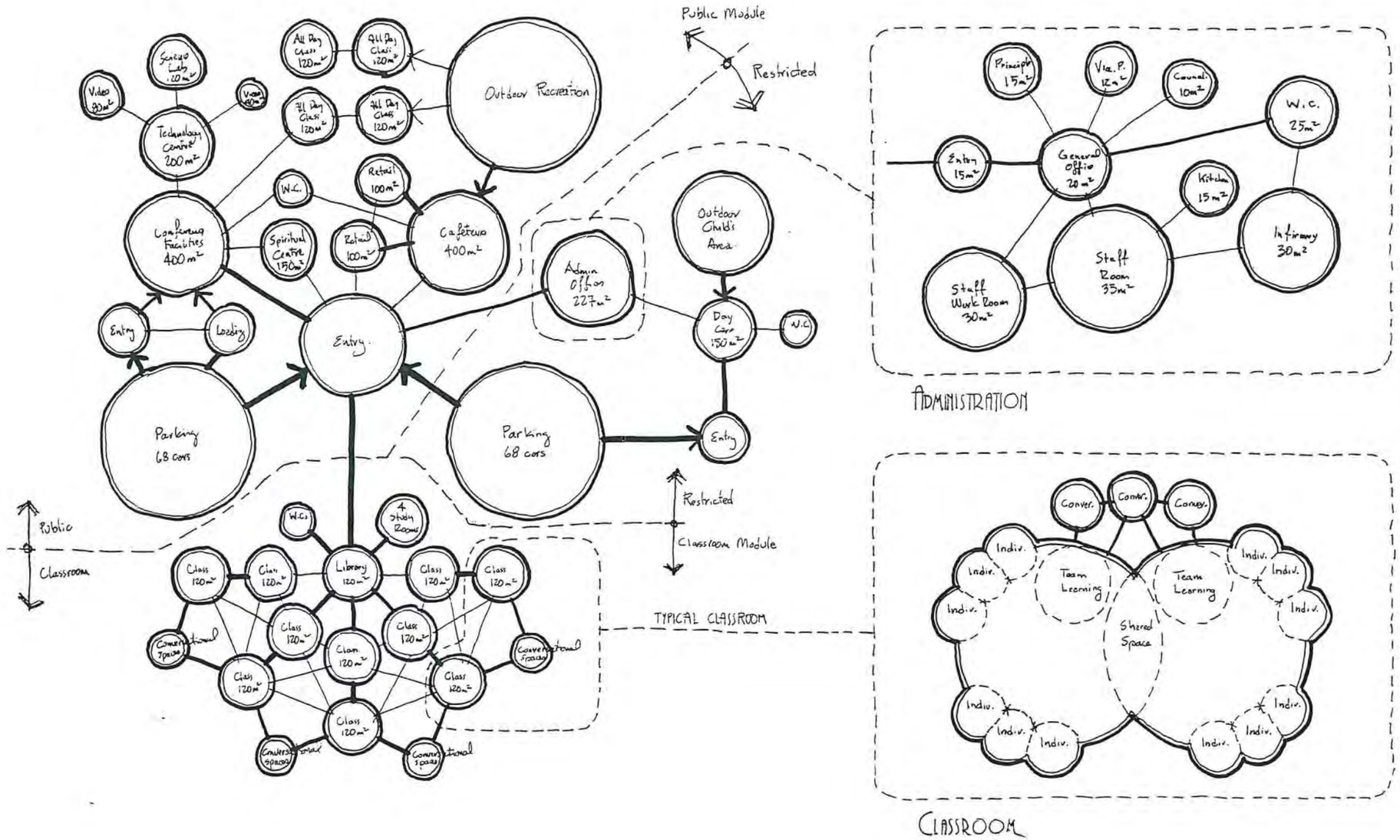

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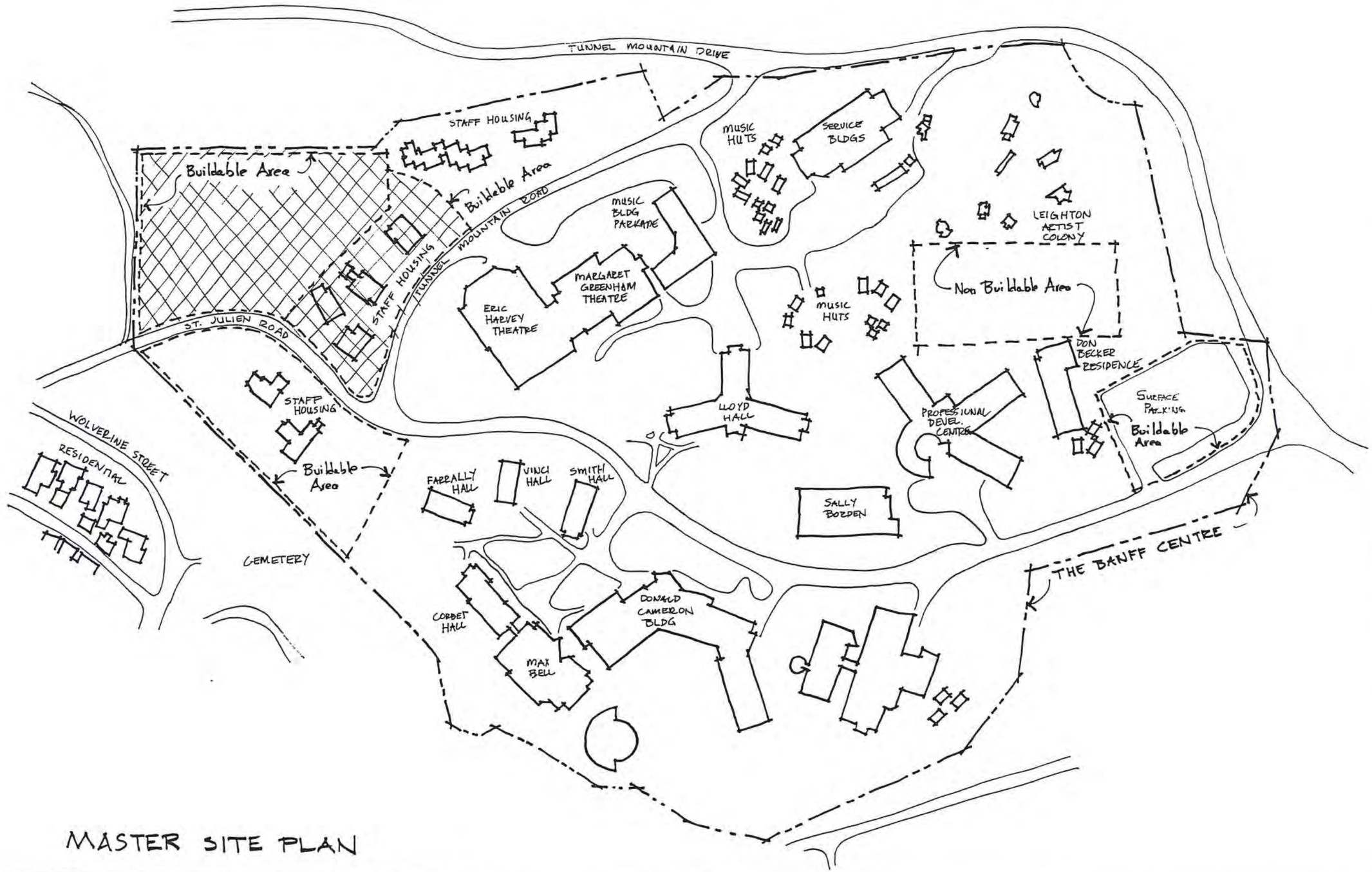

MASTER SITE PLAN

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STUDENT NO. AB 830004

TRUE NORTH
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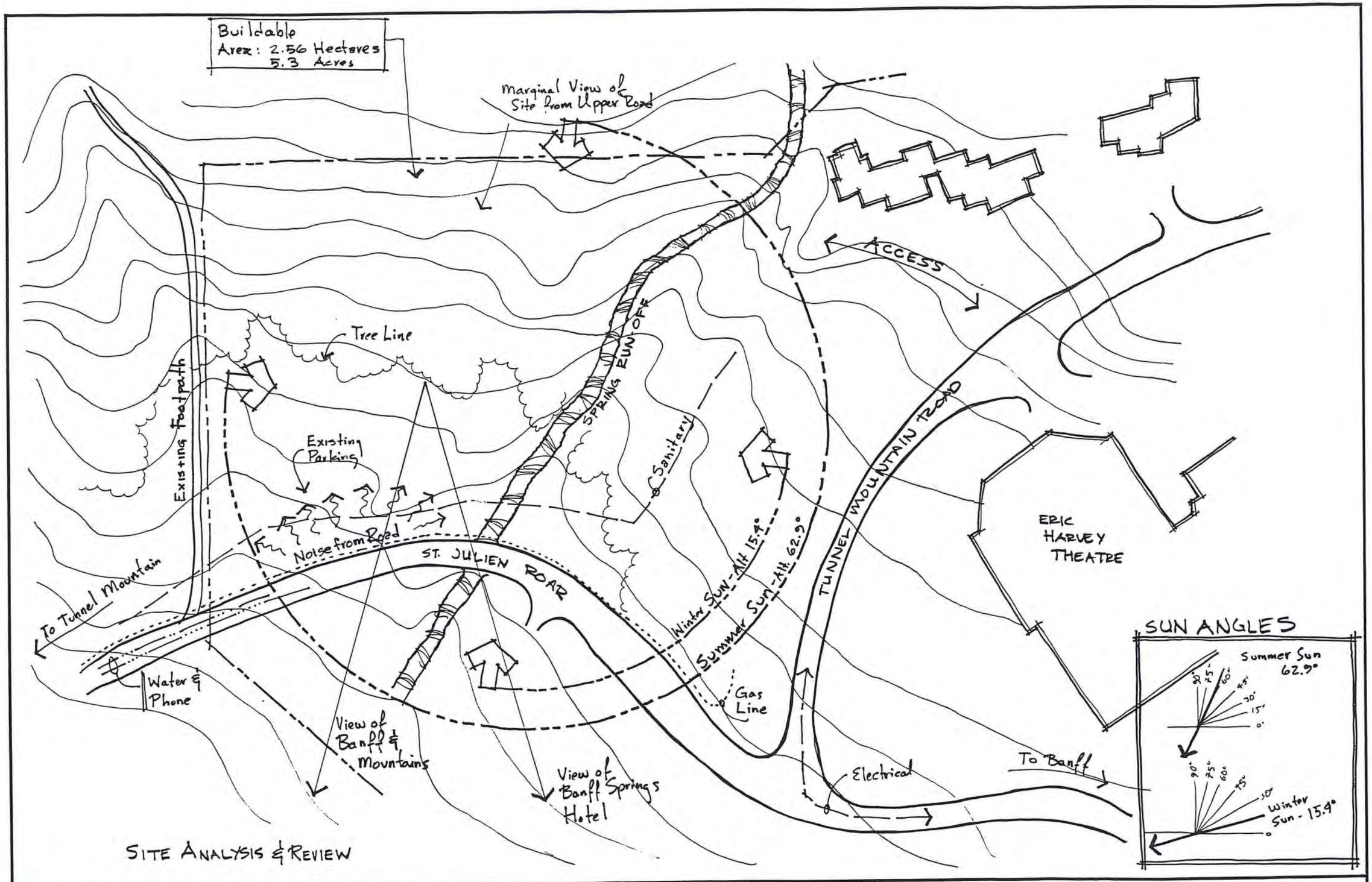

RAIC SYLLABUS
THESIS LEVEL DESIGN
STUDENT NO. AB 830004

TRUE NORTH
DRAWING NORTH

COMMUNITY ACCESS SATELLITE NODE

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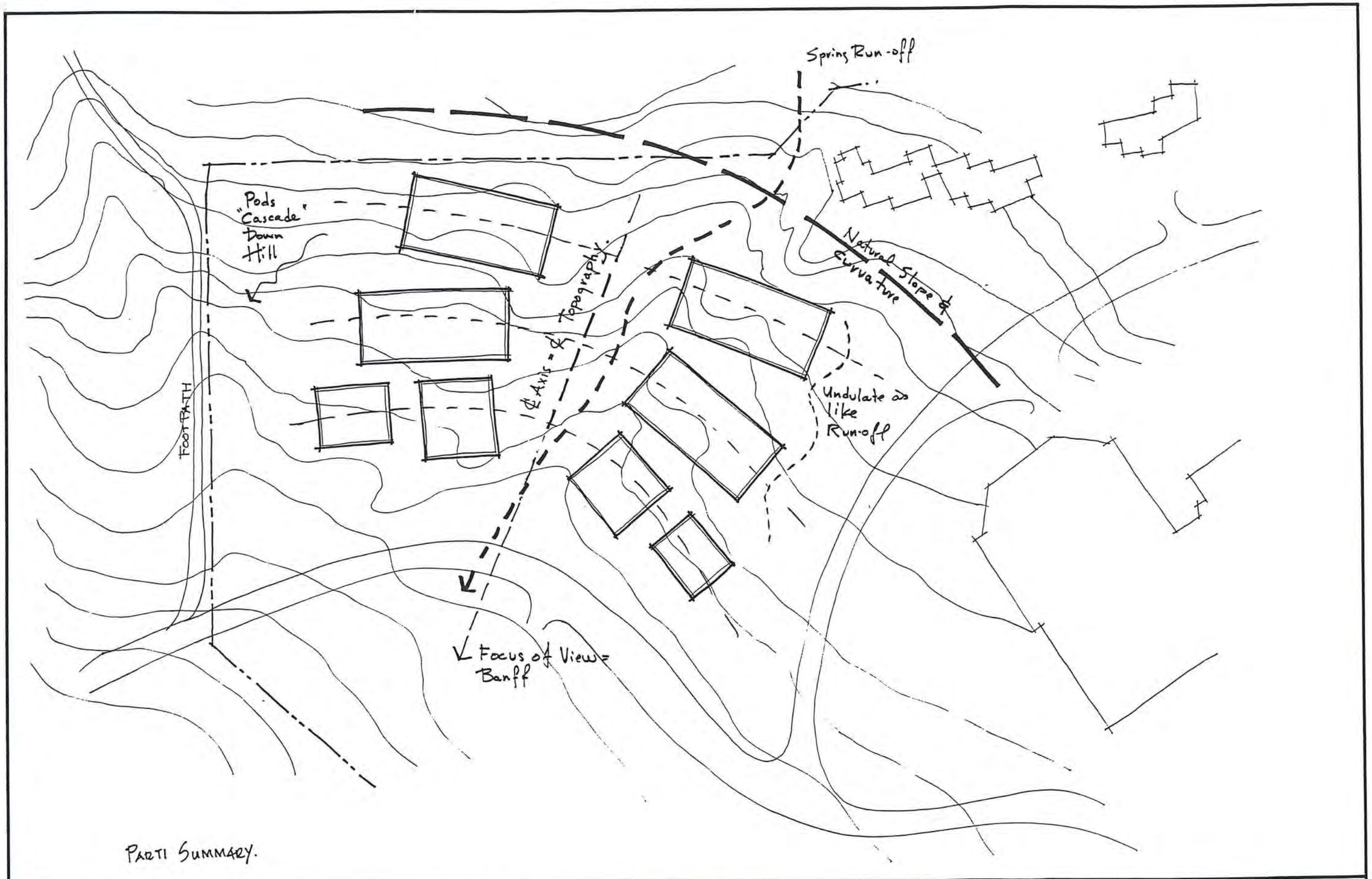

RAIC SYLLABUS
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TRUE NORTH
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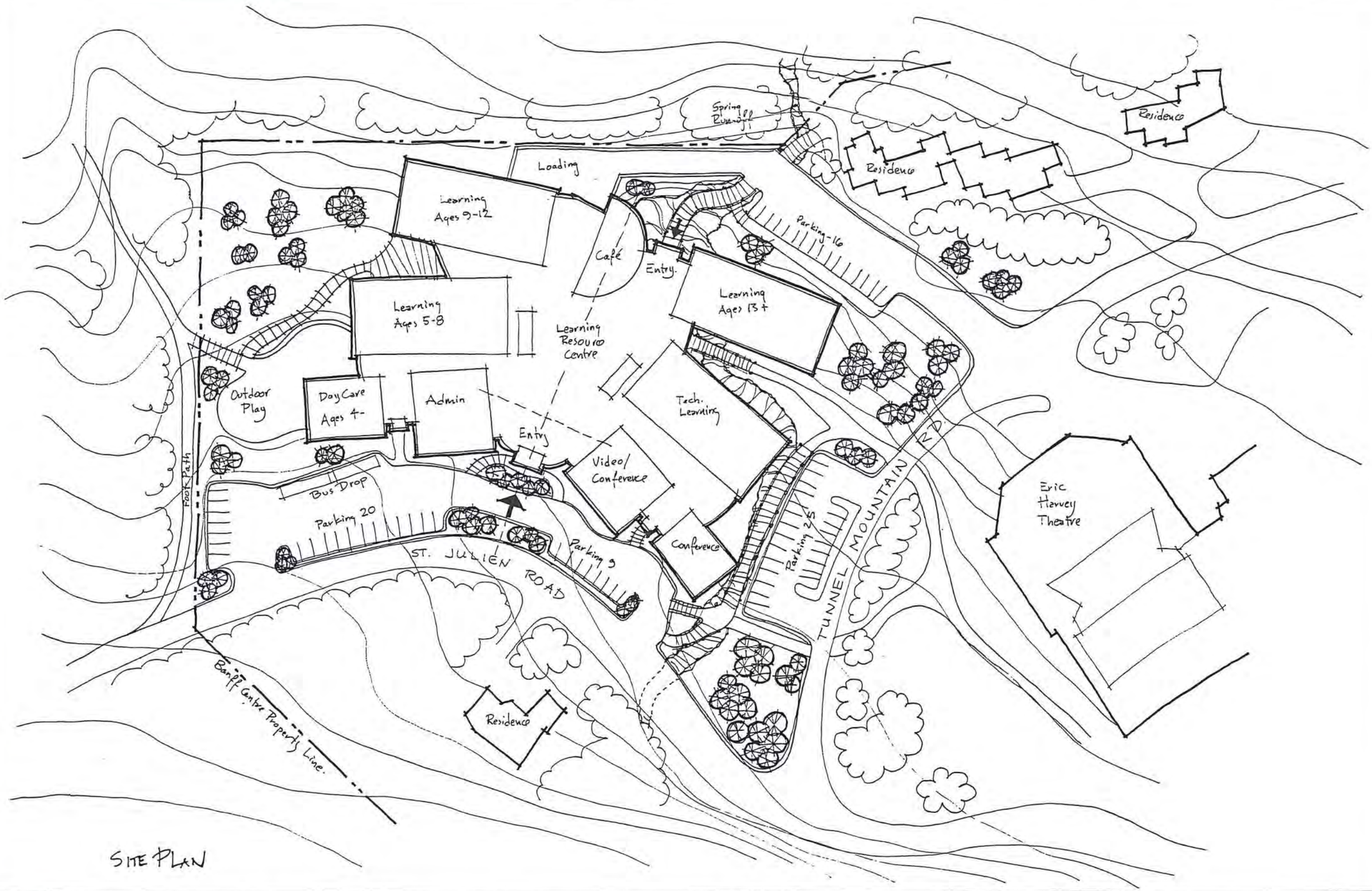

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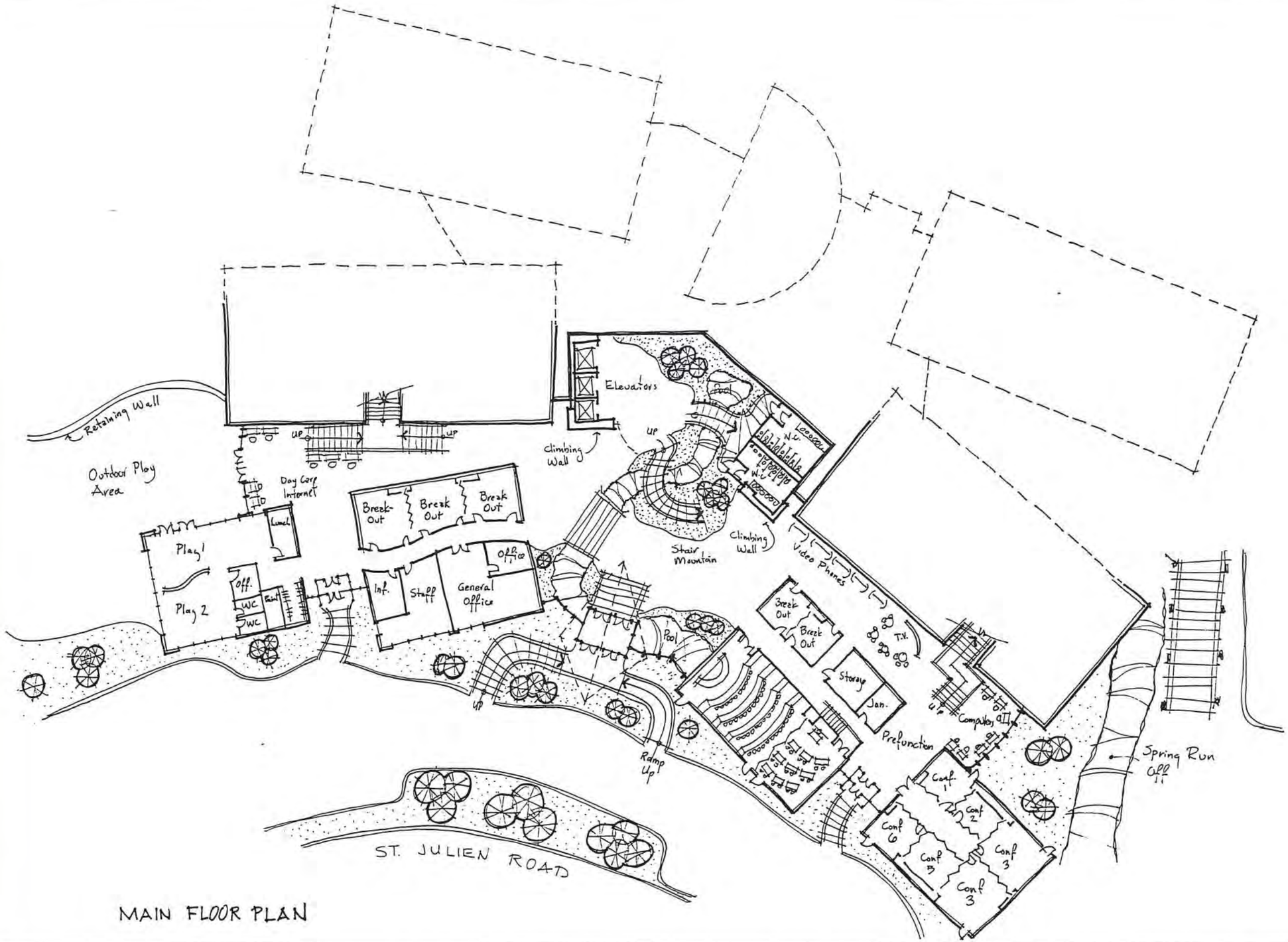

MAIN FLOOR PLAN

RAIC SYLLABUS
THESIS LEVEL DESIGN
STUDENT NO. AB 830004

TRUE NORTH
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COMMUNITY ACCESS SATELLITE NODE

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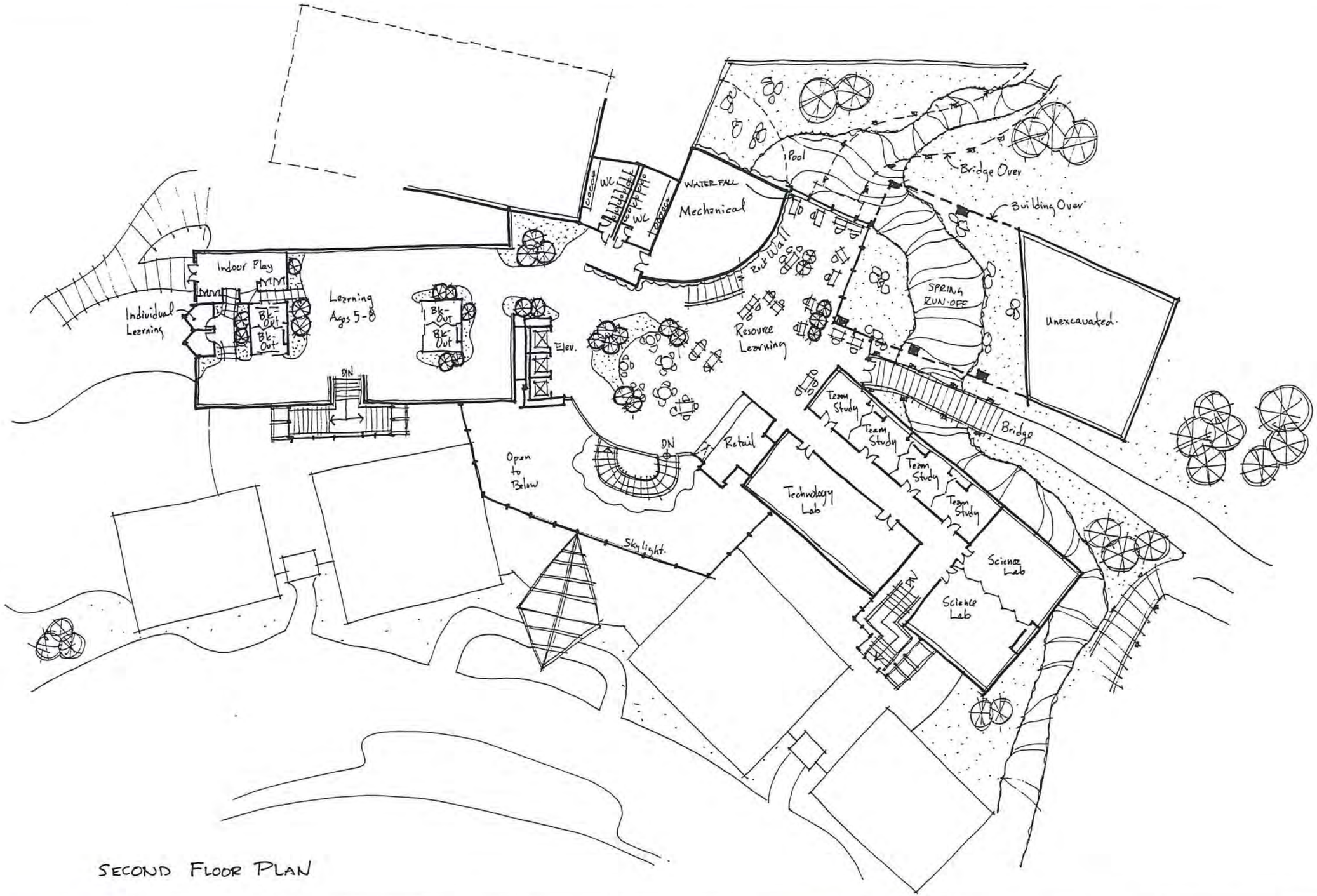

SECOND FLOOR PLAN

RAIC SYLLABUS
THESIS LEVEL DESIGN
STUDENT NO. AB 830004

TRUE NORTH
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COMMUNITY ACCESS SATELLITE NODE

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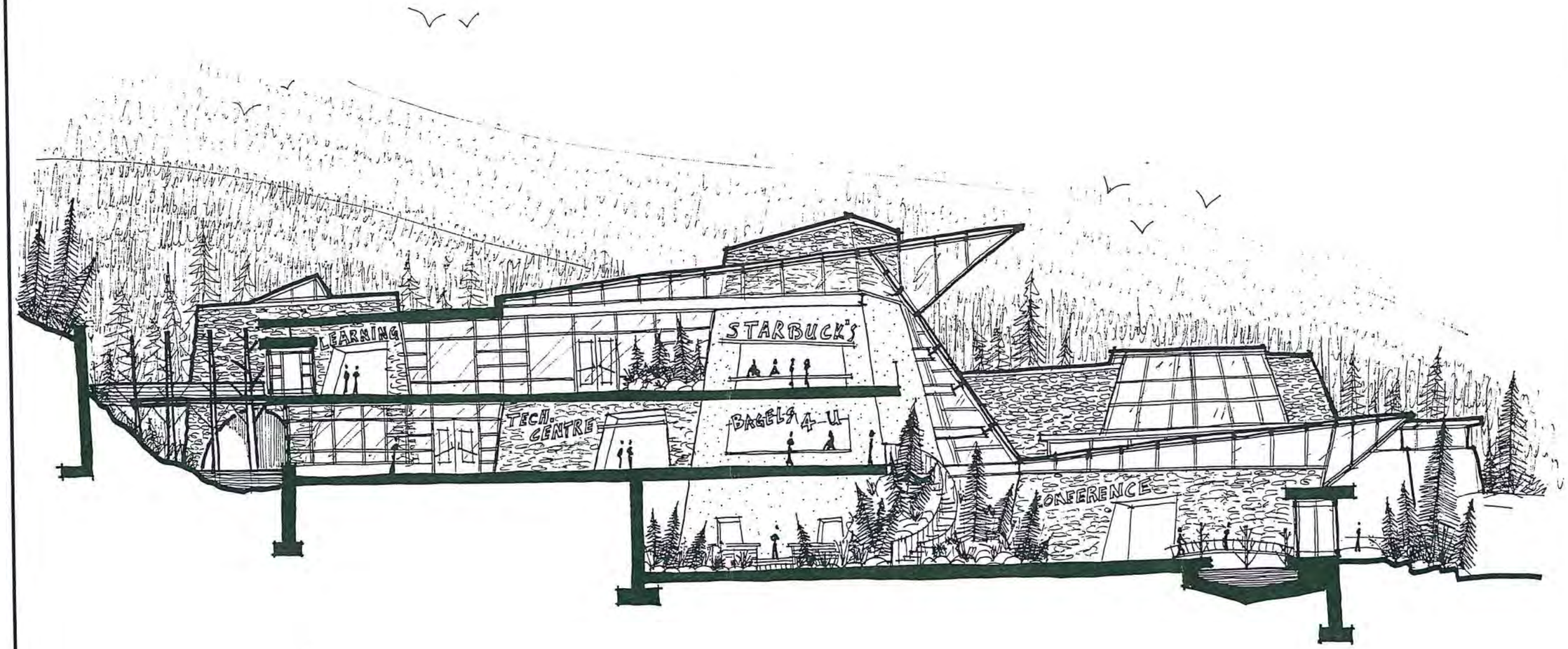

SECTION LOOKING EAST

RAIC SYLLABUS
THESIS LEVEL DESIGN
STUDENT NO. AB 830004

TRUE NORTH
DRAWING NORTH

COMMUNITY ACCESS SATELLITE NODE

--- THE BANFF CENTRE ---

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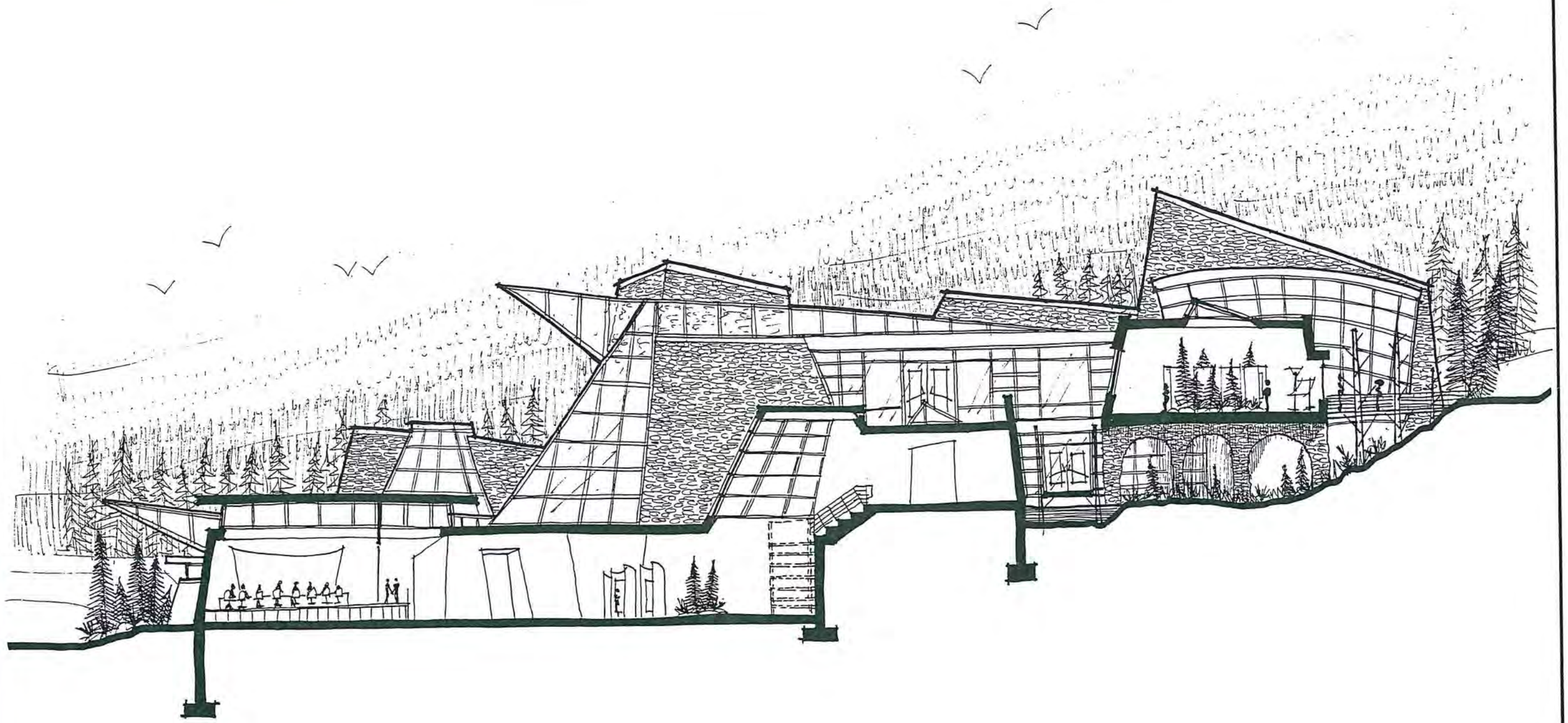


SECTION LOOKING WEST

RAIC SYLLABUS
THESIS LEVEL DESIGN
STUDENT NO. AB 830004

TRUE NORTH DRAWING NORTH

COMMUNITY ACCESS SATELLITE NODE

--- THE BANFF CENTRE ---

LINUS MURPHY
SCALE: 1:100
DATE: APRIL 23, 1999

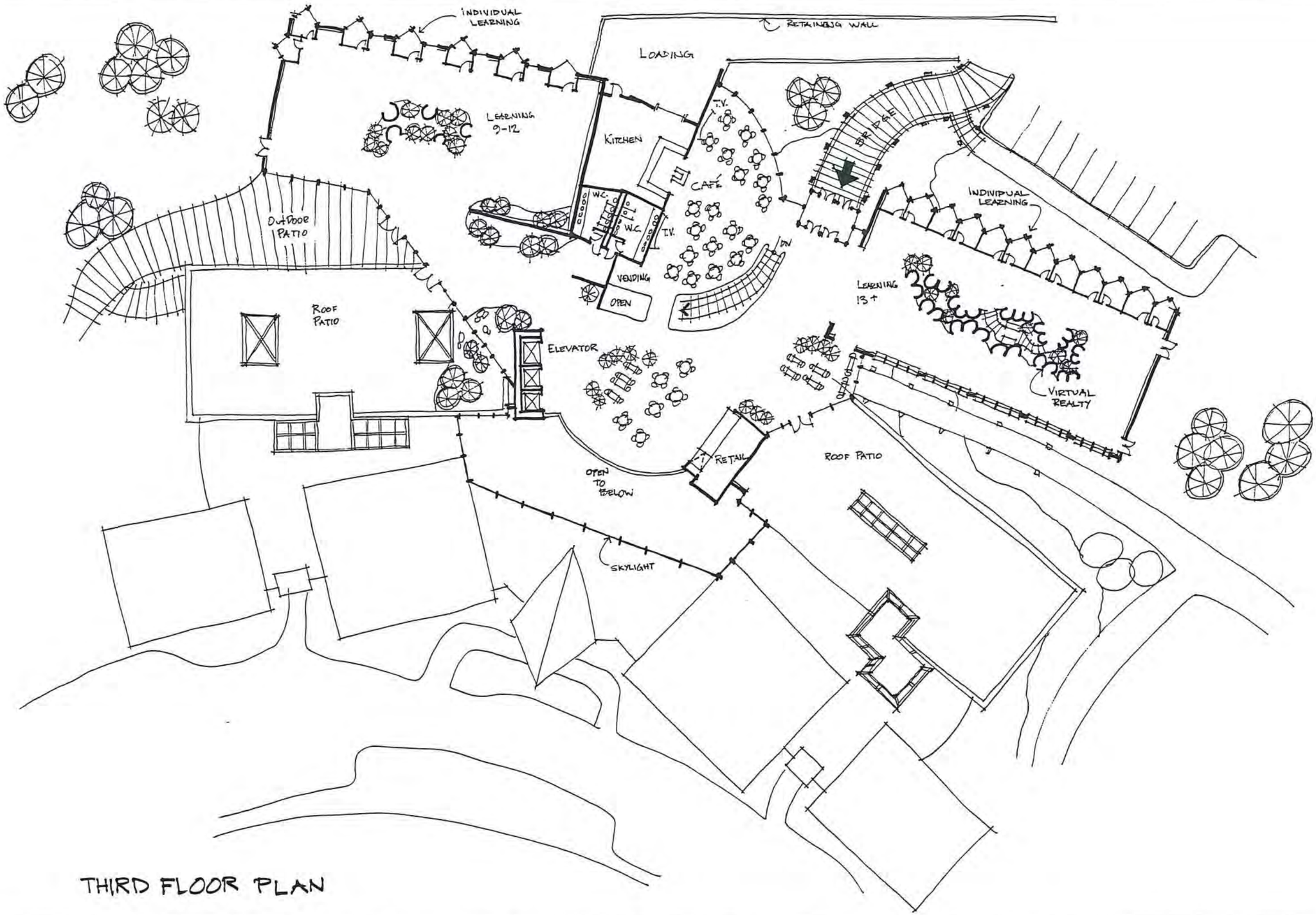
RAIC SYLLABUS
THESIS LEVEL DESIGN
STUDENT NO. AB 830004

TRUE NORTH
DRAWING NORTH

COMMUNITY ACCESS SATELLITE NODE

--- THE BANFF CENTRE ---

LINUS MURPHY
SCALE:
DATE: APRIL 23, 1999



THIRD FLOOR PLAN

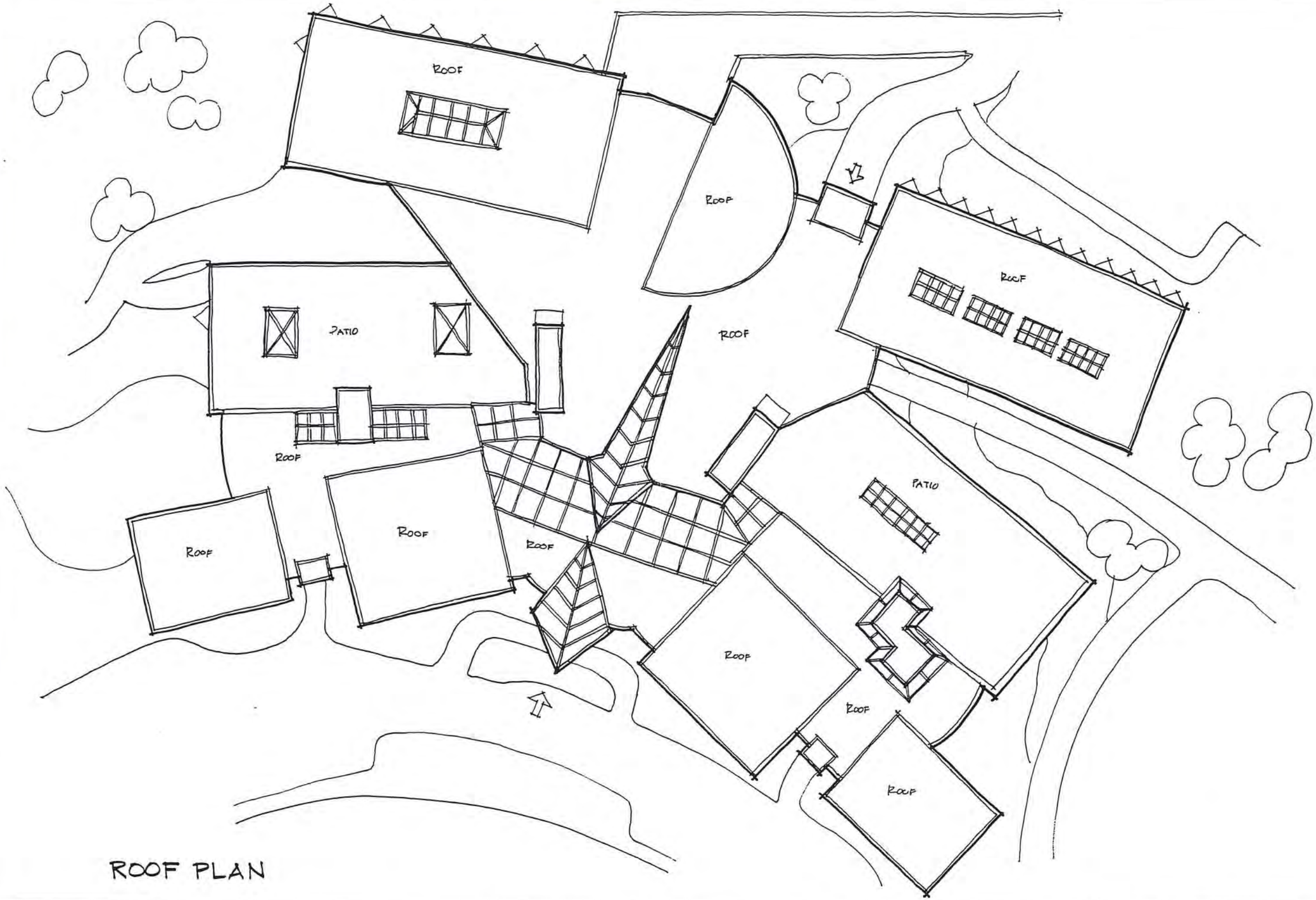
RAIC SYLLABUS
THESIS LEVEL DESIGN
STUDENT NO. AB 830004

TRUE NORTH
DRAWING NORTH

COMMUNITY ACCESS SATELLITE NODE

--- THE BANFF CENTRE ---

LINUS MURPHY
SCALE: 1:200
DATE: APRIL 23, 1999



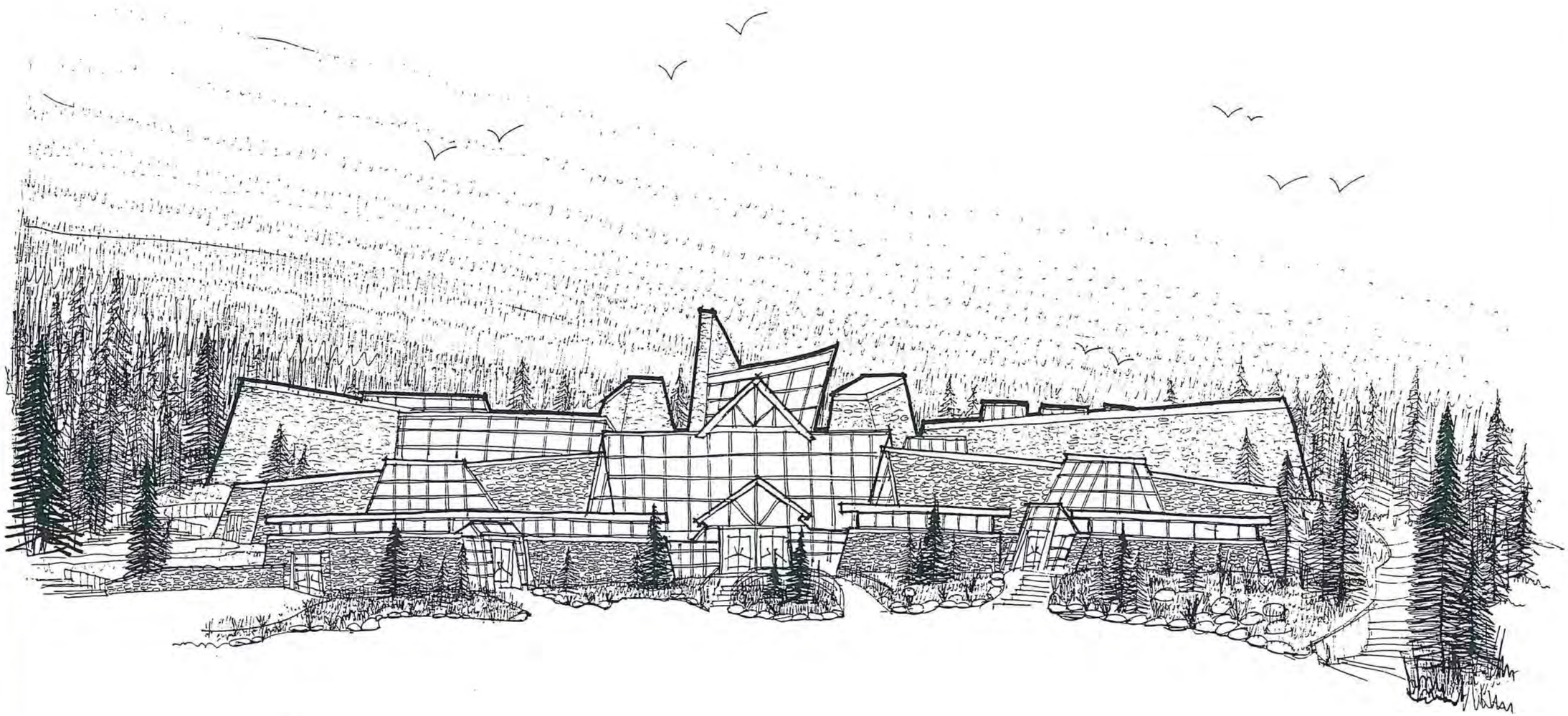
RAIC SYLLABUS
THESIS LEVEL DESIGN
STUDENT NO. AB 830004

TRUE NORTH
DRAWING NORTH

COMMUNITY ACCESS SATELLITE NODE

--- THE BANFF CENTRE ---

LINUS MURPHY
SCALE: 1:200
DATE: APRIL 23, 1999



SOUTH ELEVATION.

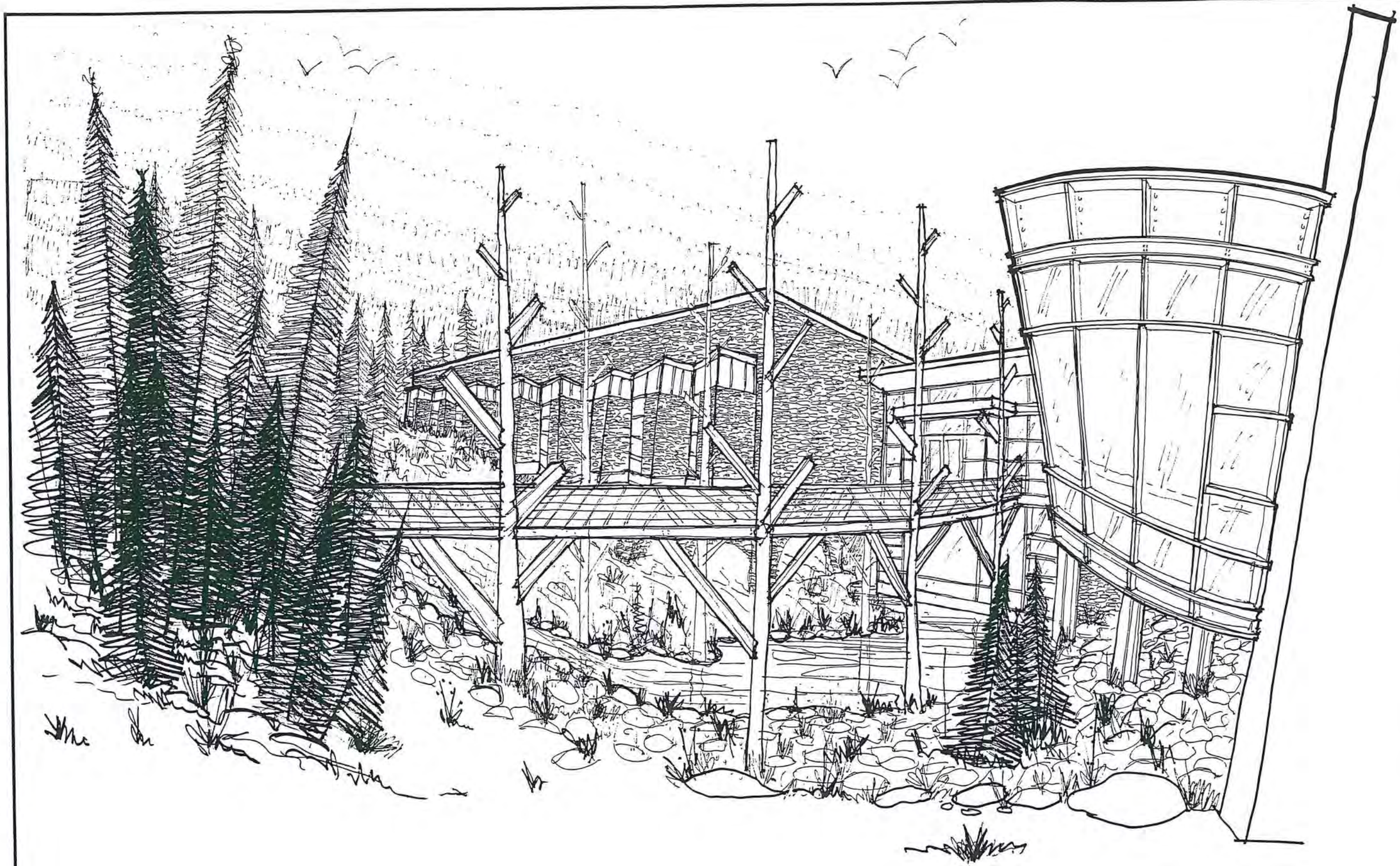
RAIC SYLLABUS
THESIS LEVEL DESIGN
STUDENT NO. AB 830004

TRUE NORTH
DRAWING NORTH

COMMUNITY ACCESS SATELLITE NODE

-- THE BANFF CENTRE --

LINUS MURPHY
SCALE: 1:200
DATE: APRIL 23, 1999



REAR ENTRY

RAIC SYLLABUS
THESIS LEVEL DESIGN
STUDENT NO. AB 830004

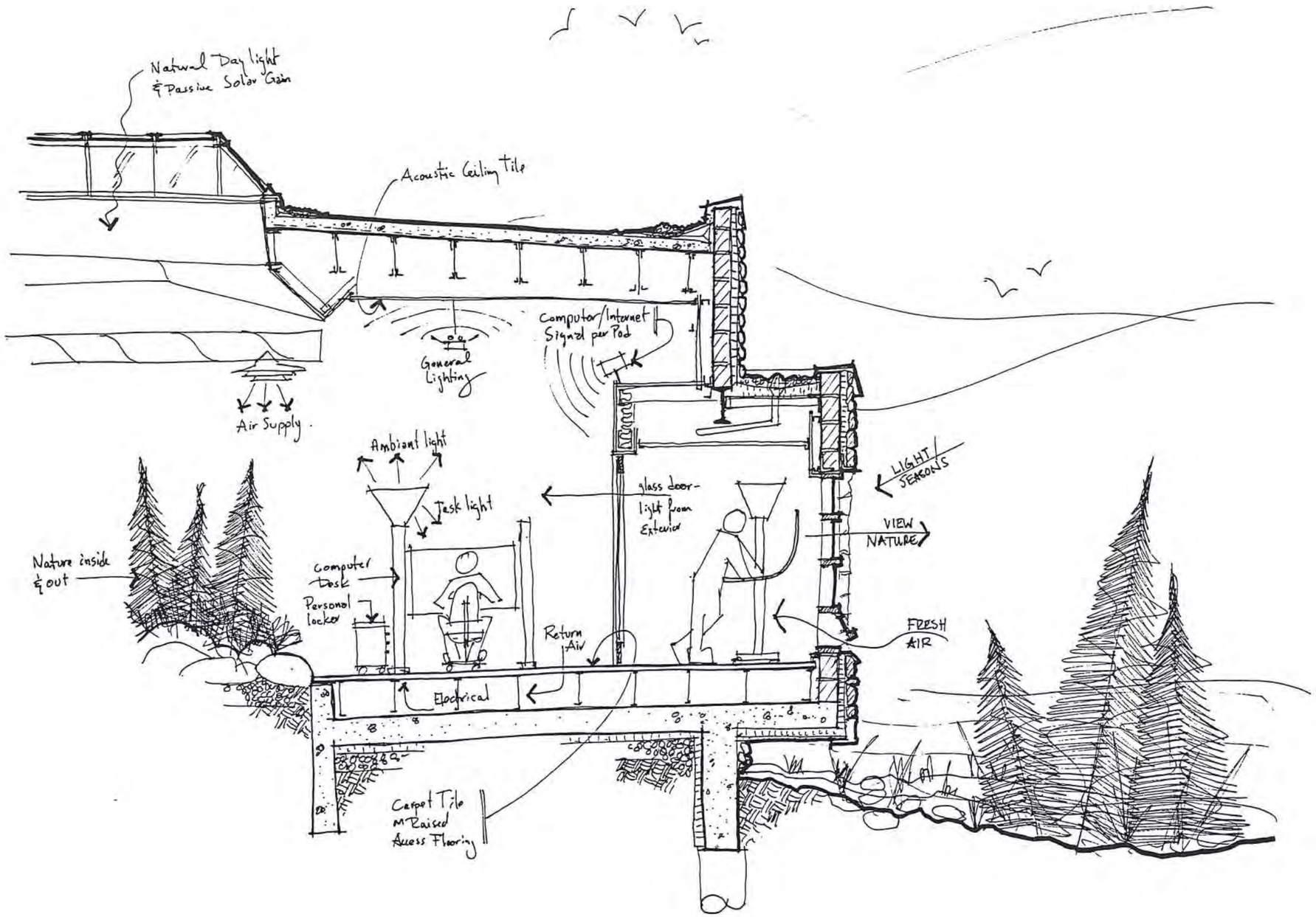
TRUE NORTH
DRAWING NORTH

COMMUNITY ACCESS SATELLITE NODE

--- THE BANFF CENTRE ---

LINUS MURPHY

SCALE: N.T.S.
DATE: APRIL 23, 1999



RAIC SYLLABUS
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STUDENT NO. AB 830004

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DRAWING NORTH

COMMUNITY ACCESS SATELLITE NODE

--- THE BANFF CENTRE ---

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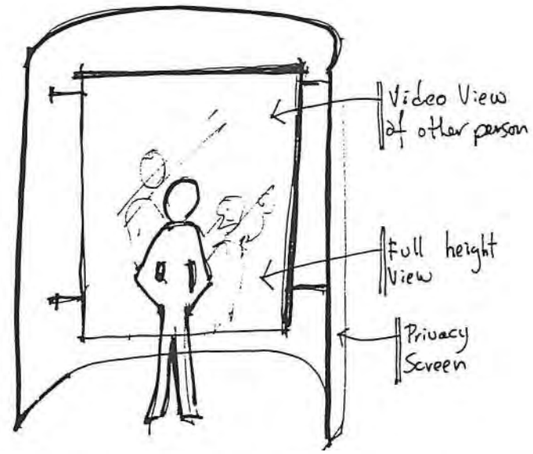
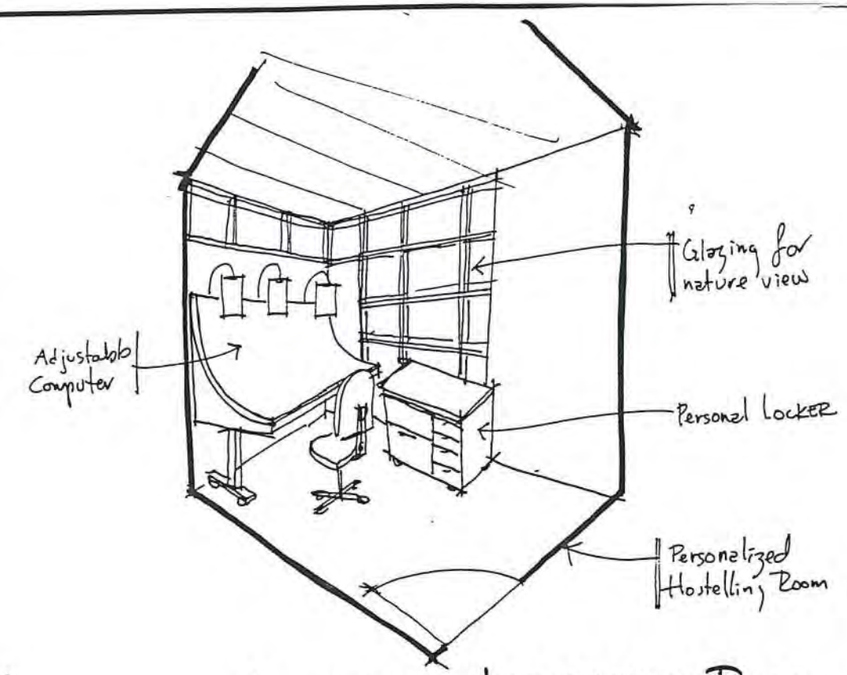
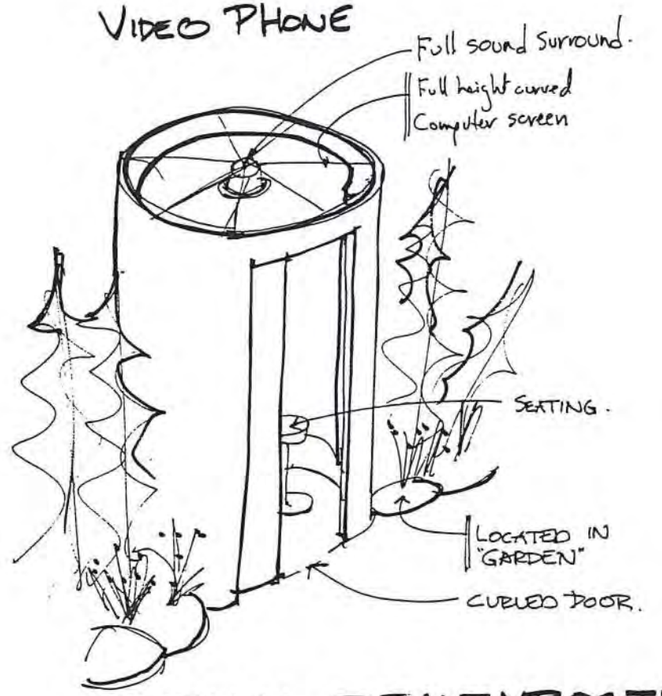


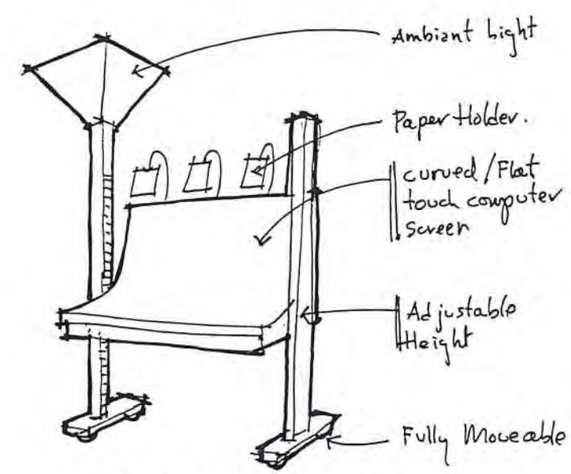
VIDEO PHONE



INDIVIDUAL LEARNING ROOM



VIRTUAL REALTYBOOTH.



TYPICAL DESK

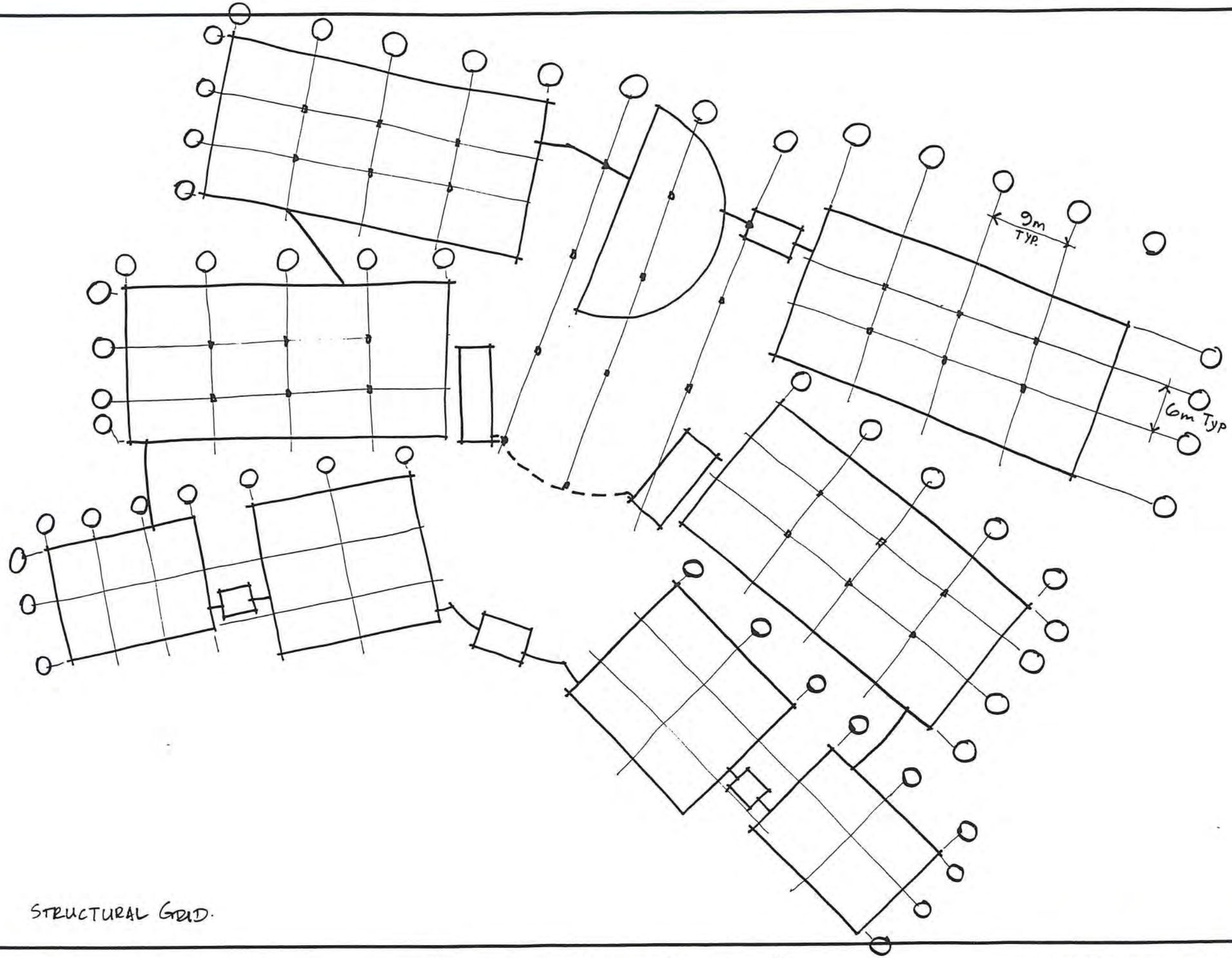
RAIC SYLLABUS
THESIS LEVEL DESIGN
STUDENT NO. AB 830004

TRUE NORTH DRAWING NORTH

COMMUNITY ACCESS SATELLITE NODE

--- THE BANFF CENTRE ---

LINUS MURPHY
SCALE:
DATE: APRIL 23, 1999



STRUCTURAL GRID.

RAIC SYLLABUS
THESIS LEVEL DESIGN
STUDENT NO. AB 830004

TRUE NORTH
DRAWING NORTH

COMMUNITY ACCESS SATELLITE NODE

--- THE BANFF CENTRE ---

LINUS MURPHY
SCALE: 1:200
DATE: APRIL 23, 1999

Programme Areas - Community Access Satellite Node

CASN - Community Access Satellite Node

Description	Number of Students (Note 1)	Traditional Area (Note 2)		Thesis Area (Note 3)		Quantity (Note 4)	Total Area Req'd (Note 5)		Total Area Provided	
Total CEF Facility	340									
School Facility										
Classrooms		80	sq. m	120	sq. m	17	2,040	sq. m	2,010	sq. m.
Library \ Resource Centre		435	sq. m	240	sq. m	1	240	sq. m	728	sq. m.
Science \ Laboratories		120	sq. m	120	sq. m	3	360	sq. m	327	sq. m.
Technology Centre		N/A	sq. m	200	sq. m	1	200	sq. m	180	sq. m.
Day Care Facility		N/A	sq. m	300	sq. m	1	300	sq. m	344	sq. m.
Retail Shops		N/A	sq. m	100	sq. m.	3	300	sq. m	280	sq. m.
Cafeteria - Public \ Students		400	sq. m.	600	sq. m.	1	600	sq. m.	800	sq. m.
Administration Offices										
Principal's Office		15	sq. m.	15	sq. m	1	15	sq. m	15	sq. m.
Vice Principal's Office		12	sq. m.	12	sq. m	1		sq. m		sq. m.
Counselling Office		10	sq. m.	10	sq. m.	1		sq. m		sq. m.
General Administration		30	sq. m.	30	sq. m.	1	30	sq. m	31	sq. m.
Conference Room		40	sq. m.	40	sq. m.	4	160	sq. m	158	sq. m.
Staff Room		35	sq. m	35	sq. m.	1	35	sq. m.	36	sq. m.
Staff Work Room		30	sq. m	30	sq. m	1	30	sq. m	31	sq. m.
Men's Washroom		4	sq. m.	4	sq. m.	1	4	sq. m	4	sq. m.
Women's Washroom		6	sq. m.	6	sq. m.	1	6	sq. m	6	sq. m.
Infirmary		30	sq. m.	30	sq. m.	1	30	sq. m	21	sq. m.
Kitchen Area		15	sq. m.	15	sq. m.	1	15	sq. m.	5	sq. m.
						Subtotal	325	sq. m.	307	sq. m.
Video Conferencing Classrooms - Large		N/A	sq. m	80	sq. m.	2	160	sq. m.	152	sq. m.
Video Conferencing Classrooms - Small		N/A	sq. m	40	sq. m.	2	80	sq. m.	82	sq. m.
Conference Room - New Requirement for Banff Centre							440	sq. m	435	sq. m.
						Subtotal	680	sq. m.	669	sq. m.
Self Contained Study Rooms		N/A	sq. m	10	sq. m.	10	100	sq. m	Included in Res. Area	
Washrooms - Male		26	sq. m.	35	sq. m.	2	70	sq. m.	104	sq. m.
Washrooms - Female		31	sq. m	45	sq. m.	2	90	sq. m	104	sq. m.
Conversational Spaces \ Teaming Areas		N/A	sq. m.	20	sq. m.	3	60	sq. m	163	sq. m.
Mechanical and Physical Plant		60	sq. m.	60	sq. m.	1	60	sq. m.	163	sq. m.
Ancillary (Art / Music etc.)		90	sq. m.	90	sq. m.	6	540	sq. m	Shared with Banff Centre	
Exterior Complex										
Parking		68							65	
Loading		1							1	
Sporting Areas (Baseball / Football / Track)		1	Shared with the Banff Centre							
Bus Loading and Unloading Area		1							1	
Outdoor General Play Area		1	Shared with the Banff Centre							
Outdoor Children's Play Area		1							1	

Subtotal	5,965	sq. m	6,178	sq. m.
Net to Gross at 30%	1,790	sq. m.	1,670	sq. m.
Total Estimated Area	7,755	sq. m.	7,848	sq. m.
Variance from Programme:			94	Over
Percentage Variance from Programme:			1.21%	Over

BUILDING SYSTEMS

STRUCTURAL

Foundation: Driven piles; and
Anchored back to mountain side

Flooring: Slab on Grade: and
Suspended structural Slab

General Support: Steel columns based on a 6m x 9m grid

Walls: Concrete Block supporting exterior Rock; and
Steel Wide Flange or HSS columns at curtain wall

Roof: Concrete on steel decking on OWSJ on steel beams

MECHANICAL

Basic System: Heating and Ventilating: Individual Heat pump units servicing wings; and
Centralized ducted system from main central plant for large public spaces;

Mechanical Room: Centralized boiler and condenser

Outside Air: Outside Air and exhaust at building north end

BUILDING MATERIALS

Exterior Walls: Rundle Stone; and
Curtain Wall Glazing

Glazing: Curtain Wall with coloured, low E Double sealed units.

Interior Walls: Drywall with wall vinyl; and
Rundle Stone

Interior Floors: Carpet Tile:
Slate:
Wood bridges; and
Porcelain Tiles

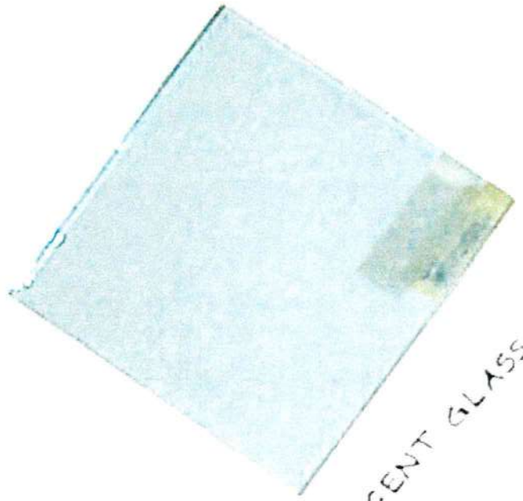
LIGHTING

Public Areas; General Full spectrum daylight fluorescent

Classrooms: Desk mounted ambiant and task lighting

SOLAR:

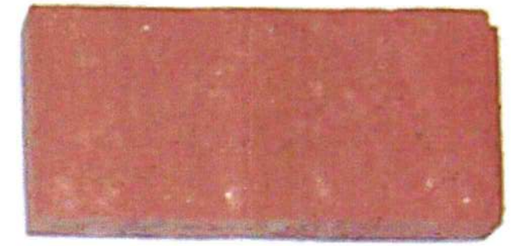
General: Simple passive solar gain from main lobby with natural ventilation at top of skylight



ACCENT GLASS

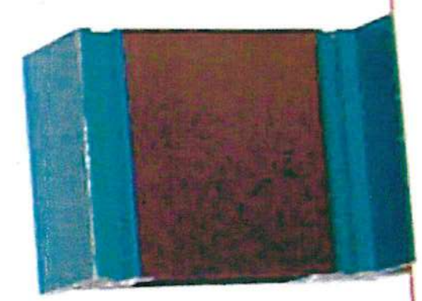
CLIMBING WALL

HARDWARE

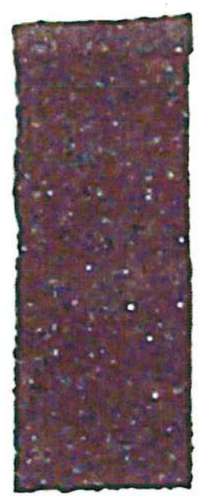


ROOF PAVER

TYPICAL MULLION & TRIM COLOUR



TYPICAL GLAZING
EXTERIOR MATERIALS



SBS ROOF

RUNDLE ROCK

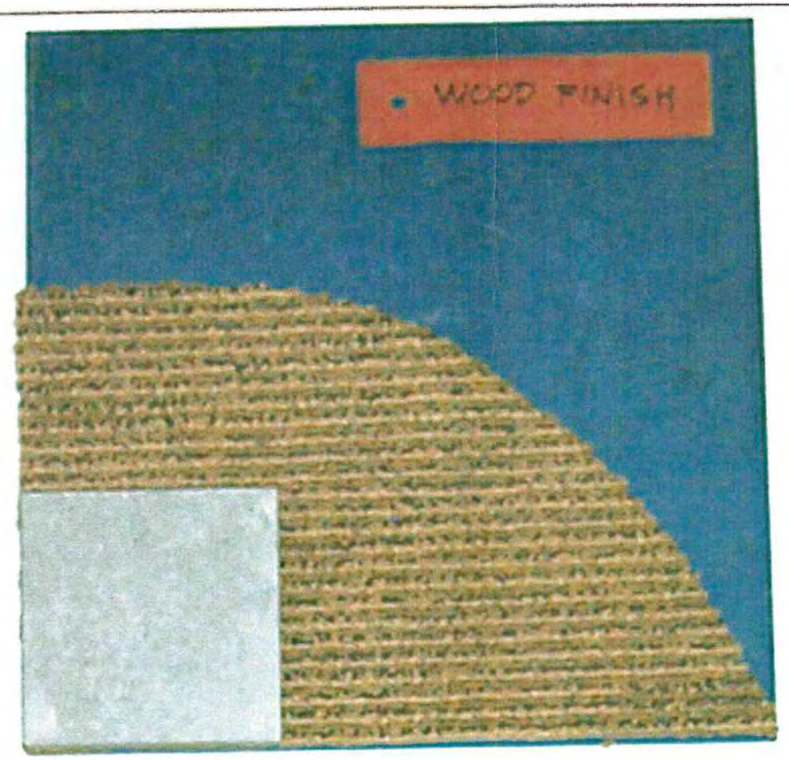
RAIC SYLLABUS

THESIS LEVEL DESIGN
STUDENT NO. AB 830004

COMMUNITY ACCESS SATELLITE NODE
THE BANFF CENTRE

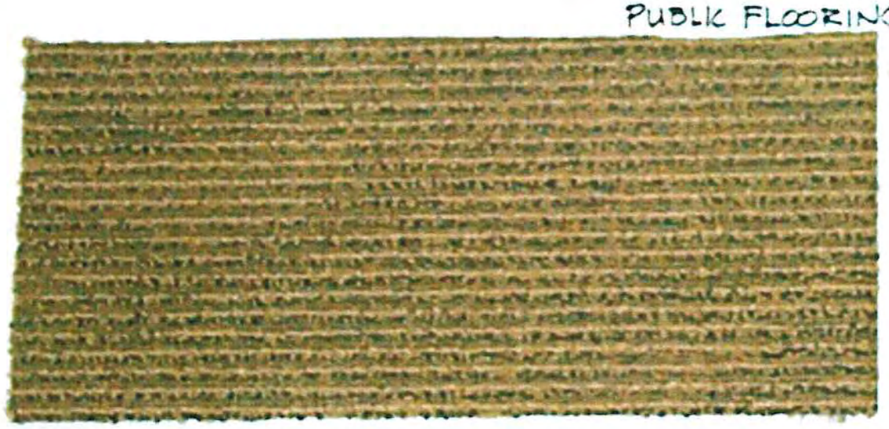
LINUS MURPHY
FULL SCALE

PLAY AREA
FLOORING &
TRIMS



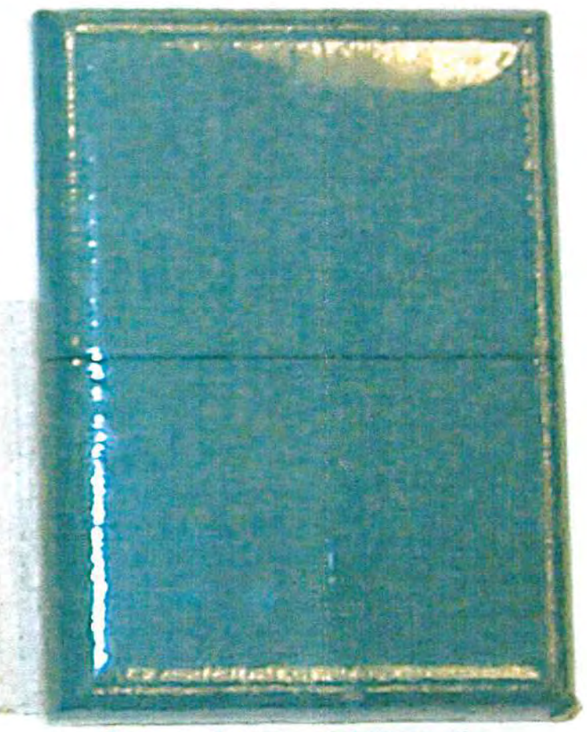
PUBLIC FLOORING

CEILING TILES



CARPET

WALL COVERING



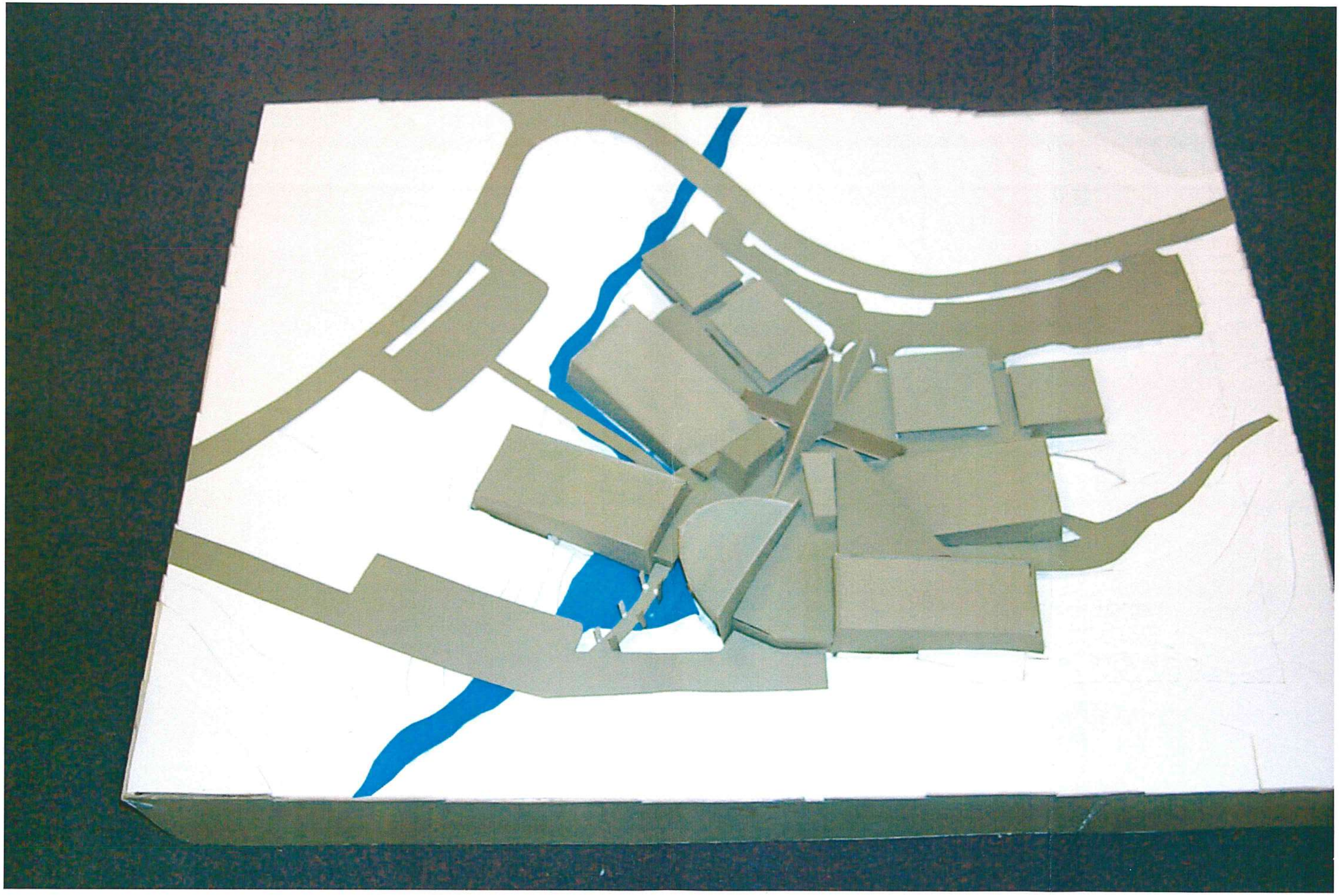
ACOUSTIC PANELS

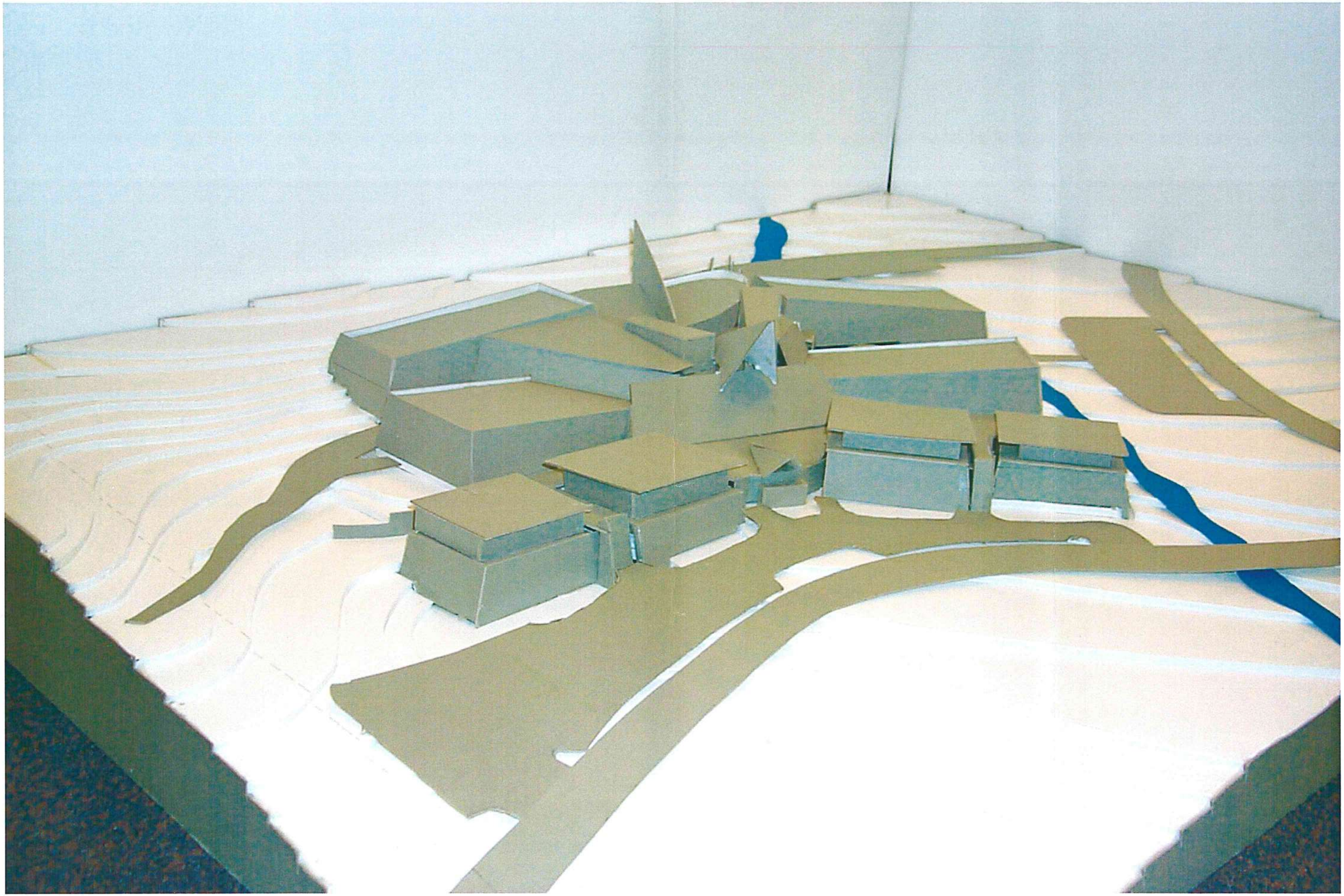
INTERIOR MATERIALS

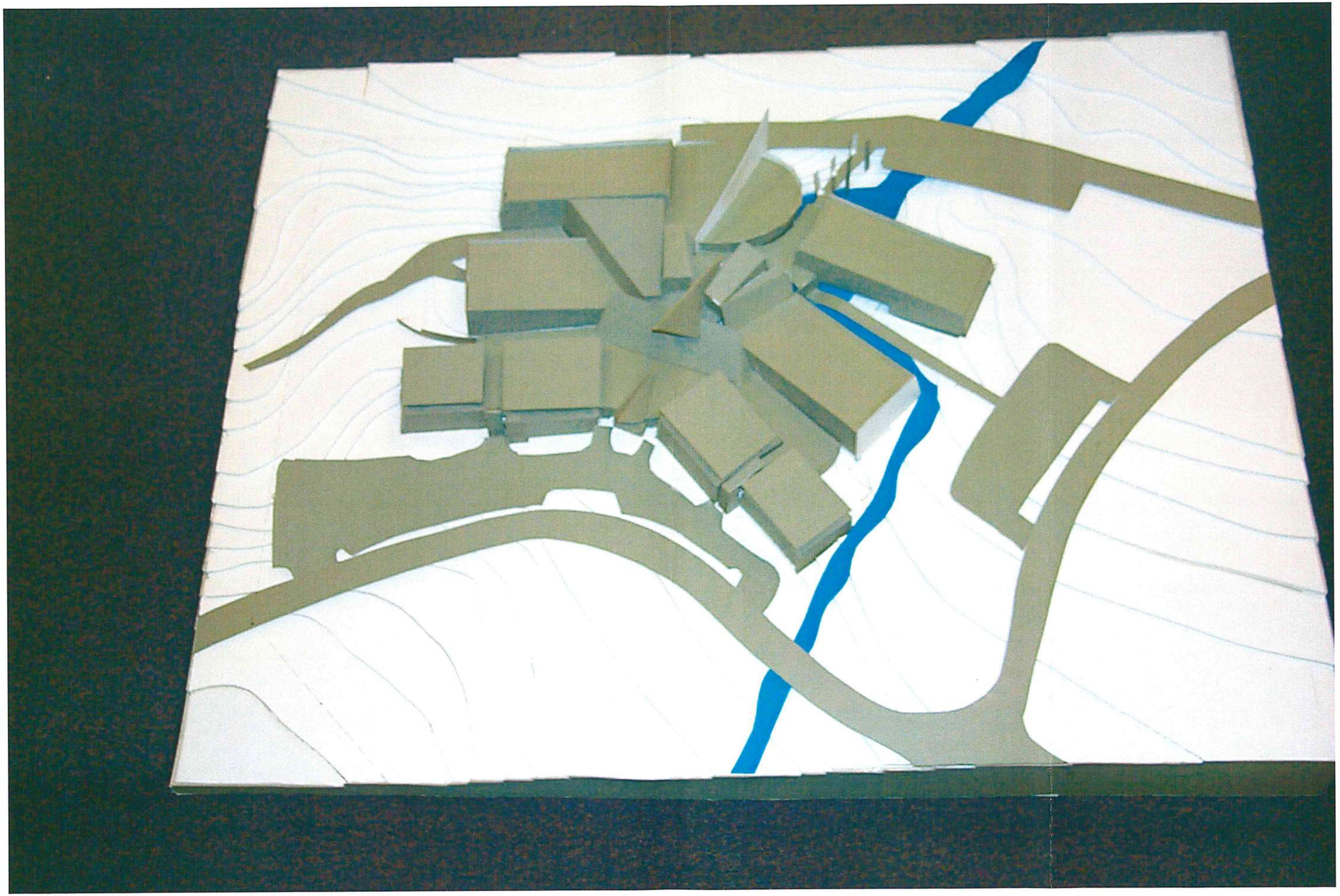
RAIC SYLLABUS
THESIS LEVEL DESIGN
STUDENT NO. AB 830004

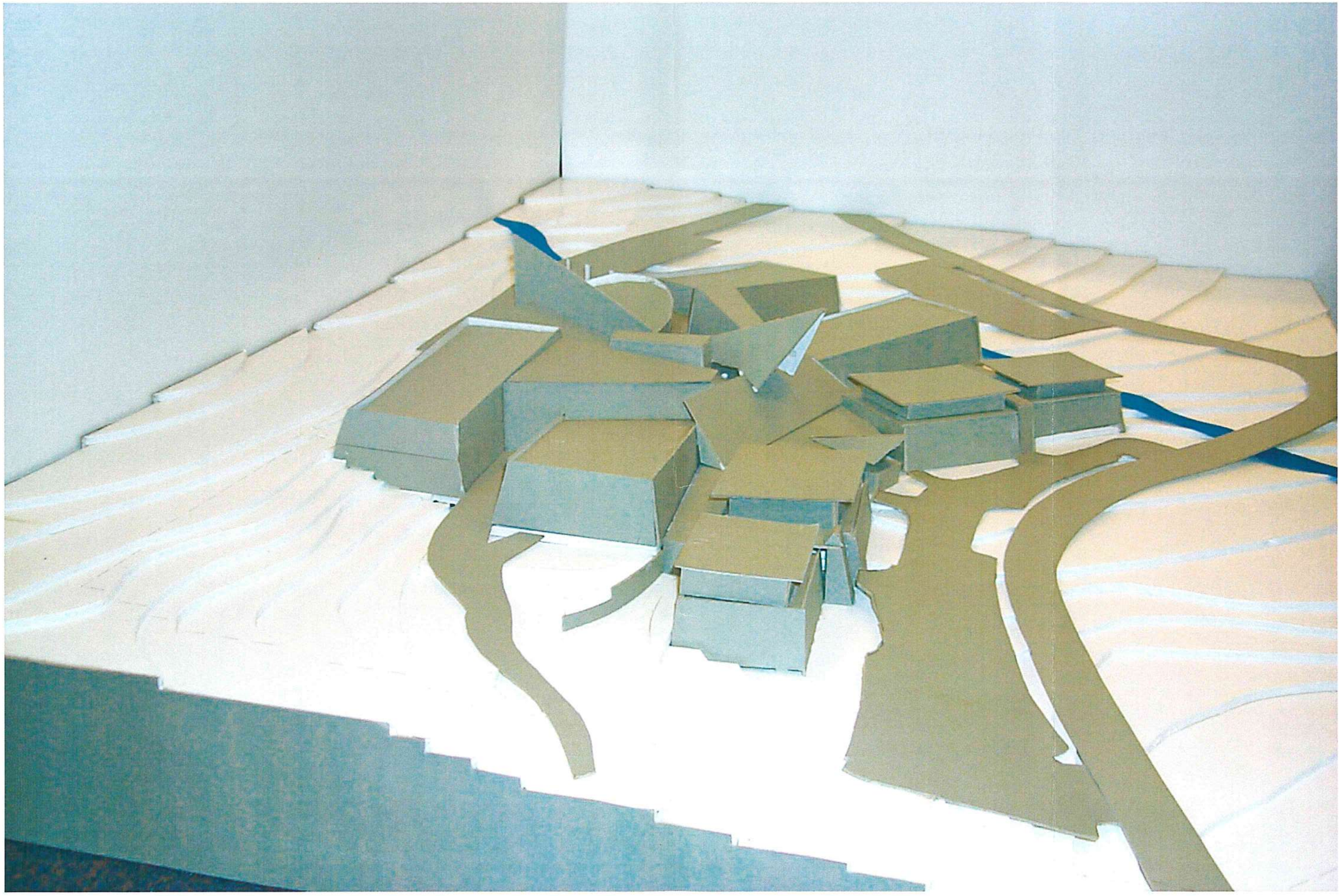
COMMUNITY ACCESS SATELLITE NODE
THE BANFF CENTRE

LINUS MURPHY
SCALE: FULL SCALE
DATE: APRIL 23, 1999









A SERIES OF SUPPORTIVE RESEARCH NOTES

APPENDIX-C

13.1 Academic Productivity - The Case for Instructional Software - An Excerpt

The following quoted excerpt is taken from an Educom published report of the Broadmoor Roundtable on computer assisted education convened in Colorado Springs, Colorado on July 24-25, 1996. The report is written by one of the main contributors and Vice President of Educom, Ms. Carol A. Twigg.

In the report, Ms. Twigg speaks to the round table's consensus that there is a need to support computer assisted and managed education. In the quote included below, problems associated with creating software by teachers, specific for their course use is shown as problematic.

Source: Twigg, Carol, **Academic Productivity: The Case for Instructional Software**, A Report from the Broadmoor Round table, Colorado Springs, Colorado, July 24-25, 1996.

"*Proposition 3. Colleges and universities cannot create the requisite software on their own because:*

> *Traditional "soft money" development strategies have failed to produce a scalable body of instructional software.*

Strategies depending on the efforts of colleges and universities to encourage individual faculty members to develop instructional software will not result in a sustainable, scalable body of materials. Despite the potential offered by such materials, many in our community have noted the failure of most institutions - even those who have worked hard to create them - to integrate their use into their academic programs [sic]. In the past, such efforts have been generously supported by government agencies, private foundations and by various corporate entities. But the incentive offered by those grant programs are microscopic, and they are all in the wrong direction. The weakness of focusinng on individual faculty members as a sstartegy for change can be edemonstrated by assessing three approaches to stimulating new learning enviroemtns at the national level.

In the 1980's, IBM spent millions funding more than 3,000 individual faculty projects and Advanced Education Projects. Similarly, the National Science Foundation curriculum reform program [sic] *has spent millions of dollars on award to individual faculty members to improve individual courses at individual institutions. NSF grants are designed t support "innovation" rather than commercialization: the NSF will only fund you if you do something new. For example, literally hundreds of algebra innovations have been funded, but they all tend to be micros-scale. They do not scale up beyond an institution and frequently, they do not even scale up in one institution. From the beginning, those projects are misdesigned because they are planned for a pilot of 10 to 15 students. The faculty fail to anticipate what it would mean if you have 1,000 students to deal with; they ignore the fact that a model that will work with 15 students may or may not work with a thousand.*

Mark Luker, of the University of Wisconsin-Madison, also added another explanation as to why attempts to get faculty to develop software within individual universities have not been successful. What has typically happened is that the faculty are provided with only a minimum amount of preparation. They think they can develop software by using various kinds of authoring tools which are supposed to be easy to use. But the development process inevitably ends up being a full-fledged programming job. Software development is an iterative process: as project progress, additional

improvements are always recommended and upgrades as always needed which, in turn, leads to more programming. And then the grant funding runs out.

Bernie Gifford spent from 1989 to 1992 as vice president for education at Apple Computer. He was convinced that the way to build software was to subsidize faculty members, and he spent a lot of money trying to do just that. Gifford cited one of many failed experiments. He approached six well-known physics faculty members to create 30 credit hours of instruction. At the end of 18 months, he had six separate programs with six different nomenclatures, six different products that could not fit together. He had to ask Apple systems engineers to "glue" them together. Gifford's conclusion: it is very difficult to build coherent courseware by supporting individual faculty members because it requires enormous discipline to submit to a common mission. Software development requires tremendous coordination.

IBM, Apple, and the NSF meant well, but all of their programs have failed to achieve results beyond the individual classroom. A wealth of experience shows that the attempt to "add-on" innovations with external support, and without internal structural change - especially commitment of resources in the educational system's core budget - has been almost totally unsuccessful. The most surefire way to tell whether an innovation is for real or is artificial is to look at its funding. Unless an innovation is paid for directly by those who stand to benefit from it, its chances to flourish are dubious at best.

> *The business of colleges and universities is educating students and conducting research; it is not the development, production, distribution, and marketing of products.*

Colleges and universities are organized, financed, and staffed to provide educational services and conduct research. They are nonprofit, tax-exempt institutions. Public institutions in particular have specific mandates for service as a condition of their existence. Were they to reconceptualize their mission to become producers of learning materials - i.e. to go into business - they would need to transform their basic organizational and financial structure, and forego their special status, in order to compete with the private sector. Such a transformation appears both unlikely and undesirable."

13.2 A Sample of a School Web Page

The following is a sample of a Canadian School's Internet Web Page which highlights Holy Trinity School in Richmond Hill, Ontario. The content of the information is fairly typical for schools on the Internet. It shows information pertaining to mission statements, general curriculum, some E-Mail addresses, photographs and enrollment information all wrapped up in a very slick, very nice graphic package.

This web page even has more information than most elementary or secondary schools as it contains a head master's message (a current version of it too!) which tends to make the web page more interesting than just a once read thing.

One interesting thing to note is the "Sorry!!! Being Constructed" page. This is all too typical on the Internet where information is incomplete, in progress or under construction. For the reader who is an Internet user, the ubiquitous "Error, Web Page Not Found" error, which frequently happens, is just as ubiquitous. These errors are indicative of a new and growing technology and may be seen as minor and temporary irritants. These problems will probably not be evident once the system matures but the author feels that they just represent the typical kind of information on an Internet Web Page - almost finished, but not quite.

13.3 Huron Street Public School

The following quoted excerpt indicates what one Canadian school is doing to try to teach students "high order reasoning and learning skills." To accomplish this, the school is using a system they have called CSILE which is an acronym standing for "Computer Supported Intentional Learning Environment". This is a computer system that grows with the student as the data a student obtains grows. In this way, previous data supports and is a basis for subsequent data - and therefore learning.

Source: Bruer, John. T., **Schools for Thought - A Science Of Learning in the Classroom**, The MIT Press, A Bradford Book, 1993, pg 250-52.

"Huron Street Public School is several blocks from OISE and the University of Toronto campus. The students are the Commonwealth mix one often finds in Canada - children of English, Celtic, East Indian, and Caribbean backgrounds, and more recent arrivals from Eastern Europe, the Soviet Union, and Latin America. This school is the site of an experiment to improve writing and to create a learning environment in which knowledge transforming replaces knowledge telling. Here Scardamalia, Berceiter, and their OISE colleagues are testing CSILE, a Computer Supported Intentional Learning Environment.

CSILE (pronounced "Cecil"), which is based on 20 years of cognitive research fosters strategic thinking and the development of learning skills in the course of subject-matter instruction. These skills, in turn, allow students to regulate an monitor their learning. CSILE aids students in becoming active learners who know how to learn, who can set their own learning goals, and who can apply effective metacognitive strategies to learning problems.

CSILE confronts directly the traditional classroom practices that favour knowledge telling. If school writing tasks are to result in knowledge transforming, they must have a genuine rhetorical purpose. CSILE creates a classroom culture in which the purposes of writing are to communicate with fellow students and to help writers master new ideas. "An interesting aspect of CSILE is that it attempts to teach the knowledge transforming strategy directly. Advancing knowledge is the central classroom goal," according to Scardamalia. "The interesting question is: If one makes knowledge transforming the primary educational objective, will one gt better writing as a secondary result?"

This is an intriguing educational experiment because it reverses the traditional roles of writing and thinking. We typically thing that producing better writers is the way to produce better thinkers and learners; CSILE reverses the cause and the effect in this assumption. Do better learning and better reasoning, - after all, that is what knowledge transforming consists of - lead to better writing? The early data coming out of Huron Street School suggest that the answer is "Yes!"

On the blackboard in the fourth - and - fifth grade CSILE classroom is the beginning of a unit on oceans. The teacher has helped the students summarise on the blackboard what they already know about oceans. The summary is not a list of isolated facts; rather, it has the form of an associative network. Written in the corner of the board, in the place where teachers write things that are never to be erased, are three questions: "What are three important things I already know about the topic?

What do I wonder about? What words would I use to look up information about the ocean from my database?" These questions remind the students of the importance of preexisting knowledge and the importance of metacognition - reflecting on what they already know and what they would like to know - in learning. In the back of the room are eight Apple workstations, with colour monitors, which are linked to a mainframe computer that supports CSILE.

CSILE is a sophisticated information - management environment. At its heart is a student - generated database into which students can enter both graphics (which they call charts) and text (which they call notes). Each student is a member of a small study group (6-8 members) and ens 30 minutes a day on a workstation composing material for the database. The material in the database relates to all aspects of the curriculum - science, math, social studies, and language. Students can generate new items for the database, retrieve items indexed by the student-authors' names or by key words, browse through the database, comment on other students' charts and texts and submit items they have written or drawn for publication. The computer allows all student entries to be electronically linked or associated in any way the students think appropriate. With this capability, the students can create note-link, associative knowledge structures on the computer screen. At the end of a course unit, the study group meets as an editorial board to decide what material in their collective database they will publish as their group report.

CSILE encourages the students to focus on the growing body of knowledge they are building together and on what they need to know collectively. The system promotes a community of scholarship in that the students are essentially and actively involved in knowledge construction. The students are members of a knowledge-building team; the teacher is a coach, a guide and a fellow learner.

A fully operational version of CSILE has been in daily use in two fifth-and sixth-grade classrooms at Huron Street since autumn 1986. Positive results are starting to emerge. CSILE students perform significantly better than other students on the language portions of standardized achievement tests, although that is not the purpose of the research or the outcome measure of OISE group values. The researchers' main interest, in these initial years, has been to see how the children compose unit reports and write notes for the communal knowledge base. Any computer - base system will encourage children to write more, but with CSILE they also write better.

The researchers have found at least two ways in which the students' writing improves.

First, as students become more experienced with CSILE, they tend to use mental-state verbs and rhetorical words ("wonder", "understand", "explain", "hypothesis") more than students in a traditional classroom. Use of the mental state verbs suggests increased metacognitive awareness of mental processes. Their increased metacognitive awareness is also evident in the CSILE students' abilities to predict what they will learn in a new unit and to describe beforehand what they will need to learn to master a unit. Their writing indicate that they are aware of what they know, what they don't know, and what they must do to reach their learning goals. The rhetorical words are those that often refer to uses of language and to discourse elements in writing - words that usually appear in the plans of mature, expert writers.

Second, when giving handwritten answers to the question "What have I learned from doing this unit?" the CSILE students write well-constructed essays which contain some mature text conventions, whereas typically elementary students rely on straightforward knowledge telling.

[The quote "A" below in our text] *compares excerpts from two "What I Learned about Primates" essays, one written by a non-CSILE student whose paragraph is a series of declarative sentences about gorillas - a string of facts transcribed in the order in which they are retrieved from long-term memory and where consecutive sentences have no relation one to another. The writer could drop or rearrange the individual sentences with little impact on the paragraph's quality or coherence.*

The CSILE student's paragraph has a different flavour. This student, too, "tells what she learned," but in an interesting way. She engages the reader with questions and talks about her own interest. She states her focus explicitly: There is a particular primate, Koko, she wants to talk about. The paragraph has organization above the sentence level, which gives it an overall coherence. Independent judges consistently rate CSILE students' end-of-unit summaries higher than those of non-CSILE students on the quality of knowledge expressed and quality of organization and presentation.

Scardamalia feels that the best example of knowledge transforming are found not in students' final essays but in cases where a group of students pursue a question through a series of notes and comments on CSILE. One of Scardamalia's favourite examples of a CSILE dialogue occurred in a biology unit. One student wrote a note stating that sponges have three way of reproducing. Other students became interested in the topic and started exchanging notes and comments. Early in the exchange, one student tried to think of some reasons <u>why</u> sponges have three ways to reproduce and offered a theory:

> *"One reason why Sponges and the animals like it (Sponge) have three ways of reproducing instead of one may be because their (the animals I am referring to) cell structure is so simple that you can get the cell structure easily by . . . losing some cells. For example I have a theory about one of the ways Sponges and related animals reproduce, when a wave detaches part of the skin from a sponge or other animals like it (the Sponge) is like algy* [sic] *and grows into a full sized animal this is called Regeneration and Budding is probable like it."*
>
> *"Then theres* [sic] *Sexual and I think the female eggs are probably parts of a female which are less developed than buds so they need the sperm of the male to speed up the process."*

Another student then commended the previous author but raised another question and offered a tentative reason:

> *"I think this is a really good answer and its different from mine. One thing is, why don't other animals have three ways of reproducing as well? Maybe because there are more of them? Well, I don't know but I still think this is a great note."*

The exchange proceeded from stating a biological fact, to giving reasons for it, to wondering why

other animals differ from sponges. this is an example, according to Scardamalia, of how CSILE students, in all subjects, start pushing beyond the immediate information to look for deeper explanations.

CSILE's preliminary successes arise not from technology alone, but from the use of technology to implement instruction based on cognitive research. CSILE restructure the classroom by changing the traditional roles of student and teacher, by changing student-teacher interaction in the classroom and by changing student-student interaction. CSILE discourages knowledge telling and encourages knowledge transforming.

CSILE is still in its early stages of development, and its designers are only now beginning to configure it for use in other schools. Like John Anderson's GPTutor, CSILE faces the obstacles of institutional resistance to restructuring and the expense of computer hardware. The ultimate payoff may be years away, but already CSILE is changing our perceptions about what happens, and what can happen, in the classroom.

Quote A

"Student from a traditional classroom:

I know most about gorillas so that's what I'll start with. There are different types of gorillas. For instance, the mountain gorilla has much nicer shinier fur than the low land gorilla. They mostly eat plantain with an occasional snail or slug. They also have been seen to eat their own dung! They live in groups which can have anywhere from 3-8 or 9 gorillas in it. There is no particular breeding season for them. The silver back - the leader has exclusive breeding rights. The baby will sleep in the same night nest with their mother until the mother has another baby which will usually not happen until the first baby is about 4 or 5. A night nest is a bid nest mado of all kinds of big plants."

CSILE student:

There is another primate which I want to talk about. I expressed great interest in learning about this one special gorilla. This gorilla's name is Koko. Have you heard about this gorilla before? Koko was taught sign language by a person named Dr. Francine Patterson. From the age of 2 and up, Dr. Patterson has lived with Koko and did everything for her. At first, when Dr. Francine Patterson got Koko, Koko was a little shy, but after the years went by, Koko got more used to her. I won't go into every detail about Koko because there is a lot to tell. I will just say what I think about Koko, I think that Koko is a warm and gentle gorilla who loves animals and people. I also want to say thank you to Dr. Patterson who has taught Koko everything. I'm glad I did this project because I had fun doing it and I now feel that I know Koko myself."

13.4 CyberHigh - An Alberta Virtual High School

The following pages illustrate the data printed off the Internet concerning the Province of Alberta's CyberHigh. Of interest is the "CyberHigh Distinctives" comparison to traditional and other forms of educational delivery on page 8 of 9.

13.5 A Sample of a Student / Teacher Chat Session - October 8, 1997

The following pages illustrate one session from one of the University of Waterloo chat lines. The chat session is accessed from the "conference room" icon illustrated on the first page of this appendix insert. This excerpt is taken from an October 8, 1997 chat session of the English Technical Writing Course 210G which is offered "virtually" through the Internet.

By selecting (double clicking) one of the rooms on the main icon, the student is "transported" to that particular area or item of interest.

13.6 Print Copy of This Thesis Design Project's Web Page

The following page is a print copy of this Thesis Design Project's Web Page which was posted on the Internet through a link from the RAIC Syllabus Web Page. This Web Page was posted with a number of other students' works through the work of the North Bay RAIC Student chapter. Although every effort was made to ensure that this Web Page contained no grammatical or spelling errors, it is extremely easy to post published material on the Internet which is wrought with errors. I have often joked that "I don't talk no good," but in reality, "I donut typo no gaud nether!" But thanks to spell check, I "donut typo" any spelling or other errors when I "typo." (This page returns no errors when run through a spell checker.)

13.7 A Sample of Virtual University's Falsified Place Web Page

The following few pages are a sampling of what the author terms Falsified Places. This is a sample from a Web Page calling itself Virtual University. This Web Page was accessed during word searches conducted for the research of this Thesis Design Project. These pages show the ability of the computer to very effectively blur reality and non-reality. The pictures look real, some of the data appear real, even the registration page (not included in this sampling) looks real. But the literature does not appear real and even is wrought with apparent puns, metaphors, double entendres and maybe even jokes. The author never even started the registration or request for information sections for fear of soliciting charges or some sick kind of E-Mail from the creators of this page.

But just glancing over the graphics, the first impression I got, especially after browsing through hundreds of other Web Pages that were "real" schools, was that this was also a real school.

13.8 The Open Classroom; Quantity and Quality Education - An Excerpt

The following excerpt is from Methods and Techniques of Holistic Education, (1984) edited by Isadore L. Sonnier and published by Charles C Thomas Springfield Illinois, USA. This excerpt is chapter 6 of the book (pgs 36-41) and highlights pedagogical theories toward the open classroom and the dichotomy found by teachers who try to use open teaching.

"The term 'open education' was found by Sonnier (1981) to have different meanings for different teachers because of philosophical differences. A paradigm was proposed, built around such parameters as teacher preferences for teaching strategies that are teacher--centred with affective objectives. Two systems evolved in this paradigm, each having different and predictable quantity-quality aspects of 'openness' in education. The paradigm evolved from asking individuals within groups of practising teachers to identity their own classroom managerial styles and types of teaching strategies preferred. It was discovered the way that individual teachers define openness is related to this paradigm.

Gulley and Norwood described the open education in the classroom as having flexibility in the available learning space, and the role of the teacher as instructor is to diagnose and evaluate the progress of all students. Further, Gulley and Norwood emphasized the need for humane environment. Simoes emphasized the need for a structured curriculum and expressed doubt as to the amount of freedom possible in the curriculum of open education.

The need for humane environment was echoed by Roderick and Week who added that this increase in humanness has caused teachers to implement more affective teaching goals. A difficulty arises, however, in that any adequate evaluation must measure affective achievement as well as achievement in the basic skills. This is widely recognized as an incoherent task. Bart expressed concern that the altering of the traditional classroom space may well be open for reasons of [shrinking] economy' rather than for the advantage of student's learning.

All of these researchers reported the lack of available teacher training in the methods and theories of open education. Misiti and Lesniak found further the lack of self-confidence and know-how among the teachers to be a major negative influence frustrating the success of the open classroom and open educational programmes. Elberty reported the existence of a paradox in that the proponents of the open system of education must tolerate highly structured systems cannot tolerate openness.

The Qualities of Open Education

The term open education means different things to different educators, each thinking himself as being an 'open person'. Therefore, open education has almost as many meanings as persons referring to their own quantity and quality of 'openness', at least in educational terms.

Traditionally, educators have tended to be authoritarian in the nature that teaching objectives were strongly oriented toward the achievement of teacher-developed plans in the cognitive domain. An educator who displays strong authoritarian tendencies is not inclined to open the content of his

course to the scrutiny of students. The student's cognitive domain encounter is best left in the hands of the teacher according to the traditional educational philosophy.

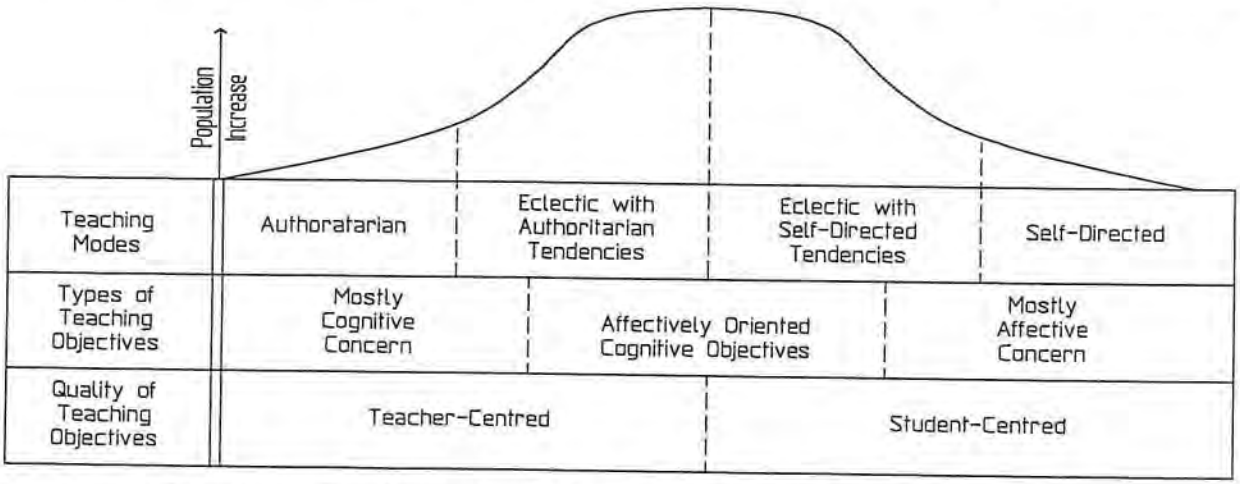
Traditionally, these educators have had other ways of providing 'open education'. One can open the physical environment, or 'open space.' Some teachers practice this quality of openness for student interactions and involvement so as to provide a learning experience in the affective domain.

The student-centred educator who displays strong tendencies toward affectively oriented cognitive objectives thrives on a course in which students select curricula content. For the self-directed teacher, it is more meaningful to open the course content so as to promote more effective student interactions in the learning environment.

Quantity education, as it related with cognitive achievements, and quality education, as it relates with the affectiveness of a teaching strategy, undertake different meanings for different teachers. For the authoritarian teacher, the quantity-quality parameter fuse means having covered a larger and larger set of materials for student's cognitive achievements.

For the self-directed teacher, it means having involved more and more students n the learning environment. Ultimately, the self-directed teacher enhances students' cognitive achievements. Here the cognitive domain is in varying degrees, balanced with the affective domain.

These are calculated successes to both of these strategies, which explains whey there are different values for these different teachers. Success for any teacher comes with the adjustment or alignment of the values that they hold sacred in the realities of their classroom environment. Success usually requires the development of group-managerial skills compatible with the teaching strategy employed.



Teacher Preferences in a Quantity-Quality Paradigm

By categorizing the quantity-quality factors in the context of teacher preferences, the types of teaching objectives are likewise aligned into coherent strategies.

Thus, a dichotomy is proposed to exist amount the practitioners of open education. The dichotomy evolves from the 'kinds of activities' that a teacher prefers to have students perform. These activities are based on different sets of individual preferences from teacher to teacher reflecting their philosophies, to which a paradigm is herein suggested.

A Teacher Preference Paradigm

Authoritarian and self-directed teahcers are proposed to be at opposite ends of a teacher-preference dichotomy which serves as the basis for a number of behavioural patterns among teachers. Although authoritarian and self-directed teachers display opposite patterns of classroom behaviour, the paradigm appears to be a continuum, fusing into a blend that is exhibited by the large numbers of eclectic teachers. The paradigm categories, or teaching modes, include: (1) the authoritarian mode; (2) the eclectic mode with authoritarian tendencies; (3) the eclectic mode with self-directed tendencies; ad (4) the self-directed mode (see figure above).

When considering the various modes of education that are prompted by quantity-quality parameters of teacher preferences, the types of learning objectives preferred also become tangible and measurable. The quality of teacher-centeredness or student-centeredness is likewise exposed.

Quantity vs. Quality in Classroom Instruction

The measurable parameters of quantity and quality classroom instruction depend entirely on the teacher-preferences and the managerial skills with which teachers implement these preferences, different skills and different ideals for different teachers. The quantity-quality parameter of classroom instruction is always present. One cannot exist without the other, Any teaching strategy will yield a certain quality toward cognitive achievement and have a certain affective quality. The confusing factor lies with the subjectiveness of quantifying th quality of affectiveness. That subjectivity is a matter of degree, definition, and semantics. Some teaching modes rely more heavily on 'quantity strategies' while others rely more on 'quality strategies.'

Cognitive Domain	Affective Domain
1. Students Learned a Lot	And Enjoyed the Lesson a Lot
2. Students learned a Lot	But Did Not Enjoy the Lesson
3. Students Did Not Learn Much	But Enjoyed the Lesson
4. Students Did Not Learn Much	And Did Not Enjoy the Lesson

Range of Quntified Effectiveness of the Quality Parameter
(Listed From Most to Least Desirable)

With the exception of this phenomenon having a continuum quality, with all possible interblending, the four categories best describe the cognitive-affective parameter in terms of the affective domain.

Any teacher can determine the degree of effectiveness of a lesson, unit, or course by simply asking the students, 'Did you enjoy the lesson, unit, or course?' If done candidly, the students will be very honest. The 'yes' and 'no' answers, arithmetically averaged, are co-ordinated with the cognitive success of the students for that lesson, unit or course, as shown in figure [above]. *The range of quantified effectiveness is listed from the most desirable outcome to the least desirable.*

While the characteristics of the authoritarian, eclectic and self-directed modes are described in earlier chapters, some conclusions can be made concerning how open education is implemented by these different teachers. By trail and error, a teacher usually develops the managerial skills that are compatible with personal values and the mixed bag of realities of the classroom environment with students. Most teachers, being eclectic, find comfort with happy mediums. Others step further and further out on the philosophical limb. The potential for failure is greatest out on these limbs; however, so is the potential for pleasure with success for the few that dare to taste of these fruits. For both the dedicated authoritarian and the dedicated self-directed teachers, professional comfort comes to each believing that theirs is the only way to teach."

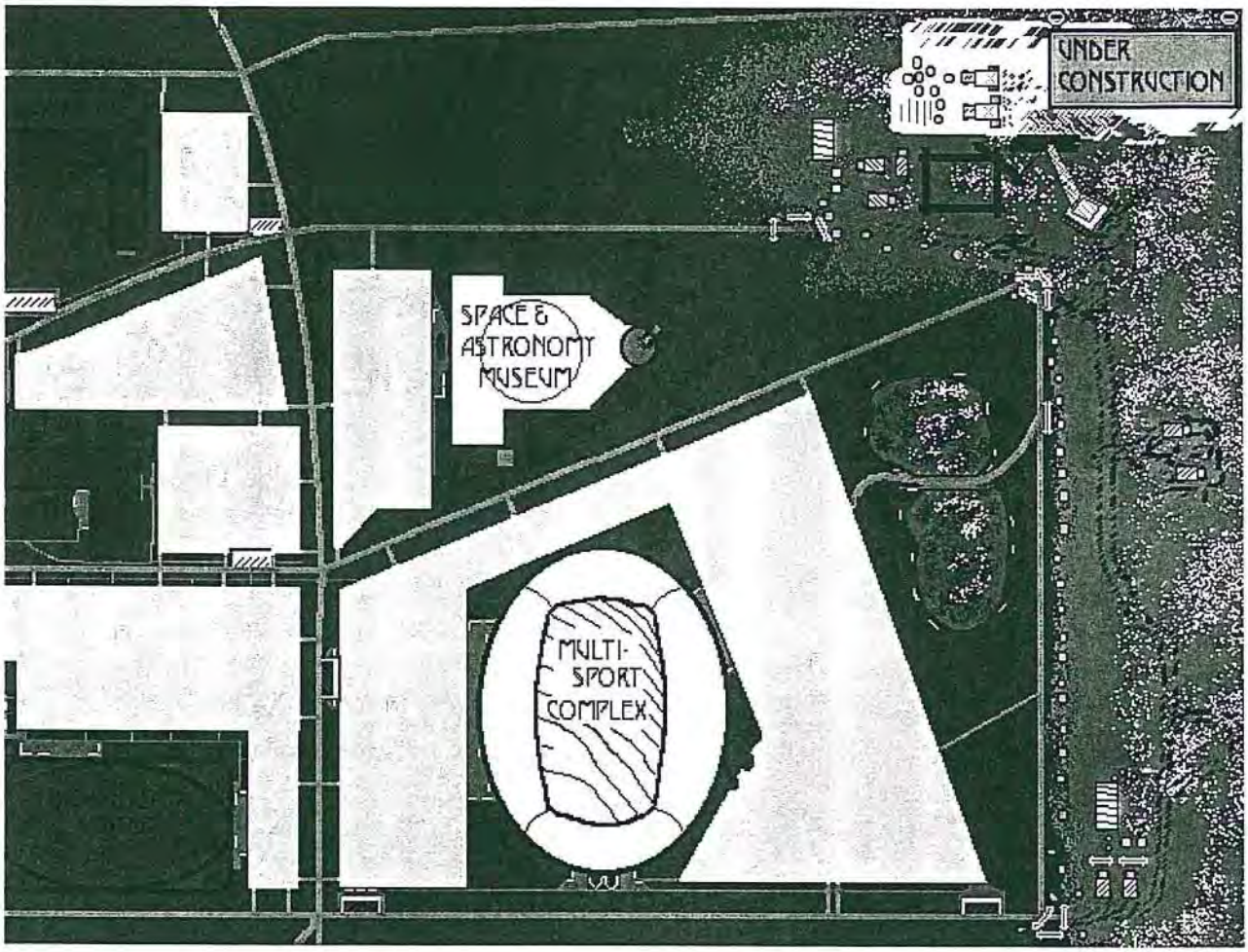
Virtual U. Demographics

- Virtual University
  - Enrollment: 15,062
  - Tuition: $60.00 per semester hour
  - Housing: On Campus--Divine Hall, Orlando Hall, Fleming Hall, and Westwood Hall Off Campus--students may live off campus after their first 30 hours.
  - Athletic Facilities and Programs: Virtual University Multi-Sport Complex
  - Virtual University Center: The Virtual UC has a food court, a lounge, a travel agency, and a bookstore, where students may enjoy virtual social interaction.
  - Administrative Actions during Spring '96: The administrators of Virtual University allocated funds for research and decisive action on the following topics:
    - The Sale of Alcohol on the V. U. Campus
    - Financial Aid, Academic Receipts, and Advertising: Virtual University students can receive various grants, scholarships, and loans, both from federal and local agencies.
    - Sports Programs
    - Remote Registration Process: In addition to the on-site registration process, Virtual University offers registration by mail, phone, fax, and email.

Tour Sans Re'al

Go Back to Sans Re'al at a Glance

Virtual University Campus East



Go Back to Campus West

Continue Campus Tour

Go Back to Home Page

The Area

The San Isabel Mountains, which surround Sans Re`al and Virtual University

A mere 40 minutes by plane to Springfield, USA, Virtual University promises unique educational and cultural opportunities. Located in Sans Re`al in the heart of the San Isabel Mountains, Virtual University overlooks gorgeous Lake Solitude. Yearly, this beautiful and awe-inspiring region receives approximately 8 inches of rain during the summer and 100 inches of snow during the winter in the upper mountainous areas. Sans Re`al promises renowned restaurants and bars, a golf course, tennis courts, horseback riding, water sports, snow sports, and breath-taking vistas.

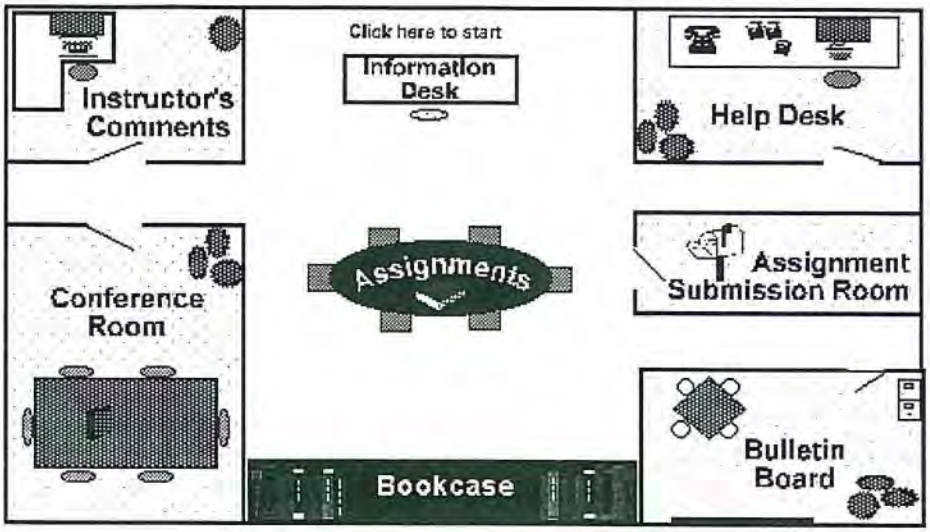
Sans Re'al Local Color

Let's go back a century or so, when two literature-loving explorers first stepped foot in this peaceful and picturesque region. Rudy von Reest, an amateur archaeologist and reader of great works, teamed up with Nyla Gnikne, a philosopher and cultural explorer extraordinaire, in the later part of the nineteenth century on the Llano Estacado, in a location now known as Lubbock. They decided that cultural and educational endeavors in America were unfulfilling, so they set off North, in search of a place known as Auquantna, or the "City of Heavenly Paradise and Lots of Other Fun Things To Do," only referred to in ancient folklore and legend. After three years of searching, several very pleasant experiences with the settlers of the region, and a few broken wagon wheels, von Reest and Gnikne could not find Auquantna. They decided to give up and return home with little precious knowledge of the great city. Early the next morning, as they crossed through the Chasm of Great Expectations, von Reest and Gnikne found their city, although not the legendary Auquantna. They were exhausted from their journeys and had had little food and sleep; the circumstances looked grim.

Hallucinations ebbed and flowed through their minds as they broke through the upper formations of the Chasm of Great Expectations. They took their first steps into the valley that would soon become Sans Re'al. Overwhelmed by the beauty of the landscape, they decided to establish a new cultural and educational hub for the nation. Von Reest and Gnikne established a general store, a small hotel, and a tavern. Soon, frontier travelers heading for the West began to stop in and stay for a while. Now, some 100 years later, Sans Re'al has grown into a cultural and educational icon.

Go Back to Home Page

English Technical Writing 210G



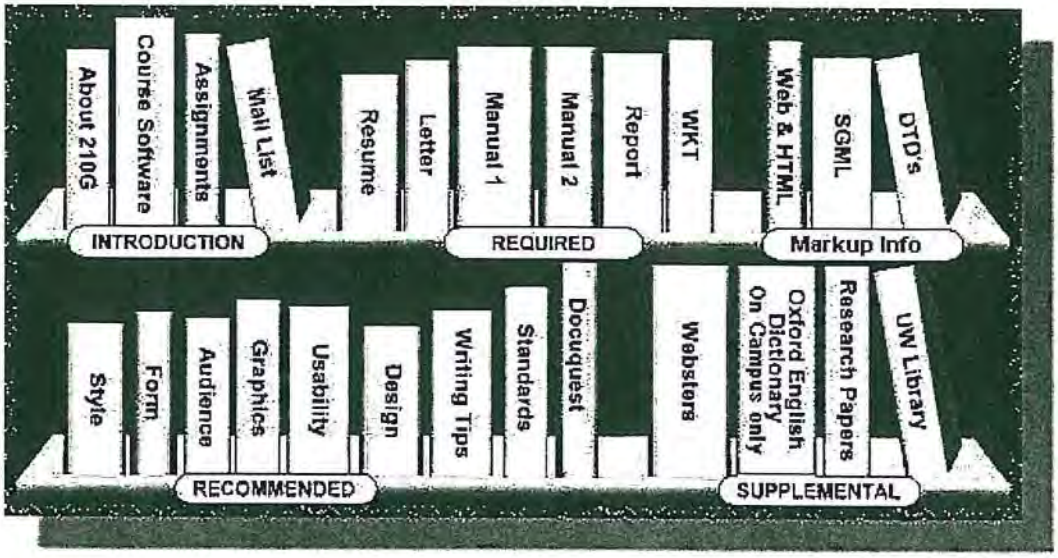
Visitors Tour

[Instructors Comments] [Information Desk] [Help Desk]

[Conference Room] [Assignments] [Assignment Submission]

[Bookcase] [Bulletin Board]

English Technical Writing 210G



Introduction

[About 210G] [Course Software] [Assignments] [Mail List]

Required

[Resume] [Letter] [Manual 1] [Manual 2] [Report] [WKT]

Markup Information

[Web & HTML] [SGML] [DTD's]

Recommended

[Style] [Form] [Audience] [Graphics] [Usability] [Design]

[Writing Tips] [Standards] [Docuquest]

Supplemental

[Websters Dictionary] [Oxford English Dictionary - On Campus Only]

[Research Papers] [University of Waterloo Library]

October/8 Session

Paul_Beam: . . . . Wed, Oct 8, 8:41AM (EST)
Clint -- a demo! We'll be doing this at 3 for any class members who want to consider special topics. Good for us!

andrew: . . . . Wed, Oct 8, 3:00PM (EST)
Deb and dave....go to room #2

Archana: . . . . Wed, Oct 8, 3:01PM (EST)
Hi Ingrid, you there yet?

Ingrid_Exner: . . . . Wed, Oct 8, 3:01PM (EST)
Hey Arhcana! Do you want to ask

Aparna_Shikaripur: . . . . Wed, Oct 8, 3:03PM (EST)
Hi there.

Ingrid_Exner: . . . . Wed, Oct 8, 3:03PM (EST)
Ecuse my incomplete sentence. Let me repeat. Archana, do you want to ask Professor Beam about Project #1?

Archana: . . . . Wed, Oct 8, 3:04PM (EST)
Hello all! Ingrid, is Prof. Beam here yet?

Ingrid_Exner: . . . . Wed, Oct 8, 3:04PM (EST)
Hi Arpana ! Nice to "meet" you.

Ingrid_Exner: . . . . Wed, Oct 8, 3:05PM (EST)
Nope, I don't "see" him.

Ingrid_Exner: . . . . Wed, Oct 8, 3:06PM (EST)
How many people out there are interested in doing the "extra" projects?

Ingrid_Exner: . . . . Wed, Oct 8, 3:07PM (EST)
Is Professor Beam supposed to be at both chat sessions?

Aparna_Shikaripur: . . . . Wed, Oct 8, 3:08PM (EST)
We are two people in the group and have been looking for a third desperately. Any suggestions?My other group member is Gloria.

Ingrid_Exner: . . . . Wed, Oct 8, 3:09PM (EST)
Hi, Professor Beam! Archana, Manal and I are interested in Projecct #1. Can you explain a little more about it?

Paul_Beam: . . . . Wed, Oct 8, 3:09PM (EST)
Just like the tv sitcoms - -Prof rushes into room late, flustered, email blowing around . . . Hi! Sorry I'm late, my darn browser got stuck in trafic.

Paul_Beam: . . . . Wed, Oct 8, 3:10PM (EST)

Sure I can -- which is project #1?

Archana: . . . . Wed, Oct 8, 3:10PM (EST)
Hi Prof. Beam! We're just curious about the project before we submit a bid for it?

Paul_Beam: . . . . Wed, Oct 8, 3:11PM (EST)
Archana, thanks for the interest. I'll be here at 8 as well and we'll post both sessions as the comments on the projects.

Paul_Beam: . . . . Wed, Oct 8, 3:13PM (EST)
What's the subject of our itnerest? I'm not looking at Inst Comms, so can't guess which '#1' is.

Archana: . . . . Wed, Oct 8, 3:13PM (EST)
It's the one involving the setting up of a similar course... and we gather that we will be helping with evaluating instructors etc. but could you be more specific about what our part of the project would be?

Ingrid_Exner: . . . . Wed, Oct 8, 3:15PM (EST)
Also, will our participation in the projects perhaps replace the need to do "the report"?

Paul_Beam: . . . . Wed, Oct 8, 3:15PM (EST)
I'm going to go over to Inst Comm and check -- sorry to be vague, but I don;t think you'll be evaluating instructoirs . . .

Beth_Woof: . . . . Wed, Oct 8, 3:15PM (EST)
HI folks, great to see you here. I'm here for a short while but Prof Beam can answer your special project questions. If you have other course questions just send email as usual. We can also arrange to meet here if that suits your better.

Brian_Cameron: . . . . Wed, Oct 8, 3:16PM (EST)
He!!o all... Paul, project #From our research into this form of learning, we have begun a long-term project in Bandung, Indonesia. Brian Cameron and I will be going there to initiate it in latter November and we will be able to communicate with course members from our presentations at a conference and our training of people on site in Bandung. 1 deals with

Paul_Beam: . . . . Wed, Oct 8, 3:16PM (EST)
I'm going to go over to Inst Comm and check -- sorry to be vague, but I don;t think you'll be evaluating instructoirs . . .

Archana: . . . . Wed, Oct 8, 3:16PM (EST)
Not evaluating instructors exactly but checking if they 'get' the software, perhaps? We're none to sure about it ourselves...

Ingrid_Exner: . . . . Wed, Oct 8, 3:20PM (EST)
Hey Beth! I would like to chat with you, perhaps on Friday? I would like to discuss gif's and how to chat them. Do you "catch" them like bit maps and then "fix them up" in a paint program? These are just two questions. But how about "chatting" Friday @ 10:00 a.m. in the Main Chat Room?

Paul_Beam: . . . . Wed, Oct 8, 3:21PM (EST)
Thanx Bri, Hi Beth! Great to chat with both of you too! OK --Bandung -- we are starting a major project in Indonesia by Bri Cameron and me going there in November to start them on our system. We want to start an initial project, with some Engg 210 folk, to meet and work with their students getting

started on our course, via their system in Bandung. We will use email and our cousrse software to help them get started on: the interface, course tools; the software; our exercises; English writing skills. We will select who among them will join -- maybe 6 to 12 folk -- and how we'll work with them. This could include the Reprot if we decide to extend our work that far. I'd like to do that if some of you are interested.

Archana: . . . . Wed, Oct 8, 3:23PM (EST)
So, basically we would be meeting these people and seeing if they had the same problems we did when we first used SGML... Am I getting close to what Engl210 stuidents who are selected to do this project woulf\d be doing?

Ingrid_Exner: . . . . Wed, Oct 8, 3:23PM (EST)
Excuse my spelling and word slip in the last message Beth. Gif's don't "chat". Excuse my mild dyslexia.

anonymous: . . . . Wed, Oct 8, 3:25PM (EST)
Ingrid, Friday at 10 a.m. isn't great for me. However, I think we can handle your questions by email and/or via existing books on the shelf. The graphics manual is excellent and you should also read *SGML* and *DTDs* located in the upper right hand corner of the bookshelf. Also, some of your classmates are now posting graphics tips at the newsgroup. Why don't you start checking in these places first. Then we can talk some more. Basically, I often press *Print screen* to capture whatever is on my screen and then take it over to something I use called LViewPro. It crops things nicely and can turn graphics into web-happy formats such as .GIF or .JPEG. Most paint programs create graphic as bitmaps and then they need to be converted to something that browsers like to view.

Paul_Beam: . . . . Wed, Oct 8, 3:26PM (EST)
Bri and I are now arranging to select the Indonesian participants and we will have them by earl next week. We will work with the UW group(s) on this project to arrange as series of activities and support processes fro these people, some of whom may have real ESL language problems. We will then set up a schedule to get them organized for series of mini 'lessons' which you will prepare and conduct and assess and we want to build theiur interest, confidence, respect and writing ability. I'd like this to be a 2-year project, with on-going interest from here and a growing commercial and academic role there. We will be working with the National Research Councila nd CIDA from the start.

Beth_Woof: . . . . Wed, Oct 8, 3:27PM (EST)
Ingrid, that last anonymous was really a message from me. Oops! Forgot to enter my name. Please send email if you want to talk more. I'm pressed for time and must go immediately to my kids' school to take in the annual Book Fair. How's that for a noble excuse to leave a chat? Bye everyone.

Archana: . . . . Wed, Oct 8, 3:29PM (EST)
Have fun at the Book Fair, Beth... I wish I was going with to one too, but I don't have time to read anything apart from texts this semester!

Gloria: . . . . Wed, Oct 8, 3:50PM (EST)
I made it! my server was so busy I could't get on until now

Gloria: . . . . Wed, Oct 8, 3:55PM (EST)
Aparna I sent you a couple of E-mails . I found a third member, Dan Gagnon. Thanks for putting us in touch with him Beth.

Aparna_: . . . . Wed, Oct 8, 3:56PM (EST)

Hi Gloria, Glad that you made it .

Kim: . . . . Wed, Oct 8, 3:57PM (EST)
Do we still have a chat session?

Kim: . . . . Wed, Oct 8, 4:02PM (EST)
Hmmmmm...one minute they are there ... next minute .. gone

Brian_Cameron: . . . . Wed, Oct 8, 4:04PM (EST)
Paul Beam will be back in 10 minutes

Kim: . . . . Wed, Oct 8, 4:06PM (EST)
Thanks..but what happened?

Gloria: . . . . Wed, Oct 8, 4:06PM (EST)
Aparna I can't make the 9:00 chat session (I'm working)But how about we meet in chat room2 at 10:00pm to discuss our manual. I will E-mail Dan to let him know we will be there at 10pm. Im Sorry I have to go but I have to be at work soonI'll see you at 10

judy: . . . . Wed, Oct 8, 4:17PM (EST)
is this a private team chat?

Brian_Cameron: . . . . Wed, Oct 8, 4:18PM (EST)
No judy the prof is on his way

Adam: . . . . Wed, Oct 8, 4:18PM (EST)
Is paul back yet?

judy: . . . . Wed, Oct 8, 4:18PM (EST)
okay :) thanks :)

Paul_Beam: . . . . Wed, Oct 8, 4:21PM (EST)
I'm here! Let's talk.

Kim: . . . . Wed, Oct 8, 4:23PM (EST)
Hi Prof. Beam. I am interested in #2. What's the student involvement please? Could a distance education student participate?

Paul_Beam: . . . . Wed, Oct 8, 4:23PM (EST)
Folks, we've had a serious interuption but our server is fine and we're back -- I'll pick this up with interested folk over the next few sessions and will announce a time for a a chat on Thursday. I'll ask Beth to post this session too.

judy: . . . . Wed, Oct 8, 4:23PM (EST)
question: How can you tell the converter to accept other output formats, and what would they be besides html and rtf?

judy: . . . . Wed, Oct 8, 4:24PM (EST)
I have been playing with the converter, and I can't figure that out

Paul_Beam: . . . . Wed, Oct 8, 4:24PM (EST)
Sorry, my earlier problem -- what's #2? The major authoring systems? Yes, a DE is as good as everyne

else and better than some!

judy: . . . . Wed, Oct 8, 4:25PM (EST)
I am playing with the html options too but I don't want any hints about those just yet...I think I may be able to figure those out

Paul_Beam: . . . . Wed, Oct 8, 4:25PM (EST)
Great -- I won't comment on these Judy. They are the 'style sheets' of the online display world.

Kim: . . . . Wed, Oct 8, 4:26PM (EST)
yes, "major authoring systems", could you tell me of the student's involvement?

Paul_Beam: . . . . Wed, Oct 8, 4:29PM (EST)
re the authoring systems .. . We have identified 5 commercial authoring systems. Your project would be to a) from their web sites, determine the capabilities of the software, its costs, the systems it requires, its major features and what is needed of systems resources and training of personnel to use it. We will use the course facilities and tools as an index -- not necesssarily the most sophisticated, but a good one, and we'll make our comparisons from there.

Kim: . . . . Wed, Oct 8, 4:32PM (EST)
Who are these 5? And, whom are they educating?

Paul_Beam: . . . . Wed, Oct 8, 4:41PM (EST)
Michael Tabor of e-Commerce has identified the 5 pieces of software and he will work with me to supervise the assessments of them.

Paul_Beam: . . . . Wed, Oct 8, 4:43PM (EST)
Your group will work with him in making a matrix of authoring features, systems, etc, by which we can compare how authoriung of online materiasl is done and how it is distributed -- you will see the main features of online learning/training development and be in aposition to assess them.

Kim: . . . . Wed, Oct 8, 4:44PM (EST)
Just to clarify then, these 5 pieces of software are used in the training of business products, not academic material?

Paul_Beam: . . . . Wed, Oct 8, 4:48PM (EST)
Student involvement: Michael will identify the systems. You will go to the company web sites and a) prepare a report of what you find there, b) make some initial comparisons and we will then link you with people who know about the systems for more information. c) you will contact the companies then with specific questions and comparisons. We will use 210G features as the base for comparison. At this point we will see if we can get you access to some or all of the systems from which to complete assign #4, as your report, if you were now sufficiently interested and knowledgeable -- and you could complete the course work with a good analysis of a a sophisticated authoring system. We'll keep you in touch with our own folk, like Susan Bodnik and Paul Reader, to get advice and share opinions.

Kim: . . . . Wed, Oct 8, 4:50PM (EST)
Is there any interest in the delivery of public school education?

Paul_Beam: . . . . Wed, Oct 8, 4:51PM (EST)
These are authoring systems -- kinda like pens and pencils on a large scale -- they can be used to create materials for 210G or for Ontario Hydro -- they are the tools like the SGML editor and

converters, by which anyone, academic, employee, can make online information & training.

Paul_Beam: . . . . Wed, Oct 8, 4:53PM (EST)
You could use them for that too. Whose interest? The software companies? I don't know. I think you will see that they all have many markets - -it's the focus on what they do and how they do it that is the project, not so much an audience. You could apply the test of them against that education group, I guess.

Kim: . . . . Wed, Oct 8, 4:55PM (EST)
Oh, I see ... authoring systems

Paul_Beam: . . . . Wed, Oct 8, 4:58PM (EST)
Our authoring systems in 210G is the SGML report dtd. How do other online systems create their information and tools for their learners? There are other neat systems and you would see new ways of working together.

Kim: . . . . Wed, Oct 8, 4:59PM (EST)
Thanks for the information.

Paul_Beam: . . . . Wed, Oct 8, 5:00PM (EST)
You're welcome. Hope it helps -- see you! Bye for now.

Paul_Beam: . . . . Wed, Oct 8, 7:39PM (EST)
Welcome folks -- thanks for joining. Here are the 4 topics for special projects 1) The Indonesian online learning topic 2) Evaluating online authoring systems 3) Building a new Library Resources module 4) Assessing the Course Administration Tool Let's refer to these numbers in our discussion. In each we plan to make the work across assigns 2 &3 equivalent to the regular assignments. It may be possible to complete your assignment 4 from this involvement too, but we have to determine that by how these projects develop. If you enjoy the work and it expands by your enterprise, then there's lots to do in each one -- let's have the work fill the bill.

Paul_Beam: . . . . Wed, Oct 8, 7:46PM (EST)
This afternoon, at about 3:40, our server access . . . died. Bri Cameron was on chat at the time and he then trouble-shot (is that a word?) the server -- itrc@uwaterloo.ca, our course machine. He found several possible problems but nothing specific. If that happens this evening, I'll address project issues from Inst Comments from folks' emails. The point is that we have a small window to decide on these. There are no tricks; the work load is proportionate and the involvement with several current topics is a bit more direct. Life urges some risks . .

Shelley: . . . . Wed, Oct 8, 8:01PM (EST)
Hi, Sorry I'm late.

Paul_Beam: . . . . Wed, Oct 8, 8:03PM (EST)
On topic 1, Indonesia, we are starting a large development project there, to bring our course and authoring technologies to their educational system. It's a chance to meet and work with students there. We will be centered on our machine here and on a similar server there. We want to teach them both technical writing and how to author their own online learning. I'd like to see them independent and doing their own work in their own langugae -- but we have ot start them with support from here. I'd like several groups to help Beth and Bri and me to do that -- and to stay involved then for a long time. If you are interested in ESL this might be for you.

Shelley: . . . . Wed, Oct 8, 8:03PM (EST)
I"m not interested in the four projects-Is that the only topic for tonight?

Archana: . . . . Wed, Oct 8, 8:03PM (EST)
So that's why we were suddenly cut off in the middle! I wondered if it was something like that because a lot of the machines on campus had problems around the same time. Prof. Beam, sorry to ask you again, but could you tell us more about Project 1 because we didn't really understand the student share of it?

Archana: . . . . Wed, Oct 8, 8:05PM (EST)
One of my partners and I have both had some experience in ESL tutoring so are really interested in this project.

Paul_Beam: . . . . Wed, Oct 8, 8:06PM (EST)
Shelley, you might want another room -- this was the agenda item.

Shelley: . . . . Wed, Oct 8, 8:07PM (EST)
Thanks anyway... Bye.

marley: . . . . Wed, Oct 8, 8:09PM (EST)
Hi everyone. Is Cathy Roks here?

Christy: . . . . Wed, Oct 8, 8:09PM (EST)
Re: Bandung, In the instructor's comments you mention that we should understand the time and expertise requirements and the "conditions" of the project. Could you expand on this?

cathy: . . . . Wed, Oct 8, 8:10PM (EST)
Hi Marley

Paul_Beam: . . . . Wed, Oct 8, 8:10PM (EST)
Archana, I want to get some of our 210G students to 'host' the Indonesian counterparts thru the features of the course. We are setting up a copy of it so they can access it quickly there but we need more support in writing, which will be hard for some of them, and in technical issues -- because they have no one there to handle details. this is where we will come in -- especially Bri. We will not be requiring them to complete assignments during this time, but will work them thru the details. Bri and I will be on site to do some specific creation of materials in latter Nov -- and we'll be in touch with the support groups here from there!

Brian_Cameron: . . . . Wed, Oct 8, 8:10PM (EST)
He!!o all... just back from piano lesson.

marley: . . . . Wed, Oct 8, 8:11PM (EST)
Cathy maybe we could meet in room 3.

cathy: . . . . Wed, Oct 8, 8:13PM (EST)
I'll talk to you in rm 3

Archana: . . . . Wed, Oct 8, 8:13PM (EST)
Thank you very much, Prof. Beam. That sounds somewhat do-able!

Brian_Cameron: . . . . Wed, Oct 8, 8:14PM (EST)
... just catching up on the backlog of chatting

Paul_Beam: . . . . Wed, Oct 8, 8:14PM (EST)
re Indonesia, check it out a bit on the web. We'll see to getting you connected to the individuals -- and may involve you in selecting them if we have time. We think we would like to work with about 12 folk that side and maybe 6 here. We can break out our groups to cover cultural, technical, administrative and pedagogic issues. Each of you will work directly with one or more members on language/writing/composition. Does that help?

Archana: . . . . Wed, Oct 8, 8:16PM (EST)
And I guess we will be communicating with them via email and chats?

Paul_Beam: . . . . Wed, Oct 8, 8:19PM (EST)
How we turn to this stage will depend a bit on: a)how well we can get the course running there. They are technically smart in the research group, so this isn't a big problem right now. b) who gets the bid here, with what skills you bring and your interests and c) the calibre and motivation of their candidates. I want to carry this work ahead in 1998 and will need on-going support from here as special studies credits or graduate work as theses. You don't have to commit to that but we do want to get exchanges going as soon as possible.

Christy: . . . . Wed, Oct 8, 8:19PM (EST)
Prof. Beam, yes that helps me understand the Indonesia project and what's involved.

Paul_Beam: . . . . Wed, Oct 8, 8:23PM (EST)
Something else I want to do culturally is to ahve us use the resume to show how we infer so much from apparently innocuous statements -- and then let's see what they see! This will be a good and useful introduction and will lead to help and support issues around our writing.

Paul_Beam: . . . . Wed, Oct 8, 8:24PM (EST)
But how about other topics?

Archana: . . . . Wed, Oct 8, 8:26PM (EST)
So in a way, you'll be examining the different nuances of meaning as we use the language and as they do?

Nash_Damji: . . . . Wed, Oct 8, 8:26PM (EST)
What's involved in Project 3 ?

Paul_Beam: . . . . Wed, Oct 8, 8:26PM (EST)
If you want to see what a good version of #3, Library Resources looks like, use the present Library module . . . Not that hard and a lot of info out there to make other students' info sources easier next term.

Christy: . . . . Wed, Oct 8, 8:26PM (EST)
Prof. Beam, could you clarify what you mean when you say you will be looking for our "suggestions for aids based in module and program features of the course." Do you mean you will look to us to design the learning modules and features of the course?

Paul_Beam: . . . . Wed, Oct 8, 8:27PM (EST)
Nash, that was coincidence - -I can't type that fast! Does that give an illustration?

Olivia_D'Costa: . . . . Wed, Oct 8, 8:29PM (EST)

Hi Nash and Steve (fellow group members)

Nash_Damji: . . . . Wed, Oct 8, 8:29PM (EST)
I am not sure what you mean when you say "Library Resources"...

Paul_Beam: . . . . Wed, Oct 8, 8:30PM (EST)
Christy, this means that we need you, as participating members, to think through how we could be doing things 'better' -- what options we could use, how we could better group tools and features. Is the course well laid out? Well, it's not perfect -- and we're looking for improvements from the folk who work in it.

Nash_Damji: . . . . Wed, Oct 8, 8:30PM (EST)
Hello Olivia, Steve...

Olivia_D'Costa: . . . . Wed, Oct 8, 8:30PM (EST)
I think library resources are on the Bookshelf....

Steve_V: . . . . Wed, Oct 8, 8:30PM (EST)
Hi Olivia. Hello Nash.

Nash_Damji: . . . . Wed, Oct 8, 8:31PM (EST)
Thanks... Olivia..

Olivia_D'Costa: . . . . Wed, Oct 8, 8:31PM (EST)
Are we meeting on the BBS later?

Nash_Damji: . . . . Wed, Oct 8, 8:32PM (EST)
Yes.. 10 ?

Paul_Beam: . . . . Wed, Oct 8, 8:32PM (EST)
Nash, this means exactly those resources not included in the course materials themselves -- that whole range of sources on technical writing, writing standards, sources for info on tech writing and organizations who take a position on its quality.

Steve_V: . . . . Wed, Oct 8, 8:32PM (EST)
I think so, Olivia.

Olivia_D'Costa: . . . . Wed, Oct 8, 8:34PM (EST)
How about 9:00?

Steve_V: . . . . Wed, Oct 8, 8:35PM (EST)
9:00 is fine for me. Nash, you indicated 10 may be better for you?

Paul_Beam: . . . . Wed, Oct 8, 8:35PM (EST)
Nash, I meant to emphasize "on the Web" -- the links out to areas of information 210G students can turn to get help on their 210G assignments. This will never, like a library, be 'inclusive' or all-encompassing, but it doesn't ahve to be because thsi is a term course with a limited time for each of us to follow particular sources of info.

Nash_Damji: . . . . Wed, Oct 8, 8:36PM (EST)
ok... Paul, what's involved in the Project 4. Are you testing out beta software?

Christy: . . . . Wed, Oct 8, 8:37PM (EST)
Prof. Beam, thanks for taking the time to clear some things up. Nancy, I look forward to hearing your thoughts (via e-mail) now that we have more info on the Bandung project. Bye for now.

Olivia_D'Costa: . . . . Wed, Oct 8, 8:37PM (EST)
Nash, was that OK for 9:00?

Nash_Damji: . . . . Wed, Oct 8, 8:38PM (EST)
Yes...Olivia :)

Olivia_D'Costa: . . . . Wed, Oct 8, 8:39PM (EST)
I will meet youoring fields will identify five major authoring systems. We'll then set up a matrix to list the features the group feels make for good online creation/display. Group members will then assess each system against these criteria and we'll then begin to ask the producers for access to them to try them out -- we're now a bit beyond assign 3 and some of you would have the option to complete a survey of the full system on assign #4. That would be your option.

Paul_Beam: . . . . Wed, Oct 8, 8:59PM (EST)
Folks, I have to go - -I've enjoyed this and I think Beth will edit it for later readers. Good luck on the bids. I want those to be 'fun' in the sense of trying something different -- and we'll try to bring latitude and our own imagination as we work with you on them. Best to the group, and Good Night!

Lois: . . . . Wed, Oct 8, 9:30PM (EST)
Hi Brenda & Shelly, just checking in. I don't see you names up yet so I will just pop out for a bit. I'll be right back.

Lois: . . . . Wed, Oct 8, 9:34PM (EST)
Hi Brenda, I see you've arrived

Brenda: . . . . Wed, Oct 8, 9:38PM (EST)
Yupper! I'm here! Good evening Lois. (I noticed a Shelley in an earlier conversation.... I wonder if she got the wrong time? Just reading the conversations re: the extra projects.... sounds pretty bizarre eh? You still want to stick with our manual eh?

Shelley: . . . . Wed, Oct 8, 9:39PM (EST)
Hi, sorry I'm late-lines were busy

Shelley: . . . . Wed, Oct 8, 9:40PM (EST)
Did either of you get my e-mail today? there were a few different ones.

Lois: . . . . Wed, Oct 8, 9:40PM (EST)
I think that I still want to stick with the Manual. Hi Shelley

Lois: . . . . Wed, Oct 8, 9:41PM (EST)
Yes, I got your e-mail.

Shelley: . . . . Wed, Oct 8, 9:42PM (EST)
Hi to both of you! The manual sounds challenging enough- but that first project looked really interesting. way beyond my abilities though!

Brenda: . . . . Wed, Oct 8, 9:43PM (EST)
Welcome aboard Shelley... there was a Shelley chatting bout an hour ago.. was that you?

Lois: . . . . Wed, Oct 8, 9:43PM (EST)
I missed the Web Chat with Paul Beam, but I took a quik look at the conversations. Very interesting.

Shelley: . . . . Wed, Oct 8, 9:43PM (EST)
Lois- did you get my responses in italics? I wasn't sure if I did the attachment correctly.

Lois: . . . . Wed, Oct 8, 9:45PM (EST)
No, Shelley I didn't. Something is not working right with the attachment that I sent you and it came back in bad shape You will need to just tell us now or send your replies back in a regular e-mail, without the stuff I sent you. Sorry.

Shelley: . . . . Wed, Oct 8, 9:46PM (EST)
No that was not I chatting an hour ago- I was there at the begining of the chat but Prof. Beam was only discussing the projects so I e-mailed you both and then left the system and I have been trying to get connected ever since- all the server lines were busy what a pain-finally I got on. That was not me chatting.

Shelley: . . . . Wed, Oct 8, 9:49PM (EST)
I was fine to try the Title page and Convert, I liked the informal tone, Simple fonts, headings is okay, I appreciate all the work you put into that outline Lois-tres bien- is that correct?- or how about-THANK-YOU!!

Lois: . . . . Wed, Oct 8, 9:51PM (EST)
You're welcome. I was glad to do it. So now I think except for some details we are almost ready to get rolling. As Brenda mentioned in her latest e-mail we need to talk about deadlines (the big one being Oct 17) and our editing schedule. Throw out your thoughts.

Lois: . . . . Wed, Oct 8, 9:53PM (EST)
Also, do we have a clear understanding who we are writing this manual for. Did the short list I mentioned in my last e-mail do it, or would you like to narrow it down even further?

Brenda: . . . . Wed, Oct 8, 9:54PM (EST)
Considering the 17th is next Friday, how about if we try to have a rough rough first draft to each other by this Tuesday (keeping in mind this is a long weekend).

Shelley: . . . . Wed, Oct 8, 9:55PM (EST)
My screen here is all chopped up-my thoughts are should we start with the main sections first and then create the extra parts? What is the format that you both want to take as far as style etc.?

Shelley: . . . . Wed, Oct 8, 9:56PM (EST)
That's right-this weekend is going to be busy. Tues should be goog for me- as a rough draft.

Lois: . . . . Wed, Oct 8, 9:57PM (EST)
I think I will be able to have my portion done by Monday. So Tuesday suits me fine.

Shelley: . . . . Wed, Oct 8, 9:58PM (EST)
That e-mail from Beth was great Brenda-Thanks! There was useful info. there

Shelley: . . . . Wed, Oct 8, 10:00PM (EST)
I'm still unsure of how and what to put into my part. There are a lot of terms that I keep reading that look like another language!?!

Brenda: . . . . Wed, Oct 8, 10:01PM (EST)
as far as styles, formats etc., I don't think we have to worry about that initially....I started playing with the editor, and it pretty well takes care of everything....I inputted a title, paragraph and ulist and tried indexing... I than ran it through the converter and amazingly it looked like a manual already. Has anyone else had a chace to play with it?

Lois: . . . . Wed, Oct 8, 10:03PM (EST)
I think as far a style is concerned we probably want to use the 8.5x11 portrait page with whatever fonts the system produces. Most of all the final edit will need to make the style consistent. Is there any particular style type that you want to see included Shelley. If we get some of this nailed down first it will make the editing at the end easier.

Shelley: . . . . Wed, Oct 8, 10:04PM (EST)
Not yet, Brenda but that seems neat- I think I might be letting my fear get into the way-and just relax and "play" with it more. Its just that the terms seem so daunting.

Brenda: . . . . Wed, Oct 8, 10:07PM (EST)
Do you want to quickly try it now Shelley? i.e. just enter a title and a short line in the paragraph and run it through the converter... you'll be amazed how easy it is!

Shelley: . . . . Wed, Oct 8, 10:07PM (EST)
The information that both have you have sent has been very useful-Thanks so much. Tomorrow I'll spend some more time with the converter. I have read and re-read all of the online stuff.

Lois: . . . . Wed, Oct 8, 10:08PM (EST)
Yes, Brenda, you're right. Really all the stuff is there. Yes I have just briefly played with it and it is not hard to figure out at all. Shelley, you need to explain as simply and clearly as possible what the converter is doing. I don't think it will have to be very long. Just think about what questions people might have. Why are they pushing the Convert button? What is happening?, etc.

Brenda: . . . . Wed, Oct 8, 10:13PM (EST)
One small bit that might help, on the converter screen there is a HELP button. Once you press it, you just click on any spot or button... it gives a very brief description... might be a good starting point.

Shelley: . . . . Wed, Oct 8, 10:14PM (EST)
Wow-that was cool-thanks- it was very easy.

Lois: . . . . Wed, Oct 8, 10:14PM (EST)
Brenda, have you been able to draw up the check list you mentioned earlier?

Shelley: . . . . Wed, Oct 8, 10:15PM (EST)
Thanks for that advice Brenda and Lois-great info. I've got to get going-I'll email you both if I need assistance okay?

Lois: . . . . Wed, Oct 8, 10:16PM (EST)
Yes, those help screens are definitely as asset. Brenda, will you be able to insert the on-line screens as figures?

Brenda: . . . . Wed, Oct 8, 10:16PM (EST)
That was fast Shelley! Do you feel comfortable with it? Feel free to email me with any questions and concerns while you're working through the project, together we can work things out!

Lois: . . . . Wed, Oct 8, 10:17PM (EST)
Bye, Shelley.

Shelley: . . . . Wed, Oct 8, 10:18PM (EST)
I just did a couple of sentences and it was easy. What else is needed before I go be a parent(4 year old has just woke up)

Brenda: . . . . Wed, Oct 8, 10:18PM (EST)
I started a check list, I'll e-mail it to you both tomorrow. Please add to add to it.... it's just point form (sort of brain storming)

Lois: . . . . Wed, Oct 8, 10:19PM (EST)
We can probably e-mail anything else, Shelley. Four-year-olds get priority.

Brenda: . . . . Wed, Oct 8, 10:20PM (EST)
Shelley... good night and good luck... I'll be in touch tomorrow! Good luck with your daughter!

Gloria_: . . . . Wed, Oct 8, 10:20PM (EST)
Aparna are you there?

Lois: . . . . Wed, Oct 8, 10:21PM (EST)
Anything else you would like to add Brenda.

Brenda: . . . . Wed, Oct 8, 10:21PM (EST)
Lois... did you have anything else you wanted to discuss before we call it a night (boy an hour flies by so quickly on these chat sessions)

Shelley: . . . . Wed, Oct 8, 10:21PM (EST)
Thanks again to you both- I'll contact you both tomorrow after I have spent more time with the converter and have any questions-again-THANK-YOU!!to both of you. Bye, Shelley

Brenda: . . . . Wed, Oct 8, 10:22PM (EST)
Nothing else from moi!

Lois: . . . . Wed, Oct 8, 10:24PM (EST)
I think this is good for now. Time sure does go fast. I think it's all the waiting for replies. We can e-mail as things come up. So talk to you later. Good night.

Brenda: . . . . Wed, Oct 8, 10:24PM (EST)
Good night all!

Brenda: . . . . Wed, Oct 8, 10:25PM (EST)
Good night all!

CYBERHIGH

"Not If, but When, How and to What End"

1. EXECUTIVE SUMMARY

> *"I think CyberHigh is the best thing that has happened to my daughter in a long time. The system works beautifully for us. She is having fun learning, she works well independently and she is getting positive Christian feedback from the teachers and she is making friends all over the province."* .... A Parent

If the parents of students in grade seven and eight had the opportunity at this time to register their children in the CyberHigh program for the 1996/97 term, seventy five percent would do so "definitely" or "in all probability". If students were given the same choice, only eight percent indicated a categoric "no".

The above result is generally indicative of the opinions of parents and students about the various dimensions of the program. Parents responded favourably (average or above) on all thirty of the questions. Although not as positive in terms of above average ratings, students responded favourably on twenty four out of twenty six questions.

One of the major purposes of the study was to determine if there were any areas that were in need of immediate attention. Three areas emerged:

1. The resource materials, the instructional strategies used in mathematics and the progress being made in covering the curriculum
2. The time lost due to technical failures
3. Reporting of student achievement. While all concerns have already received some attention, it is recommended that they be " revisited" to ensure that shortcomings have been remedied. In addition, a number of recommendations have been made in readiness for 1996/97, should the program be continued.

The major limitation of the study was the lack of data related to the academic

growth of students. It is essential that this area be addressed in Phase II of the study.

Teachers remain highly committed to the program and remain optimistic as to the potential of the learning strategy. Their enthusiasm and confidence is shared by the leadership team.

There is little question that the technology and approach to learning demonstrated in the CyberHigh program will continue to expand in the years to come. The question now is not "if", but rather "how" and "when" and "to what end." Any future study of CyberHigh must become a key component in the Division's strategy for capitalizing on technology to enhance student learning. The challenge ahead is to ensure that all students will benefit in terms of meeting the learning outcomes as defined by the curriculum from what is being learned from the CyberHigh experience.

Gain is seldom made without an element of risk. The Trustees of Greater St. Albert Regional Catholic Division No. 29 are to be commended for having the professional courage to pioneer a project of such magnitude.

2. HISTORY AND DESCRIPTION OF PROGRAM

At the board meeting of September 5, 1996, trustees considered the following motion:

"That the Board of Trustees accept the proposal to adopt CyberHigh as one of the division schools as a pilot project for the 1995/96 school year subject to the following provisions:

- That full funding is obtained for each student registering with CyberHigh, and that the school operate on a balanced budget.
- That the buy out of CyberHigh be subject to negotiation and not exceed $46,750 plus GST.
- That the grade offerings and final staffing requirements be determined by the superintendent or his designate in consultation with the principal.
- That the pilot project be evaluated during the 1995/96 school year to determine its effectiveness as an alternative form of instructional delivery.
- That CyberHigh operate under the same philosophical foundation as all other schools in the Greater St. Albert Catholic Regional Division No. 29.

With its approval, the Division embarked on a highly innovative, progressive project. The program had previously operated for one year with twenty nine students in grades 7 to 9, dramatically increased to one hundred students for the following year. A request to be incorporated as a school within the Division was made by the founder in order to ensure its continuation (Appendix 1). A

description of the program is contained in Appendix 2.

3. ENROLLMENT AND STAFF

As of January 1, 1996, enrollment in the program is as follows:

Grade 7 ... 33
Grade 8 ... 34
Grade 9 ... 33
Total 100

Twelve students have withdrawn from the program since September and seven new students have enrolled.

The staff complement consists of four full time equivalent teachers and a coordinator. With the resignation of one of the original teachers, a teacher on staff at V. J. M. will teach part time in the program starting in the New Year.

4. PURPOSE OF STUDY: PHASE I

The purpose of Phase I of the study is two fold:

A. Early identification of problem areas.

Considering the expeditious manner in which the program was introduced into the Division, it is reasonable to expect that there will be some areas of the program that are in need of attention. While such areas are generally reviewed at term end, a condition of acceptance of the program into the Division was to conduct a preliminary review mid term to identify any area that required immediate attention. Succinctly stated, the study was intended to answer the question "Are there any areas of the program that should be remedied immediately?"

B. Identification of areas in need of development prior to May 1996.

While it is appreciated that the future of the program for the 1996/97 term has yet to be determined, the study would identify any areas that should be addressed before May 1, 1996:

a/ in preparation of the second phase of the report (eg. achievement testing of students).
b/ in readiness for next year (eg. development of parent and student criteria for enrolment).

In order to serve it's purpose, it was essential that Phase I of the study be completed early in the New Year.

Phase II of the study will be completed by May 1 and will contain a recommendation as to the status of the program and any possible expansion for the 1996/97 term. A recommendation to alter the original format and timing of Phase II is contained in this report.

5. PROGRAM REVIEW COMMITTEE

To assist in the development and formation of the recommendations, a program review committee was established. The group consisted of the following individuals:

Mark Anderson, Teacher, Vincent J. Maloney Junior High School
Gordon Falk, Teacher, CyberHigh
Rus Hathaway, Coordinator, CyberHigh
Jim King, Alberta Teachers' Association
Cathy Rasmussen, English Dept. Coordinator, St. Albert Catholic High School
Pat Redhead, Consultant, Edmonton Public Schools
Orest Rusnak, Parent
Ron Smith, Director, Regional Office, Alberta Education
Bob Smilanich, Consultant, CyberHigh
Lee Lucente, Superintendent (Ad Hoc)

The committee has met on three occasions:

1. To identify the areas to be addressed by the survey and design the study,
2. To review the survey questions,
3. To review results and recommendations.

Three subcommittees were established to propose questions to be included in each of the surveys: parents, students, staff.

The committee will continue to meet to serve the same purposes for Phase II of the study.

It should be noted that the committee was advisory in nature. Interpretations and recommendations presented in the report do not necessarily reflect a consensus position.

6. DESIGN OF STUDY

Ten areas to be examined were identified:

1. Philosophy and pedagogical beliefs
2. Role of the teacher
3. Delivery of program
4. Program

5. Student commitment
6. Student growth
7. Role of parents
8. Social development
9. Partnership with V. J. M.
10. Funding

Stakeholders to be consulted included:

- Parents
- Students
- Teachers
- Leadership Team

A questionnaire was developed for each group. In developing the student questionnaire, an opportunity for students to contribute to what was being asked was provided (Appendix 3). A number of insightful responses were received and incorporated. In developing the parent questionnaire, a draft was discussed "item by item" first hand with the parents at the call back on November 24. The comments and contributions were of exceptional quality. A copy of each of the surveys in included in Appendices 4 to 7.

It was decided that in designing the questionnaire, maximum opportunity be provided by way of open ended question, particularly in the case of the staff and leadership team survey.

The survey was administered during the week of December 11, 1995. The vast majority of the respondents used the program technology to complete the survey. The return rate was as follows:

100 percent for Leadership team
100 percent for teachers
48 percent for parents
44 percent for students

7. LIMITATIONS OF STUDY

As is the case with any study, it must be determined how complex, costly and sophisticated the study will be.

For this study, it was decided that it's basis would be one of stakeholder perceptions and observations as opposed to a statistical approach. The budget allocated was very moderate and time restraints a consideration.

The most significant limitation of the study was the lack of data pertaining to the academic growth of students. No data was available as to past performance. Also,

other than teacher and student perceptions, no standardized achievement tests have been administered. Especially with the introduction of Alberta Education's "Three Year business Plan" no program review can be complete without addressing the rate of student academic growth.

A second limitation of the study is the absence of a "control" group. While the data obtained regarding the various stakeholders opinion is relevant, it would have more significance if a comparison could be made with stakeholders not involved in the program. Are the parents of CyberHigh students more supportive of the program than parents of students in regular programs? Is student commitment to their studies between the two groups comparable? Notwithstanding the above, the exceptional calibre of the comments received provide valuable insights into the status of the program and areas in need of further development.

8. SOCIAL DEVELOPMENT ISSUE

Much of the media and public attention to date has centred around the perceived limited social development of students whose classroom is their home.

While there is no question that the affective growth of students is of importance, there remains many questions as to the relative contribution of each of the determining factors. What would the indicators of social development be? What factors contribute most and are they the same from student to student? Would the rural, strong familyÐbased Christian values of many of the participants affect such comparisons? What percent is of social development can be attributed to hereditary factors?

There is research, however, to suggest that the home and early years of development have a lasting effect. As students mature, the influence of peers take on greater significance. Considering that students spend less than fifteen percent of first eighteen years under the influence of the school, it is difficult to isolate the specific contribution made by the school. The degree of certainty even becomes more clouded when it is attempted to determine the effect on students who spend more time under the mentorship of their parents in a structured situation and who maintain their "outside" contacts with friends, clubs and the church.

Before claims that these students will not mature socially at a compatible rate, it is suggested that a highly sophisticated, controlled local research project would have to be completed. Until such is done, little is to be gained by debating the issue. The energies might better be used if they were channelled towards developing additional quantitative measures of student achievement and further

exploring the contribution technology can make to the selfÐdirected, individualized learning of all students.

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For information regarding CyberHigh, contact Rus Hathaway

Webmaster: John Lindeman

CYBERHIGH

INDIVIDUALIZATION AND PERSONALIZATION OF INSTRUCTION—LIBERATING CURRICULUM AND STUDENTS

Warren E. Hathaway[1]

Lois M. Hathaway [2]

The concept of individualized instruction is as old as education itself. Dow (1992) reported: "The concept of individualized instruction has been traced by Blake and McPherson (1969) to the teachings of Confucius, Aristotle, Plato and Socrates all of whom recognized the existence of human differences and variables in the educational process. "

Fletcher (1992: 1-2) described and defined individualized instruction. "Instruction is individualized to the extent that it adjusts to differences in learners. Instructional systems combine organized collections of subject matter content with procedures and rules for presenting the content to bring about learning outcomes. In individualized systems of instruction, these procedures and rules adjust the pace, content, sequence, and/or style of instruction to the needs of individual learners."

The notion of individualizing or personalizing instruction is discussed in the literature under several headings—individualized instruction, personalized instruction, continuous progress, non-graded classes, mainstreaming, independent study, and self-pacing. Equivalent to individualized instruction is tutoring, especially one-on-one, and also closely related to individualized instruction is the notion of reduced class sizes—especially sizes that approach very small numbers.

Bloom (1984: 4) found evidence that tutored students performed, on average, two standard deviations above comparable students in traditionally grouped instruction. This means that students performing at or near the 50th percentile while in grouped instruction (i.e., about 30 students and one teacher) would probably perform above the 95th percentile on the same tests when tutored.

With respect to Bloom's findings, Fletcher (1992: 16) noted: "An obvious way to solve Bloom's 2-sigma problem is to provide every student with an individual tutor. The reason we do not do this is equally obvious—it costs too much. Indeed, individualization of instruction has been called a moral imperative and an economic impossibility (Scriven, 1975)."

Andrew Rae (1993) used video to support individualized instruction following the Keller Plan—a plan that is described by Keller and Sherman (1974) as follows: "Material to be taught is broken up into units each representing at most one week's work. Print materials suitable for self-study are handed out on each unit. Tutorial help is given on a one-to-one basis, preferably by senior students (who are themselves rewarded by course credits for doing this teaching). When a student feels s/he has mastered a unit, s/he takes a diagnostic test on the unit. This test is marked by a tutor and if the student passes (the pass mark being high, say 90%) s/he goes on to the next unit; if not, the test is re-taken at a later date. There is a final examination which counts for about 30% of the marks, the rest being given for passing the unit tests. Occasional lectures are given as a 'reward' to those students who have passed sufficient units."

Dunn, Dunn, and Perrin (1994); Jane Vella (1994); Coffman (1993); and Brockett and Hiemstra (1991) provide further insights into ways and means for implementing individualized and personalized instruction.

Individualization of instruction or tutoring are not the only ways to enhanced learning. Literature on the effects of class size suggests that students presently performing near the 50th percentile on standardized tests, while in classes of 35 students, would rise to the 60th percentile in a class of 20, to the 65th percentile in a class of 15, to the 82nd percentile in a class of five, and to almost the 90th percentile in individualized or very small group settings (Glass, et al, 1982: 49).

Finn, Fulton, Zaharias and Nye (1989: 76); Folger (1989: 123-132); Mitchell, Beach, and Badarak (1989): 35-74); Hooper (1992); Taylor and Reeves (1993: 13-18) all cited research supporting reduced class size. Findings include: (1) Under certain circumstances, small group instruction is more effective than traditional large-group instruction (i.e., in classes of 25-30 with one teacher). (2) Costs of small group instruction vary inversely with class size. The smaller the class, the higher the implementation costs. (3) Individualized instruction is unquestionably able to improve student achievement significantly. (4) For the most part, individualized instruction is

most often applied to gifted students, students with special needs, and to adult students. Instances of individualization applied to programs for average students are rare. (5) The literature on individualized instruction peaked in the 1975-85 period and now appears to be diminishing. This may be accounted for by the fact that costs for implementing individualized instruction is higher than teacher-centered, large group instruction. Indeed, one can only conclude from these observations that Fletcher (1992) was right—"it [individualization or reduced class sizes] costs too much." In programs that have high costs associated with them—especially special education—individualized instruction may be a viable alternative. For the masses, individualized instruction has been too expensive. (6) Most of the research pertaining to individualized or small group instruction encountered in the literature suggests that these alternative approaches were implemented with considerable reliance on the traditional teaching paradigm.

Today, technology holds the key to cost-effectively unlocking the potentials of reduced class sizes and individualized instruction. As suggested by Merron (1991) and Rae (1993), achieving the objectives of individualized, personalized, or small group instruction may be more easily achieved within the context of a new educational paradigm rather than in the present educational paradigm. The difference between these two paradigms (illustrated in Figure 1) lies in sources of information and the roles of teachers and students.

When reduced to its lowest denominator, individualized and personalized instruction is not widely adopted because of the extreme workload placed on teachers as they attempt to track the progress of numbers of students and to provide individual students with suitable learning resources as needed. A simple technologically-enhanced learning system for managing and tracking students and for locating and retrieving learning resources as required has been developed by the author (Hathaway, 1990).

Summary

Individualized, personalized, and small group instruction are proven ways for enhancing student productivity. The fact that few instances of these alternatives are found in operation in main stream education lies with the higher costs of these alternatives when implemented with the tools and baggage of traditional large-group instructional strategies.

Evidence is now beginning to accumulate that technology holds the key to cost-effective and more widespread use of individualized, personalized, and small group instruction. Merron (1991) and Rae (1993) offered some suggestions for using technology—especially in management systems and good multimedia learning resources to support print-based learning or instructional guides. In this regard, Hathaway (1990) offers a simple technologically-enhanced learning system for

managing and tracking students and for locating and retrieving learning resources as required

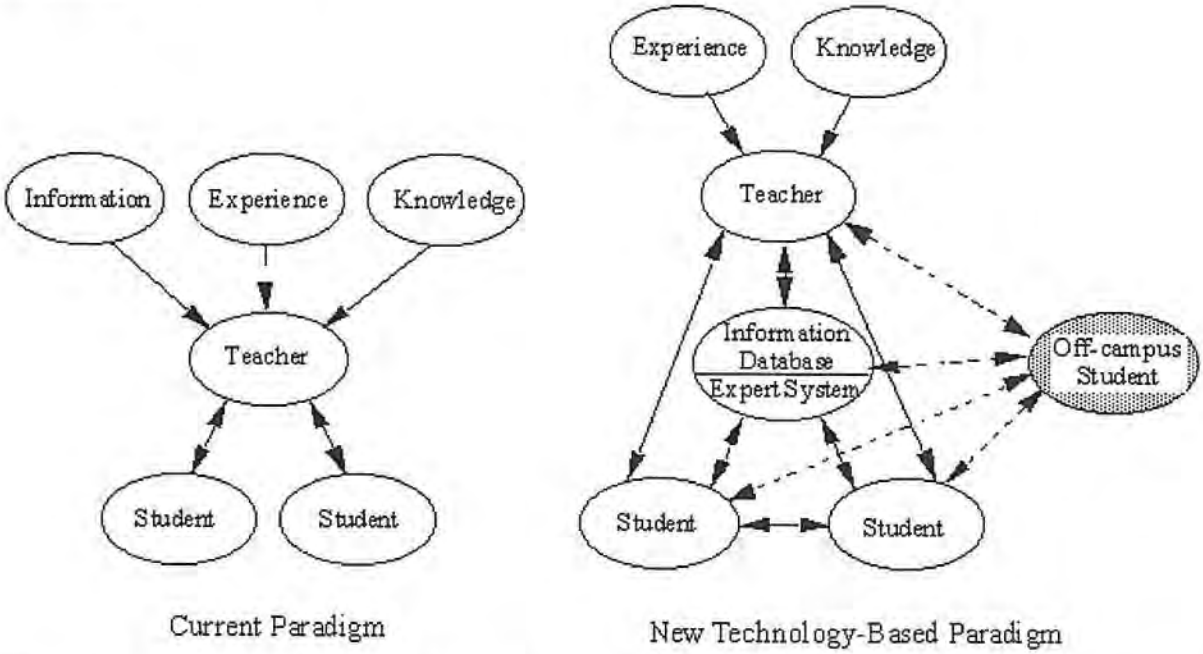

Figure 1. The current educational paradigm contrasted with a new technology-based educational paradigm (Hathaway, 1993: 9).

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CYBERHIGH

Administration in CyberSpace—Emerging Roles of Principals

Warren E. Hathaway

Traditionally, leadership (i.e., managers, administrators) in productive enterprises engaged in juggling three factors of production (land, labor, and capital) in order to attain the most productive and efficient use of resources. The information age has served to introduce a new factor into the production equation—information. Today the productivity equations are balanced by considering land, labor, capital, and information.

Information means different things to different people. Herein, information is taken to mean the resources needed to both get and use information. This information may take many forms—data, graphics, video, audio, and interactive media. Technology and information combined have the effect of increasing productivity and of reducing the labor component. Moreover, inasmuch as information is doubling every three or four years, there is a monumental need for investment in on-going training and up-grading.

Having identified information as the fourth factor in the productivity equation, it is useful to revisit some of the more common components of administration and the traditional forms of education and to ask how they might be changed in the future. To facilitate this discussion, it may be useful to consider the present educational paradigm and a future technologically-enhanced educational paradigm (see Figure 1).

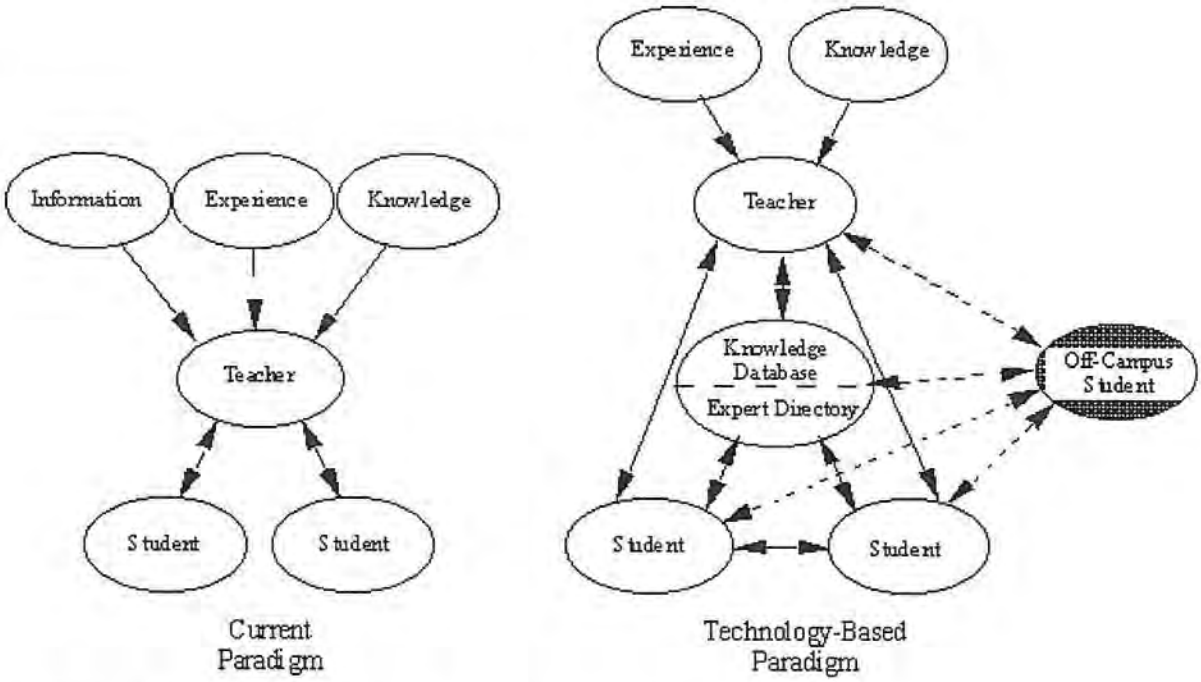

Figure 1. Contrasting educational paradigms.

In the traditional educational paradigm, students are processed in cohorts and the teacher serves as the principal source of information. To the extent that the teacher is knowledgeable in a number of fields, the students are prepared from a variety of possible futures. Unfortunately, few teachers have ever held a permanent job other than teaching and for that reason they have a limited or distorted view of the marketplace and the world of work that students will face.

Technology has a potential for application in two important areas. Technology may be used to individualize and personalize education to the extent that individual students may be prepared with the education of their choice. To make this first application possible, information in a variety of forms is brought into the educational arena via telecommunications. Teachers assume a changed role—facilitators of learning rather than dispensers of knowledge, as shown in Figure 1.

As education moves closer and closer to the technologically-enhanced educational paradigm, many roles and responsibilities will change for the teachers and students. Equally important, many roles will change for administrators.

Among the administrative tasks presently encountered in education are: needs assessment; standards and accountability; recruitment of students; motivating teachers and students; public relations; resource acquisition, allocation, and budgeting; scheduling time; and policy and planning. Each of these components are discussed from the point of view of what is now, and what could be in the future.

Needs Assessment of Students

Needs assessment means assessing students to know their abilities, aspirations, and learning styles and using this information to ensure that programs for students adequately meet their needs and prepare them for world beyond high school and in the real marketplace.

Standards and Accountability

Traditionally, students have been evaluated in cohorts at significant points throughout their academic career—at the end of selected grades (e.g., Albert's achievement exams) and at the end of their high school experience (e.g. Alberta's diploma exams). While these exams served as crude indicators of student progress in general, they fall short of providing useful information for helping students plan and follow programs to meet their individual goals.

The present system of student evaluation contributes little to the overall accountability of teachers. For the most part, teachers are evaluated by superiors no more than once or twice during a year and then for only short periods of time. There are no accepted indices of teacher performance based on the throughput of students under their charge.

As individualized and personalized forms of instruction are provided for students, information loops may be developed that will help assess the effectiveness of both students and teachers. Perhaps the following equation could serve as a better indicator of teacher productivity:

$$p = \frac{na \times g}{t}$$

p =

where:

p = teacher productivity,

n = number of students,

a = multiplier describing student ability and aptitude,

g = achievement gains expressed in completed hours of instruction, and

t = total elapsed time.

Recruitment of Students

There is no guarantee that a single school will have the capacity to meet the individual needs of all the students that might attend. As a consequence, students may reach beyond the boundaries of their school or district to obtain desired programs—the

off-campus students shown in Figure 1.

A school with a rich program to offer may very well choose to cater to some segment of the student population at large. To the extent that a school has something to offer to students (other than its own captive audience), there will be a need for recruitment of students.

Motivating Teachers and Students

Entry into cyberspace is a personal adventure. Those teachers and students who are not technologically literate, highly motivated, and able to follow a project through to completion will be "roadkill" on the information highway. Administrators will have a significant task in equipping and motivating teachers and students to meet these challenges.

Public Relations

The public at large (including parents) believes that it understands education and what it is all about and this may be somewhat true for education in the traditional mode. After all, everybody has been through at least part of the traditional educational experience.

To the extent that a school begins to move into a new educational paradigm and to the extent that new technologies are involved, the public may be apprehensive and cynical. In the future, administrators may have to spend significant amounts of time in overcoming these concerns.

Resource Acquisition and Allocation (including budgeting)

Resource acquisition and allocation involves planning for educational logistics, equipment maintenance and repair to support both in-school and off-site students and their teachers.

Traditionally, basic education grants have had levels set on the basis of selected pupil-teacher ratios and paid on the basis of registered pupils. Modest equipment allocations and the building maintenance and operation were factored in together with some overall administration costs—and the budget was completed.

In tomorrow's schools a more complicated production equation will have to be used (i.e., productivity involves a balance between land, labor, capital and information). Accountability will also demand that revenues will be generated only on the basis of production units. Presently, Alberta is moving in this direction—future grants in Alberta will be based on credits earned and not bench time in classrooms.

Scheduling of Time

To the extent that individualized and personalized educational paradigms are pursued, there will be a need for individual student programs that are carefully laid out with milestones of progress clearly identified. It will then be important for the administrators to ensure that teachers, students, and learning resources all come together at the correct times.

Policy and Planning

The policy and planning cycle consists of policy setting, development of mission statements and goals, planning, programming, budgeting, evaluation, and feeding back the results of evaluations to modify subsequent policy and planning cycles (see Figure 2).

Virtual Schools

A virtual school could be developed on the basis of the Bishop Carroll model using learning packages, relevant learning resources, and differentiated staffing—teaching assistants, instructional assistants, evaluation and evaluators. To the extent that the learning packages, learning resource, and sufficient human resources are made available, students could access them remotely by means of telecommunications. In some subjects, there may be a need to provide lab settings for some subjects as well as practical environments to learn science, mathematics. Students need to see practical (concrete applications). Piaget's work suggests that many students are well into adolescence before they are ready to leave the concrete world and enter into a more abstract world.

In the future, virtual schools may: have more course offerings per capita (and in total) than traditional schools; offer freedom from the tyranny of schedules; require substantially less in the way of facilities and more in the way of distributed equipment; and, provide far more individualized and personalized instruction for students than has ever been the case in the past.

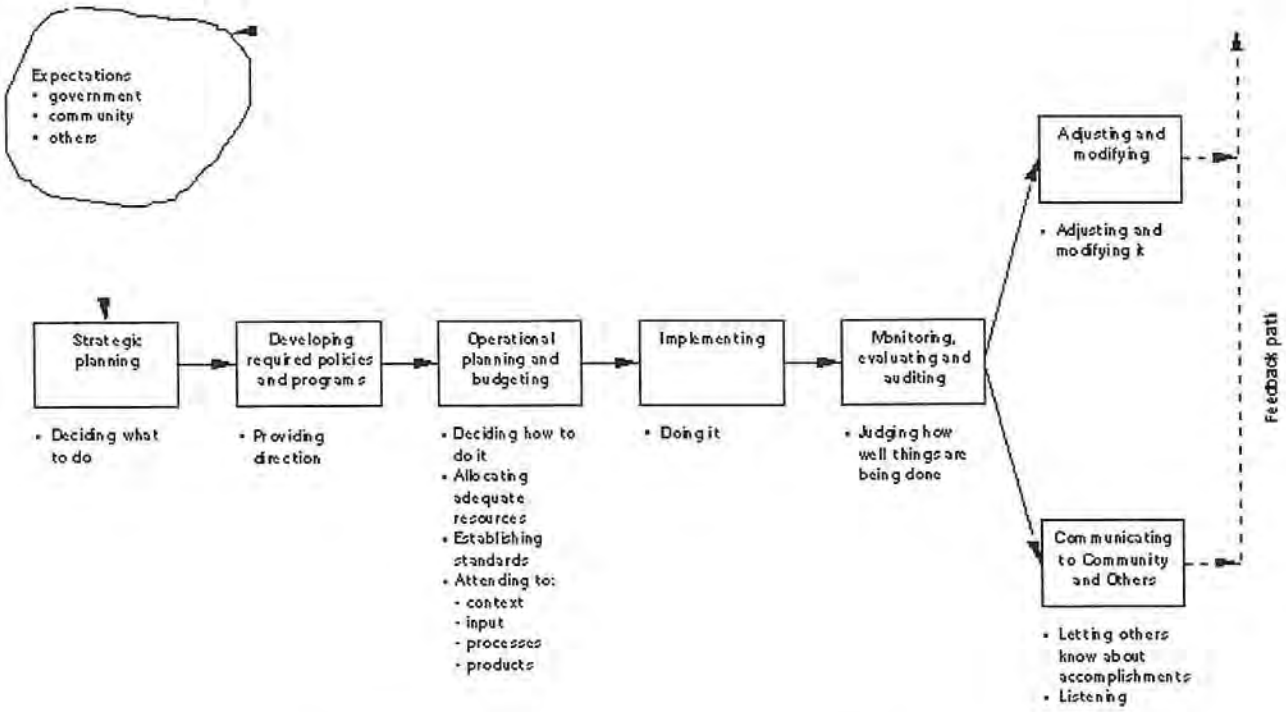

Figure 2. The educational management process.

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The Mission of Holy Trinity School

Holy Trinity School is committed to educational excellence,
as measured by readiness for university entrance,
and to the development of the character and individual abilities
of our students within the context of
Christian values and personal integrity.

The Mission of our Faculty and Staff

Everyday, in a Christian setting, we strive to foster and advance
the intellectual, social, spiritual, moral and physical well-being
of our students, that they may exhibit integrity and excellence of
character as they take their positions in the world.

Holy Trinity School

Richmond Hill, Ontario 905-737-1114

Our Mission Statement

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School News

Staff & Student Pages

The W

Headmaster's Letter: September 24th

Founders' Weekend: Oct. 24-26, 1997

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Welcome to Holy Trinity School!

- **The HTS On-Line Prospectus**
- **HTS Profile**
- **HTS: A Christian Setting**
- **A Tour of Holy Trinity School**

Comments/Questions: *wraymond@hts.on.ca*

- **Return to the Holy Trinity School home page**

Let's have a look at Holy Trinity School!

- Classrooms
- Science & Computer Labs
- Gyms & Sports Fields
- Fine Arts Studios
- Libraries
- Chapel

Comments/Questions: *wraymond@hts.on.ca*

- To Return to the HTS home page

Holy Trinity School - LABS

Holy Trinity School has several modern laboratories serving the Science and Computer Science departments.

The school boasts a **Computer Network with Pentium Workstations** distributed in two central Computer Labs, in various classrooms throughout the school, and in the school libraries. The network provides a Windows(TM) graphical desktop allowing students to easily access a rich variety of computer resources including a CD-ROM tower with on-line interactive access at every station.

Comments/Questions: *wraymond@hts.on.ca*

Return to the TOUR of Holy Trinity School

Holy Trinity School - Classroom Life

Classrooms are exciting places at Holy Trinity School. Whether children listening to a story in our Primary School classrooms (pictured above) or young men and women discussing abstract concepts in our Senior School, all HTS students enjoy an active, dynamic, day-to-day classroom life.

Comments/Questions: ***wraymond@hts.on.ca***

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Holy Trinity School - ATHLETICS PROGRAM

Holy Trinity School offers a wide range of team sports and athletic programs -- over 80 extra-curricular teams and clubs in all. The school boasts a Triple Gym and several quality sports venues on campus or in the neighbouring community.

Comments/Questions: ***wraymond@hts.on.ca***

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Holy Trinity School
-
THE FINE ARTS

The Arts program at Holy Trinity School is richly endowed with studio space in the school. The Visual Arts have two studios; the Music department has two large studio-classrooms with adjoining rehearsal rooms; and the Drama department has a new theater classroom.

Comments/Questions: ***wraymond@hts.on.ca***

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Holy Trinity School - LIBRARIES

Holy Trinity School has two libraries: the **Junior Library** (pictured above) for children in the Primary and Junior Schools (Grades 1-6); and the **Senior Library** for students in the Middle and Senior Schools (grades 7-OAC).

The **Junior Library** includes a modern computer resource centre, a video lending library, and an important collection of books for primary and junior school children.

The **Senior Library** offers a bank of multimedia computer research tools -- including a CD-Rom periodical research library and a significant collection of reference books, reading materials, and media resources.

Comments/Questions: ***wraymond@hts.on.ca***

Return to the TOUR of Holy Trinity School

Icon of the Holy Trinity by Anton Rublev

Holy Trinity School Chapel

Holy Trinity School was founded by a group of Christian parents many of whom are still parishioners at Holy Trinity Anglican Church, in Thornhill, Ontario. One of the goals of the founding parents was to build a school where Christian faith and values would be respected and communicated to future generations. So it is that the worship and traditions of Christianity play a part in the day-to-day life of our school.

Also, because of our Anglican roots, Holy Trinity School is a community that respects all faith traditions. Students are encouraged to take pride in their faith heritage and to respect and appreciate the faith traditions of others. Many non-Christian families choose our school because we place a premium on the spiritual life and on the moral

values that flow from the Spirit.

- The school gathers for a Chapel Service at the beginning of each school day.
- We give thanks for our food at lunch hour; and we end our day together with prayer.
- A programme of Religious Knowledge (moral education, basic Bible literacy, and the study of world religions) is required for all students in Grades 1-8.
- A group of senior students serve as Chapel Wardens. They help prepare chapel services and plan guest speakers, retreats, and chapel events.
- There is an annual School Retreat at Muskoka Woods Sports Resort.
- Preparation courses are offered for children preparing for their first Holy Communion and for young men and women wishing to confirm their membership in the Christian church (Confirmation).
- Three times a year (All Saints Day, Ash Wednesday, and Ascension Day) we come together as one big community for festive celebrations of Holy Communion.

School Chaplain:

Father Walter Raymond, OGS
wraymond@hts.on.ca

HTS Email Directory

Got a question or a comment about HTS? Click Here!

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Headmaster's Letter

September
24,
1997

Dear Parents:

We are right back into the swing of things at Holy Trinity School. This mailing is the first in a series of newsletters that will be sent to you throughout the year. These are designed to inform you of upcoming events in the school pertaining to you and your child(ren).

INFORMATION TECHNOLOGY PROJECT UPDATE

This summer, a great deal was accomplished to move our project along.

In late June, we hired Carolyn Kayne as our I.T.Specialist. She has had extensive experience in a similar capacity with the York Region Separate School Board and the City of York Board of Education. Carolyn has also planned and conducted numerous training sessions for faculty and staff.

We had technical reviews of the plan carried out in accordance with the Board's motion. The members of the I.T. Committee along with the faculty are meeting to discuss the recommendations in light of the plan.

The network cabling and the necessary electrical outlets were installed throughout the school including the administration offices, thus completing this portion of the project.

The current computers in the labs have been repaired and their memory has been upgraded.

The current file server has been cleaned and maintained.

Members of the faculty were given training during late June. Some of them travelled to the Technology Institute at Trinity College School in Port Hope. This five-day institute gives teachers in independent schools the opportunity to learn more about technology and discuss its implementation in the classroom. Fr. Raymond taught there for one of the sessions.

There will be further updates as we progress.

FAMILY DIRECTORY AND HANDBOOK

This is enclosed with the mailing.

STUDENT ACCIDENT INSURANCE

Enclosed with this mailing is a document outlining the plan from Seaboard Life Insurance Company which has been provided for your child(ren).

MEDICAL/EMERGENCY FORMS

Thank you for submitting these forms for our records. **If you haven't returned them, please do so, as the information that they contain is vital to the well being of your child(ren) in case of an emergency.**

PARENTS' GUILD

For the last few years, the Parents' Guild has run successful magazine campaigns. The monies raised go towards capital items to enhance the education of our students. Last year, approximately $10,000 was donated to the school in this manner. The delivery problems that some parents experienced last year, which were due to a change in the clearinghouse used by the company, have been alleviated. You are invited to read the letter that is enclosed in this mailing from Gabrielle Manski, one of our parents who is running this campaign.

Later in the term, you will receive other notices about the poinsettias and Christmas cakes that will be offered by the Guild.

FOUNDER'S DAY WEEKEND

This year's Founder's Day weekend starts with our second **Wine Tasting Evening** at H.T.S., **Friday, October 24.** Please refer to the enclosed flyer or the invitation that you received in the mail recently. Your support is much appreciated.

On **Sunday, October 26**, you and your family are invited to attend the 11:00 a.m. **Church Service** at **Holy Trinity Church**, 140 Brooke Street, Thornhill, to celebrate the birth of our school at this church.

SCHOOL VISITATION OPPORTUNITIES

If your friends, neighbours or colleagues are interested in finding out more about what H.T.S. can offer for their child(ren), please advise them of the following dates.

PROSPECTIVE PARENT TOUR – FRIDAY, OCTOBER 3, 9:00 A.M.

OPEN HOUSE – THURSDAY, OCTOBER 30, 7:00 P.M.

ENTRANCE ASSESSMENTS TESTS – SATURDAY, NOVEMBER 15, 9:00 A.M.

For further information or assistance, please contact Mrs. Lynn Gowan (737-1114, ext. 236)

ATTENDANCE

We take attendance each morning. If your child is not going to be in school when attendance is taken (i.e., late due to an appointment or absent due to illness), please call (905)737-1114 and leave a message on the school's answering machine. As Mrs. McManus calls your home to double check the attendance, this would make this task more efficient. If your child is late, please have your child sign in at the Front Office.

PARENT CHEERING SECTION

The fall season of games is now underway. Parents are most welcome at games. The teams really appreciate the support of a hometown crowd. Times and locations of games are posted throughout the school and have been given to the team members. Whenever you can, please come out to support our teams.

INTERIM REPORTS AND PARENT/TEACHER INTERVIEWS

Interim reports will be sent home with the students Friday, October 24. Accompanying them will be the Parent/Teacher Interview Forms for the interviews scheduled to take place November 6 and 13.

TERRY FOX RUN

At the time of writing, approximately $17,000 has been raised for this Foundation. Our thanks go to the committee that planned and organized this event: **Bert Forse and Tina Lage (Co-Chairs), Doug Caines, Sandi Crawford, Jennifer Deacon, Nora FitzGerald, Marion Hepburn, Pat Konecsni, Art Lightstone, Nicole Marsh-Burke, Anne Martz, Father Raymond, Sherry Rioux and Terry Thomson.**

I look forward to seeing you at the many games and events that are planned for the fall term.

Yours
truly,

George
Rutherford

Headmaster

News & Publications

- The Week Ahead (Calendar of Events)
- Headmaster's Monthly Newsletter
- The Executive (Student Newspaper)
- Founders' Weekend: October 24-26, 1997
- The Trinitarian (School Magazine)

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Facsimile (905) 737-5187

Comments/Questions:

- Fr. Walter Raymond, Development Committee

The Executive

Thank you for dropping by *The Executive's* World Wide Web site!

On this site you have total access to every issue of The Executive as it is published. By selecting the options contained in the left column, you can:

- *learn about The Executive;*
- *read the current issue of The Executive;*
- *examine past issues of The Executive;*
- *learn how to advertise in The Executive;.*
- *take part in online discussion forums and surveys; and*
- *email the editorial board, directors, or writers.*

Enjoy your visit!

This site designed and maintained by Art Lightstone, Copyright © 1997.
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Staff & Students Pages

- **HTS Staff Email Directory**
- **HTS House Pages**
- **Music at HTS**
- Abbas Alidina (Grade 11)
- Mr. Lightstone (Teacher)
- Michael Chan (Gr. 10)
- Ryan Thompson (Gr. 11)
- David Chung (Gr. 11)
- Chris Walsh (Gr. 11)
- Drew Houser (Class of '96)
- Pak Tsun Wong (Gr. 9)
- Jaime (Gr. 7)

Holy Trinity School is not responsible for the content found on the private pages of our staff and students ...

Comments/Questions: ***wraymond@hts.on.ca***

Sorry!!! PAGE BEING RECONSTRUCTED.

Go Here Instead!

Do you Want to know how to keep and Idiot Busy? Click here

CYBERHIGH

- CyberHigh Handbook
- Frequently Asked Questions
- CyberHigh Charter

A Proposal for Accredited Charter School Status

- An OverView of the Program

CyberHigh: A Real School in a Virtual Community

- Teaching and Learning in the 21st Century

The Case for Virtual Schools

- CyberHigh Program Review
- Individualization and Personalization of Instruction

Liberating Curriculum and Students

- A Community of Learners in a Virtual School

Includes frequently asked questions

- Administration in Cyberspace

Emerging Roles of Principals

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For information regarding CyberHigh, contact Rus Hathaway or Warren Hathaway.

Webmaster: John Lindeman

CYBERHIGH

CYBERHIGH—A COMMUNITY OF LEARNERS IN A VIRTUAL SCHOOL

Ralph C. Hathaway, B.Ed. [1]

Warren E. Hathaway, Ph.D. [2]

The present version of CyberHigh is based on a successful 1994-95 pilot study and uses *FirstClass* bulletin board technology, *ClarisWorks* integrated software, and multi-media materials operating on Macintosh equipment. Together these tools permit emulation of most of the interactions that transpire normally in classrooms, halls, and locker rooms. Students are able to exchange news freely at the "Pit Stop." More personal and private discussions are carried out in the "Locker Rooms"—conference areas strictly supervised by volunteer parents. Instruction entails teacher-developed assignments, class discussions, group work, private exchanges between teachers and students, and private work by students. Students progress at their own rate and are evaluated on the basis of mastered objectives.

Parents have opportunities to monitor their children's work and to exchange ideas and concerns with teachers through the "PTA"—a parent-teacher conference board.

SOME FREQUENTLY ASKED QUESTIONS (FAQS) ABOUT CYBERHIGH

What is CyberHigh?

CyberHigh is a community of learners in a virtual school. It uses a computer based wide-area network to link students with other students and with certified teachers who teach them from the approved Alberta curriculum. Teachers send their study assignments out over the wide-area network, lead group discussions, evaluate students' assignments, and engage in most of the same teacher-student interactions that occur in regular classrooms. Students complete their assigned work using print material and software provided

with their computers. Completed assignments are sent back to teachers for marking and then returned to the students, with copies to their parents—all by e-mail.

The wide-area networks automatically transfer mail between all nodes several times each day. Students and teachers are free at any time to check their mail, work on current assignments, or to discuss issues with each other.

How is CyberHigh funded?

Like every other separate or public school in the province, CyberHigh operates entirely within the per pupil operational funds provided by Alberta Education. These funds are available for each child in the province and follow them to the public, separate, or charter school of their choice. CyberHigh receives only per pupil grants. It does not receive any additional capital or transportation grants. All equipment is provided free to registered students and is fully covered from within the operational grant. The Greater St. Albert Catholic Regional Division #29 has purchased computer hardware worth $250,000 to start the program. This outlay will be recovered over the four-year life span of the equipment.

The students—Where do they come from?

CyberHigh has registered 98 students in grades 7, 8 & 9. These students are distributed right across the province. Some of the students are separated from others by as much as 750 miles. Over half the students are from outside major centres where resources and programs of study may be limited. CyberHigh's enrollment is 48 percent female, and 52 percent male—almost an even split.

What about the school's socialization role?

Though in-school measures of socialization for use as comparison measures are scarce, some research is available on the socialization of students who study independently. The bottom line seems to be that non peer-dependent students are well adjusted and demonstrate strong self concepts. Students who study independently often benefit from fewer peer models and more adult models. (Socialization is a process of modeling behavior, much of it adult. A typical junior high class has one only adult role model but 20 or more adolescent role models—and some of these adolescents may be very inappropriate models.) CyberHigh students are also free to work part time (especially during the day when more of the better—and better paying—jobs are to be found), participate in sports training programs,

travel, or engage in community activities.

What are the obvious advantages of CyberHigh?
CyberHigh offers many advantages.

Improving Student Learning.
Because CyberHigh offers individualized and personalized instruction to students who are studying somewhat independently, there are several important outcomes that may be anticipated on the basis of past research Students are more likely to edit and refine their work when using a productivity tool like a word processor than when using pencil and paper. Students participating in virtual class discussions are not inhibited by time or shyness constraints of a class period. Students can review every aspect of their class activities, including; teacher lectures, group discussions, and assignments and instructions, because everything has been recorded digitally—a clear benefit over oral communications that are most often just lost in the wind. Students who are tutored or who study individually or in very small groups have been found to achieve about two standard deviations above the mean of comparable students in grouped instruction and students who study independently are better prepared for post-secondary studies than students who study in traditional settings (see Hathaway & Hathaway, 1995).

Improving Teacher Preparation and Support.
Several aspects of CyberHigh support improved teacher education and support. Teachers prepare and present their lesson as "bits" not atoms, a major difference when it comes to distribution or storage. Bits can be copied and transported electronically, and can be further edited, reworked, or re-purposed as needed. CyberHigh is the only school in Alberta presenting instruction entirely in digital bits. Because of the public nature of the technology, teachers are encouraged to share materials, to collaborate in the preparation of new materials, and to provide collegial support.

During the pilot study, student teachers from the Faculty of Education at the University of Alberta were permitted to complete their practicums in CyberHigh. This represented a new experience—planning group and individual student activities and interactions that would enable the students to master assigned objectives. CyberHigh also enables University students preparing for careers in rural or native education to engage remotely located students in instruction and to become sensitive to culture gaps without leaving their university campus. As well, CyberHigh also makes it possible for a number of small rural schools to form a network and to offer much broader programs to their collective student body—each site offering some

instruction to all students. The assembly of remotely located students into a virtual school brings together enough students and teachers to justify a much enriched program of studies.

Improving Curriculum and Assessment.
CyberHigh is designed to support mastery learning. To provide structure to the students' educational program, the curriculum is clearly defined and laid out in scope and sequence charts (plans are underway to translate these into cognitive maps—following Hathaway, 1990) so that students and parents can follow along as teachers guide the students through the curriculum.

Improving Learning Resources.
Because CyberHigh maintains a 1:1 student/computer ratio, learning resources such as simulation and multimedia software can be easily integrated into the course. Such is not the case in traditional schools where the computer labs must be booked, and the student/computer ratio is much greater than 1:1. Because of its modularized nature, it is also a simple matter to identify good supporting learning resources and to link them to appropriate modules.

Improving Access.
CyberHigh is available to any student that has access to electrical power and a telephone line. Moreover, students of any age can benefit from CyberHigh capabilities—for example, upgrading, adult education. Students may complete their studies in their own time frame. For example, students who prefer to work early in the day can do so. Their counterparts who perform better later in the day can exercise that option. Students who are working part time can optimize their schedule—working when work is available and studying during non-work hours. Teacher response to student work or questions occurs within hours, regardless of when students choose to study.

Improving Community and Business Partnerships.
Several businesses have expressed interest in providing work-experience sites for CyberHigh students, because they will be well-versed in high-tech productivity tools. These work experience and mentorships are readily accommodated by CyberHigh.

Improving Planning and Coordination.
CyberHigh is an open environment in that anyone can tour the virtual school without interrupting the interactions that are going on, (unlike having administrators sitting in the back of classrooms). Moreover, education needs to have a number of on-going innovative projects from which it can learn and then develop new and improved programs. CyberHigh offers one such

innovation.

BIBLIOGRAPHY

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Hathaway, W. E. & Hathaway, L. M. (1995). "Individualization and personalization of instruction—Liberating curriculum and students." *Proceedings of the Twelfth International Conference on Technology and Education*, Hyatt Orlando Hotel, Kissimmee, Florida, February 28 - March 3, 1995.

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For information regarding CyberHigh, contact Rus Hathaway

Webmaster: John Lindeman

CYBERHIGH

CyberHigh: A Real School in a Virtual Community

The Future is Here

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CyberHigh—An Overview

In response to the bold vision and challenge laid before educators by Alberta's Minister of Education, a virtual school is being tested in Sherwood Park, Alberta. CyberHigh has a present enrolment of about 29 home education students ranging from Grade 7 to Grade 11. The school follows the prescribed curriculum for Alberta as set forth in Programs of Study. Achieved results will be measured through traditional testing programs already adopted in Alberta (i.e., standardized test such as the *Canadian Test of Basic Skills*, achievement tests in Grades 3, 6 and 9 and diploma exams in Grade 12 subjects).

The CyberHigh Board of Directors commit to ensuring that CyberHigh offers quality individual programs of study. The students commit to learning to use their high quality computer workstation, and to participating in on-line activities. Parents commit to

providing time and space for students to do their work, as well as committing to group call-back sessions where students meet in person, three times a year, or as needed. Parents also commit to ensuring that students are spending adequate time daily and weekly on CyberHigh activities in order to properly manage their workload.

How is CyberHigh configured? CyberHigh is a network of students and teachers each equipped with a Macintosh LC475 computer equipped with 4 MB of RAM, a 160 MB internal hard drive, a color monitor, a *FirstClass* bulletin board system, and ClarisWorks (an integrated package of productivity tools). Each student acts as the system operator (SysOp) for the bulletin board on their machine thus allowing each student to work and to read and respond to screen messages without being on-line. Teacher workstations are similarly equipped. The Principal of CyberHigh acts as the system operator for the total network.

Modems tie the student and teacher computers into the network. CyberHigh students and teachers must arrange for an office area to set up their workstation, as well as a phone line to the workstation. The office area will also need to be equipped with a suitable desk or table to do paper based work, and storage (both physical and electronic) for all learning materials.

CyberHigh assumes the phone charges between each computer in the network and the CyberHigh hub server, however this cost will be kept to a minimum by using delayed computer-to-computer mail exchanges.

CyberHigh—A Description

CyberHigh—The Background

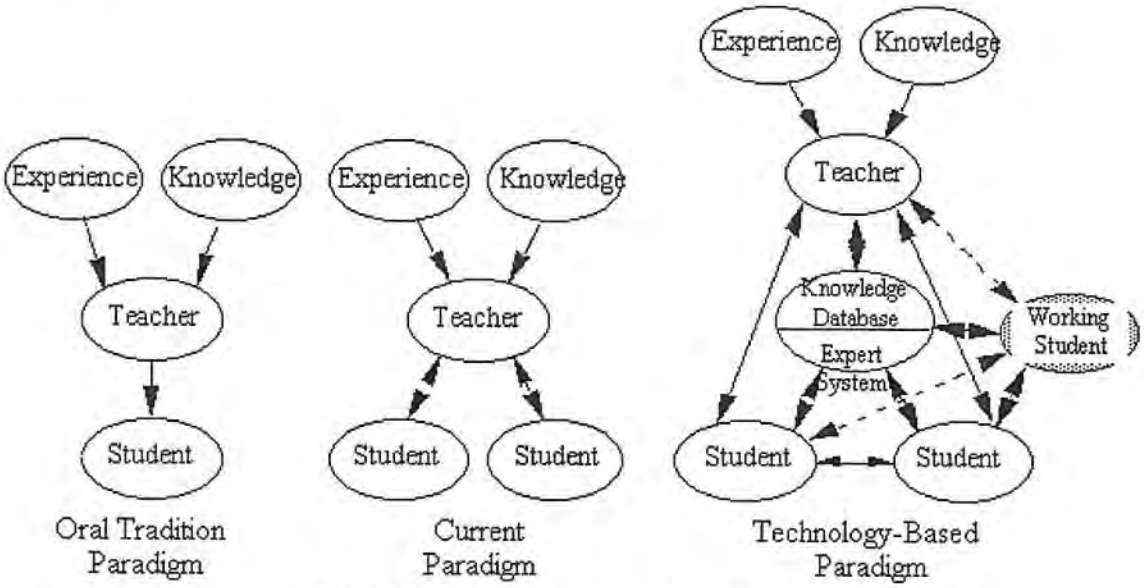
Cyberspace has been defined as the landscape of information. It is an intangible place that houses the digital communication of real communities. Since 1980, computer bulletin board systems (BBS) and networks have been developing user bases that exhibit the qualities of a community. Inherent in a community is a culture -- defined in an educational context by B. J. Caldwell, as "the way we do things around here".

Since much of the effective school research points at developing a positive school culture, and cyberspace communities exhibit very defined cultures, it is plausible that one could develop an effective school culture in cyberspace. The School Act defines "school" as -- "a structured learning environment through which an education program is offered to a student..." CyberHigh will provide a structured learning environment without the need for land, bricks, or mortar.

CyberHigh—The Concept

A virtual school represents the complete decentralization of teacher/learner

interactions. In a virtual environment learning takes place not only outside the teaching institution, but also outside the teacher's time constraints. The asynchronous nature of the virtual school means that for much of the time, teachers and learners are accessing each other's information on their own time schedules. A technology-based paradigm as illustrated on the following page, recognizes the interdependence of the teacher, the student, and the out-of-school student (or autonomous learner) to interact with each other as well as with the knowledge databases. This paradigm most clearly outlines the linkages a virtual school would have to accommodate.



School Models of the Past, Present, and Future

Distance learning may be viewed as the first step in developing an asychronous or unscheduled learning environment. Because parents in home bound distance learning situations are around their children for much of the day, children have the freedom to indulge in learning events outside of regular school hours. This may not be the norm in all distance learning environments, but it may be viewed as the first attempt to remove learning from an institutional time frame.

The virtual school, being of similar nature to off-campus or distance education, thus becomes an attractive alternative to home-school families as they struggle with program integrity at secondary levels. The provincial home-schooling body could provide a feeder system for CyberHigh, which would offer Alberta-approved programming and credits, thus reassuring parents, bureaucrats, and legislators.

CyberHigh's logo reflects something of the character of the school. The open book represents learning resources in real and tangible forms. The fading of the book into a pattern of dots on the right hand side represents the transition from real and tangible forms of learning resources to electronic forms suitable for transmission over telecommunications channels. The infinity sign represents the wealth of opportunities

open to CyberHigh's students. The school's name, set in *Star Trek Classic* font, points to the future.

CYBERHIGH

CyberHigh's school logo.

CyberHigh—The Project Goal

CyberHigh will begin operations in the fall of 1994 with a projected enrollment of 50 students. It is further projected to be a viable junior/senior high school of 125 - 175 students by the fall of 1996, with an offering of a wide range of core and complementary courses. In addition, two further areas of development would be a division II elementary offering, as well as a home-school support program to help integrate elementary students into CyberHigh.

The objectives of CyberHigh are :

- to provide quality teacher-directed education to students studying at home and at reduced costs (when compared to traditional forms of education),
- to provide individual and personal programming and instruction,
- to give students more control/responsibility for choices in their program,
- to provide learning interactions on the students'/family's time frame,
- to provide programming consistent with both provincial goals and families' values,
- to ensure learners understand the context of lesson objectives, and
- to provide students user-friendly, guided access to resources on the information super-highway.

These objectives will be reviewed annually by the CyberHigh Board of Directors to ensure that they are being met.

CyberHigh—Technology Requirements

In order to develop a computer network capable of exchanging information suitable to support a virtual school, each student and teacher would need to be supplied with a workstation equipped as follows:

- a Macintosh computer,
- a CD ROM drive (for CAI math, and reference encyclopedia),
- a 14" color monitor,
- FirstClass Server software,
- AppleTalk Remote Access software,
- ClarisWorks productivity software,
- a 28.8k baud modem, and
- an inkjet or laser printer.

CyberHigh students and teachers would have to arrange for an office area to setup the workstation, as well as a phone line to the workstation. The office area will also need to be equipped with a suitable desk or table to do paper based work, and storage for all learning materials.

CyberHigh will assume the phone charges between each computer in the network and the CyberHigh hub server, however this cost will be kept to a minimum by using delayed mail exchanges after midnight computer to computer.

CyberHigh—Philosophy

It is our belief that parental involvement in education is pivotal to a student's academic success. The home-learning nature of CyberHigh requires that parents monitor, supervise, and provide time and space for their child's education. The commitment a parent makes to CyberHigh is not a financial commitment, but one of involvement.

Secondly, each student is an individual. Recognizing this reality, CyberHigh will ensure that each student is working at a suitable program, and that each student is given the resources and time to complete the program. The asychronous nature of CyberHigh allows families to organize learning around life on a daily or weekly basis. However, it would also imply that students have the same degree of flexibility at the yearly level. All students will have the opportunity to complete their courses in more or less than 10 months, as individual learning styles dictate. Every effort will be made to make sure a child is not held back by inappropriate program placement, teacher-learner communication lag time, or learner/parental lack of motivation.

CyberHigh—Programming and Staffing

CyberHigh will use the Alberta Programs of Study for determining the scope and content of courses offered. course offerings are identified in Table 1.

Learning resources will be composed of: print material, computer assisted instruction, software simulations, and digital video, (listed in priority of use). Print materials will range from Alberta prescribed and approved materials, to texts locally authorized by a resources committee made up of parents, teachers, and CyberHigh board

representatives.

Computer assisted instruction will be used when the material is of good quality and directly relating to the course of studies. The high school math series developed by Dr. Milt Petruk will be the first CAI resources to be used. As students become familiar with their workstations, CyberHigh may seek to become an Apple Educational Beta Test site.

Software simulations, and digital video will be used when appropriate to the lesson objective, at the teacher's discretion.

CyberHigh will employ staff that understand the important nature of school culture, and who can build community in cyberspace by friendly interaction. Teachers at CyberHigh will be Alberta certified and hired by the CyberHigh administration.

CyberHigh—Roles and Responsibilities

The Board of Directors CyberHigh commit to ensuring that CyberHigh offers quality individual programs of study. The students commit to learning to use the workstation, and participating in on-line activities. Parents commit to providing time and space for students to do their work, as well as committing to group call-back sessions where students meet in person, three times a year, or as needed. Parents are also responsible to ensure that students are spending adequate time daily and weekly on CyberHigh activities to keep on top of their workload.

CyberHigh—Organization

CyberHigh is the name of the educational organization run by the CyberHigh Educational Society (C.E.S.), a non-profit society registered with Alberta Corporate Registry. The board of directors of CyberHigh Educational Society, will advise and direct the CyberHigh administration regarding operation of programs. The board of directors is made up of three persons each bringing an area of expertise:

Ralph (Rus) Hathaway - CyberHigh founder and administrator

Thomas B. Johnson - Technology strategist

Dr. Warren E. Hathaway - Learning systems and educational futures consultant

CyberHigh—Its Distinctives

CyberHigh has a number of distinguishing characteristics when compared to traditional schools, home schooling, and distance learning. Table 2 serves to identify some of these distinctives of CyberHigh in comparison to other educational choices available to students. Table 3 compares traditional and technology-based educational systems.

Table 1. CyberHigh Course Offerings

Courses offered in the 1994-95 school year include:

Junior High:

Language Arts 7	Social Studies 7	Science 7
Language Arts 8	Social Studies 8	Science 8
Language Arts 9	Social Studies 9	Science 9
Mathematics 7	Computer Literacy 7	Health 7
Mathematics 8	Computer Literacy 8	Health 8
Mathematics 9	Computer Literacy 9	Health 9
Ethics 8		

Senior High:

English 10	Social Studies 10	Science 10
English 20	Social Studies 20	*Science 20**
*English 30**	*Social Studies 30**	
		Physics 20
Math 13		*Physics 30**
*Math 10**	Computer Literacy 10	
Math 23		*Chemistry 20**
Math 20	Computer Processing 10	Chemistry 30
Math 33	Computer Processing 20	
Math 30	Computer Processing 30	CALM 20
Special Projects 10	Work Experience 15	
*Special Projects 20**	*Work Experience 25**	
*Special Projects 30**	*Work Experience 35**	

** Courses listed above and in italics will not be offered in the 1994/95 school year because no students are registered in those courses.*

Locally authorized high-school courses:
(Pending Alberta Education approval)

Computer Graphics 10	(Introduction to graphic and design tools)
Computer Graphics 20	(Elements of design and electronic layout)
Computer Graphics 30	(Graphic pre-press production)
Information Studies 10	(Database structure, design and searching)
Information Studies 20	(Finding & accessing remote information pro
Information Studies 30	(Designing, and maintaining information ser

Table 2. CyberHigh Distinctives

	CyberHigh	Distance Learning	Home Schooling	Regular School

Learning format	Individual	Individual	Individual	Group
Lecture	Rare	Rare	Rare	Common
Directed group work	Yes	No	No	Yes
Multiple teaching and learning methods	Yes	No	Yes	No
Uses many mediums of instruction	Yes	No	No	Yes
Students use technology as tools	Yes	Rare	Rare	Rare
Fosters personalized programs of instruction and independent study	Yes	Yes	Yes	No
Peer learning and teaching	Yes	No	No	No
Socialization in context of local community—i.e., "community-referenced"	Yes	Yes	Yes	Limited
Socialization in context of peers/classmates—i.e., "peer-referenced"	No	No	No	Yes
Parental involvement with teachers	Yes	Yes	Yes	Limited
Parental monitoring of program	Yes	Maybe	Yes	No
Parental choice of curriculum and materials	Yes	Limited	Yes	No
Uses certified teachers	Yes	Yes	No	Yes
Transportation pay load	Information	Information	Information	People
Timely feedback to students	Yes	No	Yes	Limited
Provides opportunities for both formal and informal interactions among and between students, teachers, and parents	Yes	No	No	No

Table 3. A Comparison of Traditional and Technology-Based Educational Delivery (CyberHigh)

Traditional	Technology-Based (CyberHigh)
• Transport students to one site where they are taught by a teacher.	• Transport information to stude where they can use it to support their learning.
• Offers limited scheduling flexibility; instructional time and learning opportunities restricted to regular school hours.	• Offers considerable scheduling flexibility; instructional time learning opportunities extend beyond regular school hours.
• Allows for limited individualized	• Allows for more individualized

instruction and independent learning.	and customized educational progr and fosters independent learning
• Generally does not accommodate a variety of learning styles.	• Can accommodate a variety of learning styles; provides studen with an increased opportunity to progress at their own pace.
• Results in limited course offerings; course offerings restricted by the expertise and availability of teachers resident in school.	• Enhances equity in education b providing students with greater access to course offerings and teacher expertise.
• Requires facilities with traditional classroom configurations to accommodate groups of students.	• Requires facilities with individual work stations. *(In t case of CyberHigh, space for wor stations are provided in student homes and are not a public cost.*

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CYBERHIGH

Teaching and Learning in the 21st Century

The Case for Virtual Schools

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Virtual Schools—What Are They?

Cyberspace has been defined as the landscape of information, an intangible place encompassing the digital communications of real communities. Cyberspace is supported by computer bulletin board systems and networks which permit development of countless sharable databases.

Within cyberspace one may find innumerable virtual communities, among them virtual schools. A virtual school is a school with its students and teachers separated by distance. Rather than meeting face-to-face in a classroom, teachers and students in virtual schools are linked together by available communication channels.

Ken Blystone provides a glimpse of the new generation of virtual schools as he describes the Academy Virtual School presently serving eight school districts in west

Texas.

> This new electronic school provides kids of all ages a fun and exciting place to gather. It is a safe environment that can be explored from home under parental supervision....As a virtual school, the Academy is radically different from traditional schools. It remains open 24 hours a day, 365 days a year. Students read lessons, take tests, ask questions and get answers 'virtually' as they would do in a traditional physical school building but without leaving their keyboard. Instead of going to school, the virtual school comes to them through their computer screen.

A virtual school represents the complete decentralization of teacher/learner interactions. In a virtual environment, learning takes place not only outside the traditional teaching institutions (school buildings) but also outside teachers' time constraints. The asynchronous (or unscheduled) nature of virtual schools means that for much of the time, teachers and learners are accessing each other's information on their own time schedules.

Virtual schools are not new nor are they unique to cyberspace. Primitive versions of virtual schools emerged early in the twentieth century but they were called correspondence schools and most provinces had one. Nor were correspondence schools limited to public elementary and secondary education, they also extended to post-secondary education and trade schools. For these first-generation virtual schools, the medium of communication was the postal service. Lessons were mailed to students and the completed lessons were returned to teachers in the correspondence school, again by mail.

Correspondence Schools—Precursors to Virtual Schools

Correspondence schools and distance learning may be viewed as a first step in development of an asynchronous or unscheduled learning environment. Because parents in home-bound distance learning situations are around their children most of the day, children have the freedom to indulge in learning events outside of regular school hours. This may not be the norm in all distance learning environments, but it may be viewed as the first attempt to remove learning from an institutional time frame.

It may be argued as well that first-generation virtual schools (correspondence schools) were necessary in order to meet the demand for education posed by people living on the sparsely populated frontier or for children who were for some reason homebound.

A New Vision of Schooling

Based on the premise that a school is not necessarily a building, a number of bold and visionary goals and strategies for cost-effectively ensuring access to a quality education

for students can be set forth Indeed, in his three-year business plan, Alberta's Minister of Education included as one of his goals the intent to, "Restructure the governance and delivery of education to achieve increased efficiencies and effectiveness." The key strategy for achieving this goal is to "increase use of technology to deliver education."

In the same document, the Minister of Education holds the learning expectation that, "Schools will provide a variety of learning experiences so that students...use computers and communication technologies."

On the matter of education delivery, the Minister had this to say, "Schools may use any instructional technique acceptable to the community so long as results are achieved. The school will have the authority to deploy resources and determine how results are achieved. Schools and teachers are encouraged to take the advantage of different delivery options such as distance education and workplace learning."

Clearly, the way is being cleared for the introduction of the next generation of virtual schools—schools that use, not the mail and postal services, but electronic telecommunications and information highways.

While virtual schools are not a new phenomenon, cyberspace (that intangible place whichencompasses the digital communications of real communities) offers some unique new opportunities. What might the new generation of virtual schools look like?

Towards a New Model of Education

First and foremost, the new generation of virtual schools may be quite different from present schools. Indeed, looking at the economics of the situation, they **must** be different.

The factors of production (to use some economic terms) include land, labor, capital, and information—the latter factor introduced by Naisbitt. To meet the challenge set forth by Alberta's Minister of Education simply by adding to one of the factors only increases costs and reduced the possibility of achieving a cost-effective solution. The real solution lies in substituting one of the factors for one of the others.

To substitute information for labor would in all probability end in failure—teachers are greatly needed in education and perhaps in virtual schools even more so. No. The answer lies in substituting information for land or capital. This means eliminating, or at last minimizing, the need for schools and all of their associated costs and in turn acquiring more and better information and technology.

A Look at the Research Literature

Five broad areas of research and development are explored in an attempt to develop a theoretical or conceptual underpinning for a virtual school. These five areas of research

and development include: individualization or personalization of instruction, effects of class size on achievement, home education (including distance learning), technology and telecommunications, and environments for learning.

What Does the Research Literature Say About Individualization?

The concept of individualized instruction is as old as education itself. Dow (1992) reports:

> The concept of individualized instruction has been traced by Blake and McPherson (1969) to the teachings of Confucius, Aristotle, Plato and Socrates all of whom recognized the existence of human differences and variables in the educational process. Charlemagne, in the middle ages, recognized the individual teacher who paid attention to individual differences in the teaching method. During the renaissance in Italy and the reformation in England, students with natural ability were urged to proceed at their own rate. Rousseau strongly influenced education in the eighteenth century when he criticized teachers for giving the same educational material and process to all students, thus stifling individual creativity. In the twentieth century, Alfred Binet's 'IQ' test greatly influenced education as he believed that the aptitude of children determined what they learned. In the same time period Maria Montessori introduced her beliefs in student self-paced instruction and in concentrating on what interested the learner.

Fletcher (1992: 1-2) describes and defines individualized instruction.

> Instruction is individualized to the extent that it adjusts to differences in learners. Instructional systems combine organized collections of subject matter content with procedures and rules for presenting the content to bring about learning outcomes. In individualized systems of instruction, these procedures and rules adjust the pace, content, sequence, and/or style of instruction to the needs of individual learners.
>
> Individualization of *pace* controls the rate at which individual learners progress through instructional content....Individualization of *content* is usually implemented in a diagnostic-prescriptive fashion. The learner's knowledge and skills are assessed prior to initiating work in a component of instruction which may range in scope from the entire program of instruction, to a chapter-length unit, to an individual item....Individualization of *sequence* may take place at two levels. At a macro level it concerns the order of topics addressed by the instruction...at a micro level, individualization of sequence determines the order in which items are presented....The manner in which different learners perceive,

> acquire, retain, and retrieve information may differ. These differences are usually called cognitive styles, and instructional systems that try to adjust to these differences are said to provide individualization of *style*.

The notion of individualizing or personalizing instruction is discussed in the literature under several headings—individualized instruction, personalized instruction, continuous progress, non-graded classes, mainstreaming, independent study, and self-pacing.

Bloom (1984: 4) found evidence that tutored students performed, on average, two standard deviations above comparable students in traditionally grouped instruction. Bloom's assertion means that students performing at or near the 50th percentile while in grouped instruction (i.e., about 30 students and one teacher) would probably perform above the 95th percentile on the same tests when tutored.

With respect to Bloom's findings, Fletcher (1992: 16) noted:

> An obvious way to solve Bloom's 2-sigma problem is to provide every student with an individual tutor. The reason we do not do this is equally obvious—it costs too much. Indeed, individualization of instruction has been called a moral imperative and an economic impossibility (Scriven, 1975). In some sectors, individualization may also be an economic imperative. Each year billions of dollars are spent on military and industrial training, which is instruction intended to prepare individuals to perform specific jobs (Eurich, 1990). Instructional efficiency achieved through any means is obviously important and desirable in these training settings. Systems that respond to individual needs by adjusting pace, content, sequence, and style without raising costs should contribute substantially to this efficiency.

Andrew Rae (1993) used video to support individualized instruction following the Keller Plan. The Keller Plan relies on printed self-instructional units with one-to-one tutorials and a diagnostic test on each unit to ensure that each unit is thoroughly mastered. The originators of the plan, Keller and Sherman (1974), describe the Keller Plan as follows:

- Material to be taught is broken up into units each representing at most one week's work. Print materials suitable for self-study is handed out on each unit.
- Tutorial help is given on a one-to-one basis, preferably by senior students (who are themselves rewarded by course credits for doing this teaching).
- When a student feels s/he has mastered a unit, s/he takes a diagnostic test on the unit. This test is marked by a tutor and if the student passes (the pass mark being high, say 90%) s/he goes on to the next unit; if not, the test is re-taken at a later

date.

- There is a final examination which counts for about 30% of the marks, the rest being given for passing the unit tests.
- Occasional lectures are given as a 'reward' to those students who have passed sufficient units.

Rae summarizes his research findings by saying:

> The Keller Plan for self-paced instruction has been shown to be effective in enhancing learning, especially in basic science and mathematics, but it is little used nowadays. The author reports on its use with extensive electronic backup (25 half-hour videotapes, an interactive video disc and computer delivered tutorials). He found that in this way improved examination marks can still be obtained while the amount of tutorial support can be reduced to an economic level.

It should be noted in passing that the program offered at Bishop Carroll High School in Calgary is based on the Keller Plan and is presently being implemented in much the same manner as the program described by Rae. Students use learning packages as the principal source of instruction. Teacher advisors (providing guidance, tracking, and counseling) and instructional advisors (providing tutorials) support the students. Students may also use a variety of media-based learning resources. Over the years, students at Bishop Carroll High School have done as well as, or better than, students in other Alberta high schools—this in spite of the fact that the school has to compete with two other schools: one offering a gifted program and the second offering the International Baccalaureate program. The Calgary RCS School district operates five high schools in total.

Dunn, Dunn, and Perrin (1994) stress the need for understanding learning style and the need for individual diagnosis and prescription. They identified a number of variables found to significantly differentiate students. Their present model includes twenty-one elements that affect how and what students learn.

1. Their immediate environment (sound, light, temperature, and furniture/seating designs);

2. Their own emotionality (motivation, persistence, responsibility (conformity versus non-conformity), and need for either externally imposed structure or the opportunity to do things their own way);
3. Their sociological preferences (learning alone, in pairs, in small groups, as part of a team, with either an authoritative or a collegial adult, and wanting variety as opposed to patterns and routines);
4. Their physiological characteristics (perceptual strengths, time-of-day energy

levels, and need for intake of food and drink, and/or for mobility while learning); and
5. Their processing inclinations (global/analytic, right/left, impulsive/reflective).

Dunn and colleagues base their model on the theory that:

1. Most individuals can learn.
2. Instructional environments, resources, and approaches respond to diverse learning style strengths.
3. Everyone has strengths, but different people have very different strengths.
4. Individual instructional preferences exist and can be measured reliably.
5. Given responsive environments, resources, and approaches, students attain statistically higher achievement and attitude test scores in matched rather than mis-matched treatments.
6. Most teachers can learn to use learning styles as a cornerstone of their instruction.
7. Most students can learn to capitalize on their learning style strengths when concentrating on new and/or difficult academic material.

Jane Vella (1994) uses twelve principles as the foundation for planning effective instructional programs.

- Needs assessment: participation of the learners in naming what is to be learned;
- Safety in the environment and process;
- A sound relationship between teachers and learners for learning and development;
- Careful attention to sequence of content and reinforcement;
- Praxis [practice]: action with reflection or learning by doing;
- Respect for learners as subjects of their own learning;
- Cognitive, affective, and psychomotor aspects: ideas, feelings, and actions;
- Immediacy of the learning;
- Clear roles and role development;
- Teamwork: using small groups;
- Engagement of the learners in what they are learning; and
- Accountability: how do they know they know?

Coffman (1993) offers some other important insights.

1. Holding common standards for all pupils can only encourage a narrowing of educational experience for most pupils, doom many to failure, and limit the development of many worthy talents. Rather, goals should be formulated in terms of continuous progress toward a wide variety of understandings and skills valued in our democratic society, recognizing that pupils have different interests and

talents and will not all be learning the same things at the same rate.

2. Evaluation of the day-to-day instruction in the schools should be the responsibility of professional teachers using observation and what is currently referred to as 'authentic assessment' as well as traditional tests.

Brockett and Hiemstra (1991) offer some perspectives on adult self-directed study (most of their ideals are probably also generalizable to K-12 education). First, they contend that there is a continuum with student-defined learning on one end and teacher-defined learning on the other (i.e., definition of both content or goals and processes). In between are many shadings. Second, they identify ten myths surrounding self-directed study—*myths which need to be dispelled.*

Myth 1: Self-directedness is an all or nothing concept.
Myth 2: Self-direction implies learning in isolation.
Myth 3: Self-direction is just another adult [general] education fad.
Myth 4: Self-direction is not worth the time required to make it work.
Myth 5: Self-directed learning activities are limited primarily to reading and writing.
Myth 6: Facilitating self-direction is an easy way out for teachers.
Myth 7: Self-directed learning is limited primarily to those settings where freedom and democracy prevail.
Myth 8: Self-direction in learning is limited primarily to white, middle class adults [and children].
Myth 9: Self-directed learning will erode the quality of institutional programs.
Myth 10: Self-directed learning is the best approach for adults....We recognize that there will be times when utilizing an individualized teaching approach may not be appropriate or expedient [e.g., when teaching to meet affective objectives such as values, and cooperation].

What Does the Research Literature Say About Class Size?

An educational equivalent to individualized instruction is tutoring, especially one-on-one, and also closely related to individualized instruction is the notion of reduced class sizes—especially sizes that approach very small numbers. Some of the results of research using these various instructional strategies are summarized below.

Literature on the effects of class size suggests that students presently performing near the 50th percentile on standardized tests, while in classes of 35 students, would rise to the 60th percentile in a class of 20, to the 65th percentile in a class of 15, to the 82nd percentile in a class of five, and to almost the 90th percentile in individualized or very small group settings (Glass, et al, 1982: 49).

Other recent research carried on in Tennessee (Project STAR) is also important. Project STAR examined the effects of class size reduction on student achievement in the

primary grades. Finn, Fulton, Zaharias and Nye (1989: 76) report that:

> The results of Project STAR show clearly that average pupil performance in the primary years can be increased by approximately one fourth to one third of a standard deviation without the introduction of new materials or curricula and without retraining teachers.

Folger (1989: 123-132) identifies five lessons learned from the Project STAR research.

Lesson 1. Project STAR found that the maximum effect of reducing class size is in kindergarten and first grade. The effect on achievement levels off and declines in second and third grade even when students remain in small classes.
Lesson 2. The achievement advantage of small class students dropped about 50% the first year after they were back in regular sized classes (21-28) in the fourth grade.
Lesson 3. A one-third reduction in class size will increase per pupil costs about one third.
Lesson 4. The high cost of substantial reduction in class size and the modest achievement that can be expected, even in kindergarten and first grade, suggest that less expensive targeted reductions should be tried.
Lesson 5. The most important lesson may be that just changing class size without changing what is taught or how it is taught will probably have modest results, because the various factors all influence achievement.

Mitchell, Beach, and Badarak (1989): 35-74) re-analyzed the Project STAR data in an attempt to model the relationship between achievement and class size. They defined and tested six models—three models assuming a direct class size impact and three models assuming an indirect class size impact.

Models Assuming a Direct Class Size Impact

Model 1. Instructional overhead: Achievement is a linear function of class size.

Model 2. Classroom interaction costs: Achievement is a quadratic function of size squared and size [largely because student interaction time increases exponentially with the addition of each new class member].

Model 3. Distribution of teaching resources: Achievement is a logarithmic function of class size.

Models Assuming an Indirect Class Size Impact

Model 4. Heterogeneity in student capabilities: Achievement is a function of class range and standard deviation; range and standard deviation are functions of class size.

Model 5. Instructional pacing to low achieving students. Achievement is a function of lowest achieving student in class and a function of the skewness of class scores; lowest student and skewness are functions of class size.

Model 6. Ability based grouping or achievement modeling. Achievement is a function of lowest and highest students and a function of the kurtosis [i.e., shape of the frequency distribution—peaked, normal, flat] of class score; lowest, highest students and kurtosis are functions of class size.

Following analysis of the six models, the team posed a question, Do we have a true test of class size impact? The answer appears to be, No. Not really. The researchers declare:

> The surprises found in this re-analysis of Project STAR data lead us to be cautious about proclaiming an end of the search for definitive answers regarding the direct and indirect effects of class size on student achievement. The Student Grouping/Modeling theory [Model 6] is the clear winner as a model for interpreting the data....High achieving students are able to raise the performance of their peers, while low achievers have a similar penchant for depressing the performance of classmates....The most effective strategy for raising overall class achievement is to isolate and remove from classes low performers while spreading out the assignment of high-performance students. Such a strategy would [however] have disastrous consequences for equal educational opportunity.

Hooper (1992) discusses the effects of peer interaction during computer-based mathematics instruction. He notes:

> Hooper and Hannafin (1988) found that low-ability students demonstrated higher performance when grouped heterogeneously, but high-ability students performed better when grouped homogeneously....The results of this study indicate that students who completed the instruction in pairs scored significantly higher on posttest than did students who completed the instruction alone. Furthermore, the relationship was consistent across ability groups. Although achievement gains were greatest for average students, high-ability students also benefited from completing the instruction in groups.

Taylor and Reeves (1993: 13-18) report a trial with reduced class sizes involving 90 seventh graders who possessed at last two of the following characteristics of potential dropouts: high absenteeism, excessive number of discipline referrals, two or more years older than their classmates, poor grades, low stanine scores on standardized tests, and parents who did not complete a high school education. The researchers report their results as follows:

Twelve months ago, they were identified as potential dropouts. Their active participation in an especially designed program has yielded these impressive results: an overall cumulative grade point improvement from 1.17 to 2.12, and three school-wide intramural championships.

What lessons have been learned by Taylor and Reeves?

1. Reduction in class size is not enough....Teachers must be trained in appropriate instructional techniques and must be coached to practice those techniques.
2. Academically at risk students may be found in every classroom and will benefit from the use of alternative teaching strategies.
3. Demanding that students meet higher standards, not lower ones, improves students' productivity and self-esteem.
4. Teaching students to act responsibly by holding them immediately accountable for their actions.
5. Empowering students to realize their true potential through a variety of activities.
6. Administrative commitment is critical to the concept of creating successful learners from the early planning stages through implementation and evaluation.
7. Involving parents of academically at risk students, and providing educational experiences for them as well, provides support for the students.

While tutored students and those who receive instruction in smaller than traditional classes (i.e., classes approaching 30 students and one teacher) appear to learn more, these alternate forms of instruction are not commonplace. As Fletcher (1192: 16) commented: "The reason we do not do this [individualize or reduce class sizes] is equally obvious—it costs too much."

As illustrated in Figure 1, the literature on individualized instruction peaked in the 1975-85 period and now appears to be diminishing. This may be accounted for by the fact that costs for implementing individualized instruction is higher than teacher-centered, large group instruction and individualized instruction was therefore dismissed as a viable educational choice.

Indeed, one can only conclude from the message contained in Figure 1 that the observations made by Fletcher (1992) were right—"it [individualization or reduced class sizes] costs too much." In programs that have high costs associated with them—especially special education—individualized instruction may be a viable alternative. For the masses, individualized instruction has been too expensive.

What Does the Research Say About Home Schooling and Distance Learning?

CyberHigh is not just another form of home school or distance education—it is a hybrid. Instuction is provided by teachers (just the same as in regular schools) but the

students remain in their homes (just like students engaged in home schooling). Unlike regular schools, parental partnerships in CyberHigh and homeschooling are critical.

Because CyberHigh is built on some of the same foundations as homeschooling and distance learning, a review of the literature in relation to these forms of education is also important.

Litcheer and Schmidt note that home schooling has been around for a long time. It is a well established institution.

> Home schooling is the earliest form of education, as old as the family itself. In most of the United States, public education from kindergarten to college is relatively new. Indeed, mass attendance of free public facilities is a twentieth century phenomenon, largely resulting from the increased urbanization and industrialization of the past few decades. Home schooling, however, began with the arrival of the Puritan colonists to American shores in the early seventeenth century.

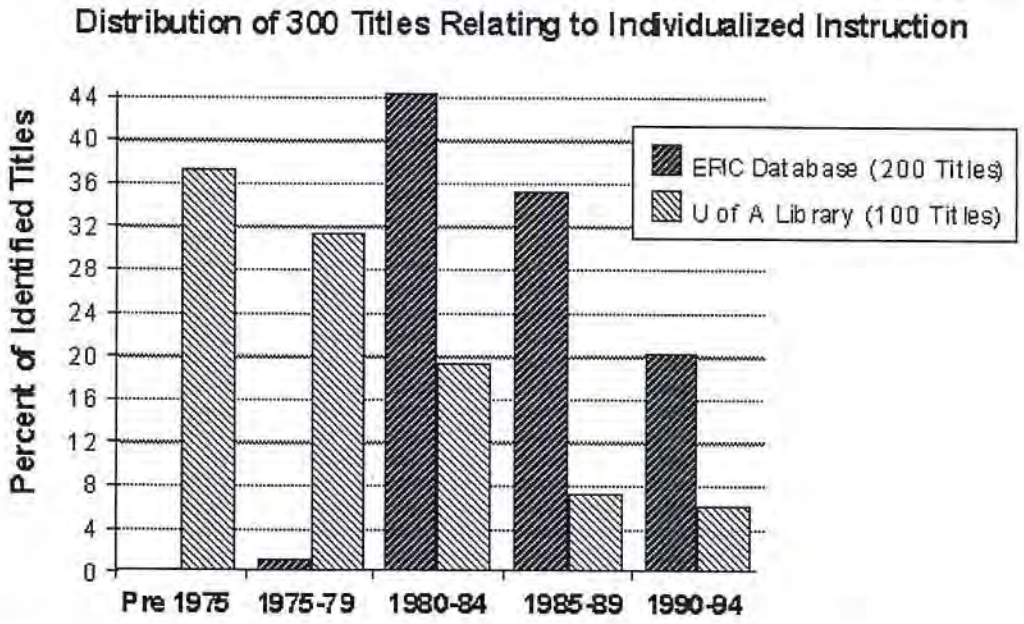

Figure 1. Distribution of research articles and book titles pertaining to individualized instruction.

The present interest in home schooling began in the 1950s and gained momentum in the 70s and 80s. John Holt (1964) and Ivan Illich (1971) not only criticized public education but they also began to encourage parents to "unschool" their children and to teach them at home.

Two significant questions surround initiatives to educate children at home:

- Will the academic achievement of home schooled students be comparable to regular school students? and
- Will the students become well socialized?

Though there is only a small amount of research available to answer these questions, the available results are optimistic.

A study of home education in Canada was completed by Dr. Brian Ray for the National Home Education Research Institute. The study is based on data provided by 808 home-educating families representing a combined total of 2,594 students. With respect to student achievement, the author reports:

> Of 1,393 students who were at lease age 5, had been home educated, and for whom relevant data were available, 524 (37.6%) took a standardized achievement test during the past 24 months. The most frequently used test was the Canadian Test of Basic Skills (by 52%), while 34% took the Canadian Achievement Test. Copies of test results prepared by the test publisher or test administrator were submitted for 61% of the students. Information was collected on the following: reading, listening, language, math, science, social studies, basic battery (typically reading, language, and mathematics), and complete battery (all topics included in the overall testing of the student).
>
> The home educated students scored, one the average, at or above the 76th percentile in all eight of the preceding categories. The national average for conventional school norms is the 50th percentile. Consistent with data in several other studies and reports, these findings show that the achievement scores are high in all grade levels (K-12) and in all subject areas.

Webb summarizes a study she undertook into the outcomes of home-based education on employment and other issues.

> Aspects of the adult lives of wholly or partly home-educated people who took part in a study carried out from 1982-88 are examined.... All those who attempted entry to further and higher education courses were successful in achieving this: there is no evidence of prejudice against the home-educated. In the area of employment the same seems to be true: the importance of personality attributes gained through home-based education is apparent. The socialization of home-educated students is often regarded as a problem by the uninvolved: the study shows that, on the contrary, home-educated people may be much better prepared socially than some of their school peers.

These findings are consistent with conclusions drawn in a study which examined correspondence study in Alberta.

> Interestingly, when comparing correspondence students with regular students, the findings often favor the correspondence student.
>
> Childs (1966) noted that the length of time to complete a correspondence course had no practical effect on grades. Neither did mental ability have any clear relationship with one's ability to complete a correspondence course.
>
> Mathieson (1971) reported that he found students with some experience with correspondence study achieved better grades in subsequent residence study than did regular residence students.
>
> Macken (1975) reported several studies in which it was found that correspondence students did better in subsequent studies than regular students.

Litcheer and Schmidt believe that a forte of home schooling is the superior socialization of students.

> Socialization continues to be the main avenue of research interest in the affective domain. As home school learning typically occupies less time than conventional school instruction, Wartes (1987) discovered home schooled children spending between twenty and thirty or more hours per week engaging in community activities such as clubs and sports teams. Using psychological profiles, Maarse Delahooke (1986) and Taylor (1986) noted non peer-dependent, well adjusted children with strong self concepts.

What Does the Research Say About Technology in Education?

Perhaps technology hold keys for cost-effectively unlocking the potentials of reduced class sizes and individualized instruction and for opening up new forms of schooling which are more productive than traditional schools today.

Merron (1991) describes an interesting experience.

> A teacher's dream: a pupil/teacher ratio of eight to one, a variety of materials and carte blanche to devise a curriculum *[i.e., to assemble the learning resources and appropriate teaching strategies]*. That was the situation I stepped into over 20 years ago when I began teaching a special education class. Other teachers were conspicuously envious.
>
> With enthusiasm and visions of individualized instruction, I began applying all of my knowledge and skills. I remained upbeat until I had to actually write those individualized plans and projections. With the goal of mainstreaming students where possible, it was a necessity to be familiar with the curricular objectives in the 'regular' grades. Eight children seemed

like 80, and my dream became a near nightmare.

Fast forward to 1991. I am conversing with a basic skills teachers....She is not at all flustered as she discussed individualized objectives and charting progress. Each of her 550 students has a personal educational prescription based on the California Achievement Test scores. She has a computerized instructional management system [IMS] to assist her....This system contains eight basic steps:

- The curriculum skills are entered as a skills array;
- Teaching resources, including CAI, are aligned to the skills to which they apply;
- The instructional management system identifies the skills to be mastered by scoring an assessment test or by reading previously scanned or downloaded results;
- Students are placed into flexibly defined classes;
- Individual and group lesson plans and summary reports are generated indicating weak areas;
- Instruction proceeds by concentrating on skills to be mastered with prescribed teaching resources;
- Subjective tests or skill tests scored by the IMS may be administered any time; and
- Progress reports are generated to continue the instructional process *[added by author]*.

Rae (1993) found that by using multimedia resources to support instruction in the Keller Plan—that is to say, by means of printed learning packages—improved examination marks can still be obtained while the amount of tutorial support can be reduced to an economic level. Indeed, he found that when videos were used after students had completed (or attempted to complete) the learning package, achievement was higher. It seems there was a readiness for a video presentation following a period of time spent in struggling with the basic printed learning package. The "Zeigarnik effect" may provide a partial explanation for this phenomenon.

The Zeigarnik effect is described by Mann (1994: 593):

Work by Bliuma Zeigarnik (1927) established the fact that subjects ranging widely in age tended to remember interrupted tasks better (and with greater frequency) than they did tasks they had completed....Studies have found that the Zeigarnik effect is sensitive to a number of factors that may be difficult, if not impossible, to control within the context of a laboratory study: (1) The Zeigarnik effect is less likely to appear if the subject is, to some extent,

> ego-involved in the task. (2) The effect is more likely to appear if the interruption of the task does not seem to be part of the experimental game plan. (3) The effect is most likely to appear if the subject has set a genuine level of aspiration in the interrupted task, that is, has not come to the conclusion that the thing is impossible or beyond his or her capacity.

The third factor to which the Zeigarnik effect is sensitive—the subject has set a genuine level of aspiration in the interrupted task—may be of most importance when planning individualized and personalized educational programs and when designing interactive learning resources.

Dhariwal reported the successful results of the use of telecommunications to link students at remote locations with teachers.

> Screen share computer-mediated communications can be used to functionally provide a learner at a remote location with access to a teacher at a different location. This means that a self directed learner doesn't have to rely on mail or other relatively slow means of communications for submission and return of assignments, or for solutions to learning problems. Nor does the learner have to face the limitations of communicating learning problems or receiving teacher solutions to learning problems only verbally as is the case in audio teleconferencing. The availability of a cost effective means of electronic communication which permits both voice and textual information to be used concurrently by learners and teachers, suggests that a self directed learner can learn successfully in the home, workplace, or any other remote location equipped with ordinary telephone service.

As suggested by Merron (1991) and Rae (1993), achieving the objectives of individualized, personalized, or small group instruction may be more easily achieved within the context of a new educational paradigm rather than in the present educational paradigm. The difference between these two paradigms (illustrated in Figure 2) lies in sources of information and the roles of teachers and students.

What Does the Research Say About Environments for Learning?

Ergonomics is a well articulated field of study which focuses on work spaces and seeks to provide insights into work space designs that comfortably interface users with the work environment. Much of the research in this field has already been summarized and will not be repeated here.

Lanier considers the learning environment from a different perspective—as an environment that challenges and stimulates the mind and enhances learning.

> We contradict human nature by placing children in schools, then asking

> them to learn and remember many, many different things, all in exactly the same environment.... Human memories can be keyed by many things—to a person you're with when you first encounter a piece of information, to a certain smell. But memories are keyed especially to environments. That's why field trips are so important, of course, and why bringing new media into the classroom is so important, too.

Following Lanier's line of thought, it might be easy to conclude that the home and community provide a richer and more varied learning environment than the space contained within the walls of a classroom—no matter how carefully designed or equipped. Students' computer work stations in this more enriched home and community environment simply provides the points of contact with teachers, other students, and further learning resources—it becomes the umbilical cords tying students and teachers together.

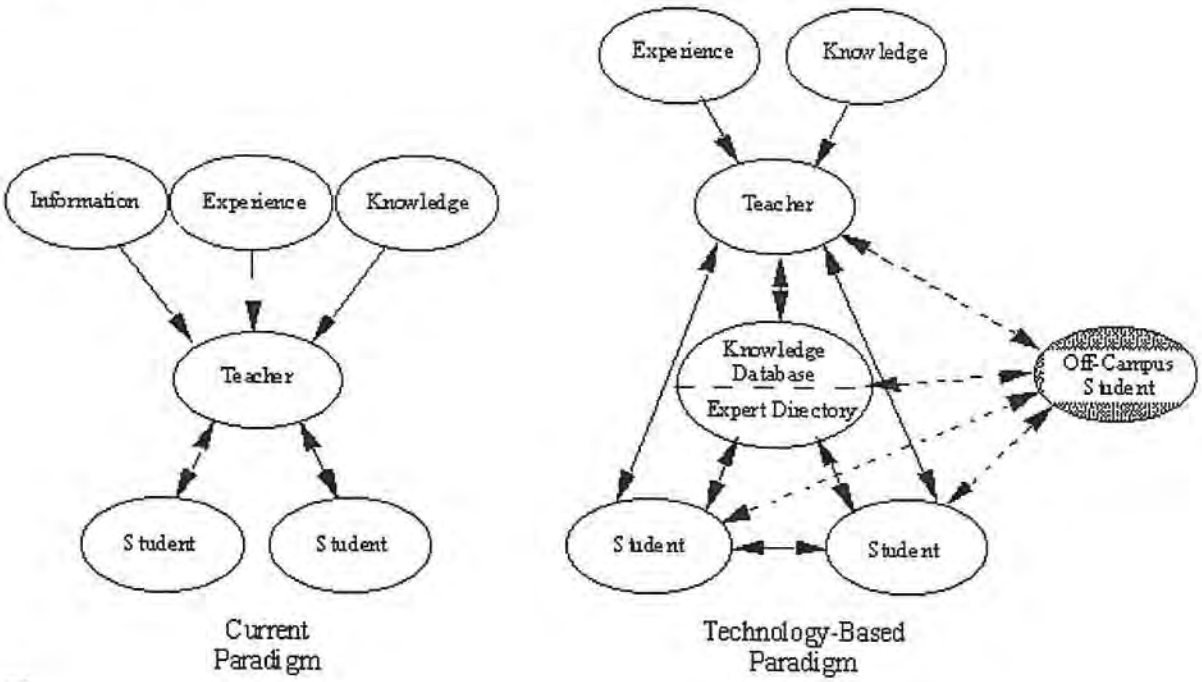

Figure 2. The current educational model or paradigm contrasted with a technology-based educational paradigm (Hathaway, 1993: 9).

Observations from the Research

A review of literature pertaining to smaller class sizes, tutoring, and individualized or more personalized instruction provides some interesting observations.

1. Under certain circumstances, small group instruction is more effective than traditional large-group instruction (i.e., in classes of 25-30 with one teacher).
2. Costs of small group instruction vary inversely with class size. The smaller the class, the higher the implementation costs.

3. Individualized instruction is unquestionably able to improve student achievement significantly.
4. For the most part, individualized instruction is most often applied to gifted students, students with special needs, and to adult students. Instances of individualization applied to programs for average students are rare.
5. Most of the research pertaining to individualized or small group instruction encountered in the literature suggests that these alternative approaches were implemented with considerable reliance on the traditional teaching paradigm.
6. Virtual schools have potential for expanding and enriching learning environments beyond even the best in-school learning environments.
7. Student achievement by students in home schooling programs has been found to be at least 1.5 standard deviations above scores of students in traditional settings.
8. Students who were home schooled have been found to be well socialized and to demonstrate stronger self concepts than peers in traditional school settings.
9. Information, technology, and telecommunications provide a fourth factor in the production equation and offers the potential of:
   - (a) significant decreases in the costs of education,
   - (b) significant increases in student achievement, or
   - (c) both.
10. When compared to the richness of the learning environments contained in homes and communities, classrooms are by comparison impoverished—no matter how well designed or equipped.

Summary

One of the goals of Alberta Education is to "Restructure the governance and delivery of education to achieve increased efficiencies and effectiveness." A key strategy for achieving this goal is believed to be to "increase use of technology to deliver education." Indeed, the Minister of Education holds the expectation that, "Schools will provide a variety of learning experiences so that students...**use** computers and communication technologies."

Research into the effects of: individualization and personalization of instruction, reduced class sizes, home schooling and distance learning, and educational applications of technology all affirm that the goals of Alberta Education can be met.

Though attainment of Alberta Education's vision is possible, the leadership for new ventures in education are not likely to come from within the educational system. Rather new educational models and paradigms will evolve on the fringes of education and only later will they move into mid stream. (The matter of system inertia and forces which hinder educational change are already documented (Hathaway, 1990) and will not be enlarged on here).

CyberHigh is presently a pilot project but CyberHigh also appears to be an innovation whose time has come. The promise is that student achievement will prove to be superior to achievement in traditional schools while per student costs will be less.

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