

THE UNIVERSITY OF CALGARY

The Merits of Multimedia in the Social Studies Curriculum

by

Glenda Joan Korella

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES
IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE
DEGREE OF MASTER OF ARTS

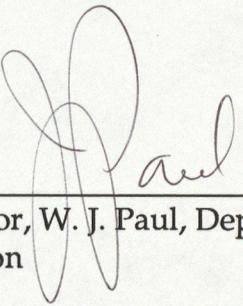
DEPARTMENT OF EDUCATION CURRICULUM AND INSTRUCTION

CALGARY, ALBERTA

MAY, 1995

THE UNIVERSITY OF CALGARY
FACULTY OF GRADUATE STUDIES

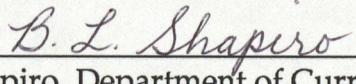
The undersigned certify that they have read, and recommend to the faculty of Graduate Studies for acceptance, a thesis entitled "The Merits of Multimedia and the Social Studies Curriculum" submitted by Glenda Joan Korella in partial fulfillment of the requirements for the degree of Master of Arts.



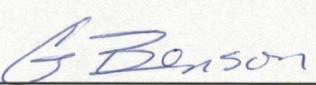
Supervisor, W. J. Paul, Department of Curriculum & Instruction



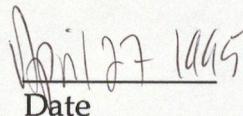
B.E. Griffith, Department of Curriculum & Instruction



B.L. Shapiro, Department of Curriculum & Instruction



G. Benson, Department of Teacher Education & Supervision



Date

ABSTRACT

This thesis investigates the merits of multimedia in the social studies curriculum from a constructivist perspective. We have entered an era that is being reshaped by an electronic consciousness. Teachers are being asked to prepare their students to live and work in a world that has changed a great deal since they grew up. Many educational strategies that seemed to work well in the past are no longer adequate. Multimedia is the combining of audio, video, textual and animated sources of media into a virtual environment mediated by the computer. It has the promise to provide learners with a vehicle to construct their own meaningful but virtual representations of life. In multimedia settings, learners experience and respond to simultaneous multiple representations as activities or problems to solve with the result that learning can occur through more than one modality.

ACKNOWLEDGEMENTS

There are many people who have provided insight and encouragement towards the completion of this thesis, and it is to them that I wish to extend my sincere thanks.

A special thank you to the members of committee: Dr. Jim Paul for his insight, concern and guidance; Dr. Bryant Griffith for his positive attitude and constant expectation of my success; Dr. Garth Benson for his thoughtful suggestions and willingness to be of help; and to Dr. Bonnie Shapiro for the unselfish time and effort she devoted to assist in the development and improvement of my thesis.

Thank you to my family and friends for their loving encouragement and especially to my husband Lynell, without whose council, reassurance and willing assistance I would not have had the courage and endurance to reach my goals.

TABLE OF CONTENTS

Approval Page	ii
Abstract	iii
Acknowledgements	iv
Table of Contents	v
List of Tables	viii
CHAPTER 1: AUTHOR IN REFLECTION	1
CHAPTER 2: INTRODUCTION AND OVERVIEW	6
CHAPTER 3: A NEW EDUCATIONAL PARAMETER	12
Is There a Need for Change?	12
A Journey Back in History	18
The Rise of Psychology and Behaviorism	21
Social Studies: A Need For Change?	22
CHAPTER 4: CONSTRUCTIVISM AS A TEACHING/LEARNING PHILOSOPHY	26
Introduction	26
What is Constructivism?	27
Constructivist Epistemological Perspectives and Their Pedagogical Implications	30
1. The nature of human interaction and the pedagogical implications.	30
2. The nature of knowledge and the pedagogical implications.	32
3. The nature of reality and the pedagogical implications.	37
Constructivist and Traditional School Environments - A Comparison	37

CHAPTER 5: MULTIMEDIA AS THE NEW INFORMATION TECHNOLOGY: CAN ITS USE BE JUSTIFIED?	41
Introduction	41
A Brief Historical Sketch of Media	42
The Challenge of Change	43
The Great Media Debate	46
Clark's Argument	47
Kozma's Concern	51
Problems in Media Research	56
An Instructional Designer's Perspective	60
1. Instructional methods versus media attributes debate.	60
2. Necessary versus sufficient media attributes.	61
3. Replaceability challenge.	62
4. Research claims.	63
5. Learner perceptions and media.	63
The Importance of the Debate	64
Conclusion	67
A New Direction	68
CHAPTER 6: RESTRUCTURING THE DEBATE	69
Introduction	69
The Debate from a Constructivist Perspective	70
Situated Learning	70
Cognitive Apprenticeship	72
Multiple Resource Theory	73
Affordance Theory	74
CHAPTER 7: LEARNING AND TEACHING WITH MULTIMEDIA	76
Introduction	76

Media Application for Higher-Order Learning Skills	80
Creating a Multimedia Report	84
The MacMagic Program	84
Lester B. Pearson High School	87
Peakview Elementary School	91
HyperCard and Social Studies	96
CHAPTER 8: A SUGGESTED STRATEGY FOR USING INSTRUCTIONAL TECHNOLOGY FROM A CONSTRUCTIVIST STANCE	98
Introduction	98
A Social Studies -Multimedia Project	99
Summary	105
CHAPTER 9: IS THE JOURNEY OVER?	106
Does Multimedia Merit a Place Within the Social Studies Curriculum	106
Author Again in Reflection	108
Implications for Application	108
Implications for Future Research	110
The Implications for Teachers, Teaching and Teacher Training	111
Implications for Students	112
Final Reflections	112
Conclusion	115
BIBLIOGRAPHY	117

LIST OF TABLES

Table 1	39
Table 2	91
Table 3	92
Table 4	93
Table 5	94

CHAPTER 1

AUTHOR IN REFLECTION

For several years I have enjoyed taking classes at the university. My motivation was to keep learning, sharpen my cognitive skills and to also up-date my professional training. I reasoned that having been out of the classroom for many years my teaching techniques must be quite dated. For many of the classes I experienced *deja vu*. They were almost mirror images of what I had experienced during my pre-marriage, pre-children days. I entered the classroom, found a seat (preferably a safe distance from the professor), and proceeded to listen to what the goals, course content, assessment procedures and deadlines would be for each class. For me this regimen was comforting and familiar. I anticipated entering the room as an empty vessel prepared to receive an intellectual feast offered by the instructor. Each day of class followed a similar scenario: walk in, find your seat (only the most daring person would try to sit in a different chair), answer a question only if personally asked by the professor, dutifully take copious notes and when the lecture was completed, leave. To evaluate how much learning was taking place examinations were given. The traditional format was a multiple choice examination, unless, for subjects like history, then essay questions were used. After regurgitating all the information I had memorized from the lectures and my reading assignments, I waited with baited breath until the examinations were marked and a grade was

assigned. Then, and only then, did I know my worth. If the grade was high, my self-esteem soared and I thought the course and the professor were equally great. Does this sound familiar? I happily discovered, although I was a bit rusty, I could compete very adequately with the younger, more confident students. I was feeling happy with my life back at school. I was not vegetating, I was progressing.

This feeling of euphoria was short lived when I made a decision to pursue a Masters of Arts degree in Curriculum and Instruction. My comfort zone evaporated quickly. I was now required to actually think, make contributions to the class, decide what I wanted to get out of the class and literally make it happen. At first I felt disappointed, frustrated and intimidated with my classes. I was not getting my proverbial 'money's worth'. I had been conditioned to expect my professors to provide all the information I was to digest and to impart his/her expertise in a energetic and fluent manner. This was not happening.

The realization as to what was happening with my education was gradual, not a sudden burst of light with great insight. I progressively appreciated not being so structured in my learning experiences and gained confidence in my own personal opinions and thought processes. Working and discussing in groups was also totally foreign to me. My previous schooling had been very individualistic and competitive. I marveled at how a problem could be quickly

dispatched by the efforts and suggestions of many. I gained an appreciation of my colleagues' willingness to collaborate and to be helpful.

This new paradigm of learning I was experiencing was constructivism -- a term I had previously never heard. For the first time in my educational career I was challenged to create my own reality and understanding. This approach to learning made a lot of sense to me. I was now analyzing and evaluating concepts and seemed to be able to apply them in other areas of my life. I became excited with the possibilities this philosophy held for education and desired to learn more about its tenets. With an undecided thesis topic continually disrupting my peace of mind, I became hopeful that I could use some area of constructivism as my thesis topic.

Fortunately, and almost simultaneously, I became very interested in another previously unfamiliar concept to me -- that of multimedia. Multimedia is the combining of audio, video, textual and animated sources of media into a virtual environment mediated by the computer. While working on a multimedia project for one of my courses, it quickly became evident that I might have discovered an area within the constructivist paradigm that I might pursue for my thesis inquiry. Being somewhat in awe of the computer and its capabilities, I approached my self-determined task with timidity, fear and great anticipation for a novel learning experience -- I was not disappointed. Having the freedom of

choice to determine the topic I would investigate (empowerment), I was motivated to research the literature, find film clips, scan pictures from texts, discover appropriate background music, decide on the proper sequencing and learn how to use computer applications such as Astound and Quicktime. It was during this project that I became cognizant of the possibilities of multimedia to enhance student attitudes towards social studies and to become a partner to heighten learning construction and learning retention. The question, "Does multimedia merit a place within the social studies curriculum?", kept reoccurring in my mind. The plausibility of using multimedia, from a constructivist perspective, to strengthen and improve the social studies curriculum, became an exciting possibility for my thesis topic.

The fields of history and social studies have been of abiding interest and importance to me for many years. This importance is reflected in some misgivings about how learners experience these subjects. My concern, when I question students, is based on the notion that these subjects are generally viewed with disdain and are found to be boring and of little relevance in their lives. My early recollections of social studies substantiate these claims. I remember walking into a classroom with blackboards filled with notes to copy, coloring endless maps and listening to a didactic lecture including little if any student participation or contribution. The coming of multimedia, with its myriad of amazing attributes, with a constructivist-driven teaching philosophy, appeared

to offer the potential to address and solve many of the ills of the social studies curriculum. While I do not prescribe a miracle cure, I do wish to present an argument for the use of learner-directed, interactive multi-modal experiences of the type that will allow learners to develop their own conceptual representations of the social studies curriculum. My thesis on *The Merits of Multimedia in the Social Studies Curriculum* is, therefore, an attempt to consider a very small segment of the Constructivist philosophy co-joined with an integrative multimedia approach to the social studies curriculum.

CHAPTER 2

INTRODUCTION AND OVERVIEW

This thesis proposes to investigate the merits of multimedia in the social studies curriculum within a constructivist philosophy of learning. The focus of the discussion will relate to the effectiveness of a multi-modal approach to providing a constructivist learning experience. An emerging conceptual model will be presented to include the notion of virtual learning experiences combined with student involvement in their own learning.

One of the original goals of schools, beside providing a basic education, was to transfer the culture. Much of this capacity has been lost through distancing, compartmentalizing and segmenting the learner from the 'Gestalt' of direct experience. A common complaint of teachers, curriculum builders, and instructional designers has been the dealing with components of life rather than life. Progress in information technology offers an avenue to redress these concerns by permitting learners to reintegrate curricular goals by way of virtual experiences. One subset of the new virtual technology is interactive multimedia. The combining of audio, video, textual and animation (multimedia) has the promise to provide learners with a vehicle to construct their own meaningful but virtual representation of life. In multimedia settings, learners experience and respond to simultaneous multiple representations as activities or problems to solve with the result that learning can occur through more than one modality. In

short, multimedia acts instrumentally to create virtual experiences permitting the student to build mental images.

This thesis will advance the position that virtually enabled and interactive multimedia should play a central role in changing our education system -- particularly in the area of social studies. To develop an argument and justification for this position, I will create the following context for exploration.

Chapter 3, "A New Educational Parameter", will investigate the literature supporting the contention that great changes are needed in our educational system. Incorporating the benefits of new information technology could result in a new educational paradigm. School environments have changed little since Horace Mann established the class-and-grade classroom over one hundred and forty years ago. Often schools boast of exceptional academic achievements by their graduate students only to have the business community bemoan the fact that there is virtually no transfer between what has happened in school and subsequent learner performance in real life. The field of social studies does not escape the need for changes and improvement. Evaluating the attitude of students towards social studies will substantiate this claim for needed change.

During this brief historical journey a few important educational milestones will be briefly discussed, including the development of the psychology of

learning, the rise and fall of behaviorism and latter-day progressivism. Further, an investigation of some shortcomings inherent to current learning paradigms will lead to a discussion to support a constructivist approach to learning.

Chapter 4, "Constructivism as a Teaching/Learning Philosophy", will investigate the philosophy of Constructivism as it relates to education. Learner-derived meaning for concepts and relationships in school has been different than those in the extra-school environment. The transfer of learning from the traditional instructional setting to a real life setting has historically been weak. The notion of a constructivist approach to learning will be explored as one answer to current deficiencies particularly as they exist in the social studies curriculum. Conceptual operations which focus on learner independence, self discovery, and teacher-student role reversal will be examined in a context of an instructional design theory. The curriculum should provide assistance and a context around which learners make sense of the environment as it is encountered. Exploration of authentic tasks to acquire meaning is fundamental to a constructivist approach. The literature supporting constructivism will be discussed and evaluated in this chapter.

Chapter 5, "Multimedia as the New Information Technology: Can Its Use Be Justified?", will investigate the literature pertaining to multimedia and learning. The 'media debate' and its participants will be discussed. We have

entered an era that is being reshaped by an electronic consciousness. Teachers are being asked to prepare their students to live and work in a world that has changed a great deal since they grew up. Many of the educational strategies that worked well in the past seem no longer adequate. In the real world, learners are expected to elaborate upon and interpret informational experience as an enabling strategy. Media, especially in the microcomputer format, is reshaping our social, economic and educational systems. The implementation of the new information technology has been received with mixed reviews. Questions regarding its validity and use in the classroom are being raised. This media versus method in learning debate is hotly contested. Richard Clark(1994) and his "media will never influence learning" statement provided the stimulation for extensive discussion. The literature responding to Clark's 'profound truth' will be discussed and analyzed in relation to its potential to reshape our traditional approaches to learning. This chapter will be followed by Chapter 6 with a discussion on restructuring the debate by focusing on a learner-centered conception of learning. This restructuring focuses less on media attributes versus instructional methods and more on the role of media in supporting rather than controlling learning processes. Theories which support this perspective, such as, situated learning, cognitive apprenticeship, multiple resource theory and the affordance theory will be discussed.

Chapter 7 will address the issue of "Learning and Teaching with Multimedia". Educators in the field of the social studies are confronted with the challenge of harnessing the emerging technologies to attain curricular goals and to prepare their students to flourish in the next century. Teachers must be cognizant of the potential of multimedia to assist students as they construct personal knowledge and attempt to make sense of a rapidly changing world. Teachers must also be prepared for changes in their teaching strategies due to the paradigm shift toward cognition and constructivism.

This chapter will provide many examples of how technology is being introduced into schools and the positive effects of its use. The new computer-based technologies should be viewed as valuable allies to teachers as they explore their new role as mentors and facilitators and the new, more active roles of their students.

Chapter 8 presents a personal attempt to apply multimedia, from a constructivist view, in the construction and completion of a social studies project. The practical application of many constructivist beliefs are accessed and the many attributes of multimedia are explored and utilized in this educational project.

This work concludes by contemplating the goals that were set at the commencement of the writing of this thesis and considers the practical application of these goals.

This thesis inquired into how modern instructional technology, particularly multimedia, can be utilized to enhance the learning milieu in a social studies classroom. An appropriate conclusion for this thesis is to address the question of action -- that is, the implications for change which arise from this work. The implications for future action will be discussed under the headings of research, teachers, teaching, teacher training, and the student.

CHAPTER 3

A NEW EDUCATIONAL PARAMETER

Prior to putting forward suggestions for changes and improvements to our educational system, especially in the area of social studies, it is expedient to discover if, in fact, changes are warranted.

Is There a Need for Change?

There is a widely held belief (Banathy, 1990; Brooks, 1993; and Hart, 1983) that education is failing to accomplish its mandate to educate our children and to prepare them to live effectively in our society. Arthur Koestler (1959) referred to a need for change in our education system when he stated:

The symptom that a particular branch of science or art is ripe for a change is a feeling of frustration and malaise, not necessarily caused by any acute crisis in that specific branch... but by a feeling that the whole tradition is somehow out of step, cut off from the mainstream, that the traditional criteria, have become meaningless, divorced from living reality, isolated from the integral whole. (p. 520)

Even students who are capable of demonstrating success, who pass tests with high marks and obtain honors diplomas, frequently don't connect the information they receive in school to interpretations of the world around them. Gardner (1991), in the book, *The Unschooled Mind: How Children Think and How Schools Should Teach*, indicates:

I contend that even when school appears to be successful, even when it elicits the performance for which it has apparently been designed, it typically fails to achieve its most important missions. Evidence for

this startling claim comes from a by-now overwhelming body of educational research that has been assembled over the last decades. These investigations document that even students who have been well-trained and who exhibit all the overt signs of success -- faithful attendance at good schools, high grades and high test scores, accolades from their teachers -- typically do not display an adequate understanding of the material and concepts with which they have been working. (p. 3)

David Kilgour (1991), in his paper *The Front Line*, presented some very discouraging facts about Canadian schools. According to his numbers, five million Canadians are functionally illiterate. Amazingly, one third of them are high school graduates. A surprising 30 percent of all Canadian youth today are dropping out of high school before graduation.

The results of the 1988 Second International Study of Achievement, carried out in 23 countries, suggests the quality of our high school education on an overall national basis is far from satisfactory. In grade five, Canadian students ranked sixth. By the end of high school, our students had dropped to 22nd place (second last).

Bela Banathy (1990), in his book *Systems Design of Education*, addresses his concern for needed changes in education by suggesting that during recent years a host of reports have brought into focus the crisis in education that has placed the nation at risk. The reports have offered remedies for 'fixing' education. Whatever terms are used -- reform, restructure, renew -- the recommendations

suggest making adjustments or improvements in the existing system. Despite massive increases in expenditures and numerous corrective efforts, a National Alliance of Business survey had found that seventy-two percent of executives believe that the math skills of new employees have worsened in the last five years, and sixty-five percent said that reading skills decreased over the same period. Why is this?

Around the middle of this century, our society entered what is often called the post-industrial/information age, a new stage in the evolution of humanity. This stage has brought about new thinking and revolutionary changes and transformations in the society. Faced with these changes, merely making adjustments and improving an educational system which is still grounded in the assembly-line thinking of the 19th century is not acceptable.

Theodore R. Sizer (1983) stated the following:

Given the durability of American views of school practice, it is no surprise to find that, with few exceptions, school programs have altered little since the 1890's. Considering the prodigious changes in American society since 1900, it is remarkable, and not merely the result of chance, that only minor rearrangements have been seen. (p. 28)

Charles Reigeluth (1992), in his paper *The Imperative for Systemic Change*, expresses a belief similar to Sizer. Reigeluth states that :

The current system is substantially the same as it was when we became an industrial society. The reforms that have been made since then have all been piecemeal changes. ...Society is changing in sweeping ways that make our current educational system obsolete. (p. 9)

He discusses two different types of change. The first kind of change is piecemeal change, often called tinkering, which entails modifying something (fixing a part of it). The second kind of change is systemic change, often called paradigm shift. This change entails replacing the whole thing. For education, he suggests sweeping changes must pervade all levels of the system: classroom, building, district, community, state government (provincial) and federal government. It would seem that the entire educational enterprise has to be rethought. A new design of education has to be created that can guide a broad sweep of a comprehensive transformation: 'a metamorphosis of education.'

Banathy (1991) proposes a new learning agenda for future generations, a design which focuses on the learning experience level and integrates all systems in the community that can offer resources for learning and human development.

Marshall McLuhan (1964) exposed how schooling has lagged behind modern technology. In his book, *Understanding Media*, he stated the following:

The young student today grows up in an electrically configured world. It is a world not of wheels but of circuits, not of fragments

but of integral patterns. The student today lives mythically and in-depth. At school, however, he encounters a situation organized by means of classified information. The subjects are unrelated. They are visually conceived in terms of a blueprint. The student can find no possible means of involvement for himself, nor can he discover how the educational scene relates to the 'mythic' world of electronically processed data and experience that he takes for granted. (p. vii)

For a growing number of educators, questions regarding understanding are far more important than questions regarding achievement as measured by test scores. The classic remark, "I taught them but they just didn't learn", is often sadly uttered by the teacher who tried hard but didn't succeed in producing the intended learning by the students. The classroom teacher often feels this kind of frustration even after presenting a well prepared lesson with skill and enthusiasm. Who is to blame for this apparent lack of learning? Teachers often blame themselves, wondering what they are doing wrong. If a solution is not found other excuses are used:

The parents didn't prepare these children for school. They don't encourage and discipline them. You can't really expect youngsters from a neighborhood like this to be interested in learning.

The teachers in the lower grades passed these students along without basic skills. What can I do with them now?

We don't get the facilities and supplies and support we need

Schools reflect society. What can you expect? We have to change society first. (Hart, 1983, p. 14).

We must recognize that these explanations are excuses and serve as distractions from the real issue. Schools must work with the students as they are, not as how we wish they were. Justly or unjustly, the pressures grow on schools, and on teachers, to produce learning results.

In 1972 The Rand Corporation issued the report on a major study done for the President's Commission (United States) on School Finance. Known as the *Averch Report* (1972) for its chief investigator, it found the following:

We are saying that research has found nothing that consistently and unambiguously makes a difference in student outcomes. (p. 10)

Further, the report observed:

There is a suggestion that substantial improvement in educational outcomes can be obtained only through a vastly different form of education. (p. 10)

Christopher Jencks et al. (1972), described similar results:

We can see no evidence that either school administrators or educational experts know how to raise test scores, even when they have vast resources at their disposal. (p. 95)

A Journey Back in History

To gain insight as to why education seems awash in criticism, frustrations and failure, a quick look back 140 years to Horace Mann might prove enlightening. When Mann was named to his position in Massachusetts (a position similar to a provincial Minister of Education) in 1837, he was an attorney, with no children of his own (until later in life), no previous experience with children or schools, and no special preparation for his new assignment other than interest. According to Hart (1983), the existing schools of the time revolted him. They were generally on the old schoolmaster pattern, the teaching being done by having the students, mostly boys, get their lesson by heart and then come forward one by one to recite it to the master. The content was often totally irrelevant to the times and place and student needs, and generally unbearably dull, pointless, crude and mean. There was also another type of school: the one-room school. This form of schooling was suitable to communities where students were few in number and of a wide range of ages. In older towns and villages, as the population grew and density increased, pressures were created that invited changes.

Mann, an earnest, able, tenacious, and devoted person, saw quickly that some new system was needed that would be adequate to the needs of a growing population. After much investigation, he went to Europe to find one that he could adopt. It has been speculated that perhaps he saw the Prussian system

through the tinted glasses of hope and need. In any event, that source became our class-and-grade system-- a system which has scarcely changed and is still in use today.

Mann had a sense of practical politics. By dividing the school into classrooms, a huge amount of population growth could be accommodated. Many students could be accommodated physically and an economy of sale achieved. By grading the classroom, the labor problem was resolved. Male schoolmasters were hard to find but 'respectable' females had few options for employment. They could be hired at far less cost and could be directed and managed with ease by male supervisors. This class-and-grade school was not unlike the factories which were spreading across the country. The students were the raw material, fed in at one end, batch processed, and turned out at the other. The teachers were the factory hands, the principals and supervisors were the foremen and managers, and the board of education soon became an imitation of a corporation's board of directors (Hart 1983).

Mann, according to Messerli (1972), had high hopes and great aspirations for his new concept of education. He wrote to his friends:

Under the soundest and most vigorous system of education which we can now command, what proportion or percentage of all children who are born, can be made useful and exemplary men-honest dealers, conscientious jurors, true witnesses, incorruptible voters and magistrates, good parents, good neighbors, good members of society? Some replies

suggested a failure rate of below one-half percent, and others predicted not a single case of failure. (p. 444)

It is not surprising to learn that problems became evident almost instantaneously, problems which still exist today. Children were regarded as inert raw material. Many did not process well and were discarded to the scrap heap. Those who were turned out were referred to as 'dropouts' -- a term not unfamiliar to us. It was also discovered that children could not be processed successfully at a uniform rate. Learning was improperly seen as a function of time. Another problem was that few questioned the belief that if students were educated they would become model citizens and admirable individuals and that teaching would automatically and reliably produce learning.

The basic method of teaching was derived from the centuries-old 'learn the book' approach, a simple transference of knowledge from the teacher's head to the student's. Much of the instructional effort was directed towards training students to give 'right answers's to standard questions. The spelling bee was enormously popular. Handwriting had to be precise, arithmetic was done by unvarying algorithms, and geography meant storing facts. Unfortunately, many schools today are governed by the same curriculum principles.

The Rise of Psychology and Behaviorism

An overview of the history of education requires a look at the rise of psychology and behaviorism. Hart (1983) claimed that the behaviorist's deliberately stayed outside the brain and concentrated on what subjects did that could be observed. Psychology became the study of rats, mice, cats, pigeons, and other animals convenient to deal with in a laboratory setting. Ausubel (1968) has pointed out:

The more scientifically conducted research in learning theory has been undertaken largely by psychologists unconnected with the education enterprise, who have investigated problems quite remote from the type of learning that goes on in the classroom. The focus has been on animal learning or on short-term and fragmentary rote or nonverbal forms of human learning rather than on the learning and retention of organized bodies of meaningful material. (p.9)

He adds:

The extrapolation of rote learning theory and evidence to school learning problems has had many disastrous consequences. (p. 9)

Further, Ausubel (1968) notes that educational psychologists have long concerned themselves with measurement, group dynamics, counseling, and that despite "the self-evident centrality of classroom learning and cognitive development (p. 9)," these areas were both theoretically and empirically ignored.

Historically, the roots of behaviorism rest in studies of observable behavior, often conducted under laboratory conditions. The attempt to transfer findings

from contrived experiments with rats and other small animals to humans has also inhibited and distorted insights. Learning was viewed as a process of conditioning in which the instruction itself was responsible for, and directly related to, the prescribed learning outcome. Learning could then be operationalized as a set of stimulus-response associations. Hart (1983) lashes out at the avoid-the-brain 'pure's behaviorist approach called behavior modification. He suggests that their motive is to force behavior that suits the modifiers, "who often appear perfectly willing to play God" (p.17). B. F. Skinner gained much fame as a behaviorist but many of his claims have progressively come under condemnation and dispute.

Social Studies: A Need For Change?

The need for change is compounded in the field of social studies. Not only has little change occurred in instructional methods but there is also an almost palatable dislike for the course on the part of the students. It is distressing to witness this negative attitude amongst many junior and senior high school students. Even more alarming are the research studies (cited later in the thesis) showing that young people do not feel social studies is a particularly valuable or interesting part of the school curriculum. It may be argued that students' attitudes are secondary to achievement, but Robert Mager (1968) believes that attitude is fundamentally important and supports his beliefs with a number of reasons. First, attitude may be causally related to achievement. Second, students

with a positive attitude toward a subject matter are likely to want to continue their education in that area. Third, a negative attitude conveyed to parents could prejudice them against social studies. Lack of support could result in diminished resources.

In the paper, *Why Kids Don't Like Social Studies*, Schug et al. (1984) expressed similar opinions when they suggested that if social studies is perceived by youth as not being valuable, then learning social studies will be adversely affected. Shaughnessy and Haladyna (1985) researched student attitudes toward social studies and discussed the implications of their research. The following are their findings, at the secondary level, of the status of social studies:

1. Over the last two decades there is a consistent negative attitude towards social studies (Curry and Hughes, 1965).
2. Boys tended to show a greater interest in the subject than girls (Curry and Hughes, 1965).
3. Children of more formally educated parents tended to like social studies (Cobb and Gardozi, 1966).
4. High school history class was reported as the second most boring subject (Enman, Mehlinger and Pattrick, 1974).
5. From a sample of thirteen and seventeen year olds, only thirteen percent selected social studies as a favorite subject (Frazer, 1981).

6. Reasons given for what was wrong with social studies --"boring" and "redundant subject matter" (Schug, Todd and Beery, 1982).
7. Social studies attitudes declines as a function of grade level -- the higher the grade, the lower the attitude (Haladyna and Thomas, 1979).
8. Most students failed to see the relevance of social studies to life or the relationship of social studies to future occupational goals (Fernandez, Massey and Dornbusch, 1975).
9. Teacher variables (i.e. enthusiasm for the subject area, knowledge of the subject matter, commitment to help students learn, provision of individual attention, fairness and frequent use of praise and reinforcement)and learning environment variables (i.e. a sense of direction for the goals of the class, the use of interesting materials, a friendly group of students, a pleasant physical environment and satisfaction with the work of the class) were consistently and highly related to social studies (Haladyna, Shaughnessy and Redsun 1982a, 1982 b).
10. Students involved in more activities (extracurricular) tended to like social studies (Walberg and Weinstein, 1982).

Through this brief review of educational history and current complaints about education, specifically social studies, many scholars readily agree that changes must be made. We all have ample supply of 'hindsight'. It is easy to criticize the past and the present. The challenge and chief goal for this thesis is to

develop a learning strategy based on a constructivist philosophy and using multimedia, that will accommodate our children's educational needs leading into the 21st century.

The following chapter will describe and discuss constructivism as a philosophy of learning and to explain how it may serve as a basis for teaching strategies that employ instructional technology.

CHAPTER 4

CONSTRUCTIVISM AS A TEACHING/LEARNING PHILOSOPHY

Introduction

This chapter will address the use of a constructivist philosophy to serve as a basis for reform in education. One of the most important considerations, when contemplating educational changes, is to understand how learning takes place. That is, how can changes be implemented that improve the educational or learning experience without a comprehensive understanding of the nature of learning? I believe that it is crucial that teachers have some understanding of the foundational principles of cognitive developmental theory. Theories of learning (i.e. constructivism) and prescriptions for practice (i.e. multimedia) go hand in hand. If a teacher has a different theory of learning from that of the curriculum designer, they will modify the instructional prescriptions to accommodate his/her own philosophy, possibly creating an ineffective system. It is therefore important to understand the basic theory of learning held by constructivists before we contemplate ways to enhance its implementation in the classroom. This chapter will also discuss possible teaching strategies, inspired by the constructivist philosophy, which is an attempt to connect theory to practice.

What is Constructivism?

Jean Piaget, the well-known Swiss scholar, is regarded by current thinkers as one of the most influential proponents of constructivism. His research led him to conclude that the growth of knowledge is the result of individual constructions made by the learner. Piaget (1971) wrote the following:

The current state of knowledge is a moment in history, changing just as rapidly as knowledge in the past has changed, and, in many instances, more rapidly. Scientific thought, then, is not momentary; it is not a static instance; it is a process. More specifically, it is a process of continual construction and reorganization. (p. 1-2)

Constructivism is different things to different theorists. Ernst Von Glastersfeld (1993) defines constructivism as "an alternative theory of knowing that takes into account the thinking organism's cognitive isolation from reality" (p.121), Roberta McKay (1993) views it as "a theory about the nature of mind"(p. 47), and Brent G. Wilson (1993) states that:

Constructivism is not an instructional strategy to be deployed under appropriate conditions. Rather, constructivism is an underlying philosophy or way of seeing the world. (p.6)

The concept of constructivism is not new. According to Von Glaserfeld this orientation was proposed by Vico at the beginning of the 18th century, disregarded for two hundred years, and then advanced independently by Piaget. McKay (1993) believes that the constructivist perspective is supported in the philosophical tradition of pragmatism and is also argued in the philosophical

tradition of Piaget. Jerome Bruner (1986) traces the constructivist stance, that is, what exists is a product of what is thought, to Kant.

Kant's philosophy (according to the *Encyclopedia of Philosophy*, 1967) lies between empiricism and rationalism and yet he could accept neither in their 'pure' form. In his work, the *Critique of Pure Reason*, he states the following: "There can be no doubt that all our knowledge begins with experience... but it does not follow that it all arises out of experience" (Kant, p. 41, (1781) 1950, cited in the *Encyclopedia of Philosophy*, (1967)). Kant was concerned to find the source of human knowledge and the way of establishing truth.

Bruner (1986) suggests that the idea of mind as an active creator of meaning has found much acceptance in cognitive psychology but cautions us to be aware that there are differing stances. In the Piagetian stance, constructions are seen as representations of an autonomous 'real' world to which the growing child accommodates. Bruner's stance is based on the work of the contemporary American philosopher Nelson Goodman. Bruner argues that the meanings we construct do not correspond to an ultimate reality, but rather, as individuals, we construct personal meanings from experiences that are given in the social and cultural environment into which we are born. For this paper, we will use the functional definition of constructivism conceived by Nelson Goodman. He characterizes constructivism as the human mind's capacity to represent thought

through symbols, enabling us to create or construct meaning. Constructivist theory focuses on the individual as an active constructor of meaning rather than a passive recipient of knowledge (cited in Bruner, 1986, p. 123).

Constructivism holds that we construct our own understandings of the world in which we live. It provides an alternative epistemology to the objectivist tradition which holds that meaning is something that exists in the world quite aside from experience (Duffy and Jonassen, 1991). Bruner (1986) claims that the objectivist/traditionalist "looked at the process of education as a 'transmission' of knowledge and values by those who knew more to those who knew less and knew it less expertly" (p. 123). Constructivists argue that meaning is imposed on the world by us, rather than existing in the world independently of us. Meaning is seen as rooted in experience (Brown, Collins, and Duguid, 1989). Each of us makes sense of our world by synthesizing new experiences into what we have previously come to understand. To illustrate this point, consider the example given by Brooks et al. (1993). A young girl has only experienced water in a bathtub and a swimming pool. The water is calm, moving only in response to the movements she makes. Now consider her first encounter with an ocean beach. She experiences waves swelling and crashing to the shore and the water tastes differently. This type of water does not conform to her prior understanding. She must actively construct a new understanding of water to accommodate her new experience. This, according to Piaget and Inhelder (1971),

occurs because knowledge comes neither from the subject nor the object, but from the unity of the two. Each new construction will also depend upon an individual's cognitive abilities to accommodate data and perceptions and utilize the available fund of experiences at the time.

Constructivist Epistemological Perspectives and Their Pedagogical Implications

Since constructivism is a philosophy or way of seeing the world then its application in the classroom by teachers has great significance. Shapiro (1994) suggests that, "The constructivist perspective is a powerful framework for understanding how individuals organize experience and what they believe to be reality" (p. 3). Wilson (1983) believes that when we see the world in constructivist terms, we go about our jobs as educators in a different manner. Some of the key epistemological features of a constructivist view of learning, which I believe helps guide the thesis, will be considered under the following categories: (1) The Nature of Human Interaction, (2) The Nature of Knowledge, and (3) The Nature of Reality.

1. The nature of human interaction and the pedagogical implications.

Constructivist theory focuses on the individual as an active constructor of meaning and acknowledges the importance of understandings that the learner brings to new learning -- in other words, the interplay between prior experience and new knowledge. Learning is viewed as a complex process involving the

interaction of past experience, personal intentions, and new experience. Each experience with an idea -- and the environment of which that idea is a part -- becomes part of the meaning of that idea. (Brown, Collins, and Duguid, 1989).

Duffy et al. (1991) give emphasis to the importance of testing one's own understandings via collaborative activities. They emphasized the social negotiation of meaning or understandings. The Cogniton and Technology Group at Vanderbuilt wrote a paper, *Some Thoughts about Constructivism and Instructional Design* (1991) in which they also discussed the social nature of cognition. They elaborated that the constraints on constructed knowledge come largely from the community of which one is a member. According to them:

Knowledge is a dialect process the essence of which is that individuals have opportunities to test their constructed ideas on others, persuade others of the virtue of their thinking, and be persuaded. (p. 16)

The role of the educator, in a constructivist approach, is to encourage students to develop socially acceptable systems for exploring their ideas and their differences in opinion. This is not an easy task but if the teacher believes that a student's thoughts are important and is not threatened by differences of opinion, the teacher will maximize opportunities for the student to express his/her points of view, to reveal conceptions, to reflect on these conceptions, and

to grow intellectually. The importance of working in groups and collaboration are important beliefs held by constructivists. Britzman (1986), provides some insights concerning the advantages inherent in collaborative, small group learning. She states that when students tend to become more actively involved in learning, they acquire skills which enable them to construct meaning without direct didactic teaching while acquiring important negotiating and social skills. This approach allows the teacher to assume a more constructivist compatible role of mentor or facilitator.

2. The nature of knowledge and the pedagogical implications.

Behaviorist theory emphasizes learning as a process of starting with small units that, when added up, will lead to complex thinking. However, constructivist theory emphasizes understanding of the whole as a prerequisite to understanding the parts. According to Brooks et al. (1993), structuring curriculum around primary concepts is a critical dimension of constructivist pedagogy. The teacher using a constructivist perspective would organize information around conceptual clusters of problems and questions because students are most engaged when problems and ideas are presented holistically rather than in separate, isolated parts.

Constructivism maintains that in order for learning to occur, the curriculum must have relevance in a student's life. Brown et al. (1989) suggest that learning is situationally dependent. That is, it is fundamentally influenced by the activity,

context, and culture in which it is used. Situated learning occurs when students work on "authentic tasks" whose execution takes place in a "real-world setting" (Winn, 1993). Duffy and Bednar (1991) claim:

that we are not making individual experience relevant to each learner in a way which facilitates development of a personal perspective, one that will transfer from the school environment to the real-world application. (p. 13)

Learning for transfer is an important goal in education. The experience with concepts and relations in school typically is quite different from the experience with them in the real world. John Dewey (1902) had this to say:

From the standpoint of the child, the great waste in the school comes from his inability to utilize the experiences he gets outside the school in any complete and free way within the school itself; while, on the other hand, he is unable to apply in daily life what he is learning at school. That is the isolation of the school - its isolation from life. (p. 75)

Brown et al. (1991) point to these differences as major factors underlying the failure of transfer from schooling. They emphasize a need to :
situate cognitive experiences in authentic activities. ... Educators must invite students to experience the world's richness, empower them to ask their own questions and seek their own ties. (p. 14)

To help solve the problem of transfer of learning, Duffy et al. (1991) suggest turning from structuring instruction to designing environments in which learning can take place:

environments which are characterized by: rich contexts; authentic tasks; collaboration for the development and evaluation of multiple perspectives; an abundance of tools to enhance communication and access to real-world examples and problems; emphasis on reflective thinking; modeling of problem solving by experts in the content domain; and apprentice/mentoring relationships to guide learning. (p. 13)

Cunningham (1991), in an article modeled after Galileo's *Two Major Systems of the World*, contrasted objectivist and constructivist views. One of his characters, Sagredo, states a point that lies at the heart of constructivism:

Knowledge emerges in contexts to which it is relevant. ...Some have used the words 'situated' or 'anchored' instruction to convey the idea that learning should occur in realistic settings, aimed toward the solution of problems that actually confront the students in their lives. (p. 14)

The constructivist teacher selects tasks that are relevant to the child's lived experience. Students must see the relevance of knowledge and skill to their lives. Tools to help construct the solution of the problems should be provided. Appropriate solution can be accomplished by an individual learner but often a collaborative group effort is more in keeping with real-life problems.

Valuing the students' opinions and seeking to understand his/her point of view is essential to constructivist education. Brooks et al. (1993) believes that awareness of students' points of views helps teachers challenge students, making school experiences both contextual and meaningful. Central to the vision of constructivism is the notion of the student being active, not just responding to

stimuli, as in the behaviorist rubric, but "engaging, grappling, and seeking to make sense of things" (Perkins, 1991, p. 18). Bruner (1986), a self-proclaimed constructivist, believes that education should provide the forum in which students are continually "making and remaking the culture -- an active role as participants rather than as performing spectators who play at their canonical roles according to rule when the appropriate cues occur" (p. 123). The teacher becomes a mentor rather than someone who has all the right answers, whose job it is to impart all his/her knowledge to the student.

A constructivist teacher would propose situations for students to think about and watch what they do. The students tell him/her what they make of it rather than the teacher telling them what to make of it. This style of teaching should enhance student ownership of the material and increase the chances for transfer to be made in real life situations. I experienced an example of this type of teaching while on vacation in the United States. My husband, while channel surfing, happily discovered the re-runs of the old television program, "*Kung Fu*". My interest was piqued when I realized that I was seeing an example of constructivist teaching. Quang Chang would always, through no fault of his own, get into trouble or have a problem. His thoughts would return to his childhood and he would reflect upon his past educational experiences with his mentor. His master would not inform him what was right or wrong or which decision was correct. He would instead lead Quang through a series of

questions, allowing him to construct his own knowledge and understanding. These understandings were recalled and transferred for his use later in adulthood.

Jonassen (1991) suggests that evaluation of learning from constructivistic environments is perhaps the most difficult issue related to constructivism. He argues that if constructivism is a valid perspective for delivering instruction, then it should also provide a valid set of criteria for evaluating the outcomes of that instruction. Holmes et al. (1993) suggest that many teachers are cognizant of the methods, techniques and design called constructivism but continue to use conventional evaluation techniques when assessing and reporting about student learning.

Assessment, from a constructivist stance, must address knowledge construction rather than reproduction. Evaluators need to focus on learning outcomes that will reflect the intellectual processes of knowledge construction. Jonassen (1991) suggests there should be a different purpose for evaluation -- one which uses it less as a reinforcement or control tool and more as a self-analysis tool. Cunningham (1991) rejects traditional tests, suggesting that we look at the learning activity itself and at the child's ability to reflect upon or discuss that activity. The proof that the learning has been successful is demonstrated through the successful completion of the task.

3. The nature of reality and the pedagogical implications.

The subject of perception and reality often arise when discussing constructivism. According to Goodman (1984), contrary to common sense there is no unique 'real world' that preexists and is independent of human mental activity and human symbolic language. He argues that what we call the world is a product of some mind whose symbolic procedures construct the world. Such worlds, he postulates, have been constructed, but always out of other worlds, created by others, which we have taken as a given. The conclusion to be drawn from this belief is that no one 'world' is more 'real' than all others, none is "ontologically privileged as the unique real world" (Bruner, 1986, p. 96).

The belief that there are many ways to structure the world and that there are many meanings or perspectives for any event or concept is of great significance to teachers. Striving for the 'correct' meaning is no longer the primary objective and students will cease to feel invalidated and foolish for not reciting the exact answer.

Constructivist and Traditional School Environments - A Comparison

We will now consider a typical educational classroom, as many of us have experienced and is often still in existence today, and compare it to what a constructivist classroom would ideally resemble. This comparison is presented

in clearly defined colors of black and white. Many classrooms are operating in the 'grey' areas, that is they are applying some constructivist-driven learning approaches, but for the sake of comparison, the extreme scenarios will be presented. Brooks et al. (1989, p. 13) provide a basic comparison of the traditional and constructivist classroom in Table 1.

Table 1

Traditional Classrooms	Constructivist Classrooms
Curriculum is presented part to whole, with emphasis on basic skills.	Curriculum is presented whole to part with emphasis on big concepts.
Strict adherence to fixed curriculum is highly valued.	Teachers seek the students' present conceptions for use in subsequent lessons.
Teachers seek the correct answer to validate student learning.	Teachers generally behave in an interactive manner, mediating the environment for students.
Assessment of student learning is viewed as separate from teaching and occurs almost entirely through testing.	Assessment of student learning is interwoven with teaching and occurs through teacher observations of students at work and through student exhibitions and portfolios.
Curricular activities rely heavily on textbooks and workbooks.	Curricular activities rely heavily on primary sources of data and manipulative materials.
Students primarily work alone. Students are viewed as 'blank slates' onto which information is etched by the teacher.	Students primarily work in groups. Students are viewed as thinkers with emerging theories about the world.
Teachers generally behave in a didactic manner, disseminating information to students.	Pursuit of student questions is highly valued.

Constructivism proposes that learning environments should support multiple perspectives or interpretations of reality, knowledge construction, and context-rich, experience-based activities. If teachers recognize the human impulse to construct new understandings, their teaching techniques will greatly change. Teachers will encourage the active construction of meaning. Students

are freed from the dreary fact-driven curriculums and are encouraged to make their own connections and to reach unique conclusions. Later in this thesis, a comparison of a traditional classroom with a media enhanced constructivist classroom will be provided.

This thesis has established that changes are needed in education, especially in the field of social studies, because the subject is held in such low esteem. This chapter, which discussed the constructivist philosophy and its pedagogical implications, was given to provide a foundation for changes to be made in education and as a basis upon which my argument for the use of multimedia in the social studies classroom is embedded. I believe that the creation of interactive multimedia reports will greatly enhance the social studies classroom, student attitudes student learning and that the creation of such reports are actualized through the application of constructivist principles.

The following chapter will investigate the worth of multimedia as a tool for learning and not just a mere vehicle to deliver instruction.

CHAPTER 5

MULTIMEDIA AS THE NEW INFORMATION TECHNOLOGY: CAN ITS USE BE JUSTIFIED?

Introduction

The discussion of constructivism in the previous chapter indicated that learning environments should be context-rich and include experience-based activities supporting multiple perspectives or interpretations of reality through the construction of personal meaning or knowledge. The plethora of information technology that has been recently developed offers the potential to provide such environments to the classroom. This is a different kind of reality for many educators. We are entering a new era -- one that is being reshaped by an electronic consciousness (McLuhan, 1964). The versatility and accessibility of the microcomputer places it as a principal tool of post-typographic culture (Provenzo, 1986). Computer technology has made spectacular strides in the last twenty-five years of the twentieth century as evidenced by the development of multimedia -- which is the combining of audio, video, textual and animation sources of media into a computer based environment. This chapter will focus on modern technology, especially multimedia, and its potential to reshape our traditional approaches to learning. It will also discuss the 'media debate' and the varying viewpoints and arguments concerning the educational value of technology (multimedia).

A Brief Historical Sketch of Media

In the early 1950s, Norbert Weiner (cited in Provenzo, 1986, p. 27) predicted that a new industrial revolution would come about as a result of the widespread use of automatic machines such as computers. He predicted this revolution would represent a two-edged sword -- one that could be used for either the benefit or the control and manipulation of humankind. In *The Gutenberg Galaxy*, Marshall McLuhan (1962) hypothesized that the invention of movable type in the fifteenth century had been the main force in shaping western culture. Provenzo (1986), in his book *Beyond the Gutenberg Galaxy*, maintains that the current use of computer technology will be seen by future historians as a similar turning point.

McLuhan died just as microcomputers were being introduced, but in his book *Understanding Media* (1964), he appears to have understood clearly the implications of this type of technology in redefining the human experience. He explained:

Any technology tends to create a new human environment. Script and papyrus created the social environment we think of in connection with the empires of the ancient world. The stirrup and the wheel created unique environments of enormous scope. Technological environments are not merely passive containers of people but are active processes that reshape people and other technologies alike. In our time the sudden shift from the mechanical technology of the wheel to the technology of the electric circuitry represents one of the major shifts of all historical time (p. iv).

Provenzo (1986), being more current with computer development, believes that the "microcomputer represents a critical force that is bringing to an end typographic culture and creating in its place a post-typographic culture and consciousness". (p. 4)

That media and other technologies have profound cultural effects is indisputable. The computer, particularly as realized in the desktop platform, is reshaping our social and economic, and educational systems. What implications does this new culture and consciousness, as mentioned by Provenzo, have for education? Critical and far-reaching questions must be asked about how and why we are using the new technology. Provenzo (1984) believes that we must question what the appropriate use is and how technology can best help us realize our humanity. He states:

The challenge of living in a post-typographic culture is how best to take advantage of the opportunities provided by the new technology, without diminishing ourselves as humans. (p. 26)

The Challenge of Change

Today's teachers face monumental challenges. They are expected to prepare their students to live and work in a world that is very different from the one in which the teacher grew up and received his/her own training. Students must be prepared to work in an increasingly global and technologically based

world. Cohen (1993) believes that students who are encouraged to become creative problem solvers will prosper in the new information age and those who are taught by rote will not fare as well in the new global economies. She states:

Many who would have made good wages at blue collar jobs in the past will not be so fortunate, for they will be competing with others around the world who will perform the same tasks much less expensively. Fewer jobs that pay a decent wage will be available for Americans who have not completed their education or who have completed it at only a minimal level. The obvious consequence is that if America is to prosper in the post-industrial world, we must find new ways to stimulate and challenge all of our students. (p. 35)

Traditional educational strategies seem no longer adequate. Education is expensive and it is shortsighted to only train people to perform particular tasks. Cohen (1993) feels that the goal of liberal education must be the training of agile and questioning minds. Is this goal an 'impossible dream' or is it within reach?

When the computer made its appearance a few years ago, many educators interested in new technology predicted that sweeping changes would occur in education as result of its use. These exciting changes seem not to have taken place. According to Ehman (1987), the social studies classroom is much like it was ten years ago. Advocates of new information technologies suggested however, that with the computer, social studies students would have the opportunity to learn new skills and that the social studies teacher's role would change from a dispenser of knowledge to facilitator of learning. Also, social studies teachers would be able to focus their instruction on higher level thinking

and to the creative use of knowledge to solve problems. Why hasn't this happened? Some of the reasons, according to Ehman are:

1. A shortage of computers for teachers use.
2. A sameness to the materials and a lack of courseware that goes much beyond drill and practice.
3. Little research to suggest that the social studies teacher who uses the computer will effect student achievement.
4. Most teacher's knowledge about computers has been limited.
5. The computer software that is available is often not well integrated into the current curriculum.

Many of the above suggested causes for lack of computer use in the social studies classroom would be eliminated by increased funding, improved availability of curriculum compatible software and improved training of the teacher. These are moot points unless the third cause is addressed. That is, if research does not support the theory that modern technology (multimedia) exerts a positive affect upon student achievement, then why bother using media in the classroom? As educators, our main focus is to transfer the culture and facilitate and enhance learning. It is easy to become excited with the possibilities of using technology when we experience it first hand. For example, in my own experience of working on a multimedia project, I have been impressed with its potential to be an 'elixir' for many students to help facilitate the revitalization of

their interest in social studies. I shared my thoughts with a professor from the University of Calgary and was warned of the many problems that beleaguered the study of media and education. He suggested that I investigate beneath the 'glitz' and 'razzle-dazzle' of media and determine if learning actually takes place.

The Great Media Debate

It is apparent that there is no consensus of opinion concerning media and learning. Following Richard E. Clark's (1989) statement that "media do not influence learning under any conditions" (p. 22), many scholars, especially Robert Kozma (1994), felt compelled to respond. Clark (1994) indicates that he welcomes opposition to his claim by suggesting that it was, "intended to stimulate discussion" (p. 22). It certainly did that! Scholars, such as Ullmer, Reiser, Shrock and Jonassen also responded to his challenge. The "media versus learning" debate had begun and will now be discussed. The following arguments are presented to support my claim that the use of technology does support learning.

The stakes in a debate that could have great ramifications upon the future course of education are high. Ross (1994), in his article *Delivery Trucks or Groceries? More Food for Thought on Whether Media (Will, May, Can't) Influence Learning*, suggests that assigning too much influence to media can lead to

the design/development of sloppy, ineffective instructional materials that are accepted by technologists and users simply because they utilize CBI, interactive video, or other 'high status' delivery media. (p. 5)

Assigning too little influence to media, "...may discourage reflective thinking by designers about which media can best convey the instructional strategies needed to achieve instructional objectives." (p. 5)

Clark's Argument

Clarks' interest in media initially began with his curiosity about its effect on children. This concern is apparently not a recent phenomenon. We are told that Plato expressed concern about the influence of the written delivery of instruction and recommended oral teaching instead. A fear of change has been with us for a long time -- it is not a Twentieth Century phenomena. It would be impossible to comprehend our world without the use of the written word. Would it be too large a leap to consider the same scenario in twenty years, only substituting the use of the computer instead of the written word?

Historically, media research began during the behavioral era in education. Early researchers assumed learning to be reactive -- that students responded to external stimuli. Questions concerning cognitive interaction were largely ignored. There was a search for the 'one best medium' and media comparison

studies were carried out. In 1983, after completing an analyses of media comparison research, Clark concluded that media do not influence learning, but essentially serve as "delivery vehicles" for teaching strategies. Clark proceeds to build his case by giving a brief history of media research. He believes that he is not alone in his claim of media having "no learning benefits". The following are some of the examples he cited that support his position:

1. Lumsdaine (1963), in the first *Handbook of Research on Teaching*, concluded that the benefits of media were primarily economic and that their use was "to develop the technology of instructional method" (p. 669).
2. Mielke (1968) in the article, *Questioning the Questions of ETV Research*, predicted that adequately designed research on the learning benefits of various media would yield no significant differences between treatments. Learning is influenced more by the content and instructional strategy in a medium than by the type of medium.

In earlier articles, Clark (1985, 1985a) claimed that media are: mere vehicles that deliver instruction but do not influence student achievement any more than the truck that delivers our groceries causes changes in our nutrition." (p. 445)

His hypothesis was "that instructional methods had been confounded with media and that it is methods which influence learning." He claimed that "any

necessary teaching method could be designed into a variety of media presentations" (p. 445).

The "replaceability" test is the key to his argument. Clark challenges Kozma and other colleagues to find evidence of any instance of a medium or media attributes that are not replaceable by a different set of media and attributes to achieve similar learning results for any given student and learning task.

I find Clarks' replaceability test confusing. Why is it necessary to judge one set of media attributes against another? Is Clark in search of one attribute that is unique in facilitating learning? Perhaps several attributes or combinations of attributes contribute to learning -- and these so confounded as to render impossible the task to isolate them? In my opinion, only from a scientific, positivistic perspective are Clark's arguments justified in attempting to isolate the essential ingredient that causes gains in learning.

Clark believes that from an economic standpoint, it is important for instructional designers to be aware of the variety of treatments that will produce a desired learning goal and choose the less expensive and most cognitively efficient way to represent and deliver instruction. This perspective allows the theorists to shift their mental set from "media as causal in learning to media in

the cost effectiveness of learning" (Clark, 1994, p. 22). Clark claims the source of the problem between media research and practice is a result of a "confusion of technologies" (Clark, 1987, p. 466). Delivery technologies influence the cost and access of instruction and information. Design technologies make it possible to influence student achievement.

Clark also claims that media not only fail to influence learning but that they are also not directly responsible for motivating learning. He agrees with the cognitive theories which attribute motivation to learners' beliefs and expectations about their reactions to external events -- not to external events alone. Is Clark saying that media motivates in proportion to how much people expect to be motivated? I strongly question Clark's belief that the use of media fails to motivate learning. From my experience, students using and manipulating media often remain on task longer and their attitudes tend to be more positive toward the task at hand. It also provides a more 'active' role for the student which, according to the constructivist stance, increases learning. Clark discusses media attributes and contends that no one media attribute has a unique cognitive effect. He believes that even if research shows media attributes to be associated with learning, they do not play a role in instructional theory unless the relationship between them is a 'necessary' one.

Kozma's Concern

Kozma (1994) addresses the position taken by Clark (1983) that "media do not influence learning under any conditions" (p. 445) and reframes the question to ask, "Will Media Influence Learning?" (p. 7) He believes there is a need to consider the capabilities of media, and the methods that employ them, as they interact with the cognitive processes by which knowledge is constructed. He believes that if we do not understand the potential relationship between media and learning, then perhaps one will not likely be made. With the prospective capabilities of interactive video, Kozma suggests that if we have not forged a relationship between media and learning -- this capability may be used only for such things as interactive soap operas and on-line purchasing of merchandise. We may find ourselves on the sidelines of our own game (Reigeluth, 1989).

Kozma now addresses the problem of why the relationship between media and learning has failed to be established. He believes that a large part of the source of this failure is due to the behaviorist roots from which Clark and his followers' theories and research originated. He states the following:

Embedded in the instructional presentations and criterion-referenced tests of our instructional designs (Dick and Carey, 1990) and embedded in the comparative media studies included in Clark's (1983) review are the primal stimuli and responses of the behavioral paradigm (1994, p. 8).

Important considerations missing in these studies are any mentalist notions or descriptions of the cognitive, affective, or social processes by which learning occurs. According to Kozma, Clark's delivery truck metaphor is using the medium as an inert conveyer of an active stimulus to which the learner makes a behavioral response. Our understanding of learning has changed. It is not the receptive response to instruction's delivery. Kozma concurs with Shuell's (1988) definition of learning:

Learning is an active, constructive, cognitive and social process by which the learner strategically manages available cognitive, physical, and social resources to create new knowledge by interacting with information in the environment and integrating it with information already stored in memory. (p. 276)

To examine the potential relationship between learning and media, Kozma uses as his framework the interaction between information and processes in the mind and those in the environment. His approach is examined within the context of two major media-based projects --*ThinkerTools* and *The Jasper Woodbury Series* and the results of these projects indicate that student learning is enhanced from using these technologies.

ThinkerTools, a computer-based learning environment, was developed by White (1993, cited in Kozma, 1994) to address learning difficulties that students have in Newtonian mechanics. Students' understanding is very different from experts. Mental models built by students (novices) are composed primarily of

entities that correspond to familiar, visible objects. These models formed by novices are insufficient to solve the problems (Chi, Feltovich, and Glaser, 1981).

The curriculum for this microworld (*ThinkerTools*) consists of four modules that present progressively sophisticated models of force and motion: a motivation phase, a model evolution phase, a formalization phase, and a transfer phase. In the motivation phase, the teacher describes real-world situations involving forces acting upon objects, and students are asked to predict the outcome. Motivation is drawn from the conflict between the statements. In the model evolution phase, students work in pairs to solve problems and perform experiments using the microworld. These exercises are structured so that problems and activities become increasingly sophisticated. During the formalization phase, students must come up with a 'law' that describes the behavior in the microworld. Students work together in small groups with the computer to test the different laws and decide which ones are supported by their results. During the transfer phase, students apply the laws that they have formulated to answer the predictive questions raised during the motivation phase. This is done by conducting experiments on the computer and with real-world objects in the classroom.

Both the students who used *Thinker Tools* and the high school students that studied mechanics performed significantly better on their tests than their

respective control groups. However, the students using *Thinker Tools* both demonstrated significantly greater improvement and scored significantly higher than the high school students. The high school students were on the average six years older, had personally chosen physics, and had been taught about force and motion using traditional methods.

The *Jasper Woodbury Series*, a set of videodisk-based problem situations in mathematics, was developed by the Cognition and Technology Group at Vanderbilt University in response to the problem of learning transfer. In schools, students frequently have difficulty drawing on the knowledge that they have of situations in the real world (Resnick, 1987, cited in Kosma, 1994). Conversely, the knowledge of solution strategies that they acquire in school is frequently stored in ways that are not evoked by problem situations that they encounter outside of school (Kosma, 1994). This series provides students with real-world contexts (i.e. stories) for learning complex mathematics problem solving.

The experimental and the control group each viewed the video story (problem contexts) and studied problem solving skills. However, only the experimental group explicitly integrated problem solving and context. This group scored significantly higher from pre- to posttest on questions related to the boat episode -- the control group did not. Also, the experimental group scored

significantly higher than the control on a different, video-based story (transfer task).

Kozma (1994) summarized the findings as the following:

The learners in the 'Thinker Tools' project benefited from the use of computers because the capabilities of the medium were employed to provide representations and perform or model operations that were salient to the task and that the learners had difficulty providing for themselves. Learners in the 'Jasper' project benefited from the use of television because the capability of the medium was used to present problems embedded in complex social contexts that allowed students to connect their knowledge of solution procedures to real-world-like situations. (p. 13)

Clark (1983) believes that only necessary conditions are at the foundation of all instruction theories. Attributes are "occasionally sufficient but not necessary contributors to learning" (p. 452). Kozma responds to Clark's "sufficient" verses "necessary" instructional conditions. He concurs with Cohen and Nagel (1934) and their belief that necessary conditions are those in whose absence an event cannot occur, while sufficient conditions are those in whose presence and event must occur. Kozma (1994) further adds:

Given that learning fails to occur so frequently in our schools and work place, we must look for sufficient conditions in our theory, research, and designs. (p. 14)

Kozma feels that media comprises a separate independent variable that can be found to influence learning. And, if the media are controlled, they can result

in improved learning over conventional forms of classroom teaching. Kozma supports his beliefs that media can make a difference in learning by citing the media-based delivery system (i.e. *Thinker Tools*) and by "... systematically selecting and combining effective strategies/ingredients" (Ross, 1994, p. 5). Clark and Kozma each have valid arguments but appear to be approaching the topic from different perspectives. It is important to understand the different ingredients (Clark) but it is also important to understand that different combinations of these ingredients often produce unexpected results (Kozma).

Problems in Media Research

Eldon J. Ullmer (1994) also responds to Clarks' controversial statements in his article, *Media and Learning: Are There Two Kinds of Truth?* His article examines the assumptions and methods of conventional instructional media research to determine if Clarks' belief is justified. Ullmer introduces his article with this interesting quote by Niels Bohr (1960):

The opposite of a truth is falsehood, but the opposite of a profound truth is an equally profound truth. (p. 124)

Opposing value models are common in research disciplines. For example:

1. E.G. Boring (1960) observed that the scientific truth of any research finding, "depends upon value judgments" (p. 124). In psychology he referred to the

two groups as "Nothing-But" people (reductionists) and "Something-More" people (those who resist rules that shackle).

2. Solomon (1991) cited the divergent values and uses of analytic (when the independent variable is isolated and its effect on dependent variable is measured) and the systemic (each event has the potential of affecting the classroom as a whole) research in education.

Ullmer suggests that in any field, when a research finding is offered as a 'profound truth', such as Clarks', then close inspection of the value system that governed the inquiry is warranted.

Ullmer (1994) does not attempt to disprove the "mere-vehicles" finding which he believes reflects the "Nothing-But" and analytic values. His inquiry grants that it is true in that its path is technically valid (truth one), but argues that:

the traditional research model's limitations render it incapable of providing an inclusive account of media's complex effects and, therefore, of discounting the thesis that more resourceful research might demonstrate that media do affect learning, that truth two is truth, too. (p. 21)

It is difficult to frame the media and learning question. A common perception is required about the two central concepts -- medium and achievement (learning). A consensus is difficult in the definition of instructional medium and a constantly changing technology exacerbates the situation. Ullmer (1994) makes the following observations about traditional media research:

1. Important research problems are often "messy" and "defy technical solution".
2. Researchers often oversimplify technical solutions to difficult problems.
3. The traditional image of media-use is a tools and tasks paradigm. That is, media are seen as information carriers (teachers aids) and learners assume relatively passive roles.
4. Studies concentrate on a medium's enhancement effect (communication efficiency or accuracy) while overlooking significant enabling and activating effects.

The media question is indeed complex and the goal of resolution difficult. This dilemma brings to mind an argument by Walker (1980). He feels that we need to appreciate the worth of the vehement debates that characterize curriculum literature and labels them "rich confusion".

The cultural effects of media and other technologies are indisputable, hence the axiom "the medium is the message" (McLuhan, 1963). The effect of media

on education is less defined, hence the Clark debate. Kochen and Winner have provided some illuminating insights into media effects in education. Kochen (1981) suggests a three-level view of media effects -- "amplification of ...cognitive abilities, ...control of an individual's affect, and new forms of communication and control in society" (p. 148). Winner (1986) asserts that " technologies are not merely aids to human activity but also powerful forces acting to reshape that activity and its meaning" (p. 6)

Ullmer (1994, p. 6) believes that anytime a medium acts to create its own kind of experts among users, or makes all students equal, it is no longer a mere vehicle -- it has become an active agent within the system of which it is a part. He concludes his article by suggesting that creative educators are recognizing that the question is no longer which stimulus delivery to buy but how to fashion technology-based knowledge environments in which students will want to learn.

Ullmer's approach to the problem seems to be to 'get on with it'. Technology is more than a vehicle to transport the curriculum -- it has an active role in the learning process and therefore we should put the debate behind us and start to implement its use in our classrooms. It is prudent to exercise caution prior to joining the 'media is the answer' band wagon. When decisions concerning the welfare of students is to be made -- reflection and research should be two important considerations.

An Instructional Designer's Perspective

Reiser (1994) responds to and examines the issues raised by Clark (1983) in the statement "...media attribute research may contribute to instructional design but not to theory development" (p. 451) from an instructional designer's perspective. The following section outlines five of Reiser's responses to Clark's perspectives and summarizes his beliefs about value of media on learning.

1. Instructional methods versus media attributes debate.

In the "it's-the-methods not-the-media" debate, Reiser agrees with Clark that the methods are what cause learning to occur but argues that Clark fails to acknowledge the fact that certain media attributes make certain methods possible. He relates back to Clark's delivery truck analogy and points out that successful delivery of instructional methods (groceries) is dependent, in part, on the medium (vehicle) used to deliver them. For example:

the successful delivery of corrective feedback requires the use of a medium that can analyze a learner's response and provide feedback that directly addresses the nature of that response. Or, returning again to Clark's truck analogy, the successful delivery of frozen foods requires the use of a vehicle with refrigeration. (p. 45)

Reiser feels that the medical analogy alluded to by Clark also misses the point -- it gives too little attention to the enabling characteristics of the delivery systems (media). For example, in order to work against a life-threatening disease, antibiotics must be delivered intravenously. Other means of delivery do not enable the drug to enter the bloodstream and central nervous system as

quickly or completely. It is the medication that helps cure our ills but if we do not have the proper means of delivery, it will be ineffectual. In learning, unless certain media attributes are present, certain instructional methods cannot be delivered effectively. The *ThinkerTools* project described by Kozma (1994) is an excellent example of media making certain methods possible. *ThinkerTools* enables students to manipulate forces and examine their operations through the use of the computer representations. The method would not have been possible if it were not for the capabilities of the computer.

2. Necessary versus sufficient media attributes.

Clark's (1983) second key point is that "many very different media attributes (can) accomplish the same learning goal...(therefore) the attributes must be proxies for some other variables that are instrumental in learning gains" (p. 22). Clark argues that these other variables are instructional methods and that we should focus our research on the instructional methods that are 'necessary' for learning, not the media attributes that are 'sufficient' for learning to take place. From his instructional designer's lens, Reiser claims that Clark's sufficient-versus necessary argument is 'unnecessary'. He states:

I am not troubled that many different media attributes can accomplish the same learning goal. Instead, I am delighted to find that a particular attribute, when employed in a particular way, will foster the attainment of a particular learning goal. (p. 47)

He goes on to say that perhaps other media attributes can accomplish the same learning goals and that when these attributes are identified, he would welcome the opportunity to employ them.

3. Replaceability challenge.

Reiser makes a turn-about and challenges Richard Clark to find evidence of any instance of an instructional method that is not replaceable by a different method to achieve similar learning results for any given student and learning task. He believes that regardless how effective a particular instructional treatment might be, someone can usually design another treatment that is equally as effective.

4. Research claims.

Clark claims that years of research have failed to find any evidence that media influence learning in any essential way. Reiser believes that this is true only if realized from Clark's narrow definition (i.e. sufficient versus necessary). He suggests that Kozma (1991) has described studies as well as cited several literature reviews that have indicated that certain media attributes do facilitate certain types of learning out-comes for particular types of learners.

5. Learner preconceptions and media.

As an instructional designer, Reiser is interested in how learner attitudes may affect learner performance. He believes that Clark passed over this possibility too quickly. We all approach a situation with personal

preconceptions about how much effort it will required to learn from a particular medium. There is convincing evidence that these preconceptions will influence the mental effort expended processing information presented via the medium, and the amount of effort spent, in some cases, influence learning (Cennamo, 1993).

Reiser agrees with Clark that researchers need to identify instructional problems that must be solved, such as increased achievement, improved access to instruction and reduced labor intensiveness of instruction. He believes that the media developed during the past fifteen years may serve as potential solutions to many of the problems Clark identifies.

Reiser's writings clearly support the influence of media in learning. From his writings, Reiser seems to not be too concerned about the significance of some findings in media research. Media have certain attributes, and in certain situations those attributes are unique and are not readily independent of methods.

Reiser's (1994) clever ending to his paper can only be captured in a direct quote..

But before I leave the dance, I would like to thank Richard Clark for inviting me. Moreover, I must admit that I admire the methods he has used during the course of this event; indeed, in his written work, he certainly has exhibited a great deal of fancy footwork. Of course, Fred

Astaire used a more elaborate form of this method in his films. But that was to be expected. The attributes of the medium enabled him to do so. (p. 48)

The Importance of the Debate

Shrock (1994) also responds to the Kozma and Clark debate and considers the consequences of acting upon either plan. If the field of instructional design chooses one position over the other, the field might be discouraged from studying the effects of media used in the real world. She approaches the media debate from a philosophical view that favors the scientific method. She feels that Clark's 1983 article raised important issues about the study of media influences in learning. Unlike Reiser who felt that Clark was attacking media based on outdated research methodologies, Shrock supports the need for a strong research base to test hypotheses about media influences in improving learning. She proposes using the type of analysis Postman (1985) applied on mass communication. Postman clearly thinks that media influence learning --right now, everyday. He is interested in the effects of commercial television as it exists in our lives, not of what television might be made to look like if it were forced to assume the attributes of which it is capable, but which do no characterize it. Shrock believes that "To say that television doesn't have the effects on our cognition and motivation that Postman describes misses the point about the effects it does have." (p. 50)

Shrock concludes her article by suggesting that like most debates, there is reason, insight and merit in both positions. She believes that there is right and wrong on both sides. This position is not unlike Ullmers'. She can appreciate Clark's search for the underlying instructional methods that are required for learning and his research question, although she doubts the possibility of discovering a single set of stimuli essential to learning. She prefers Kozma's research methods -- systemic, naturalistic, constructivist, exploratory research to discover what is sufficient for learning to occur. She also agrees with him that we must not be blind to the reality of the growing presence of instructional technologies in our lives.

In response to the complex nature of the debate, Shrock (1994) states the "least profitable" reaction would be to decide "that our methods are so flawed and our questions so impossible that we are not capable of making a serious and sustained contribution to improved learning" (p. 53). My thoughts returned to the conversation I had had with a professor who had strongly warned me to stay away from this issue. But this issue needs to be addressed -- it will not go away. Shrock(1994) made an interesting comparison. She stated that some physicists claim that, according to the laws of their discipline, bumblebees should not be able to fly. She suggests that - "It's a long walk back to the hive, and it's dark in there -- for sure" (p. 53). She may be suggesting that it seems apparent that some learning takes place as a result of media use (i.e. bumblebee do fly) and that it

would be unfortunate if media were stopped being used as a part of the instructional design as a result of earlier research findings (i.e. the bees having to walk home !)?

Conclusion

Each position in the media debate has merits. The goal for resolution is difficult when two conflicting sides are represented. Ross, (1994) suggests that perhaps it isn't a debate after all, but a "forum", discussing two sets of arguments on two different questions. From a more scientific, positivistic perspective, Clark is correct in arguing that media studies are limited for isolating the instructional strategies or essential "ingredients" that cause gains in learning. Kozma is also correct in supporting the design of media-based delivery systems (like *ThinkerTools*) by "... systematically selecting and combining effective strategies" (Ross, 1994, p. 6).

The journey through the media debate has been interesting, enlightening, thought provoking and at times, frustrating. It has become apparent that truth varies according to one's perspective and is seldom carved in stone. This author is reminded of the fable "*The Grove*", taken from *Rahomon and Other Stories* by Ryunosuke Akutagawa (1952). In this story, a murder was committed and witnessed by three people, each labeling a different person as the perpetrator. Will there ever be closure on the issue of whether media influences learning?

Will the 'truth' ever be really known or will it depend upon our various perspectives? Shrock (1994, p. 53) understood this dilemma when she said that Clark and Kozma each believe their own arguments but where does this leave the rest of us? The complexities of this issue have been revealed and one can appreciate the "truths" from each side, but which course should be followed?

A New Direction

For the purpose of this thesis, I propose to follow the course suggested by Jonassen et al. (1994). That is, to restructure the debate around the learner and the affordances of media for the creation of environments needed to support learning. The following chapter will investigate this new direction.

CHAPTER 6

RESTRUCTURING THE DEBATE

Introduction

Central to the purpose of this thesis is to show relationship between media technology and the constructivist philosophy of learning. Jonassen et al. (1994) offer an integrated approach. They see media, especially computer-based systems, as definitely influencing learning within the guidelines proposed by the advocates of constructivism. They are strong advocates of a constructivist approach to learning for debating the question on media. They believe that the debate should shift from instruction and media-centered design to a learner-centered conception of learning. The debate should focus less on media attributes versus instructional methods and more on the role of media in supporting, not controlling the learning process. This chapter will discuss their arguments as they relate to constructivism, media, learning and the learner.

The Debate from a Constructivist Perspective

Learning with Media: Restructuring the Debate by Jonassen et al. (1994) provides a very interesting and divergent theoretical alternative to the Clark-Kozma debate. They see media as influencing the learning process, particularly within the guidelines of constructivism. They agreed with Clark (1994) that media are “substitutable and that their effects are ephemeral, transitory, and ill-defined as well as often poorly conceived” (p. 23). They also find agreement

with Kozma (1994) "that any reasonable interpretation of an instructional medium should be more than a mere vehicle, that media are synergistic combinations of technology, task , and context" (p. 17). However, in the context of contemporary learning theory (cognition and constructivism), the debate focuses too exclusively on objectivist and instructionist conceptions of media. Jonassen et al. believe there is a need to further reconceptualize the debate by focusing on the role of media in learning.

We recommend restructuring the debate to focus not on the role of media as conveyors and deliverers of the designer's message to a stationary learner at the end of instructions, but rather on how media, however defined, can be used to facilitate knowledge-construction and meaning-making on the part of the learner. (p. 32)

The following contemporary learning theories, which fall under the larger umbrella of constructivism, support refocusing this debate by examining the role of media as facilitators of knowledge construction.

Situated Learning

The model of situated cognition, introduced in the 1989 article, *Situated Cognition and the Culture of Learning*, by Brown, Collins, and Duguid, is based on the notion that learning is situationally dependent. That is, it is fundamentally influenced by the activity, context, and culture in which it is used. According to the situated learning model, knowledge must be learned in context. The environment where learning occurs affects the experiences of the learner and

therefore defines the content of the knowledge constructed. Situated learning occurs when students work on "authentic tasks" whose execution takes place in a "real-world" setting (Winn, 1993, p. 16). McLellan, in her article *Situated Learning: Continuing the Conversation* (1994), lists six key components of the situated learning model. These components include apprenticeship, collaboration, reflection, coaching, multiple practice and articulation of learning skills. She suggests that knowledge can be learned in the context of the actual work setting -- a highly realistic or "virtual" surrogate of the actual work environment or an anchoring context such as a video or multimedia program.

Brown et al. (1989), believe that by decontextualizing learning, knowledge becomes inert, that is, the learner acquires a new concept, but is unable to use it. Knowledge is continuously under construction with each new event, situation, experience or activity whether or not media is being used to enhance the environment -- the context precedes the presentation. But, when teachers develop situated learning environments, media can be used to create the real-world context (a type of virtual reality) and enhance the learner's ability to construct and transfer knowledge.

Cognitive Apprenticeship

The cognitive apprenticeship model seeks to aid the learner in the construction of knowledge by embedding "the learning of skills and knowledge

in their social and functional context" (Collins et al., 1989, p. 454). While similar to situated learning, which is used to expose the learner to varied contexts and to improve transfer of skills in diverse settings, the notion of cognitive apprenticeship is closely allied with the use of knowledge as a tool. Brown (1992) reminds us that students have always been apprentices in school, that is, they are apprentice learners. He states that children attend school to learn how to be a student:

the implicit understanding that learning skills help people deal with a variety of problems they encounter subsequently. ... Cognitive apprenticeship supports learning in a domain by enabling students to acquire, develop, and use cognitive tools in authentic domain activity. (p. 32-42).

Media can function as powerful tools within a cognitive apprenticeship model by facilitating the construction of knowledge through the provision of mediated contexts (Jonassen et al., 1994). In this context, the role of media as a tool is to simulate a set of contextual experiences which the student selects to attend to. When organized hierarchically to present vicarious experience, media serves to act as a disembodied 'master craftsmen' to present the apprentice with cognitive alternatives.

Multiple Resource Theory

The multiple resource theory (MRT) model of attention and processing was suggested by Wickens (1980, 1984, 1991) and Klapp and Netick (1988). MRT is based on the belief that all cognitive tasks place demands on a pool of limited cognitive resources. If a task imposes a heavy cognitive load it will in turn interfere with learning by misdirecting attention and limiting remaining resources necessary for knowledge construction (Sweller, Chandler, Tierney and Cooper, 1990). Multiple resource models suggest that cognitive resources in the human processing system are functionally allocated to various pools or reservoirs which are finite. Each of these reservoirs is functionally fixed to a specific cognitive task and has its own limited amount of resource to complete this task. In dual task studies, based on the multiple resource models, there has shown to be complementary and antagonistic tasks or events for every cognitive task. Jonassen et al. (1994) suggest that:

for each cognitive action, both in the stages of processing and codes of processing, there exists a separate pool of cognitive resources. The selection of media must be defined by these cognitive actions in an effort to capitalize on the use of these separate resources to maximize cognitive effort and limit interference by antagonistic tasks. We suggest that the multiple resource model is a better theoretical foundation for a discussion of the effective use of media with the human processing system. (p. 37)

They offer an alternative to the vehicles debate by suggesting that media are more than mere vehicles; "they are resource enabling tools which if selected properly can enhance cognitive processing and affect learning efficiencies." (p. 38)

Affordance Theory

Another perspective and conceptual basis for considering media is the affordance theory (Gibson, 1979, 1987). Gibson coined the term and defines it as the following: "affordances of the environment are what it offers ... what it provides or furnishes, either for good or ill." The medium of any environment possesses a rich set of affordances to the people living in that environment. In educational environments, the media provide an abundant and great melange of affordances (attributes). Jonassen et al. (1994) submit this learning time line. "media afford attributes, which afford cognitive learning activities which afford thinking which affords learning" (p. 38-39). They believe that the affordances at each point in this mediation sequence may affect the ultimate learning outcomes and that these cascading attributes provide an unlimited number of permutations of learning, many of which are difficult to isolate.

The following is a synopsis of the conclusion of Jonassen et al. paper, *Learning with Media: Restructuring the Debate*.

1. Media are not mere vehicles. They transcend this form and behave as complex entities with multiple sets of affordances that are predicated upon the perceptions of the user and the context in which they are used.
2. Media cannot function in isolation. Media must always be considered in the context in which they function.
3. Media is not responsible for learning, learners are.

4. Media should be designed as intellectual partners in the knowledge construction process.

Jonassen et al. (1994) believe that the debate needs to be reconceptualized by focusing on the role of the learner and on the role of media in supporting, not controlling the learning process. Examining the process of learning should comes first, then the role of context and the kinds of environments and cognitive tools needed to support that learning. They concluded their paper by saying:

Media are best used as environments and tools for affording and facilitating the use of those resources (i.e., thinking) in the act of knowledge construction, not as purveyors of messages or conveyors of knowledge. The sooner that we reject our conceptions of media as conveyors of instructional interventions and accept and design them as intellectual partners in the knowledge construction process, the sooner we can support meaningful change in the learning process. (p. 38)

Jonassens' arguments clearly support my position that from a constructivist position, the use of media does facilitate knowledge construction.

CHAPTER 7

LEARNING AND TEACHING WITH MULTIMEDIA

Introduction

This chapter will provide a variety of examples of media being utilized, based on constructivism, in various school settings. One of the greatest challenges confronting social studies educators in an electronic age is how to effectively and creatively harness emerging technologies to attain curricular goals (Martorella, 1991). This challenge requires new teaching styles and methods but any change is historically met with resistance. Teachers are often intimidated with the new technologies and apprehensive of their changing role from knowledge-giver to mentor and facilitator. It is important that teachers not feel vulnerable and unsupported and that they recognize the potential of computer-mediated communications as they experience fundamental changes in their instructional strategies and beliefs. Fontana and Ochoa (1985) add their view that administrators also need to provide a supportive environment for this change.

The challenge brought by accelerated changes in the field of technology is also compounded by a paradigm shift in the psychology of learning -- behaviorism to cognitivism (Winn, 1974, 1989), objectivism to cognitivism (Jonassen, 1990; Duffy and Jonassen, 1992), and instructivism to constructivism

(Papert, 1990). Both theoretical and practical attention has been refocused on the role of the learner rather than on the effects of instruction. The quote by Tagore (1984), the Indian poet, musician, and Nobel laureate provides an excellent example of how our ideology about learning has changed:

A very great musician came and stayed in (our) house. He made one big mistake... (he) determined to teach me music, and consequently no learning took place. Nevertheless, I did causally pick up from him a certain amount of stolen knowledge. (Rabindranath Tagore quoted in Bandyopadhyay, 1989, p. 45 and cited in Brown and duguid, 1993)

Brown and Duguid (1993) in their paper *Stolen Knowledge*, suggest that the knowledge gained by Tagore was obtained by watching and listening to the musician as he played for his own and others' entertainment, not from a traditional, formal lesson. Only then, and not in dismembered didactic exercises, was Tagore able to see and understand the social practice of musicianship. This shift in the learning paradigm is expressed in cognition theory when the process of learning is not dependent upon what the instructor hopes to impart but is more likely to involve many other peripheral features of which the teacher might be unaware, but which collectively make sense for the learner (Brown and Duguid, 1993).

The loss of supremacy of the common textbook, due in part to the advances of technology and the development of multimedia, is another area of change that confronts both the teacher and student. Education has relied on printed textbooks as the primary vehicle for disseminating information to students for

hundreds of years. But the information age has transformed the way education defines the word 'textbook' (Greenfield, 1993). In the article *Evolution of the Textbook: From Print to Multimedia*, Greenfield (1993) predicts some very interesting changes in the "textbook food chain." She suggests the following:

There will come a day when textbooks themselves will become obsolete. Many states have already adopted videodisc and software curricula as textbook options... In the yearbook project alone, the Production Publisher saved the district from \$5 to \$7 per copy.

She suggests that perhaps that textbook-only instruction is on the endangered species list and cautions that:

While the emphasis isn't on abolishing text per se, or that students shouldn't be encouraged to read books, what is being acknowledged is that technology products indeed enhance education, offering a more engaging and complete learning experience. One in which sight, sound, interaction and inquiry are married with hands-on exercises and led by a mentor who is not constrained by someone else's teaching style. (p. 212)

The new computer-based technologies should be viewed as valuable allies to teachers as they explore their new role and the new role of their students. In the past computers were most often used in the classroom for drill and practice exercises, which while useful, were not very exciting. Until very recently computers were not particularly relevant to the teaching of the Social Sciences or the Humanities beyond the statistical programs used to query very large databases (Cohen, 1993). The new multimedia technologies have changed this orientation as they bring pictures and sounds as well as text which can be

organized and controlled by students and instructors. White (1990), while addressing social studies teachers stated the following:

Interactive multimedia--the marriage of text, audio, and visual data within a single information delivery system represents a potentially powerful tool for teachers and students throughout the curriculum. (p. 68)

Social studies teachers are on the threshold of a most exciting time to be teaching. Earlier in the paper, evidence was presented showing the negative attitude of students towards the subject of social studies and the far reaching effects of this attitude. If educators desire to facilitate an 'attitude adjustment' with junior and senior high students, they must accept the formidable task to become more knowledgeable in the constructivist, learner-centered approaches to cognition and to effectively utilize multimedia as environments or tools that enable learners to construct their own artifacts (Kommers, Jonassen, and Mayes, 1992; Lehrer, 1993; Hay et al., in press; Jonassen, in press(a)).

The onset of the information age has made it imperative that learners develop higher-order thinking skills. Textbooks are designed to provide students with basic information but students need tools that will help them go beyond the traditional textbook. In addition to becoming comfortable with the new information technologies, students must learn to ask questions, to look for the information they need, formulate and present their findings to their peers --

in other words, to become, as Cohen (1993) suggests, "independent learners" with higher-order thinking skills. She also suggests issues that will need to be addressed in an increasingly complex and interdependent world do not fit into discrete disciplinary categories, nor can they be solved by single individuals working alone. From these needs, new learning styles arise such as an interdisciplinary problem-solving approach and the use of cooperative learning to meld students from diverse backgrounds into productive teams. In *Pedagogy of the Oppressed*, Freire (1990) makes a distinction between what he calls the "banking" and the "libertarian" modes of education. Earlier, this thesis outlined the traditional student as an empty depository while the teacher acts as the depositor, responsible for passing on his/her knowledge. The student is asked to receive, to memorize and to repeat. The teacher is active while the student is essentially passive. In the libertarian or constructivist mode, the teacher and the student are partners in the educational process which is inherently dialectic. In this model students are encouraged to work together to define their projects, design strategies and assign tasks. The teacher sets the stage, makes sure that all students are involved in working groups and then serves as resource person and coach while the students make the discoveries.

The following section provides examples of successful media applications in various classrooms.

Media Application for Higher-Order Learning Skills

Research is beginning to reveal the full power of multimedia technologies to address the paradigm shift from the banking to the libertarian mode. The focus is on the amalgamation of multimedia attributes rather than on the significance of any one characteristic. In June, 1990, a research group (Lynn Fontana, Christopher Dede, and Charles White) at George Mason University's Center for Interactive Educational Technology (CIET) began designing a multimedia prototype to foster higher-order thinking skills in the social studies. The research group called their report *Multimedia: A Gateway to Higher-Order Thinking Skills -- A Work in Progress*. This computer-based instructional system teaches students a systematic process with which to develop higher-order thinking while they learn how to engage in historical inquiry. In a world where the amount of data increases exponentially each year, the rationale behind this project is to prepare learners to access and use information effectively. Fontana et al. believe that information management skills have never been more vital for students entering the work force. They believe that the same technologies that allow learners to manage their data can help them master the thinking skills that will promote the synthesis of information.

Prior to discussing the application of multimedia in the classroom, it is important to show the connection with constructivism. The suggested milieu in which higher-order thinking skills are best acquired resemble very closely the

constructivist's philosophy or the liberatarian (Freire, 1970) mode of how best to facilitate learning. The following list, compiled by Dede (1990 b), a member of the *Thinking Skills Project*, outlines the contributing factors:

1. Learners construct knowledge rather than passively ingest information,
2. Learning is situated in real-world contexts rather than based in artificial environment like end-of-chapter textbook questions,
3. Sophisticated information-gathering tools are used to stimulate learners to focus on testing hypotheses rather than on plotting data,
4. Multiple representations for knowledge are used to help tailor content to suite individual learning styles,
5. There is collaborative interaction with peers, similar to team-based approaches underlying today's science,
6. Individualized instruction targets teacher intervention to assist each learner in solving current difficulties and
7. Evaluation systems measure complex, higher-order skills rather than simple recall of facts.

Continuing with the discussion of their project, Fontana et al. (1990) identified eight elements to be addressed in the design of effective instructional multimedia products: explicit instruction, modeling, tutoring/coaching, student control, collaborative learning, equity, the quality of the database, and professional development. Their generic computer shell has five features: the IBI

(Inquiry Bureau of Investigation), Guided Tours, Dr. Know, the Production Console, and Custom Tours. By opening the IBI drawers, students receive explicit instruction on the steps of inquiry. Guided Tours model the inquiry process by taking students through the database on carefully designed paths that pose questions and compel them to evaluate the extent to which the data they encounter helps to answer these questions. Dr. Know is the context-sensitive coach or tutor who helps students develop data-gathering and metacognitive skills. Custom Tours is a non-structured access system to the data that allow free-form searches based on students' interests and are in the students' control. Finally, the Production Console gives students the tools with which to manipulate the information.

The following is the rationale of the Thinking Skills Project (1990):

The Thinking Skills Project views students as tourists through multimedia databases. ...users of our multimedia/thinking skills shell can decide how to explore their cognitive environment. They may choose one of several Guided Tours or they can explore the database via Custom Tours. A reflective context for learning is created in the exemplary guided Tours; these provide stimulating environments within which students become actively engaged in learning the subject domain while receiving context-sensitive instruction on the inquiry process. As students proceed through Guided or Custom Tours, they are able to call up their on-line tutor, Dr. Know, to help them evaluate information in various form. During their tours they collect information in their electronic Journal which they take to the Production Console. It is here in the Production Console where they consult the IBI and make certain they have followed all the steps; they are more than ready to create reports or design their own tours. (p. 7)

Fontana et al. (1993) believe that the educational reform movement is providing momentum for change at the same time that multimedia devices are finally becoming affordable to schools. The goal of their Multimedia and Thinking Skills Project was to demonstrate a new paradigm for inquiry-based learning and "...to provide a glimpse into the future to help us understand more clearly how to harness the instructional power of the emerging multimedia technologies". (p. 8)

The Fontana et al. multimedia prototype to foster higher-order thinking skill provides an excellent example of the application of many constructivist epistemological principles while utilizing modern technology (multimedia). For example, learners were provided the opportunity to be active constructors of knowledge, they worked on projects that were situated and grounded, the team-based, collaborative model was used, the teacher's role became that of mentor or facilitator, and the assessment consisted of demonstrable skills that were acquired during the learning process.

Creating a Multimedia Report

Another example of the potential of multimedia in our classrooms is provided by Jim Riser (1994), a science teacher in Tucson Arizona. He took advantage of the NIH Image, a multimedia authoring package, and created dozens of image processing activities for his students. These activities helped

him reach his primary goal; the development of science knowledge and observation skills in his students. His second goal was more significant for this discussion -- that is, he required his students to create a multimedia report on a topic of their choice. The HyperCard presentations that the students assembled required scanned images, student-drawn images, text, sound, QuickTime movies, student credits and biographies, and a bibliography of at least 10 research sources (this is a similar type of application this author was suggesting for use in the social studies). Riser concludes his discussion by revealing his underlying constructivist belief. He states that:

computers and software are not solutions in themselves." ...the software allows the activities, (but) the teacher or students must develop the activities. (p. 42)

The MacMagic Program

Another interesting project, combining constructivist ideologies and extensive use of technology, was carried out at the Davidson Middle School in California. The goal of this project , as reported in *An Evaluation of the MacMagic Program at Davidson Middle School* by Mergendoller and Pardo, was to develop an innovative approach to teaching English and History in which the teacher is a facilitator of learning rather than a dispenser of information. Key elements of this project included the integration of computer and video technology, cooperative learning and group projects, writing response groups, and practice in problem-

solving. The MacMagic team envisioned the project as a radical departure from traditional teaching methods. They felt that they were dealing "uncharted territory" and they hoped that their "efforts will allow other schools and teachers a huge head start that will not require the same initial infusion of time, money and people." (p. 1)

The teachers involved in this project considered the computer as a non-biased tool which provides the same opportunity for all users to be expressive. They suggest many ways in which the student's learning and efforts are enhanced by the use of computers. The following are the ones most relevant to our discussion:

1. Computers enhance the students' ability to organize and synthesize a variety of types of information such as sound, pictures, and text and
2. Computers enable students to work with other students to create complex projects merging text, graphics, and sound.

Classroom activities were developed around an integrated language arts and social studies curriculum that employed technology when appropriate. The classroom learning combined curriculum areas into student-centered, group-oriented projects that were supported by a variety of technological tools. Technology was used to enrich the classroom environments, not to control it. An interesting feature of the MacMagic program is its use in the planning of

assignments. Teachers are very careful to allow students to tailor a generic assignment to their specific interests and backgrounds. There was always room for students to personalize each assignment. Mergendoller et al. (1991) observed that the task structure of MacMagic (the nature of the assignment students complete) is what sets it apart from most English and social studies classes. MacMagic incorporates a variety of learning tasks from relatively simple to extremely complex. They observed that when complex tasks were assigned, students enjoyment with working on the computer and with multimedia motivated them to persevere on their tasks in ways they might not if it was a paper and pencil task. They also observed that complex tasks without equivocal right answers seemed to cause many students to become anxious in the face of such ambiguity. The teacher had to assume the job of providing support to the students and to accept this variety of task performance by creating a grading strategy that encouraged rather than discouraged students whose performance was weak. Another problem which surfaced was the temptation for students to spend a majority of their time on the model and little time on exploring the content to be learned. Mergendoller et. al (1991) stated that:

Teachers must be aware that the procedural dimensions of complex tasks pose specific challenges to students and the appeal of technology often overwhelm students' interest in the academic content to be learned. Establishing specific training and accountability procedures can help diminish problems stemming from the procedural aspects of tasks. (p. 28)

It would seem that the lure and fascination with the 'azzle-dazzle' feature of multimedia is ever present and must be kept under control.

Two features of the MacMagic program which exemplify the constructivist views are:

1. The use of cooperative learning and group projects which provide the social context for collaboration and mediated reality and,
2. The recognition of the importance of the personal experience that each child brings to the learning situation.

For example, the assignments were generic to allow the students to tailor them to their own specific interests and backgrounds.

Lester B. Pearson High School

One of the most impressive examples of an all encompassing program combining technology and learning under the mantle of constructivism is found at Lester B. Pearson High School in Calgary, Alberta, Canada. A report from the Implementation Team on Technology Integration within Alberta's Education System, September 30, 1994, had this to say about this school:

There are thousands of gleaming 'points of light' in education today , from individual teachers to entire schools. Towering high among these points of light is a brand new visionary school in Calgary, called Lester B. Pearson High School. This school is clearly a lighthouse for public education. (p. 10)

Pearson's philosophy blueprint states clearly that the full integration of technology into education is crucial:

Programs will be designed to promote the ability of students to function effectively in a dynamic society in which accessing, communication and using information is of primary importance... Computer and related information technologies will be an integral part of the teaching/learning process. Computers will be readily available for both student and staff use. All learners, both teachers and students, will become familiar with the electronic technology and comfortable with its use. (p. 3)

I had the opportunity to take a three hour tour of Lester B. Pearson High School and was very impressed with the thought and preparation that has gone into the school's physical structure as well as its educational philosophy. It was very informative to visit classrooms where constructivist learning strategies are being expressed and applied. The easy, relaxed atmosphere and social milieu in the classrooms is very different from that found in a traditional setting. Creating a climate for learning is vitally important in the constructivist perspective (Garmston et al., 1994). The rooms are very large which allows for easy movement, working in different sized groups or instructing the class as a whole. Most of the students work in small groups with the team-teachers each conferencing individual students. The noise level was very low, in fact, it didn't really 'feel' like school. There are no rows of desks, there is an abundance of modern technologies to be accessed when needed, students are empowered to determine how they will proceed with self determined assignments and subjects have been combined (i.e. Social Studies and English into Humanities) to break down barriers between subject areas and to increase practical application of course material.

The Pearson model is not without problems. In its inaugural year, the staff were unified in their educational aims and goals for the school. This, unfortunately is not currently the case due to changes in board policies. Many of the schools' learning strategies, which are based on constructivism, are in danger of being undermined by teachers who have not 'bought into' the Pearson vision of education (a combining of technology with constructivism). These staff members appear to have limited understanding of constructivism and its potential.

While in discussion with one of the humanities instructors, this author discovered that most of the feeder schools were not preparing their students for their Pearson experience. Many of the grade ten students have to be taught basic key boarding and computer skills before much of the available technology can be effectively used to enhance the students' learning experience. Also, many students are unfamiliar with the constructivist approach to learning and are not prepared to be responsible for their own learning. By the time students reach grade twelve and are thriving in this new environment, the threat of provincial final examinations require a return to traditional styles of teaching to ensure student success for this type of assessment. Following constructivist views, alternative methods of assessment are a vital part of teaching at Pearson. Students are invited to demonstrate and share their learning in the form of

demonstrations and exhibitions as well as the more traditional methods. Students' work is compiled in portfolios which grow as they progress through the school. Wayne Tuff, the schools' liaison person, suggested that much of the type of learning experiences that Pearson provides cannot be assessed by traditional methods. This presents problems of accountability. If the viability of the school is dependent upon the marks its students achieve on the departmental examination, then perhaps the Pearson concept of education is at risk. It would seem that a long term study is needed to access Pearson graduates success in the years following high school and then compare this with graduates from a traditional high school. Lester B. Pearson is in its fourth year of operation and it is therefore too early to determine its success as a beacon of education for the year 2000.

Peakview Elementary School

Another school which seems very close to Lester B. Pearson in its philosophical approach to education is Peakview Elementary School in Colorado. *Evaluating the Impact of Technology at Peakview Elementary School*, is a report by Wilson et al. (1991) from the University of Colorado in Denver. This project received very positive findings as suggested below:

Using a variety of data collection instruments (e.g., classroom observation, surveys and interviews of school personnel and students), we found consistent evidence that technology plays an essential role in facilitating the school's goals. The technology is positively affecting student learning

and attitudes. Teachers are using the technology to adapt to individual students' needs and interests, and to increase the amount and quality of cooperative learning activities. Students use the technology extensively for research and writing activities, as well as for instructional support in a variety of subject areas. Technology has changed the way teachers work, both instructionally and professionally, resulting in a net increase of hours and at the same time greater productivity, effectiveness, and satisfaction. (p. 1152)

Peakview made shifts in their pedagogy by incorporating the eight trends in changing teaching methods suggested by Collins (1991), a noted cognitive psychologist. Collins suggests that each of these changes in teaching method can be facilitated by technology. Table 2 illustrates the trends toward constructivist teaching methods as facilitated by technology (Collins, 1991) and provides a 'significant' example of the link between the two.

Table 2

Traditional Teaching Methods	Technology-Assisted Methods
Whole-class instruction	Small-group instruction
Lecture and recitation	Coaching
Working with better students	Working with weaker students
Less engaged students	More engaged students
Assessment based on test performance	Assessment based on products, progress, and effort
Competitive social structure	Cooperative social structure
All students learning the same things	Different students learning different things
Primarily verbal thinking	Integration of visual and verbal thinking

The technology available at Peakview affected the kinds of instructional strategies teachers used in the classroom. Peakview teachers overwhelmingly

agree that technology makes their teaching more effective. Consistent with Collins' analysis of trends in education, Wilson et al. found that technology enabled teachers to succeed in different learning goals. Their findings are summarized in Table 3.

Table 3

Learning Goal	Importance to Teachers	Effect of Classroom Technology
Accommodate different learning styles	Very high priority	Moderate to heavy
Self-directed learning	Top priority	Heavy
Accommodate students working on multiple learning goals	Top priority	Moderate to heavy
Students teaching themselves and others	Very high priority	Moderate to heavy
Student research skills and independent access of information	High priority	Moderate to heavy

Eighteen of twenty-two teachers agreed that student achievement increased when they used technology. The remaining four were undecided; none disagreed with the statement. Students across the four schools (three other schools were selected for comparison) reported a preference for technology-based learning over textbook-based learning. Teachers confirmed positive student attitudes regarding technology (Table 4). The following is a quote from Kevin, a Peakview Elementary student:

I love technology and praise this school for preparing me for tomorrow's society. I am very scared about tomorrow, but I am prepared and

confident in my peers. I wish to have a future part in the technology market. (p. 1159)

Table 4

Technology is a good way to:	Peakview Teachers	Non-Peakview Teachers
Learn basic skills	Agree to strongly agree	Agree
Help students learn to work in small groups	Agree to strongly agree	Agree
Learn oral and written communication skill	Agree	Undecided
Help students learn to research and report on a topic	Strongly agree	Agree to strongly agree
Learn problem-solving skills	Agree	Agree

One teacher commented on lower-achieving students and the help technology can be:

I have seen 'non-readers' become avid consumers of written information. I have seen 'non writers', especially those hampered by poor fine motor skills, show tremendous pride in their obvious growth as writers. Kids who, eight months ago, would have run at the mention of research projects, now actively pursue areas of interest ranging from American political figures to zoology. (p. 1162)

Table 5 is a summary of the impact of technology that Wilson et al. (1991) found at Peakview Elementary. They suggested that the study identified a number of areas that need refinement, but that they could not identify a general impact area where the technology was perceived to have a negative impact.

Table 5

Impact of Technology On:	Strongly Positive	Positive
Use of Technology	X	
Use of multiple modalities	X	
Use of media	X	
Impact on Teaching		
Accommodating ability levels		X
Small group instruction		X
Competitive vs. cooperative social structures		X
Verbal and visual learning media		X
Time on technology	X	
Time on task	X	
Self-directed learning	X	
Accommodating multiple learning goals	X	
Accommodating learning styles		X
Students as teachers	X	
Information access and research activities	X	
Changes in teacher work	X	
Teacher attitudes		
Teacher comfort levels		X
Computer coordinator	X	
Taking computers home	X	
Computer as a stimulus to change		X
Teacher perception of students		X
Self-concepts as competent professionals		X
Student achievement		
Attainment of basic skills		X
Access and use of information	X	
Problem-solving skills		X
Oral and written communication skills		X
Researching and reporting	X	
Student's perspective		X
Small-group work		X
Other forms of achievement	X	
Student attitudes		
Towards school	X	
Towards technology	X	
Towards technology	X	
Towards learning	X	
Towards teachers	X	
Towards self	X	
Student empowerment	X	
Special needs students	X	

HyperCard and Social Studies

Another example of teachers tapping into the technological bonanza is an American teacher, Norma Mota-Altman (1992). She asked her students the following question: "Who was Martin Luther King?" The class was silent. She was astonished that no one in the class could answer this question. She admits that as a teacher, she was 'shaken' by this experience. She concluded that:

although students may hear facts every so often, they clearly do not necessarily internalize these facts or make the knowledge their own. (p.

18)

As educators, we strive to make the subjects we are teaching a life experience that students will keep with them. Students assuming responsibility for learning was not taking place. After pondering how she could help her students, Mota-Altman decided to create a HyperCard stack on the civil rights movement that would combine text and video clips. She shared with her class what she was doing and asked for their input to help make the stack better. The following are some of her feelings she experienced while working on her project (1992).

As a teacher, it felt good to relate to my students as a peer. I enjoyed getting their input and exchanging ideas on how to make my stack better. They offered suggestions hesitantly at first, but soon we were all learning from each other. Technology is a wonderful tool, not only for teaching and learning but also for equalizing roles in the classroom. ... I know that creating the project was a great experience for me. In putting myself in the role of my students in learning something new, I was reminded of the

joy, the frustration, and ultimately, the pride that comes with doing something that you previously thought was beyond your ability. (p. 18)

I had a similar experience last year while creating a multimedia model for a small segment of the grade twelve social studies curriculum. Although I did not have a class or group to commiserate with, I did experience the excitement and feeling of exhilaration while creating and working on such a project.

This chapter has provided many examples of how technology (multimedia) can be used in a constructivist classroom environment to enhance learning and the learning experience. The following chapter will present my vision for the implementation of instructional technology in a social studies classroom.

Chapter 8

A Suggested Strategy for Using Instructional Technology from a Constructivist Stance

Introduction

My vision and suggestion for the implementation of instructional technology in a constructivist inspired social studies classroom is based on an appreciation of its numerous 'learning facilitating attributes'. This vision does not recommend the use of computers to the exclusion of other worthwhile teaching models. Rather, use of instructional technology can be viewed as an opportunity for teachers to broaden their teaching strategy repertoires; to provide motivation for increased student involvement with their own learning; to familiarize students with the new methods of retrieving, organizing and presenting materials; and to assist the students in the creation and retention of knowledge by experiencing learning through more than one modality.

Not all subjects taught in our schools lend themselves to the type of learning strategy suggested by this author but, in my opinion, social studies does. The following is a possible strategy for the introduction and use of instructional technology (multimedia) in a constructivist-driven social studies classroom.

A Social Studies -Multimedia Project

My strategy evolved from a culmination of ideas gleamed by taking two EDCI courses, 699.20 (Alternative Primary Resources in Social Studies - an Independent Study) and 603.02 (Qualitative Approaches in Educational Research) at the University of Calgary during the 1994 winter semester. My required research project in 603 included interviewing grade eleven students to discover their attitude toward social studies. During the interviews several illuminating opinions surfaced. For example, many of the girls expressed a desire to know more about the contributions of women in history. They felt that this was a neglected area in social studies. Also, most of the students mentioned that social studies was much more interesting when they were actively involved in a project -- when they could visit or participate in a historical 'happening' rather than sitting and listening to a 'boring' (didactic) lecture by the teacher.

Concurrently, in my independent study class, I was pursuing more knowledge about my newly acquired interest in multimedia and its pedagogical possibilities. It was during the conceptualization of my project for this class that I realized the philosophy which encompassed the project was constructivism. Utilizing the information gained from the previously mentioned class, I proceeded to work on a social studies project using the topic of *The Contribution of Women in World War Two*, employing a constructivist rubric while implementing instructional technology (multimedia).

The following are the steps that I took, and imagined a class would take, in the creation of this project.

1. The class members will choose small groups to work in (4 -5 members).

Group work supports the constructivist belief that individual construction of knowledge is achieved within a social context and requires collaboration and some consensual arrangements with fellow classmates. Group work provides a forum for ideas to be expressed and explored and a setting in which social skills may be practiced and applied. The application of social skills is necessary in order to achieve harmony within the group. Learning how to work successfully in groups and what is expected of group members must be a prior condition for students. These social knowledge skills tend to ensure that group experience is worthwhile, rewarding and enjoyable.

Constructivism holds that another major advantage of group work is the type of forum which allows students to be more actively involved in their own education and learning and gathering and organizing information for their projects. The teacher is no longer on 'center stage' acting as the major provider of information. The teachers' role changes to that of advisor and mentor -- another major component of the constructivist stance.

2. Students are extended the opportunity to choose a topic that would be of interest to them from the unit being studied. Hart (1983) discussed the characteristic of human intelligence to make plans and to carry them out and the importance of being allowed (empowered) to do so.

According to constructivism, for learning to take place, a problem must have relevance to the student. The student, when provided the opportunity, will choose to work on something that is of personal interest and to which they can apply past experience. This gesture of choice, although small, gives students feelings of empowerment and control over their own learning experiences. The notion of self-determination tends to be accompanied by an increased commitment and personal involvement with the project.

It is not always possible to provide a choice of topics that would be of interest to the student. The role of the teacher is vital to help 'create' an interest in the topics offered. One common criticism of constructivism is that, as a pedagogical framework, it subordinates the curriculum to the interests of the child. In response to Dewey's notion that education ought to take into account students' interests, Bruner (1971) writes:

It is just as mistaken to sacrifice the adult to the child as to sacrifice the child to the adult. It is sentimentalism to assume that the teaching of life can be fitted always to the child's interests just as it is empty formalism to force the child to parrot the formulas of adult society. Interests can be created and stipulated. (p. 117)

In other words, a good teacher can help the students view a problem as relevant.

3. Constructivism recognizes the value inherent in each person's point of view.

One of the extremely positive attributes of instructional technology is that all students are treated as equals and technology maximizes the opportunity for students to elaborate and express their points of view. Each student working on this multimedia project is afforded the same advantages -- to be creative, to make personal decisions as to what materials to use, to manipulate these materials, and to experience the motivation of working with a new medium.

4. The constructivist classroom requires the curricular activities to rely heavily on primary sources of data and manipulative materials. The use of technology fulfills these requirements. Instructional technology allows students the ease to access primary sources from commercial databases, the Internet, library holdings and sharing information with other classes, and other schools -- both locally and at a distance. Illustrations from a variety of sources can be scanned (given copyright approvals) into the computer for use in the designated project. Action may be captured by embedding video clips and animations as part of the project, and even appropriate music (consistent with the period of history being investigated) may be selected and incorporated into the finished product.

5. Following the gathering of media (films, pictures, music etc.) and completing a literature review, the group should meet to make decisions on how best to organize the research information. Active student involvement, a major component of constructivism, is required for the assignment to be successfully expedited. Working with and handling these materials is a very important step in the student learning process. This 'hands on' activity increases the students familiarity with the concepts they are investigating. Additionally, increased chance for retention and subsequent application should tend to occur when these concepts are discussed and explored.

6. Constructivism views students as thinkers with emerging theories about the world. The use of technology (multimedia) with a constructivist approach facilitates the quest to develop personal theories about the world in which students live. The creation of an original multimedia presentation also provides the motivation for students to remain on task longer and to take pride in the creation of an informative, interesting, creative and worthwhile project.

7. Part of the assessment in a constructivist classroom requires the teacher's observations (qualitative) of their students at work and student presentations, exhibitions and portfolios. The culmination of the multimedia project is often the groups' presentation to the class (objectives for the project

have been previously negotiated, not imposed). According to Cunningham (1991):

assessment emerges quite naturally from the task performance, if we have authentic tasks of some substance (e.g., beyond doing word problems at the end of a chapter). (p.10)

8. The assignment of creating a multimedia social studies project is not just an excuse to 'play' with the new technologies. One of the goals for such a project is to assist the students to develop (create) information gathering, social, decision-making, creative, organizational and presentation skills. The primary objective for the constructivist teacher would be to provide an environment or milieu within the classroom which supports an active (libertarian) opposed to a passive (banking) mode of learning. Another advantage of this variation (constructivism and technology) when compared to traditional 'fact-finding' assignments is that even after the group presentation, the opportunities for further exploration are not terminated. In a constructivist classroom, the teacher seeks the students' new conceptions for use in subsequent lessons. For example, issues arising from the presentation can be debated in the class and the presentation may be shared with other classrooms, other grades and with other schools.

Summary

This personally designed project was included in this thesis to provide an example of my vision for the implementation of multimedia in a social studies classroom and to support my argument for its use. There are many exciting, professionally designed multimedia kits that include videodiscs, computer software, and related teacher and student material. From my constructivist stance, I desired the students to create their own systems.

CHAPTER 9

IS THE JOURNEY OVER?

Does Multimedia Merit a Place Within the Social Studies Curriculum?

This work has been created with the objective to determine if multimedia should have a place within the social studies curriculum. Prior to making recommendations for its application in social studies, the following investigative procedure was pursued.

First, it seemed fruitless to suggest changes to an educational system (especially the social studies) that was in no need of change. Therefore my first task was to uncover literature that would support the need for change. I found the literature replete supporting change.

Encouraged with the 'confirmed' need for change, I continued my journey with the goal to uncover a possible solution for some of the 'ills' besetting the social studies (i.e. valued very little by students). It was my belief that many constructivist perspectives could be applied within the context of a multimedia driven social studies project. Again, the literature found and presented in this work substantiated these beliefs.

The next stop in my journey proved to be very interesting and intriguing. I determined that if, in the use and manipulation of multimedia, learning did not result, then my query was totally irrelevant. Answers to this dilemma came in the literature discussing the great media debate. Reading about the media debate proved to be challenging, entertaining and resulted in the need for serious reflection on my part. This reflection led me to realize that the question of media is and can be perceived differently depending on the lens we are using. I found answers to the media and learning question in the suggestions presented by Jonassen -- which was to restructure the debate around the learner and constructivism instead of media verses the method.

The final step in my journey and investigation was less difficult. It was to find examples of schools using multimedia, using a constructivist perspective, and to share my personal conception of a possible strategy that would incorporate the two.

At this point I do believe that multimedia must be considered a viable component of the social studies curriculum and feel that I have offered evidence to support these beliefs.

Author Again in Reflection

The writing of this thesis has taken many hours of thought, reflection, searching for and reading relevant literature and organizing this literature into a

meaningful format. The motivation for such an endeavor has been intrinsic -- the enjoyment of learning, discovering and finding meaning in new concepts and exploring current theories of learning previously unfamiliar to me. This journey has pushed me to reconceptualize my understanding of what education should be and it has provided me with a new vision of my role as an educator. In short it is my construction. The following quote from Pinar (1976) is particularly meaningful to me:

The thesis of our dialectic is: I don't know, and I must study, and search. I must be open to my experience, open to others', and be willing to abandon what I think in the face of what I see. (p. viii)

Implications for Application

The outcome of personal growth and the thrill of accomplishment and discovery is not a sufficient outcome for such a time-consuming task. The author is reminded of the paradigm of critical praxis for curriculum inquiry. This paradigm (Schubert, 1986) places an:

emphasis on the blending of action, and inquiry (praxis) by reflection on what it means to engage in worthwhile experience and how the latter can be pursued in the face of constraints on social justice. (p. 176)

This work has reflected on the past and present condition of education and the learning theories which drive it. It has inquired into the possible role modern

technology, especially how multimedia can be utilized to enhance the learning milieu in a social studies classroom. Now this work must address the question of action -- that is, the implications for change which arise from this work.

Change (action) may be viewed from a variety of perspectives. There are those who subscribe to the Mario Andretti school of change, "If every-thing is under control, you are going too slow." For them, the occasion of multimedia technology is reason enough to change. A more moderate course of action follow the "first law of wing walking", "Never let go of what you have hold of, until you have hold of something else." Such moderates demand more than anecdotal evidence that a dramatic shift to using technology will significantly improve either the efficiency or the effectiveness of teaching and learning. And finally, there are those who follow the "first law of engineering", "If it ain't broke, don't fix it." For the educational conservatives it is necessary to demonstrate that some, or all, of our current approach is, in fact, broken before attempting anything resembling a change in direction.

This work is based on the assumption supported by associated literature that the system is in need of change and that through the use of new forms of technology, particularly multimedia, this change will be enhanced and facilitated. To provide some future direction for the examination of educational

change and technology, I propose that the following important areas need further attention.

Implications for Future Research

The plethora of technologies provide a variety of affordances to assist learning but research must be carried out to determine which subject areas, and type of learning and learners will best be served by their use. Also, research must be shared -- time is too valuable to duplicate research projects.

I believe that an interesting research opportunity is being missed and is not being taken advantage of in Calgary. While in discussion with Glen Odland, a humanities teacher at Lester B. Pearson, I asked if much research was being carried out at the school. It was disappointing to hear that none was being carried out in the social studies area. This school was set up as a light-house school -- a school providing a new vision of education for the year 2000 and the programs that are being implemented should be worthy of study.

The Implications for Teachers, Teaching and Teacher Training

The exciting possibilities of technology in education can never be realized without teacher support and teacher willingness to embed new technologies in the learning process. The uncertainty associated with change tends to be a

disincentive for many teachers preventing a change toward new teaching techniques (constructivism) and new technologies (multimedia). Teachers need the opportunity and encouragement to examine the contextualization of information technologies in a non-threatening environment. This should extend to a need for teachers to offer support to each other and to collaborate extensively.

The training of new teachers is an awesome responsibility and carries with it the challenge to strive for excellence, to keep current with new methods of teaching and to prepare novice teachers to feel competent and comfortable with the new technologies available to enhance educational goals. Universities need to constantly evaluate and reevaluate programs offered to better prepare those who will be teaching in the Twenty-First Century. I agree with Vallance (1986) when she suggests that teacher training and the appropriate selection of teachers are matters that will most affect the viability of any conception we have of the curriculum.

Implications for Students

The students in the 1990s require a different kind of education to cope with a rapidly changing, global, technologically-based world. Preparation for this kind of change must start at the elementary level. Most of our junior and senior high school students would be unprepared to fully take advantage of a

constructivist and technologically enriched environment. They may not respond to a 'Pearson' experience, even if they were provided with such an opportunity. Students must be prepared in the earlier grades to work together collaboratively, to be responsible for their own learning, and to become more reflective about the reasons why they are attending school and what they want and need to receive from their school experience.

Final Reflections

Technology will never replace those qualities of commitment, intelligence and integrity of teachers working in our schools. However, it can serve to facilitate, motivate, and enhance the learning processes of the students. In fact, Robert C. Heterick Jr. (1989) in his paper, *Reengineering Teaching and Learning*, suggests that :

There is nothing in our technology forecasts that suggests that we are technologically constrained from reaching the holy grail of scholarship-- anything, anytime, anywhere. (p. 2)

He also adds that:

The plethora of digital technologies offers the opportunity to break the industrial age model of teaching and learning and offer a customized service directly to the learner. (p. 3)

The desire to utilize these new technologies is often met with resistance. Curriculum changes and decisions are generally difficult. Many times questions regarding curriculum changes that on the surface appear well-articulated and clear-cut, are confusing, baffling and require extensive debate, research, and reflection. I can appreciate the dilemma suggested changes in the curriculum can cause. For example, for two semesters of a graduate class I attended, the class discussed the possibilities of a National Curriculum and what it might look like. This experience proved to be most stimulating, challenging, and frustrating -- achieving consensus was difficult and closure almost impossible. There seemed to always be another perspective to consider, an alternative 'lens' with which to view the problem.

Educators should be willing to explore alternative learning approaches and regard changes in the curriculum as an integral reality of the teaching profession. This work proposes the use of instructional technology, particularly multimedia, in the social studies classroom. I feel this is worthy of consideration, although I am cognizant that there are other solutions to the problems plaguing the social studies. This perspective has been confirmed in a class I am now taking. I recently presented a paper to my graduate class and incorporated the use of an authoring package to enhance the presentation. The class and the professor expressed much interest during the presentation and also appreciation afterwards. While discussing the positive attributes of this technology to

facilitate learning, the instructor revealed some very interesting perspectives.

She commented that the computer allowed such fantastic visual affects but in the same sentence said the following: "but it's so expensive and after all - who really needs it? Learning will go on with or without it." Her words caused me to immediately recall the Clark/Kozma debate and to take heart in Shrock's (1994) belief that we must take action to contribute to improved learning despite the uncertainty of the direction to pursue.

As a teacher, I am committed to provide the best and most worthwhile educational experiences for my students. If there is any chance that a student can catch the excitement and joy of learning through working with and using instructional technology, then I am willing to devote the time and effort required to prepare myself to include its use in my teaching repertoire.

Conclusion

I consider the writing of this work and attending graduate school a major factor in my 'reconceptualization'. Pinar and Grumet (1976) discussed this concept with their definition of the verb "currere" -- an individual's capacity to reconceptualize his or her autobiography. Schubert (1986) paraphrases their thoughts by stating:

the individual seeks meaning amid the swirl of present events, moves historically into his or her own past to recover and reconstitute origins,

and imagines and creates possible directions of his or her own future. (p.

33)

I recall wondering at one point, was I in the wrong class or perhaps the wrong time-warp. Everyone seemed to be speaking in another language. Words like hermeneutics, phenomenology, ethnography, post modernity, and paradigm, to mention a few, were being glibly discussed -- I was confused and somewhat intimidated. Questions flooded my mind. "What are they talking about?" "Am I the only person in the class who doesn't understand these terms?" "Will I ever gain an understanding of this contemporary educational dialogue?

As graduate students, we were expected to contribute in class and to express our opinions on the assigned readings. This time I was terrified. My traditional education and upbringing had prepared me to memorize and to think what I was told to think. Forming my own opinions and sharing them had never entered the equation.

Several courses and a thesis later, many personal changes have taken place. I no longer fear that my thoughts are not worthy of vocal expression. I have come to understand somewhat the language of qualitative research and contemporary educational thought, and I believe that I am now qualified to

make a contribution to the field of education and to the teaching profession. This chapter is titled, "Is the Journey Over?" and for me the answer must be, "No, your journey has just begun!"

BIBLIOGRAPHY

- Akutagawa, Ryunosuke. *Rashomon and Other Stories*. New York: Liveright, 1952.
- Atkins, M. J. *Theories of Learning and Multimedia Applications: An Overview*. Research Papers in Education, June, 1993.
- Ausubel, David P. "A Cognitive View." *Educational Psychology*, 1968.
- Averch, Harvey A. *How Effective is Schooling?* Santa Monica, California: The Rand Corporation, 1972.
- Banathy, Bela. *Systems Design of Education - A Journey to Create the Future*. Englewood Cliffs, New Jersey: Educational Technology, 1991.
- Boring, E.G. "CP Speaks: Nothing-But and Something-More." *Contemporary Psychology*, 1969: 124 -125.
- Britzman, Deborah P. "Cultural Myths in the Making of a Teacher: Biography and Social Structure in Teacher Education". *Harvard Educational Review*, 56, 1986.
- Brooks, J. G. and M.G. Brooks. *The Case For Constructivist Classrooms*. Alexandria, Va.: Association for Supervision and Curriculum Development, 1994.
- Brown, A. "The Cognitive Basis of School Restructuring." Paper presented at the annual meeting of the American Educational Research Association, San Francisco, 1992.
- Brown, H.S., A. Collins, and P. Duguid. "Situated Cognition and the Culture of Learning." *Educational Researcher*, 1989.
- Brown, J. S. and Paul Duguid. "Practice at the Periphery: A Reply to Steven Tripp." *Educational Technology*, 1994: 9.
- Bruner, J. *Actual Minds, Possible Worlds*. Cambridge, MA: Harvard University Press, 1986.
- Cennamo, K.S. "Learning from Video: Factors Influencing Learners' preconceptions and invested Mental Effort." *Educational Technology Research and Development*, 41(3), 1993: 33-45.

- Clark, Richard E. "Media Will Never Influence Learning." *Educational Technology Research and Development*, 42(2), 1994.
- Clark, Richard E. and Gavriel Salomon. "Media in Teaching." *Second Handbook of Research on Teaching*, 1983 .
- Cobb, R.A., and V.R. Cardozier. "What Factors Influence Curriculum Choice?" *American Vocational Journal*, 41,1966: 30-32.
- Cohen, Kathleen. "Can Multimedia Help Social Studies Teachers? or Are Videodiscs Worth the Expense?" *Social Studies Review*, Winter, 1993.
- Cohen, M. and E. Nagel. *An Introduction to Logic and Scientific Method*. New York: Harourt Brace, 1934.
- Cognition and Technology Group at Vanderbilt. "Some Thoughts About Constructivism and Instructional Design". *Educational Technology*, September, 1991.
- Collins, A. "The Role of Computer Technology in Restructuring Schools." *Phi Delta Kappan*, September, 1991: 28-36.
- Collins, A., J.S. Brown, and D. Newman. "Cognitive Apprenticeship: Teaching the Craft of Reading, Writing and Mathematics. In L. Resnick (Ed.), *Knowing, Learning, and Instruction: Essays in Honor of Robert Glaser*. Hillsdale, NJ: Lawrence Eribaum Associates,1989: 453-494.
- Cunningham, George K. Assessing Constructions and Constructing Assessments: A Dialogue. *Educational Technology*, May, 1991.
- Cunningham, George K. "Learning in the 90's: From Educational Psychology to Educational Biology." *Educational Technology*, September, 1990.
- Curry, R. L., and H. Hughes. "Subject Areas Preferred by High School Juniors." *Peabody Journal of Education*, 42, 1965: 236-240.
- Dewey, John. *The Child and the Curriculum*. Chicago: University of Chicago Press, Phoenix Books, 1902.
- Duffy, Thomas M. and Anne K. Bednar. "Attempting to Come to Grips with Alternative Perspectives." *Educational Technology*, 1991.
- Edward, Paul. Editor in Chief. *The Encyclopedia of Philosophy*. New York: The MacMillam Company and The Free Press, 4, 1968.

- Ehman, Lee H., and D. Allen. "Computer-Based Education in the Social Studies." *ERIC Clearinghouse for Social Studies/Social Science Education*, Bloomington, In., 1987.
- Ehman, Lee H., H. Mehlinger and J. Patrick. *Toward Effective Instruction in Secondary Social Studies*. Boston: Houghton Mifflin, 1974.
- Esslin, M. *The Age of Television*. San Francisco: W.H. Freeman, 1982.
- Fernandez, C., G.C. Massey and M. Dornbusch. "High School Students; Perceptions of Social Studies." *The Social Studies*, 67, 1976: 51-57.
- Fontana, Lynn A., C. Dede, Charles White. "Multimedia: A Gateway to Higher-Order Thinking Skills." *Conference Paper*, January, 1993.
- Fraser, B.J. "Deterioration in High School Students' Attitudes Toward the Social Studies." *The Social Studies*, 72, 1981: 65-68.
- Freire, P. *Pedagogy of the Oppressed*. M. B. Ramos, Trans. New York: Seabury, 1970.
- Gardner, H. *The Unschooled Mind: How Children Think and How Schools Should Teach*. New York: Basic Books, 1991.
- Garmston, Robert and Bruce Wellman. "Insights from Constructivist Learning Theory". *Educational Leadership*, April, 1994.
- Gibson, J.J. *The Ecological Approach to Visual Perception*. Boston: Houghton-Mifflin, 1979.
- Greenfield, Elizabeth. "Evolution of the Textbook: From Print to Multimedia." *Technological Horizons in Education Journal*, May, 1993: 12-19.
- Haladyna, T.M., J.M. Shaughnessy and A. Redsun. "Relations of Student, Teacher, and Learning Environment Variables to Attitude Toward the Social Studies." *Journal of Social Studies Research*, 66, 1982b: 671-687.
- Haladyna, T. M., and G.P. Thomas. "The Attitudes of Elementary School Children Toward School and Subject Matters." *Journal of Experimental Education*, 48, 1979: 18-23.
- Hart, Leslie A. *Human Brain and Human Understanding*. Whiteplains, New York: Longman Inc., 1983.

- Heterick, Robert C. Jr. "Introduction: Reengineering Teaching and Learning in Higher Education: Sheltered, Groves, Camelot, Windmills, and Malls". *Professional Paper Series #10, Cause*, Bolder Co., 1993.
- Holmes, Glen A. and Thomas C. Leitzel. "Evaluating Learning Through a Constructivist Paradigm." *Performance and Instruction*, September, 1993.
- Hunt, Morton . *The Universe Within*. New York: Simon and Schuster, 1982.
- Jencks, Christopher and Others. *Inequality*. New York: Basic Books, 1972.
- Jonassen, David H., John P. Campbell and Mark E. Devidson. "Learning with Media: Restructuring the Debate." *Educational Technology Research and Development*, 42, No. 2, 1994.
- Kanning R. G. "What Multimedia Can Do in Our Classrooms". *Educational Leadership*, April, 1994.
- Kilgour, David. "The Front Line". *Canadian Social Studies*, 26, Fall, 1991.
- Kochen, M. "Technology and Communication in the Future." *Journal of the American Society for Information Science*, 1981: 148-157.
- Koester Arthur. *The Sleepwalkers*. New York: Macmillan, 1959.
- Kommers, P.A.M., D.H. Honassen, and T. Mayes. *Cognitive Tools for Learning*. Berlin: Springer-Verlag, 1992.
- Kosma Robert B. "Will Media Influence Learning? Reframing the Debate". *Educational Technology Research and Development*, 42,(2),1994.
- Kozma, R.B. "Learning With Media." *Review of Educational Research*, 1991: 179-211.
- Mager, R. *Developing Attitude Toward Instruction*. Palo Alto, CA: Fearon, 1968.
- Martorella, Peter H. "Harnessing New Technologies to the Social Studies Curriculum." *Social Education*, 55, (1), 1991: 55-57.
- McKay, Roberta. "Constructivism: Defining Our Beliefs, Examining Our Practices." *Canadian Social Studies*, Winter, 1993.

McLennan, Hilary. "Situated Learning in Focus: Introduction to Special Issue." *Educational Technology*, March, 1993.

McLellan, Hilary. "Situated Learning: Continuing the Conversation." *Educational Technology*, October, 1994.

McLuhan, Marshall. *The Gutenberg Galaxy: The Making of Typographic Man*. Toronto: University of Toronto Press, 1962.

McLuhan, Marshall. *The Medium is the Massage*. New York: Bantan Books, 1967.

McLuhan, Marshall. *Understanding Media: The Extensions of Man*. New York: Mentor Books, 1964.

Mergendoller, John R., and Elly B. Pardo. "An Evaluation of the MacMagic Program at Davidson Middle School." *Beryl Buck Institute for Education*, Novato, CA., December, 1991.

Mota-Altman, Norma. "The Civil Rights Movement via Multimedia." *Writing Notebook: Visions for Learning*, Sept-Oct, 1992.

Perkins,D. N. "Person-Plus: A Distributed View of Thinking and Learning." In G. Salomon (Ed.), *Distributed Cognitions: Psychological and Educational Considerations*, Cambridge, Cambridge University Press, 1993.

Piaget, J., and B. Inhelder. *Psychology of the Child*. New York: Basic Books, 1971.

Pinar, William F. and Madeleine R. Grumet. *Toward a Poor Curriculum*. Dubuque, Iowa: Kendall/Hunt Publishing Company, 1976.

Provenzo, Eugene. *Beyond the Gutenberg Galaxy*. New York: Teachers College Press, 1986.

Reigeluth, C. "Educational Technology at the Crossroads: New Mindsets and New Directions." *Educational Technology Research and Development*, 1989.

Reigeluth, C. "The Imperative for Systemic Change". *Educational Technology Research and Development*, November, 1992.

Ross, Steven. "From Ingredients to Recipes ... and Back: It's the Taste That Counts". *Educational Technology Research and Development*, 1994.

Schubert, William H. *Curriculum: Perspective, Paradigm, and Possibility*. New York: Macmillan Publishing Company, New York, 1986,176.

- Schug, Mark C., Robert J. Todd and R. Beery. "Why Kids Don't Like Social Studies." *Social Education*, May, 1984.
- Shapiro, Bonnie. *What Children Bring to Light - A Constructivist Perspective on Children's Learning in Science*. New York: Teacher's College Press, 1994.
- Shaughnessy, Joan M., and Thomas M. Haladyna. "Research on Student Attitude Toward Social Studies." *Social Education*, Nov-Dec., 1985.
- Shrock, Sharon A. "The Media Influence Debate: Read the Fine Print, But Don't Lose Sight of the Big Picture." *Educational Technology Research and Development*, 1994: 21-29.
- Shuell, T. "The Role of the Student in Learning from Instruction." *Contemporary Educational Psychology*, 1988.
- Sizer, Theodore, R. "High School Reform: The Need for Engineering". *Phi Delta Cappa*., 64, (10), 1983: 679-683.
- Solomon, G. "Transcending the Qualitative-Quantitative Deviate: The Analytic and Systemic Approaches to Educational Research". *Educational Researcher*, 20(6), 10-18.
- Sweller, J., P. Chandler, P. Tierney and M. Cooper. " Cognitive Loss as a Factor in the Structure of Technical Material." *Journal of Experimental Psychology General*, 1990:119, 176-192.
- Taviss, Irene. *The Computer Impact*. New Jersey: Prentice-Hall, Inc., 1970.
- Ullmer, Eldon J. "Media and Learning: Are There Two Kinds of Truth?" *Educational Technology Research and Development*, 42, (1), 1994.
- Vallance, Elizabeth. "A Second Look at Conflicting Conceptions of Curriculum". *Theory into Practice*, 1986, 25:1.
- Von Glaserfeld, Ernst. "Cognition, Construction of Knowledge, and Teaching". *Synthese*, 80, (1), July, 1989.
- Walberg, H. J., and T. Weinstein. "The Production of Achievement and Attitude in High School Social Studies." *Journal of Educational Research*, 1985: 285-293.

- Walker, D. F. "A Barnstorming Tour of Writing on Curriculum." In A. W. Foshay (Ed.), *Considered Action for Curriculum Development*, 1980.
- White, C. S. "Interactive Media for Social Studies: A Review of In the Holy Land and The '88 Vote." *Social Education*, 54, February, 1990: 68-70.
- Wickens, C. D. "Processing Resources and Attention." In D. Damros (Ed.), *Multiple Task Performance*. London: Taylor and Francis, 1991: 1-34.
- Wilson, G. Brent. "Constructivism and Instructional Design: Some Personal Reflections". Proceedings of Selected Research and Development: Presentations at the Convention of the Association for *Educational Communications and Technology*, New Orleans, LA., 1993.
- Wilson, G. Brent, Roger Hamilton, James L. Teslow, and Thomas Cyr. *Evaluationong the Impact of Technology At Peakview Elementary School: The Full Report*. U.S. Department of Education. Colorado, June, 1994.
- Winn, W. "Some Implications of Cognitive Theory for Instructional Design." *Instructional Science*, 1989:19, 53-69.
- Winn, William. "Instructional Design and Situated Learning: Paradox or Partnership?" *Educational Technology*, March, 1993.
- Winner, L. *The Whale and The Reactor*. Chicago: The University of Chicago Press, 1986.