The Design, Implementation and Implications of Digital Arts Programming in West Kildonan Collegiate, Seven Oaks School Division #10, Winnipeg, Manitoba

by

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A Thesis

Submitted to the Faculty of Graduate Studies in Partial Fulfillment of the Requirements for the Degree of

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Department of Curriculum, Humanities and Social Sciences

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ABSTRACT

The Digital Arts program is an action research project which took place at West Kildonan Collegiate, Winnipeg, Manitoba between 1988 and 1992. In 1988, Seven Oaks School Division set up this program, with assistance from Apple Canada Education Foundation, Roland Canada, and the Manitoba Arts Council. Under the direction of the cooperating teachers, Joanne Williams and Owen Clark, the focus has been to explore and incorporate interactive multimedia research, production and presentation techniques in the creative arts area with level 10-12 students.

At the heart of this research is the development of a creative arts curriculum that offers an expanded view of student/teacher potential for creating and communicating which has moved beyond the traditional confines of art, drama and music to include other subject areas as well. A broader range of learning experiences has been initiated which reflects the interests and abilities of students and teachers, current technology and current professional and educational techniques. Given the newness of this interactive digital technology and this line of curriculum development, professional and educational definitions for this approach tend to vary as widely as the systems in which they are employed. This project has chosen to delineate the process of integrating Macintosh and other digital technologies (music, video, laservideo, CD-ROM, scanning) as interactive

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multimedia and to bring together this interactive process and its products within the concept of the Digital Arts. Interactive multimedia at West Kildonan Collegiate have incorporated the techniques of music synthesis, sampling, sound production, music composition, graphic design, animation, wordprocessing, publishing, video production, multimedia composition and presentation within the format of student and teacher initiated projects.

There are several unique aspects to this action research project. Curriculum development has flowed from the artistic, creative perspectives of music, art and drama into the area of digital multimedia composition and presentation. A high degree of local autonomy and flexibility has been afforded by the divisional board and administration to the cooperating teachers with the proviso that responsibility for this project rested firmly with the teachers. Thus curriculum development was encouraged to progress far beyond the limits of mandated provincial curricula and to explore the implications and possibilities of interactive multimedia within the high school context. Courses have been shaped most directly by teachers and students working cooperatively with this exciting new technology. A research and presentation technique has been developed in this program which Clark and Williams have called Scholar's Workstation which in the opinion of these two researchers has a wide ranging potential as a general research platform for other subject areas.

Curriculum development at West Kildonan Digital Arts lab has led to the development and implementation of three school initiated courses:(1) Multimedia Performance Ensemble, (2) Digital Arts and (3) Music and Video Production. The central concern for this thesis is the Digital Arts program. An historical case study of the action research continuum conducted between 1983-92 is presented here as well as a critical consideration of the implications and possibilities for future programming in the Digital Arts area and beyond.

ACKNOWLEDGEMENTS

All of the action research described in this document has been conducted with the encouragement, support and active involvement of many students, teachers, administrators and the school trustees of Seven Oaks School Division # 10, Winnipeg, Manitoba. This document was produced by only one of the participants, but the innovations noted here have been the work of a broad network of people who have devoted much time and effort, often far beyond the call of duty, to try to improve the quality of educational experience within Seven Oaks Division.

I wish to acknowledge the outstanding and ongoing contribution made by Owen Clark with whom I have teamed for the last ten years. Our association began with extra curricular programming at the elementary level and evolved into three school initiated courses at the high school level. Not only has Owen played a crucial role as an instructor and program developer, but he has been an enthusiastic advocate for interactive multimedia techniques making many presentations within the province, across Canada and the United States.

Seven Oaks School Division has provided a unique environment for this Digital Arts programming. This curriculum innovation has been made possible in large part by the board and the administration of the

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school division. Seven Oaks has supported a progressive learning environment, encouraging teacher initiated, research based curriculum development. Divisional policies have reflected a view of curriculum reform as a continuous process. With this kind of encouragement, the action research being done at West Kildonan Collegiate has resulted in a continuum of projects. It has been felt that after five years of operation in the Digital Arts program, that much could be gained from a reflective comprehensive case study. Further, in defining common threads and critical ideas, it is hoped that links can be provided for future directions.

Ten years of working on creative, collaborative curriculum projects have demonstrated that the major breakthroughs in multimedia programming were best accomplished in an open, supportive and interactive environment. Not only have Seven Oaks trustees Dave Edwards, Ramona Gallos, Ben Hanuschak, Morley Jacobs, Bill McGowan, Judy Silver, Claudia Sarbit, Mike Sawka and Ben Zaidman, and superintendents John Weins, Dave Coulter, Ken Burron, and Helen Loeppky advocated innovative curriculum policies but they have shown respect for and confidence in the cooperating students, teachers and involved in projects. Trustees and these administrators superintendents have also gone out of their way to attend concerts, workshops and student presentations and to participate in positive, caring and thoughtful ways.

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Special thanks are due to Pat Stefanchuk, former creative arts coordinator, for Seven Oakes School Division. The outstanding administrative talents of Pat Stefanchuk provided strong support and wise council. Pat was directly involved from the beginning and although she has recently moved on to another administrative position within the division, her continued friendship and interest has been much appreciated.

In the pilot stages of this research 1983-87, at Elwick Community School, a talented and enthusiastic creative arts committee worked with Joanne Williams and Owen Clark, which initially consisted of teachers Tom Clasper, Marilyn Pressman, Iris Van Caeyzeele, Pat Stefanchuk and principal Don Mandryk. As a result of this collaboration, this team won a Hilroy Fellowship in 1986. During the 1986-87 school year, teachers Isadore Burdeniuk, Leslie Pescitelli, Carla Rubinfeld and David Stawn also joined the team. As well, in 1986, Peter Allen a local composer musician generously helped develop four soundscapes for one of our shows and provided expert the of soundscaping for theatre. instruction in art Songwriter/storyteller Jamie Oliviero worked with the Multimedia students, providing many useful insights into the composing and communicating processes. Thanks are also due to Saul Henteleff for his asistance in the area of video filming and editing.

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In 1987 the program relocated to West Kildonan Collegiate. Under Pat Stefanchuk's guidance, a creative arts department was established in 1988 at West Kildonan Collegiate which helped to coordinate program development in music, Digital Arts, drama, and art. This department was made up of teachers Kayla Maister, Gail Nep, Ted Stebbing, Owen Clark, Joanne Williams and principal Dr. Rosalene Saleski. While principal of West Kildonan Collegiate, Dr. Saleski gave generously of her time and talents providing a high level of interest, enthusiasm and participation in these school initiated projects. Much support for program development was also provided by teachers Brian Huminski, Rick Robertson, Richard Harbeck, Levi Reimer and Gabe Kraljevic.

Special thanks are also due to Don DeGrow and Barb Angel of the Manitoba Arts Council. The funding which was provided to this project was critical to its survival in the initial phases. Roland Canada played an important role in encouraging and helping develop the Digital Arts. Through their recognition and support, Apple Canada Education Foundation helped to give the Digital Arts program credibility and a voice within the research community. As well thanks is also due to Apple sales representatives Jordon Hickey (San Francisco) and Steve Palmer (Sacramento) for the information and outstanding support that they provided to this thesis.

Most importantly, I wish to thank all of the wonderful, creative, imaginative, talented and hard working students (too numerous to

name here) who have helped over the last ten years to give shape and to breath life into the ideas which follow.

Much credit is due also to Professor Ken Osborne for his input into this research and for his thorough and thoughtful consideration of the ideas presented here. Thanks is also owing to Professor Sheldon Rosenstock for providing the opportunity to connect course work so closely with practical teaching experience and for the confidence he has placed in my ability to bring some measure of useful interpretation to these multimedia experiences.

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INTRODUCTION

This thesis is focused on a series of experimental research projects involving digital technologies which were initiated in Seven Oaks School Division #10, Winnipeg, Manitoba. This document has two main objectives; one historical and the other forward looking. A case study of the action research conducted in the creative arts area by Owen Clark and Joanne Williams between 1983 and 1992 is presented. This case study will serve as a basis for considering the implications and possibilities of future educational applications of multimedia research, development and presentation techniques.

A prescriptive tone has been avoided in this document because it is felt that such a tone would contradict the basic realities and goals of this project. The basic realities are that educational applications of multimedia techniques are a new phenomenon, beginning sometime around the mid 1980s with such programs as APPLE Classrooms Of Tomorrow (ACOT) in the United States. Given the rudimentary stages of curriculum development in this area and the unique aspects of elaborate prescription would be school initiated courses, presumptuous. The goals for the Digital Arts program development are counter to a rigidly prescriptive model. The fundamental strategies for personal interaction which have characterized this research continuum have been cooperative and collaborative, responding as flexibly as possible to the particular people and community environments in which these projects took place. Further it is hoped

that this research may provide other educators working in this area with some practical insights. Given the wide variations in equipment that reader's may have at their disposal and the wide array of interests and talents that will be brought to this kind of action research, rigid prescription on this writer's part would be an act of futility.

Instead, this thesis is meant to be descriptive, explanatory, and reflective in nature. The personal experience, offered here, is presented in a spirit of sharing and with the full knowledge that this work raises more questions than it answers. Given the present meteoric evolution of digital technology, it would appear that educators have long since passed that peculiar place in time and space where there is a settled and definitive body of theoretical and practical knowledge to present in their classrooms. The scope, technical and social complexities of human knowledge are rapidly expanding and growing. Choosing relevant content, developing appropriate learning environments and then making sense of learning outcomes is becoming increasingly complex and difficult tasks. It is the opinion of this research that solutions to these problems are to be found in specific case studies of action research projects such as this. The research presented in this thesis has been done so in a spirit of curriculum research and development which eschews universal models in favor of explanatory case studies.

As well, coming to terms with the current technological revolution, is a task which must engage a much larger and more extensive

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community of learners in ongoing reflection and collaboration. This extended research community is necessitated by the fact that many of the choices which educators must make are not simply value free decisions regarding time, equipment and software, but rather are decisions which encompass ⁽⁻⁾ the social issues which arise from new educational approaches. Four social issues, currently the subject of intense discussion, concern questions of gender, race, class and physical and mental ability. Arising out of these issues are many questions. Who will have access to this technology and for what purposes? Do these purposes support a process for democratic reform in education?

Since the late 1960s and early 1970s computer technology has had a prominent place within the educational systems of North America. The role of the computer in the learning process has been a subject of great interest, and at times, great controversy. Three major roles for the computer have emerged over the last twenty years; computer as "tutor", computer as "tool", and computer as "tutee". 1

^{1.} These three concepts of tutor, tool, and tutee, coined by Robert Taylor, [1980 pp. 2-4] provide a useful overview of the impact of computers on educational practice. "Tutor" refers to the capacity of the computers to perform standardized instruction and the related activities of evaluation, record keeping and testing. Seymour Papert (1980 a) has described this as using computers to program students and associates this type of instruction with top down, depersonalized, decontextualized educational environments. Computer as "tool" refers to the"useful capability preprogrammed into (a computer) such as statistical analysis, super calculation, or word processing. These "practical abilities can save time and focus energy on high level thinking " [Taylor, 1980 p. 3]. Computer as "tutee" is described by Papert as the capacity of computer to learn or to be programmed by the student [Papert, 1980a].

Until the Second World War "the word computer referred to a person who computed".² The first practical digital computing machine, the ENIAC, was constructed during the Second World War to handle complex ballistic calculations. From a tool of the military, the computer, as machine, has evolved rapidly into something that touches almost all aspects of cultural life in North America- scientific, business, administrative, artistic, literary, academic, medical, and personal, to name a few. Advancements in computer and communication technologies have steadily opened the door for increasingly powerful interaction between people and machines. As a flexible interface, the computer can provide individualized instruction as well as be taught or programmed. Hense, the digital computer has become a very powerful medium for developing ideas and communicating.

Of central concern in this thesis are the roles of the computer as tool and tutee, as an "object-to-think-with" [Papert 1980 p. 11], as an object for creative expression. During the eighties, many new avenues for creative expression appeared. The standardization of such communications protocols as MIDI (musical instrument digital interface), SMPTE (society for motion pictures and television engineers time code) and fiber optics transmission have made it possible for sound and visual images to be developed and linked together with microscopic accuracy and then sent almost instantaneously to the other side of the world or out into deep space.

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^{2.} The first two statements in this paragraph rely on information from Scott, Cole and Engel, [1990, pp. 192-3].

The spinoff effects of these new communication pathways have resulted in a vast range of new technologies: for sound design and production such as music synthesis, sound sampling, CD; and for visual imaging such as graphic scanning, CAD design, video animation, virtual reality simulation, CDROM, laservideo and other interactive video technologies.

Since 1989, the term, Digital Arts, has been used to describe a series of communication applications in the West Kildonan Collegiate Lab for MACINTOSH computers, synthesizers, sound samplers, CDROM, Laservideo discs, video filming and editing equipment. Applications include music composition, multi-track recording, music publishing, sound design, signal processing, word processing, graphic design, publishing, animation, video image processing, and multimedia presentations. The following software has been in use between 1988 and 1992:

ADOBE PHOTO SHOP for manipulating video images AUTHORWARE for interactive multimedia presentations DIVA SOFT also for manipulating video images DX7 EDITOR LIBRARIAN for sound design and supplementary sounds FINALE for composition, recording and publishing GALAXY PLUS Editor Librarian for sound design MACDRAW, MACPAINT for graphic design HYPERCARD for animation and audio visual presentations MACROMIND DIRECTOR for our main animation tool

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MACWRITE II word processing/script writing. PROFESSIONAL PERFORMER for composition & recording PROFESSIONAL COMPOSER for music notation VOYAGER CD AND LASERDISK CONTROLLERS

Not only has this computer assisted technology provided many diverse avenues for students and teachers to explore but it has also opened the door to new opportunities for integrating of audio, visual and written forms of expression. These opportunities are a reflection of a far reaching cultural revolution, presently underway, which has distinctly global implications. The processes by which people work together, problem solve, store and communicate our ideas are undergoing a dramatic metamorphosis. As new and far reaching technical innovations are absorbed into our culture, the process by which people collaborate and share ideas is being radically transformed. "Formerly separate and parallel media technologies, such as television, audio recording, print publishing, and musical computers, instruments are now locked into a collision course with each other that will forever blur their distinctions. This means we must become conversant in many new technical languages and practices " [Schwartz in HYPERMEDIA, (1988), p. 4].

These new languages and practices reflect an emerging era of interactivity. "The individual, through the use of the personal computer, is becoming the center of the world's communication media. The planet is coming on line, person to person, city to city, and country by country. Electronic global communications networks, functional resources and intelligent hypertext data bases are the basis of a new global, 'wired society'... The digitization of information is the driving force behind this merger of media and information. The manipulation of bits and bytes makes it possible for us to cut, paste text, sound and images into one seamless document" [CasaBianca in HYPERMEDIA 1988 p. 4]. Terms such as Hypermedia and Interactive Multimedia, as is illustrated in Figure 1, are presently being used to describe these phenomena.³

Interactivity relates to both people and process. The computer makes it possible for many diverse elements to be brought together and synchronized into complex multi-mode presentations. The once separate and clearly defined roles of the people who produce these elements have converged into dynamic forms of collaboration within the media, business, scientific and artistic communities. The computer is supporting the rationalization of complex systems and challenging a new generation of people to function successfully within these complex systems.

As a result of increasingly rapid forces of change, the locus of power within North American society is shifting. The nature and scope of this transition is a subject of great interest to those educators seeking to

^{3.} For a more detailed description of Hypermedia and Interactive Multimedia , see Appendix I: Terms and Definitions.



Figure 1: INTERACTIVE MULTIMEDIA

GLOBAL COMMUNICATIONS SYSTEM

Inspired by HYPERMEDIA Magazine Vol. 1, No.1 p.5

empower their students.⁴

Alvin Toffler [1990] has offered the view that organization plays a key role in the relationship between knowledge and power. A link exists between "how a people organize their concepts and how they organize their institutions... When knowledge is conceived as specialized and hierarchical" institutions are designed to mirror these conditions [Ibid p. 174]. "Today, high speed change requires equally high speed decisions" [Ibid]. Toffler points out that some elements within the business, social service and education sectors of the United States are adopting less bureaucratic forms of management. Highly bureaucratic systems lack the flexibility and creativity to respond quickly and

^{4.} Alvin Toffler in his book <u>Power Shift [1990]</u>, suggests we are currently on the edge of a "Third Wave " of social/economic change where investors value a company such as Apple or IBM according to its "contacts and power of its marketing and sales force, organizational capacity of its management, and the ideas crackling in the heads of its employees...... The shift to this new form of capital explodes the assumptions that underpins both Marxist and classical economics, premised alike on the finite character of capital. For unlike land or machines (of the First and Second Waves), which can be used by only one person or firm at a time , the same knowledge can be applied by many different users at the same time- and if used cleverly by them, it can generate even more knowledge. It is inherently inexhaustible and nonexclusive...... then capital itself is becoming increasingly "unreal"- it consists largely of symbols that represent nothing more than other symbols inside the memories and thoughtware of people and computers" [Ibid p. 59].

"While in pre-literate societies of the First Wave money was characterized by the exchange of tangible goods, the Second Wave use of paper money reflected "mass literacy". Third Wave money now is increasingly controlled by a flow of digital information between computers. "Blinking, flashing, whizzing across the planet, the Third Wave money is information- the basis of knowledge" [Ibid p. 66].

effectively to rapid social and economic changes. Toffler suggests that "(t)his explains why millions of intelligent hard-working employees find that they cannot carry out their tasks.... except by going around the rules, breaking the formal procedures" [Ibid].

Toffler's ideas have some important implications for education. "Our mass education systems, (generated by industrialization which required a literate and highly mobile labor force), are largely obsolete... education will require a proliferation of new channels and a vast expansion of program diversity.... The links between education and the six principles of the new media system- interactivity, mobility, convertibility, connectivity, ubiquity, and globalization- have scarcely been explored. Yet to ignore the relationship between the educational system of the future and the media system of the future is to cheat the learner who will be formed by both" [Ibid p. 360].

Toffler's six principles of the new media, visualized in Figure 2, greatly extend the opportunities, for those students with access to the new media, to interact in democratic, open ended and community oriented styles of learning.⁵ First, a new era of interactivity is signaled by the appearance of a whole series of computer and video based entertainment and resource materials such as: interactive TV; CD-ROM and laser video databases; as well as video and computer assisted distance education possibilities. Second, the mobility of digital technology has been greatly enhanced by the processes of

 $^{^{5}}$ The next two paragraphs rely heavily on information taken from Toffler [1990 pp. 352-356].



Figure 2: THE SIX PRINCIPLES OF THE NEW MEDIA

based on Alvin Toffler, (1990). <u>POWER SHIFT.</u> p.360

miniaturization and cordless operation, including laptop computers, printers, fax machines and cellular phones. Third, convertibility refers to the ease with which one kind of information can be transferred into other kinds of information. The process of faxing includes first transforming hard copy to fiberoptic or coaxial information and then back into hard copy. As well, video images can transferred directly into the computer for editing or be printed as hard copy. Fourth, ubiquity reflects the North American and European trend of designing transparent digital technology systems which are aimed at most echelons of the consumer market and not just as highly sophisticated tools for academic and business research and operation. Last, this wide proliferation of digital technology is supported by the elements of connectivity and globalization. One of the major developments in the last decade has been an increasing ability for users to interface or to connect an ever widening array of computers, printers, audio and video equipment. Many manufacturer of peripheral devices provide hookups for both MS-DOS and APPLE formats. As well there is currently a movement to standardize personal computer operating systems. In turn, information generated by means of these computer assisted means can be transmitted via a global network of information highways for fiberoptic, coaxial and satellite transmission. Through these systems, large quantities of data can be transferred rapidly from one side of the globe to the other.

Central to the empowering and democratic processes is the element of participation. It is the opinion of this research that empowerment and democracy are not absolute or static states but instead highly evolutionary ones. The quality of empowerment and democratic process is measured by the ongoing level of consultation, responsibility and control for decision making afforded to all those involved. There is a vast difference in a view of empowerment and democracy as something to be aimed for rather than as places at which a society has already arrived. One is a developmental view and the other supports the status quo. Thus, if curriculum reform is to be empowering for the students, teachers and community in which it occurs, then it involves moving toward more complex forms of multilateral collaboration and decision making.

While the conservative elements of North American society are renewing their call for a "back to the basics" approach to curriculum reform, the implications of the current cultural, technological revolution are clear. The traditional "basics" of reading, writing and arithmetic alone omit critical and vital elements of democratic process and current global communication systems. The seat of present and future power resides in access to and fluency within the new media system. What is required is a new and expanded interpretation of "the basics" or core curriculum which is designed not only by politicians and curriculum experts. Instead, this expanded view of curriculum evolves out of and in response to the particular needs, interests and abilities of the community in which it occurs, thereby connecting learning with personal experience and building on that experience to enable all those involved to participate more effectively and morally in an ever widening community of learning the⁺ stretches from the classroom, the school, the school division and into the city, the province, nation and beyond. At the heart of this process are two elements, how people live and work together and how they develop and communicate their ideas. It has been the experience of this research that these two phenomena have parallel structures. The top down structures of association advocated in "the basics" of traditional curriculum promote limited avenues for and styles of communication.

This thesis presents an alternate curriculum model to that which is advocated in conservative reform. It directly incorporates the concepts of teacher/student enfranchisement, a multi-disciplinary approach to problem solving and presentation, digital technology and has been exploring six principles of the new media system put forward by Toffler- interactivity, mobility, convertibility, connectivity, ubiquity and globalization. Just as the technological innovations described above have triggered many new kinds of communications protocols, it is the view of this research that the educational application of interactive multimedia can trigger a much wider field of human potential for creating, cooperating and communicating.

An approach has been chosen to creative arts programming which uses digital technologies, but which is also firmly grounded in collaborative learning strategies. The theme of this research has been to explore how people, perspective, ideas and media can come together more effectively to enhance creative, artistic and academic expression. Digital technologies have been tools for gathering, extending, refining and sharing personal and collective perspectives. Outlined here is a description and explanation of, as well as a reflection on what can happen to the delicate interplay between meaning and media when curriculum is a flexible, negotiated, highly interactive undertaking.

SECTION I: A CASE STUDY- THE DIGITAL ARTS IN PROFILE

INTRODUCTION

This case study profiles a series of action research projects which began in an elementary music program and culminated in school initiated courses at the high school level. Original composition and presentation have been promoted directly through creative collaboration between students and teachers. Included in this process have been varying combinations of music composition, playwrighting, creative movement, dance, set design and construction, lighting design, sound design, production of audio, graphics, animation and video. One of the central features has been the integration of many of these components into multi-mode productions for community presentation. These projects have been exciting for five reasons.

First, an opportunity has been provided by this action research to move far beyond the boundaries of traditional music programming, to work as a part of a team including students, parents, teachers, administrators and local experts in the digital and performing arts area. Second, this action research allowed the author to address some serious weaknesses present within the traditional music curricula. Third, the inclusion of electronic technology has added many more learning and performance possibilities, encompassing a wide range of digital and electronic media as well as a wide spectrum of creative expression. Fourth, the open-endedness of this research has facilitated

some radical developments in creative arts programming. The flexibility which was incorporated into this research continuum, enabled teachers and students to respond quickly as new learning opportunities and new technologies presented themselves. Thus, this action research has taken those involved in many unanticipated directions. It would have been impossible in the initial stages of this research continuum to predict the actual course of development for this action research. When creative composition and presentation was placed in a broader social context, many unforeseen external factors came into play which had a very powerful influence in shaping the direction of these programs. Most notable of these powerful influences were the current rapid evolution of digital technology and the strong base of community support which this program received. Fifth, the research reported in this thesis has much potential for the process of curriculum development in many subject areas. For example, this thesis demonstrates the rewards and viability of an approach to curriculum development which is locally based and responsive to local needs as opposed to more traditional models which rely on top down, centrally controlled change.

Most of the curriculum ideas described in this document started out as small changes and gradually over time, as they were tested, elaborated and applied in a wide range of situations, grew into substantive innovations. The purpose of this case study is to document the key themes which have connected this research continuum and to highlight some of the ideas and events which have been critical to the

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success of this evolutionary process. These themes have emerged from a close study of: (1) the research proposals and project descriptions produced by teachers, (2) collaborative student/teacher exemplars, and (3) student application outcomes for the time period $1983-92.^{6}$

Each phase of this research continuum has been marked with formal submissions and presentations to administrators, school board members, funding agencies such as Manitoba Arts Council and companies such as Roland Canada and APPLE Computers Inc. The preparation of these documents and workshops served to transform theoretical ideas and classroom practices into concrete communications for a diverse audience beyond the classroom walls and provided an important mechanism for feedback. As well it provided the cooperating teachers and administrator with more formal and in depth opportunities for reflecting on, discussing and revising the links between theory and practice. Giving workshops within the school division, the city, and other parts of country, has allowed for the sharing of these ideas with other interested teachers and has linked this research to other relevant and current educational and technical developments. The documentation of the creative arts curriculum projects, created by Clark and Williams, has provided a historical record of project goals, initiatives, curriculum implementation, sources of funding, community involvement and project evaluation.

⁶. For an overview of these research proposals, project descriptions, students/teacher exemplars, and student application outcomes see Appendix II for Time Line.

The process of translating ideas into practice and of further reflecting on that theory in the light of practice, yielded a series of effective activities. These activities performed a function in this curriculum development process similar to Kuhnian exemplars.⁷ Creative arts exemplars provided flexible platforms for developing and presenting ideas. The flexibility was based less on rigidly prescribed procedures and techniques and more on a expanding range of options from which choices could be made appropriate to project objectives. Unlike scientific exemplars, these exemplars were applied in an expressive open-ended process and did not produce exactly repeatable outcomes. The result was that these creative arts exemplars were seen to be in a perpetual state of flux. Each new application offered new dimensions and new perspectives. Creative arts exemplars became the main vehicles for program elaboration and thus occupy a central role in this case study.

Teachers and students worked collaboratively in the developmental phases of each project but the main objective was to hand over control of creative production and performance to students. Where students were able to complete their compositions and act effectively as a team in presenting their ideas, then the program succeeded. On those

^{7.} Thomas Kuhn [1970] traced the history of science, through one aspect of community development, the transition of ideas. Major evolutionary phases (or revolutions) were defined in terms of paradigms. Kuhnian exemplars are one of three main qualities defining scientific paradigms. Powerful exemplars rooted in solutions to concrete problems are often highly abstract and reproducible such as Einstein's formula: $E=MC^2$. Paradigms are also grounded in sets of rules, definitions and values which are shared by the communities which produce and elaborate them.

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occasions, when for varying reasons, students were unable to act independently, it was time for teachers and students to seriously reevaluate technical procedures, or current approaches for developing and presenting ideas.

A colleague, Sharon Melnicer, who teaches English at high school level in Winnipeg School Division #1, has said that "encouraging creativity is like getting a kite to fly. The wind has to be right and you have to know just how much rope to give. In the beginning, I hold (the students) under close scrutiny. But as the year goes on I let go more and more until their ideas begin to take flight."⁸ In the Digital Arts context, this has meant that the teachers' role became a finely tuned balancing act of increasing the opportunities for student involvement and creativity, and at the same time providing enough support and structure to help students bring their ideas to life. This has entailed, on the one hand, encouraging students to have more control over content, context and application outcomes and, on the other hand, providing the conceptual framework critical to achieving the project at hand. Student application outcomes became a very important indicator for evaluating process and important milestones in program development.

Thus, the themes developed in this case study are the direct outcome of a process of researching, experimenting, developing, evaluating and

^{8.} Williams, J (1988). "West Kildonan Music Project: School Initiated Courses Proposal." p. 19.

communicating⁹. Highly systematic or quantitative evaluation has been a feature of this program only in so far as computerized reporting systems required numerical descriptions of student achievement. Given that most end products involved an extensive network of people and resulted in public performances, program evaluation was approached through collaborative community discussion.

The Digital Arts program came into being as a result of an interplay of three critical factors: documented program ideas and project proposals, student/teacher collaborative exemplars, and student application outcomes. This case study intends to develop an historical perspective which depicts how these three elements came together and evolved over time. Chapter I deals with the initial, formative stages of this action research through detailed description of three pilot projects. Chapter II offers a profiles of the Digital Arts program at West Kildonan Collegiate 1988-92. Chapter III considers West Kildonan Digital Arts Project within the larger context of recent curriculum theorizing.

^{9.} This process is similar to those action research strategies offered by Kemmis & McTaggart [1982, p. 11] of "plan, act, observe, reflect " except that the end product of this process was not only personal learning but public performance as well. Thus the role of communication was extended beyond everyday personal learning into a more expressive dimension.

CHAPTER I: METAMORPHOSIS INTO MULTIMEDIA

The West Kildonan Digital Arts program grew out of three pilot projects run within Seven Oaks School Division #10, Winnipeg, Manitoba between 1983 and 1987:

1983-87	Elwick Multimedia Ensemble	levels 3-6
1985-86	Divisional Multimedia Ensemble	levels 5-12
1986-87	Divisional Music Composition Project	levels 4-12.10

Several key themes evolved in these pilot projects which provided a foundation for the curriculum development at the high school level. These themes have been constant throughout the period 1983-92 and have served to shape this research continuum and to give it direction. Included in these themes are: (1) an openness to new people, new ideas and new technology; (2) a high degree of flexibility in the process of curriculum development and implementation; (3) a noncompetitive and collaborative model for personal interaction; (4) a strong aesthetic toward personal and collective creative expression; (5) a willingness to take risks; (6) a desire to explore interdisciplinary integration of media.

It is through the process of exploring and elaborating these ideas that the West Kildonan Digital Arts program came into being in September 1988 and has continued into 1994.¹¹

^{10.} Seven Oaks School Division maintains a policy of continuous development. In place of a pass fail grading system students proceed at their own pace. In order to avoid the historical association attached to the word grade, the term "level" has replaced the term grade as a descriptor for student placement.

Chapter I provides a description the people, ideas, events, exemplars and application outcomes which were essential to this program development. Instead of dealing with each of these elements as separate entities, this chapter attempts to capture the delicate interplay between these elements through an integrated style of presentation. Instead of relating each pilot project through a consistent series of isolated elements, this chapter explores how people, ideas, events, exemplar and application outcomes have come together. Part A sets out some of the founding ideas from which this curriculum evolved. Parts B, C, and D provide a detailed account the each of the three pilot projects.

A. CHOICE AND CHANGE: An Expanding Universe of Ideas.

The innovations described in this case study have attempted to address some of the problems present in the teaching models incorporated into music instruction in the late 1970s and early '80s. As an elementary music specialist, this author was responsible for providing regular class instruction as well as extracurricular activities for a school of over four hundred students. This translated into seventeen classes of about twenty-four to twenty-five students with each class receiving instruction three times a six day cycle. Provincial

^{11.} Since September of 1992, the author has been on educational leave and so, for practical purposes, only the time period up to June 1992 will included in this historical overview.

curricula framing this music instruction were modeled on a top down, teacher centered approach to learning, where curriculum experts laid out all of the concepts, and teachers selected the music and orchestrated all aspects of learning and performance. Reflected in this approach were the long standing, traditional style for music instruction and the reality of managing such large numbers of students within relatively short class periods of a half hour to forty-five minutes.

The end result of this style of teaching was a highly controlled, teacher directed environment where all aspects of musical behavior, how to sit, how to stand, when to start, when to stop, tempo, dynamics, tone quality, even when to breathe were planned, organized, directed, controlled and monitored by the teacher. What was mirrored in the products of this environment was not the students' personal interpretation of the music but that of the teacher which in turn was subject to close scrutiny at local music competition and festivals. Many music programs came to reflect a competitiveness similar to sports programs with students feeling that "our school is better" or "our school has got to win".

This top down approach to learning offered means for promoting personal discipline and technical skills, and in synchronizing and standardizing performance behavior by focusing attention at all times on the conductor. While these are important skills for musicians to possess, other very important dimensions of personal creative development and community interaction were not addressed.

This led this author to consider a series of "what ifs" and in doing so to engage in an interdisciplinary approach to problem solving. What if artistic expression is more than a competitive activity which requires winning or losing ? What if there is no one right answer in creative artistic expression? What if there are many right answers? What if other areas of cultural learning were geared only to recreating great works of the past? For example, what if art students were given only the opportunity to make copies of great paintings and then to participate in festivals geared at deciding who had done the best job? Or, what if language arts students were only given the opportunity to read great works of literature and never given a chance to translate their personal feelings and ideas into poetry or prose? What happens if teaching techniques in the music area are severely out of step with creative strategies employed in other subject areas?. What happens if teaching models for music are defined only by one isolated part of the academic community, curriculum experts? What if these models promote a bias that is in direct conflict with other community values such as democracy or multiculturalism? How do they interact with the issues of gender, economic status or physical ability? What if artistic creative expression is an important part of personal growth? What if the concepts of personal problem solving, creative expression and cultural relevance were incorporated in a more meaningful way into a music program? Grappling with these questions necessitated some serious choices. In turn, these choices involved a series of changes in

curriculum design and in teaching strategies. Over the course of a ten year period, this action research has required choosing and changing in order to integrate personal problem solving, creative expression and cultural relevance into every day classroom and extracurricular activities.

The first and ongoing step in this process of choice and change was to identify those elements of music programming which were blocking change. The following obstacles were identified. One, in traditional teacher centered classrooms, students were dependent on teachers for almost their every move. This was not an environment that lent itself easily to personal creative expression because the aim here was to control and mold student behavior and not to empower students. Second, in traditional environments, which were so intent on developing technical skill, there was little room for collaborative production of new or original ideas. Third, it was often a difficult task to find materials which were an exact match for the student and the context. Many choral and band directors feel tied to the study of musical arrangements created by experts in the field. Despite the obvious educational value of modelling techniques, these arrangements often do not fit the instrumentation or range of abilities in a band or choir as a whole. Consequently, when relying only on this source, making the shoe fit can often give the performers blisters or, on the other hand, camouflage outstanding artistic intelligence by providing no place for it to flourish; for example, by having several outstanding

keyboard players in a program which requires only one or none.

Fourth, the elementary music curriculum was strongly focused on historical rather than current musical trends. Classical and folk traditions of music formed the core styles for instruction and little attention was given to such phenomena as current technology or current social events. Great works of music have over time taken on a rather neutral life of their own, removed from the contexts and controversies which, not infrequently, surrounded their creation. The works of the "Masters" have become sacred "objets d'art" separated from a dynamic, evolving environment and carefully maintained by rigidly controlled social conventions. Within the music curriculum, the scope for listening, interacting and performing is limited to a narrowly defined set of other people's ideas. "To base our listening experience predominantly on works of the distant past is like looking to history not for help in understanding today and in solving our problems, but for a romantic escape to a fabulous golden age. Music was meant to sound, in the past, not sweet but exciting. When we contrast the conflicts which great music aroused in the past, among its hearers, to its apparent innocuous sweetness today it is sometimes taken as a sign that we have learned how to listen to this music. The truth is the opposite.We have learned how not to listen".¹² This thesis also argues that composition and creative performance are also greatly inhibited by a practice limited only to cultural reproduction.

^{12.} Finkelstein, S.W. (1975). <u>Jazz: a people's music</u>. New York: Da Capo Press, p. 13.

The goals in the early stages of the program innovation described on this thesis were not only to learn how to listen again but also to promote creative performance with teachers and students collaborating together. This was done in three ways. First, those elements of elementary school programming which already had a creative focus such as creative movement, art, creative drama and playwrighting were integrated into the music activities. This was done not only on an occasional basis, as might happen once a year in developing a school musical, but regularly as a means of exploring improvisational collaborative styles of learning. Creative musical behaviors arose in response to a broader range of contextual stimuli beyond just pure musical thought to reflect the mood, feeling or energy of a multi-dimensional social context. Music was connected to concrete visual images, events in a scene or the overall theme of a play and thus became a vehicle for describing current states of mind.

Second, other more improvisational styles of music were explored such as jazz and rock. This was done in response to the fact that the elements of form and structure in classical music have become crystallized over time. While a high degree of technical skill is often required in classical music, only the most elite performers are allowed to alter any dimension of a great work of music. Elaboration is occasionally tolerated in variations of minor technical features such as trills or cadenzas. The aesthetics of classical performance is disciplined, authentic replication. Jazz and rock styles, on the other hand, offer solid musical structures in a manner that is not static but which encourages performers to interact with rhythmic, melodic and harmonic elements. adding their own ideas.

Third, alternate formats for curriculum development which allowed for increasingly flexible, collaborative and open-ended problem solving were piloted. Multimedia Performance Ensemble was one of the main vehicles for developing alternate ways for people, perspectives, ideas and media could come together.

B. PILOT PROJECT I:

Elwick Multimedia Ensemble 1983-87- Levels 3-6

In 1983, the author took up a position as music specialist at Elwick Community School, Seven Oaks School Division. A pilot band program was established for level 4-6 students which included forty-seven students. Those students who demonstrated a high level of interest and/or high level of musical skill were invited to join the program. To select some students necessarily would mean excluding others and this ran counter to the project goals but some selection was necessitated by a lack of equipment and by time constraints. Ideally this program would have included all students who wished to participate, but in 1983 this program had a very limited funding base. Initially Clark and Williams supplied much of their own electronic equipment. Also it was felt that, given the highly experimental nature of this project, it was better to start out gradually and build up the program one step at a time.

The inspiration for the band program had come several years before while listening to a recording by Nexus, a Toronto based percussion group. The whole album¹³ was devoted to ragtime music which was performed on an assortment of xylophones and marimbas. Given the proliferation of Orff instruments in most elementary schools, this approach to jazz seemed to offer a lot of potential. All available equipment was called into service. Three old cellos were enlisted out of storage from a long extinct high school string program. It should be noted that the cellos served a function similar to the double bass common in jazz trios or quartets and carried the traditional walking bass effect. Bows were set aside in favor of plucking. Orff instruments were upgraded with chromatic completer boxes (sharps and flats; the equivalent to the black keys on a piano) because it is very difficult to play jazz without the full spectrum of tonality. The drums consisted of one small five piece drum kit while percussion included a wide assortment of claves, maracas, bongos, congas, and cabasas.

The band was organized into six groups: piano, Orff instruments, guitars, cellos, keyboards, drums and percussion. Each of the six groups had one scheduled section practice at 8:15 am, one day in the six day cycle. Classroom teachers generously allowed their students to meet for a full practice during school time (in music preparation time) ^{13.} Nexus (1976). Nexus Ragtime Concert. Special Limited Edition, Toronto, Ontario: Nimbus Production.

twice a six day cycle, ninety minutes in total. Section practices enabled students to obtain one on one support from the teachers (Clark and Williams) and to work on specific problems that each student might be experiencing. Then students were able, in full practice situations, to concentrate on the task of integrating their part into the whole context of the the music, playing their lines and at the same time listening for how this complemented the other musical elements. This process of learning to hear more than one part at a time can be a challenge for beginning musicians. Section practices also allowed teachers and students to develop a system of signals which could be quickly set into action in full band practices.

1. Exemplar#1: The Twelve Bar Blues

One of the first activities introduced to this group was the twelve bar blues. Although working with twelve bar blues was not an uncommon practice in junior high and high school jazz bands, the use of this format as a composition tool was not a common practice at the elementary level. Further, most applications of this technique, observed at the junior and senior high school levels, were more informational than creative. Junior and senior high students were introduced to the form as a tool for learning to improvise. Yet many of the jazz solos played by level 7-12 students at local festivals and concerts were taken from set arrangements or were written out by the band director. The twelve bar blues activity is considered an exemplar in this project for a number of reasons. It was through this form that students made their initial foray into the world of composition. In working with this form, both students and teacher uncovered some of the key ingredients for musical creativity. Given its simplicity and flexibility, the blues form is easy to grasp. and students quickly became acquainted with I, IV, V harmonies. Once students could locate and play these chord structures quickly, a simple twelve bar blues progression was introduced.¹⁴ Each phrase was practised separately until the students had gained confidence and then the phrases were strung together until the whole harmonic sequence had been mastered.

Next, a melody or "riff" known to most of the students was introduced. Several students were invited to act as lead singers while the the rest of the band continued to practise the chord sequence until it became second nature and students could relax into the feel of the music. Later, students were introduced to the blues scale and encouraged to improvise their own melodies against the harmony. In addition, students devised their own lyrics and singers created their own choreography. Over time, this chord pattern was transposed from C into the keys of F and G. More elaborate chord progression were also introduced which included 7th, 9th and 11th chords. Students learned to read chord symbols and were able to explore the important concepts of harmonic structure and movement. For example, they ^{14.} See Appendix III for example of simple Twelve Bar Blues progressions. learned what harmonic function a bass instrument usually plays and what purpose it serves in the overall musical effect. Bass lines generally outline the chord structure by playing the root of each chord or whatever inversion the chord appears in, which helps to ground the music and give it harmonic definition. Through a process of experimentation, such as the treble instrument playing the bass line, students were allowed to decide which effects they liked the best with the result that bass lines were carried usually by the one of the piano players, cellos and the bass xylophones.

A key idea which was introduced with the twelve bar blues, was that of patterning. Understanding form in music is a process of decoding patterns or those elements that are repeated exactly or with slight variations such as lyrics, melody, chord progressions. The first activity which was undertaken when a new piece of music was presented was to analyse the form and to look for the repeating patterns. This kind of analysis when applied over an extended period of time improved students' ability to sight read. Conversely music composition became a much less formidable task if students only had to create a few simple patterns and link them together with an introduction, a bridge and a coda. These concepts of patterning were directly transferable to writing lyrics, or working out choreography.

Early composition efforts were done within the twelve bar blues format, as a whole band activity. Students were invited to come up with their own solos, introductions and endings. In the initial stages of improvising, individual students put out their ideas and the band through a process of trial and error, would test out different ideas or combinations of ideas until a successful result emerged. Through collective interaction, the process of music composition was modeled for students: gathering and experimenting with a number of ideas, linking these ideas together and then testing the results to see if the desired effect was achieved. Musical ideas were be obtained in two ways; spontaneously "heard in your head" which were then to be sung or played, or through trial and error, playing around with ideas on an instrument. In this way, the music program reflected a "constructivist" approach to learning, in which, with appropriate guidance and help students became makers of meaning. In a sense, music took on a "discovery" or "inquiry" format, as those terms are used in science, mathematics, and social studies.

2. Application Outcomes: Platform for Creativity

The blues offered a very user-friendly pathway for learning to play jazz, improvising, and ultimately composing. The twelve bar blues served as a highly adaptable tool or context in which students could interact creatively. Once students and teachers came to understand the power of setting up a flexible framework, this concept was applied in rock and Latin American styles of music. Currently this activity is still an important vehicle for beginning composers in the Digital Arts program at West Kildonan Collegiate.

3. Exemplar#2: Large Group Percussion Ensemble

During the first year, one of the weaker elements of the Elwick program was the rhythmic component. Getting forty-seven young musicians to synchronize their effort, to feel the music as one, was a daunting task. One of the constraining factors here was limited teacher experience in the percussion area. In the spring of 1984 Owen Clark, percussion instructor at the University of Manitoba, became involved in this program. With him came a wealth of percussion experience and a vast array of percussion instruments. Having once attended a Mardi Gras in South America, Owen Clark had been quite taken with large ensemble percussion activities and had brought a number of these hand crafted instruments back to Winnipeg.

Large Group Percussion Ensemble included not just the percussion group but the whole band. A range of instruments was introduced and handed out to students which included claves, vibra-slap, tomtoms, timpani, triangles, cabasas, maracas, bass drum, gogo bells, cow bells, slit drum, conga drums, bongo drums, timbales and a drum set. Playing techniques for each instrument were demonstrated. Students were given simple, contrasting rhythms to play first in small groups and then in concert with the whole class. Several students were chosen to act as the rhythm center (like the rhythm section in a jazz band; drums, guitar, bass, piano). The bass drum, cow bell and tomtoms were the main instruments utilized in the rhythm center. This center marked the beat while the rest of the band gradually added their contrasting rhythms on top of the basic pulse. For variety a drum machine was used as rhythmic center and also for illustrating Latin rhythms.

The musical form used in this percussion ensemble technique consisted of a series of simple repetitive two bar patterns with three two bar breaks which on signal from the conductor were played in unison by everyone. At the end of a break, each group resumed its respective patterns. Students were encouraged to improvise rhythms over this rhythm center. The overall structure loosely reflected the classical rondo form: AB, AC, AD, etc. or rhythm/solo, rhythm/new solo and so on. Unlike classical rondo form this activity was never repeated the same way twice. The whole structure was spontaneously decided during performance by the conductor and the performers had to watch very closely for cues as to who was soloing, which break was to be used, and when to end. The overall effect was rather like "elastic music".¹⁵

4. Application Outcomes: Rhythmic Improvisation

The band members enjoyed the Large Percussion Ensemble activity which was refined and used in performances. This activity is a highly ^{15.} See Appendix IV for example of Large Percussion Ensemble activity.

flexible one which Owen Clark has applied across the complete educational spectrum in his travels as part of the Artist in the Schools program sponsored by the Manitoba Arts Council. The effect on the band's rhythmic awareness and confidence level was marked. It allowed students the opportunity to concentrate on one thing, the rhythm, rather than having to juggle several musical effects at one time, such as harmony and melody. Their playing became less tentative and they began to listen to each other and to communicate musically with one another. Most importantly, this activity provided the opportunity to experiment with rhythmic improvisation which is the basic building block for all music composition. Musical ideas are not just a loosely related series of pitches, but consist of sounds which have energy, movement and direction. This flow is achieved by means of a series of interrelated rhythmic patterns which provide structure, continuity and interest.

These rhythmic ensemble activities were used on a continuing basis as a warm-up activity and integrated into other teaching goals, such as promoting multicultural perspectives on Caribbean, Latin American and African music. Also students were given the opportunity to conduct this activity and thus had direct control over shaping the overall structure.

Improvisation in jazz and rock is frequently accomplished within just such a flexible format, where musicians have a set of prearranged signals for cueing one another to indicate who will solo, how long the solo will last and when a section or piece is ending. Because improvising is a spontaneous process, this technique allows some scope for taking advantage of the moment. For example, if a musician is into a "hot" solo and the audience is really enjoying the performance it is common practice to allow the solo to continue until the intensity of the musician's ideas begin to wind down. It is very important in a creative process to recognize and give scope for strong flows of ideas.

5. Exemplar #3: Rhythmic Composition

This activity was a direct outgrowth of exemplar #2. Composition was first approached as a collective enterprise and was limited to devising rhythms. The aim was to create a percussion composition based on four two bar patterns as well as an introduction and a coda of some kind. In this manner a form of beginning, middle and end was approached.

All available percussion instruments were set out in full view. This activity was introduced with a review of note and rest values and by creating a written model of a polyrhythmic composition with the whole group first. Four students volunteered to perform the composition on instruments of their own choice while one student conducted. Outcomes were evaluated by the whole group which included experimenting with different combinations of instruments. Students then worked cooperatively in small groups of their own choosing (four or five students), first improvising rhythms and then writing their rhythms down.¹⁶ The teacher moved among the groups assisting when asked. Often students would improvise a syncopated pattern that they had trouble writing down. In this case, the problem was presented to the whole band and if no one could decode the pattern then some very strong clues were provided by the teacher until the pattern was transcribed. Also it was often necessary to draw a group's attention toward mistakes in rhythmic notation.

The beginning, middle and end form was achieved by such simple techniques as choosing one pattern to act as the continuity line which appeared first as section A. The other three patterns could then be added as section B. Finally these three patterns would be withdrawn and the continuity line used to finish off the piece effectively repeating section A. This proved an excellent way to give the composition structure and to introduce ABA form. Other more adventurous groups composed new material for their introductions and conclusion.

Once a group had completed their written sketch of their composition, students were encouraged to practise their rhythms, memorize their patterns, decide on a rough plan for how the parts were to be combined and finalize instrumentation. Each group was given a trial run with help from the teacher to fit the parts together ^{16.} See Appendix V for project handout of the Rhythm Composition activity. and to evaluate the overall effect. The conducting was done by one of the group members. Students were encouraged to rewrite any area in their composition which did not work to their liking.

The final step in this activity was to tape each group's final performance. Later, the tape of each composition was played and discussed. Ideas were shared about how to improve on the next composition. Also, further variations were included in this activity. The performance process of the first composition was repeated with different instrumentation and pattern arrangements. Each group was encouraged to create a new composition with a different style, mood or feeling to it. As students became more fluent in this whole process groups were given the opportunity to improvise a composition on the spot and once the patterns had evolved to write them down. Thus, it was possible for students to become acquainted with several different styles of composing: (1) plan then play, (2) play then plan, (3) continuous interaction between playing and planning (trial and error /experimentation techniques for developing more complex ideas).

6. Application Outcomes: Classroom Use

All three exemplars, once they had been piloted successfully in the context of the band were used in regular classroom teaching. In September 1984, under the sponsorship of the creative arts coordinator and the superintendent in charge of curriculum

development, the Elwick Band program was officially recognized as a divisional curriculum development project. In September 1985, the Elwick Band program was renamed the Multimedia Ensemble to reflect the increasingly eclectic nature of its activities. Also, a second band of students from levels 3 and 4 was started. The advantage in having two bands in the Multimedia program was that every regular class from levels 3 to 6 had a cross section of students with experience in the pilot project. Peer modeling made the transfer of ideas into the classroom much easier because all of the teaching did not rest on the teacher's shoulders. Multimedia students acted as coaches to their classmates with the end result that technical and creative progress in the regular classroom activities was much faster. In return the confidence level and the skills of Multimedia students were greatly enhanced through these coaching experiences. Slowly over time the locus of control and initiative began to shift from the teachers to a collaborative relationship between teachers and Multimedia students.

7 . Exemplar #4: Multimedia Performance Ensemble

Not all exemplars in this project were focused on curriculum content. Organization of and interaction among people within Multimedia ensemble were also central concerns. Developing multi-mode performances for the community proved to be a complex task which required more than one teacher. In 1984, the Elwick Parent Liaison Committee became a sponsor of the Multimedia program, contributing funding and also applying for a grant from The Manitoba Arts Council for Owen Clark to participate as an artist in residence. The Arts Council provided this grant for three years, from 1984 to 1987. In addition, a creative arts committee was established in 1985 which consisted of four teachers, the creative arts coordinator, the principal, and the artist in residence.

The mandate of this creative arts committee was a broad one, involving program planning, production and evaluation, developing alternate funding sources, and liaising with the parents, superintendents, the school board and funding agencies. Three important elements emerged in the development of the Multimedia Performance Ensemble as a direct result of this committee.

First, instrumentation was expanded to include a wider range of electronic equipment, electric guitar, bass, electronic piano (Yamaha PF10), synthesizers (Roland Juno 106, Korg DW 8000, Technics PSR60), drum machine (Roland TR707), and sound system. Initially, the guitar, bass, PF10, the Juno 106, the DW 8000 and the drum machine were on loan to the program. Gradually over time, the guitar, the bass, the drum machine, the Juno 106, PSR60 and guitar amps were purchased with the help of the school, the parent committee, the division and money from a Hilroy Fellowship which creative arts committee received in March 1986.

Some of the older acoustic instruments were set aside in favor of newer electronic ones. Due to the technical difficulties of sustaining tuning, the antique cellos were phased out. When required, the synthesizers offered hundreds of tone colors including many string sounds. The acoustic piano was also phased out in favour of the electronic keyboards. As a result more keyboard players were included into the program. Also, in early 1986, the school division supplied an APPLE IIe computer, MUSE software and a MIDI interface for connecting the synthesizers with the computer. By the fall of 1986, the IIe was upgraded to a MACPLUS computer and the Professional Performer composing software was purchased.

The second element which changed, was the organization of the band itself to include singers, actors, playwrights and technicians on a regular basis. More roles were formally identified within the group. Further, students were encouraged to participate in as many ways as they desired. During the years 1985-86, two of the main keyboard players and an xylophone player took over the major responsibilities for technical setups which involved AC, audio and MIDI hookups. One of the drummers, a percussion player and a keyboard player were also lead singers. A cross section of the group were involved in developing and writing all scripts. Roles within the group were fluid. All students, teachers and often a few parents were involved in setting up for performances and in striking the equipment after shows. During 1986-87 several students, with support from the teachers, ran the mixing boards during performances. Multimedia students became directly involved in almost all aspects of production and performance and wherever possible student production ideas were incorporated. This breadth of training involved four teachers¹⁷ and the artist in residence, working with students in regular practices and many extra lunch hour or after school times.

The third organizational element which changed during the 1985-86 school year was that, following the traditions of jazz and rock, students were seldom conducted by the teachers during performances. Keyboard players, drummers or lead singers provided the cues. Students were encouraged to take charge of performances. Once the performance was under way, the teachers faded into the background and only emerged to help with problem solving in cases of extreme crisis.

8. Application Outcomes: Multimedia Performance

A series of multimedia shows were produced between 1985 and 1987. In creating performances, a structure which worked well was a twenty to thirty minute mixed media format which utilized acting, singing, <u>dancing</u>, instrumental solos and accompaniment, computer generated ^{17.} These four teachers included a kindergarten, a level 3 and a level 4 teacher as well as the author. All of these people had a long history of being involved with creative arts extracurricular activities and possessed expertise in photography, playwrighting, directing, lighting, costuming as well as very special abilities in relating to children in a positive, supportive and creative manner.

compositions and sound effects. These elements were tied together thematically with original scripts.¹⁸ The most successful example of this format was a show created by the students in 1986 which was entitled "EEK!". The plot was centered on a twelve year old boy with a terrible secret- he was extremely afraid of, but at the same time fascinated by the dark. Two main conflicts were developed; one between a parent and the boy with the parent insisting that it was time to shut the lights out and get some sleep, and the other between the boy and his wild imaginings which were triggered every time the lights went out. A monstrous hand reached out from under the bed and clothes strewn on the floor which turned into ghosts which chased him around the room. These nightmares were brought to an abrupt end by the appearance of the light into the room as the parent opened the door and restored order. Prior to this production, sound effects had been added live into performances by the synthesizer players. Given the intensity and complexity of the nightmares in this script, a sound effects tape was created with the help of another local composer and musician.¹⁹

19. See Acknowledgements, page iii.

^{18.} Original scripts were produced through a partnering process between teachers and students, where themes were selected, through brainstorming, discussion and improvization. Once an idea had been thoroughly explored and outlined, a script was put together, workshopped and revised over a period of a several weeks. Music, sound effect, visual and video effects were elaborated to complement the script. Everyone involved in the Multimedia Ensemble had the opportunity to have input into the building process. As much as time permitted, creative and production decisions were based often consensus.

9. Exemplar #5: Soundscaping

A technique for designing sonic environments was incorporated into the composing activities which included both sound effects and/or musical effects. Not only does soundscaping reflect one of current genres for composers, that being writing for theatre, it also permitted students to experiment with free form or through composed styles of composition.²⁰ In free form styles of composition, form is often dictated less by musical conventions and more by an external image or series of images which evolve over time. Flow and direction comes from mirroring the progress of verbal or visual images and then transferring these ideas into sonic images.

This approach to composing proved to be a very powerful one with young composers because it promoted more concrete cross referencing between sonic images and other verbal or visual ones. Also, it made it possible for students to start from an area of imaging where they generally had more experience and in which they could interact in a more sophisticated way. In turn, students could then transfer these verbal or visual feelings and perceptions into sonic

images. In the beginning, composing activities which were approached ^{20.} Free form or through composed styles of composition rely less on rigidly specified forms of repetition such as AABA and more on a less structured, free flow of musical ideas from the composer. This style of composition is typified by a more continuous flow of new thematic, harmonic and rhythmic material. Thus, as a genre, through composed styles are more easily connected to visual images or actions and consequently are commonly used in incidental music for theatre or film scoring.

in this manner had more depth and focus and were more quickly appreciated by an audience.

Instrumentation for soundscaping activities included both electronic and acoustic instruments. Soundscaping at the elementary level was most frequently approached as a large group activity where a "plan then play" strategy was employed. For example, one activity included translating the actions in a poem into sounds. Students read through the poem, identified the action and the actors, selected appropriate tone colors, and devised suitable short effects. Once this process was accomplished a continuity track similar to the rhythm center in the large group percussion activity was set up. If the poem was about a windy day or took place near the ocean, then appropriate patches from the Juno 106 synthesizer were selected. For example, patch B58 resembles gusts of wind, and patch B67 sounds like the surf crashing on the shore.

The poem was then performed by the whole group with some students reading and others adding the sound effects in their respective places. Once the sound effects were well developed, then the poem would be performed with only the sonic images sequenced in their proper order. Finally, individual students would be invited to conduct improvisations using the sonic images in a spontaneous sequence of their own device. 10. Application Outcomes: Classroom Use

As in the case of exemplars 1, 2 and 3, soundscaping was first a Multimedia project but was later adapted as an activity for the regular classroom. This particular form of composition worked well at all grade levels. Soundscaping is currently one of the first composing activities undertaken by students in the Digital Arts 105 course in the high school program.²¹

One of the most important insights gained in the course of this elementary school based curriculum development had more to do with context than content. Through the implementation of alternate programming, Multimedia Performance Ensemble, an environment for learning was established which brought together a whole community of people. One of the main purposes of this alternate program was to change the manner in which learning was to be accomplished, to change how people related to one another, to make learning, creating, producing and performing cooperative activities where responsibilities and roles became shared experience. Once this had been accomplished, the quality and complexity of the products produced 21. Appendix VI offers an example of a Soundscape Graph presently in use in DAR programs at West Kildonan Collegiate. Students are able to plot their sonic designs over time keeping track of patch numbers on synthesizers and general ideas for how different tracks will interact. The purpose of this graph is to help students organize and analyze the general elements in a sound scape including such effects as a build up in tension leading to a climax and followed by a release of tension. Many elements in the composing process evolve around the build up and release of tension such as melody, harmony/dissonance, rhythm. This graph has proved to be a useful tool for helping students to plan and describe their projects.

was radically transformed. Thus, in order to change what was learned, it was necessary to first change how things were learned. These collaborative models for interaction became the basis for all subsequent program development.²²

C. PILOT PROJECT II: DIVISIONAL MULTIMEDIA ENSEMBLE

During the spring term of 1986, a Divisional Multimedia group was initiated by Clark, Williams and Pat Stefanchuk, creative arts coordinator, which included twenty students from levels 5 to 12 as well as the creative arts committee. Six of the students were from Elwick and the rest were interested students from the three high schools within the division. The initial motive for bringing this group together was to create a twenty minute multimedia show for the Seven Oaks Festival of the Arts to celebrate the Year of the Composer in Manitoba. This group was responsible for putting together a show which was called "Catching the Light Just Right". Given the short time available for rehearsals, which was less than two months, the music was composed by Owen Clark and this author. But students were heavily involved in all other aspects of the performance. Again, the Elwick Multimedia students served to bridge the gap by helping to set

 22 One of the comments received from the parents of two Multimedia students some years later in 1992, when these students had moved on to high school, was that this program had really taught their children to have confidence in themselves and to follow up on their creative ideas. This model has been developed in Figures 6, 7, 8, 13 and 14 and explained in more detail in Section II of this thesis .

the tone for personal interactions and often led the way during improvisations and script writing. The high school students, for their part, offered strong musical role models for the elementary students. Instrumentation was adapted to suit the group's abilities with drums, electric guitar, bass, two tenor saxophones, two alto saxophones and three keyboard. Also involved were four singers, three actor and three technicians.

1. Application Outcomes: Exploring the Video Medium

The Multimedia Ensemble format proved to be a viable way of approaching creative arts performance at the high school level. Later in the spring of 1986, the divisional ensemble group began exploring the medium of video. Another fifteen minute show, "Never in Your Wildest Dreams", was devised and taped during a half day session in June. This endeavor was of a highly experimental nature but in doing it a number of important lessons were learned. One, the project was far too ambitious to be accomplished in a morning of shooting: short video projects require a very small scope of time (three to five minutes maximum not fifteen). Two, this project provided the teachers involved with an introduction to professional video editing techniques. This was our first attempt at video editing and time was booked at Video Pool on their Sony Genlock editor. Three, this experience demonstrated that prerecording sound and overdubbing it later produced far superior results because it left the performers and technicians free to concentrate on one thing at a time, singing first and acting and movement later. Four, it was also discovered that it is unwise to schedule a video shoot for the morning after a high school graduation even if that was the only time that everyone involved was available. The lessons learned in this project helped to form the basis for later video composition program development at the high school level.

D. PILOT PROJECT III: DIVISIONAL COMPOSITION PROJECT

Although techniques for music composition had been explored from many different directions, only a few students had managed by 1986 to produce compositions on their own. Composition is a time intensive and highly interactive process between students and their ideas and between students and teachers. This had proved difficult to accomplish within the context of large group activities such as band or regular music classes. As a result, the creative arts committee decided in January of 1987, that an experimental project would be started with a small group of students to explore the possibilities for composing with Professional Performer software using the MacPlus. Six students volunteered to participate; one from level 5, two from level 6. one from level 7, one from level 11 and another from level 12. Over the course of two months, students met with O. Clark and this author in after school workshops and recorded their ideas into the Mac. The guidelines for this project recommended that each student develop a composition with a bass line, a melody line, a chord structure, and background effects. Also students had the option of programming the Roland TR707 drum machine and setting the controls for external sync so that the computer would activate and coordinate the drum machine to play in sync with the synthesizers. All students, except one, composed a drum track.

For the four youngest students, developing their first composition was a slow process which required a great deal of support from the teachers. Four of the students had extensive keyboard training, resulting from many years of private lessons. One of the level 6 students and a level 12 student had limited formal training but played quite well "by ear". The most difficult dimension for everyone was not coming up with ideas but instead coming to terms with the technology, for example, in learning how to operate the drum machine, and what the protocols were for multi track recording on the Mac.

Each student was encouraged to pursue his or her own particular creative preferences. Teachers worked as facilitators, listening to students play or talk about their ideas, helping to solve problems as they arose and offering a lot of positive moral support. Once students were satisfied with their efforts, the compositions were mixed down to cassette tape. Each student was presented with a copy.

The compositions which resulted were very unique interpretations of form and style. Two of the compositions were in twelve bar blues form and two had strong visual images associated with them and consequently were through composed.²³ The two high school students chose (AABA) song form; one a ballad also with a strong visual image and the other an up-tempo rock song. Those students who used strong visual images supported these images with synthesized sound effects such as wind, waves on the shore or airplanes panning from left to right.

1. Application Outcomes: Community Presentations

Two of these compositions along with the show, "EEK!" were presented at a workshop given by the Elwick Multimedia Ensemble and the creative arts committee for the Manitoba School Board Trustees Conference in Winnipeg, March 1987.

All of the compositions were given a formal presentation at the Seven Oaks Festival of the Arts in April of 1987. Each student introduced 'His/her composition to the audience and explained how it had been composed. Both of the high school students were accomplished singers and were able to perform the vocals themselves. It was through this project that the students and teachers involved began to see the incredible potential for computer assisted composition as a ^{23.} For more details on through composed styles of composition see page 45, footnote 19.

creative and educational tool. Those students with little or no formal training were equally as successful as those students who had considerable keyboard training. It was clear that computer assisted composition allowed for many different kinds of musical intelligence to be brought bear on the composition process. This insight became one of the central forces that led Clark and this author to explore other areas of creative composition such as in the areas of computer based graphic design, animation and video production.

2. Exemplar #6: Computer Assisted Music Composition

This exemplar has, in this researcher's opinion, been the most influential of all. Computer assisted composition has made it possible to turn intuition into practice. When this project began in the early 1980s, the teachers involved intuitively felt that it should be possible for a music curriculum to reflect the same levels of creative expression and personal empowerment as art or creative writing programs were doing. Computer $\stackrel{\leftarrow}{}$ assisted media have provided a concrete improvisational pathway for developing and interrelating musical ideas. Given the opportunity, a brief introduction, and ongoing support from teachers and classmates, students with little or no formal musical background could interact with their own musical ideas, recording them, playing them back, extending, reorganizing, editing and refining them into compositions. This marked a considerable divergence from traditional practices and beliefs in music education. Creativity within classical spheres of reference has traditionally been placed on a pinnacle somewhere up beside such geniuses as Beethoven or Mozart. Music composition has been a pencil and paper job, to be undertaken once all of the rules have been learned, somewhere on the learning continuum between a Master's degree and a PHD and not an activity to be pursued by novice musicians. Yet students involved in computer assisted composition demonstrated that it was time for a radical change in thinking.

What made this method of composition viable was that it relieved students from the tedious job of always having to translate their ideas into written form before they could be preserved and repeated. The immediacy of being able to catch a portion of an idea and instantaneously send it into a computer, allowed composers to collect their ideas at about the same rate that these ideas were generated. Thus, more creative material was available to the building process. Further, once these ideas were stored in the computer, a composer could then interact with them in an infinite number of ways. All of the standard word processing type functions were at their fingertips, such as copy, paste and delete. In addition, many other musical devices for synchronizing musical data, changing tempos or dynamics, and transposing, were available. Sonic ideas could exist on a different aesthetic plateau because they no longer needed to be filtered so intensively through abstract theoretical concepts and then
reinterpreted as sonic ideas before they were connected. In other words, classical modes of composition required the composers to translate ideas first into written form in order to save them and then to translate these ideas back into their creative thinking space before collecting more ideas. This process of translating and retranslating seriously interrupts the flow of creative ideas. As a result many great ideas get lost along the way.

Consequently, classical composers have relied more on textbook defined rules of structure and forms in order to retain and give shape to a smaller collection of creative ideas. With the advent of computer assisted music composition, personal creativity has been given a place of greater prominence. A greater number of creative ideas can quickly be saved, interacted with, developed and woven together. Computer assisted composition allows students to set the computer to record before they begin playing or improvising. When finished, the improvization can be played back. If the improvization is acceptable it can kept and if it is not acceptable then it can be edited or the computer can be set again to record and the process repeated until an acceptable idea emerges. This does not mean that music can be composed without rules and structures. Obviously all music is based on some shared cultural notions for composition. What is does mean is that it is now possible to rely more on a wider range of personal experiential knowledge and less on simply applying the rules of composition straight out of music text books.

In general, composition in music is the art of developing a complex series of relationships between pitch, tone color, rhythm and harmony. Traditionally, classical composition has been approached as a linear activity, but the process of designing a complex set of relationships does not always proceed in a linear manner. Complex problem solving is often a spontaneous process which proceeds on many levels at the same time, so that random insights may occur throughout the whole composing process. For example, it is possible for a composer while working on an introduction, to come up with some great ideas for a coda or ending. This does not necessarily indicate a lack of focus or discipline of the part of the composer. In fact, quite the reverse is the case. An experienced composer will often consider how an introduction can be linked to the overall effect of the composition, which might include elements of repetition or contrast and thus might form an important component in designing an introduction. Good composers, in fact, juggle many ideas at the same time. A computer assisted mode of composition allows a work in progress to take advantage of one of the key features of the creative problem solving process, the seemingly random appearance of ideas. As they emerge, ideas may be recorded and stored on separate tracks for future reference without serious interruption to the task at hand, such as creating an introduction. Thus, composing evolves into a multi-linear activity and it is possible for people with little formal training to produce quite sophisticated compositions.

Another powerful dimension to this style of composing is the concept of "triggers". Students in North America bring to the classroom a vast wealth of personal experience. For a long time, good teachers have been striving to engage their students in more dynamic kinds of learning by directly connecting curriculum with students' personal experience. For example, language arts programs often approach creative writing activities by encouraging students to describe their personal experiences or feelings and to translate these feelings into new situations. Students' ability to create a myth or a fairy tale will rely heavily on their own personal experiences (verbal, written or visual) with this style of expression. The teacher who would initiate this activity by merely advising students that today 's writing assignment was to create a legend or a myth would probably get a very different response from the teacher who drew the students into a discussion about their favorite legend or myths before they started writing. The discussion in this case would serve as a trigger for reactivating personal experience.

Similarly, the ability to compose music rests, in large part, on the composer's personal experience. Traditional styles of composition have placed more emphasis on theoretical and technical experience and less on aesthetic and listening experience. For most students entering the music classroom, music is one of their strongest interests. But they participate in this cultural phenomenon more often as a consumer or spectator, watching and listening, rather than a

producer. Nonetheless, they arrive with a great deal of musical experience. Relating to music is one important way the students demonstrate how they feel about the world around them and what their personal aesthetics are. Yet frequently in the past, music curricula have attempted to present an alternative set of aesthetics without ever connecting it with the vast wealth of student experience. Being creative in a whole, new and complex aesthetic genre is often a very formidable task. Thus, the focus of this type of programming is on the transmission of conceptual structure and technical skills and not on creative artistic production.

Another important element in triggering personal associations in composition is the element of tone color. Our musical memories are linked not only to specific melodies, lyrics, rhythms or harmonies but also to the specific sounds made by the instruments which are used to convey these ideas. Digital technology has made a wide array of synthesized and sampled sounds or tone colors instantly available at the touch of a finger. Students at Elwick had access to three synthesizers (Juno 106, DW8000, and PSR60). These synthesizers offered a sound library of about two hundred different sounds which could be linked to the computer via MIDI interface.²⁴ Each patch on the synthesizer provided a different tone color which ranged from orchestral sounds to folk instruments to sound effects. It was discovered over time that tone colors played a very influential role in ^{24.} See Appendix X for a diagram and description of a MIDI interface system.

generating creative ideas. Tone colors acted as triggers for personal experience. If, for example, a student selected an orchestral patch, then simply playing one or two notes of this synthesized orchestral sound, could trigger a series personal associations for students. These associations might have involved the last or most impressive times that students could remember hearing this type of sound. Often accompanying this association were not only visual images, such as "I saw Victor Borge conducting an orchestra at the Hollywood Bowl," but also distinct memories about mood, feeling, tempo, melody, harmony or rhythm.

These memories did not surface as complete works of music but in small fragments and impressions. These fragments in turn represented musical data upon which the student could draw for composition. The creative process is an evolutionary one where a series of preexisting musical ideas are acted upon in such a way that a new and hopefully unique set of meaningful relationships are constructed. For example, it is possible in Mozart's early music, to see features that are very similar to the music of Joseph Haydn with whom he studied. Some of Haydn's ideas can in turn be traced back to his musical predecessors. Yet very few people would deny that Haydn or Mozart were in fact a highly creative musicians.

For untrained or young musicians, musical fragments were retained in the memory not because they were connected with theoretical musical knowledge but because they were connected to feelings derived from

personal experience. Computer assisted composition and music synthesis made possible an alternate route for linking personal experience with creative expression. This alternate route gave emphasis to different kinds of musical intelligence. While classical traditions emphasized that music composition was a solitary, abstract activity carried out by a highly skilled individual who in turn was guided by elaborately prescribed rules of form, computer assisted composition emphasized the concrete, improvisational, experiential, and collaborative aspects of music production.

3. Application Outcomes: Transition to High School

Computer assisted composition became a tool which transformed the intuitions of teachers about the creative potential of students into classroom practice. Computer assisted composition became one of the core elements of the Digital Arts program at West Kildonan Collegiate. The performances given by the six students in the Divisional Composition Project in 1987 made a very strong and positive impression on all students, teachers, parents, administration and board members and were a major influencing factor in shaping the direction and focus of the research and development that followed.

As a direct result of these pilot projects, Clark and Williams felt that they had begun to unravel the mysteries of how to incorporate music composition into a regular classroom. Multimedia Ensemble had allowed for the development of alternate ways for teachers and students to interact within the school community. Digital technology had proved to be a very powerful tool which offered exciting new opportunities for creative musical expression. Furthermore this technology could be used with equal ease by students from levels 4 to 12. The interactivity between teachers, students and technology had provided a whole new perspective on what could be expected of students and how classroom and performance activities could be organized.

In May of 1987, a proposal was submitted by Clark and Williams to the Superintendents Department of Seven Oaks School Division requesting permission to continue this action research in the high school context. In September 1987, this author took up a music position at West Kildonan Collegiate. A West Kildonan Collegiate parents' committee was formed and another grant was obtained from the Manitoba Arts Council which enabled for Owen Clark to continue as artist in residence. Early in 1988, O. Clark was hired by the division as a Digital Arts consultant and continued in that position until 1990 when he was became a permanent teacher to the West Kildonan staff, where he teaches presently.

CHAPTER II: THE DIGITAL ARTS IN ACTION

When Clark and Williams moved to West Kildonan Collegiate, ideas for incorporating music composition into the regular classroom situation were still fairly vague. But during the 1987-88 school year, serious attention was given to this project. The initial proposal for the West Kildonan Digital Arts Project was designed by a team including teachers, (Joanne Williams and Owen Clark), the creative arts coordinator, (Pat Stefanchuk), and the superintendent, (John Wiens). This proposal was presented to the school board in February,1988, and accepted in the spring of that same year. The goal was to initiate a new direction within the high school creative arts program which would reflect current trends in general educational theory/practice and current technology.

Translated into practical terms, Seven Oaks School Division committed \$150,000 for renovations, equipment and software. Over the summer of 1988, two classrooms were transformed into a rehearsal room and a ten station Digital Arts lab. In September 1988, the Digital Arts Project at West Kildonan Collegiate formally got underway. Two school initiated courses were developed and taught by Clark and Williams: Electronic Music (which was later renamed Digital Arts) and Multimedia Performance Ensemble. Each of these courses was offered at the 105, 205 and 305 levels. A. Research and Development in the Digital Arts Lab 1988-92

The opening of the lab was a very exciting time, which presented many new and sometimes difficult challenges. The learning curve, for the teachers involved here, was and has continued to be very steep. During the period 1988-92 the basic ingredients- programs, students, equipment and software- were in a constant state of metamorphosis. Curriculum development became a much more complex process.

The West Kildonan Digital Arts Project was qualitatively different in many ways from the pilot projects which had preceded it. Where the pilot projects had been extra-curricular in nature, the school-initiated courses at West Kildonan Collegiate had bona fide course status and were each worth a credit toward a high school diploma. Where the pilot projects had involved a select number of highly interested and skilled students, Electronic Music classes were open to all students regardless of musical background. In the pilot projects, there had been a team of five instructors and two administrators working together out of the formal class setting. The Electronic Music classes moved back into a more structured classroom setting with only two teachers and one administrator (the creative arts coordinator) directly involved. Responsibility had been shared by a group in the Elwick creative arts committee. At West Kildonan Collegiate, responsibility for action research and program development clearly fell to two initiating teachers. When new technology had been introduced into the pilot

projects, it had been done so gradually, one piece of equipment at a time and as a supplementary feature to creative and collaborative concerns. From the time that high school the lab opened, technology became an increasingly important consideration and was frequently the focus of difficult problem solving situations.

As a direct consequence of the confidence which the administration and board had placed in the cooperating teachers, a program was established at West Kildonan which, to the best of this researchers knowledge, was one of a kind in Canada. While there were other electronic music courses in Canada, most of them were dedicated to more teacher-centered models of instruction which focused on developing music synthesis techniques and keyboard skills. The Digital Arts Project, while addressing itself to music synthesis 2^5 and keyboard skills, had also a more eclectic and creative orientation. The result was that the program developers (Clark and this author) had to look outside the creative arts and educational milieu for help in problem solving. Like the activity which this project sought to promote, creative composition, curriculum development metamorphasized into an increasingly complex and fluid set of relationships. Local equipment dealers and Roland Canada offered many useful ideas for setting up workstations and ongoing support in solving technical problems. Figure 3 shows the location of the lab within the school complex and the initial lab setup itself.

^{25.} See Appendix I for a description of music synthesis.



WEST KILDONAN COLLEGIATE



Winnipeg, Manitoba²⁶

DIGITAL ARTS LAB 1988



26. See Appendix VII for detailed overview of lab equipment in 1988.

In the first year, two levels of Electronic Music were offered, ELM 105 and ELM 205. The general aims for these courses were to: (1) initiate discussion of the changing role of musical technology in society, (2) introduce students to basic electronic/computer terminology and research techniques, (3) provide orientation and skill development for equipment and software being used in the lab, (4) present the basic concepts of music synthesis and to encourage the practical application of these concepts in assignments and projects, (5) give students the chance to meet some of the professionals presently working in the city, (6) discuss some of the theories and practical techniques which composers use to stimulate and to accomplish the creative process, (7) provide students with the opportunity to become fluent in the recording procedures on the Macintosh computer through hands-on practical activities and creative project work, (8) encourage students to apply problem solving and creative thinking strategies that would give then the degree of autonomy necessary to elaborate their own ideas, (9) present individual/small group projects to the community at the end of each term.

Teachers in these courses had a commitment to encouraging creative thinking through an evaluation process that was open to many right answers and to many different routes for achieving those answers. Student progress was evaluated in the following manner:

(1) General Attitude- personal motivation shown in independent

project work, ability to assimilate new ideas and to make compromises, ability to cooperate in large and small group activities contributing and respecting other peoples ideas.

(2) Attendance- class, after-class lab time, field trips, and community presentations.

(3) Assignments and Tests- through these it was possible to monitor student comprehension and teaching effectiveness on basic terminology and concepts introduced in class.

(4) Major Project- a student-initiated activity giving students a chance to explore the creative opportunities of the electronic/computer music technology available in the lab, evolving over a two month period, designed by students in collaboration with teachers. The final evaluation was a joint process between teachers and students.

(5) Minor Project- also a student-initiated activity with a possible cross disciplinary focus, which will also subject to a joint evaluation by students and teachers at the conclusion of the project.

(6) Presentation - One project of the students choosing was be presented to the community at the end of the course, since an important factor in any composing process is consideration of intended audience.²⁷

Students' progress and projects were evaluated from three perspectives; student initiatives, process and products. In turn, these three elements reflected important dimensions of initiatives, process ^{27.} These areas were weighted in the following manner: General Attitude 10%, Attendance 10 %, Assignments and Tests 35%, Projects 40% and Presentation 5%. and products of the classroom learning environment as a whole. Wherever possible teachers attempted to break away from top down models of evaluation and to engage in a collaborative process involving both teachers and students in considerations of student achievement, classroom procedures and teacher effectiveness.

For example, in the early stages of the major songwriting activity, students defined their personal projects in written form, thus clarifying their goals both for teachers and for themselves. These goals were not "written in stone" and were often subject to change or alteration as the work progressed. At the completion of the project, students were asked to produce a detailed written description of their composition including such information as: title of composition, duration, general description of form and style, and equipment used. As part of this exercise students were required to explain how they went about composing, generating ideas and organizing their composition. Also students were encouraged to explain the mood or feeling they were striving to obtain in their work and any visual effects or images that they had been attempting to connect with sonic images. Finally, students were asked to give a brief evaluation of their compositions indicating the ideas which they felt had worked well and also any of the serious problems they had difficulty in solving. Finally, students reported on the positive things which they had learned from this project and also some of their personal learning objectives for future projects. When this written response was completed students

met with teachers to listen to composition, discuss the results and to arrived at a mark by mutual consensus.

During the first years of the program, ELM 105 and ELM 205²⁸ were organized in the following manner. Students and teachers in ELM 105/205 engaged in three main types of activities; music composition, soundscaping and interdisciplinary composition (which is explored in some detail in section II of this thesis under the concept of multimedia composing or MMC). All of the exemplars which had been developed in the pilot phases of this project were integrated into the Electronic Music courses.

The twelve bar blues became one of the first musical structures introduced to students through which the concepts of rhythm, melody, harmony, form and improvisation could be developed. This blues form provided an excellent starting place for developing keyboard skills and offered a flexible platform for beginning composition.

The large percussion ensemble and rhythmic composition exemplars provided the basis for creating drum tracks. Through these exemplars, a review of basic note and rest values was introduced. Similar styles for rhythmic notation were presented and although detailed written transcription was not a goal of this course, some written activities ²⁸ ELM (Electronic Music) courses were renamed, in September 1990, as the Digital Arts, to reflect a more interdisciplinary approach toward artistic composition. served to help reinforce the necessary technical language and the mathematical concepts required for computer assisted composition. Students were first introduced to the acoustic percussion instruments which were available on the synthesizers and drum machines and given the opportunity to play some of these instruments. Then basic drum patterns were demonstrated by Clark in which the concepts of pattern and fill were introduced. Students then transferred these ideas to their composition projects.

Soundscaping techniques were employed in one the ELM 105/205 assignments, usually the minor project. This techniques proved to be a powerful vehicle for introducing novice musicians to multi-track recording procedures and for presenting some of the basic concepts for combining sounds over time such as (1) beginning, middle and end effects, (2) complementing and contrasting dimensions of tone color, (3) the effect of tone color on creating a mood or an atmosphere, (4) the build up and release of tension through dynamics, rhythm figures and instrumentation(building a climax), (5) establishing a theme or continuity element which could be any combination of rhythmic/ melodic figures or tone colors.

The Multimedia exemplar provided the model for collaborative interaction between teachers and students. The role of the teacher shifted during each course from instructor to advisor and support person. Students frequently took on the task of coaching or helping

their classmates if Clark and Williams were busy working with other students. Given the wide range of new equipment and software which flowed into the Tab on a fairly continuous rate, some students frequently began to explore new software or software upgrades before teachers had the opportunity to do so and on occasion had knowledge of programs in advance of teachers. In such cases, these students often acted as instructors for their classmates. This happened on a regular basis with any animation program which came into the lab.

The Multimedia exemplar was also an important starting point for creating interdisciplinary and multi-mode compositions. Those lessons that were learned in developing multimedia performances were transferred to the digital domain. In the ELM 105 course, this initially translated into a small scale project of creating a radio commercial for a product or service offered by local businesses. Instructors contacted these companies by phone and received permission and help from local business people. Students were then free to visit the retail outlet and find out first hand about the product or service they wished to promote. From there students created and recorded commercials which included scripts, song writing and soundscaping techniques. ELM 205/305 students were involved in larger scale video projects for a variety of projects with other subject areas within the school such as developing promotional videos for the physical education program and the cooperative vocational education programs.

Problem solving is an integral component of any creative production process. In building an original set of complex relationships, it is necessary to proceed along an experimental pathway which is fraught with many difficult choices and at times seemingly inscrutable road blocks. These conceptual barriers were technical, musical and personal in nature. It was the intent of Clark and Williams to work with students in developing a creative thinking space in which problem solving could be addressed not as a one-time phenomenon but as an ongoing component of creative production. The following strategy has been used in the ELM courses: (1) define the nature if the problem and decide what kind of a problem it is, (2) generate alternative explanations of why the problem is occurring, (3) consider consequences or outcomes of each alternative, usually through a trial and error process, (4) choose the alternative which solves the technical problem or the alternative which best suits the intent of the project, (5) evaluate the results to ascertain the effectiveness of the solution, (6) if the results are not satisfactory then explore other alternatives until the desired result is obtained, (7) keep unused alternatives in reserve for future problem solving. ²⁹

1. The Digital Arts and APPLE

When the lab was first opened, there were seven stations available for ²⁹. These strategies arose from two sources, practical classroom experience and Albrecht [1980, p. 192] and Beyer [1988, p. 27].

music composition. Two of these stations had computers, the Mac Plus and a Mac SE, which operated with the Professional Performer software 30 and five workstations had Roland D20s. The Roland D20 is a digital keyboard which contains eight synthesizers, a drum machine and a multi track sequencer. In the first Electronic Music class there were twenty four students and composition became a small group activity. It was quickly apparent that more computers and outside funding were required if a truly multimedia approach was to be achieved. In September 1988, Clark and this author submitted an application to the APPLE Canada Education Foundation. Early in December, word arrived that the West Kildonan Digital Arts Project had been selected as an APPLE Innovation Center. Between 1988 and 1990, the Digital Arts Project received support from the APPLE Canada Education Foundation as an Innovation Center. The basis of this relationship was an equipment-research exchange. APPLE provided MacIntosh technology and in return Clark, Williams and their students elaborated, tested and refined an introductory electronic music curriculum. In January, 1989, APPLE shipped a MacII, a Mac SE, a Laser NT printer, cables and two APPLE MIDI interfaces. Over the next year and a half, a HyperCard application was developed by Clark and Williams which networked twelve areas with: topic overviews, activity descriptions, a dictionary of terms and definitions, a MACMIDI tutorial on how to setup AC, audio and MIDI systems and a MACMIDI game which allowed students to design their own AC audio and MIDI setups. Figure 4 shows the title page for the APPLE project. $^{30.}$ For more information on computer MIDI setups, see Appendix X.

Figure 4: APPLE Research



by Joanne Williams & Owen Clark

based on program development at West Kildonan Collegiate Winnipeg, Manitoba Canada

WEST KILDONAN DIGITAL ARTS PROJECT APPLE INNOVATION CENTER

established by

SEVEN OAKS SCHOOL DIVISION

and sponsored by

APPLE CANADA EDUCATION FOUNDATION

Also included with this HYPERCARD application, An Introduction to Electronic Music, were two articles covering course rationale and applications³¹, hard copies of all student handouts, tests, evaluation forms, and a large chart outlining the main topics, research questions, teaching techniques, possible time allotment, follow-up activities, specific and general teaching objectives, background notes. A list of resource materials was also included with the application.

The complete package was submitted to APPLE Canada Education Foundation in the summer of 1990. The intent behind this curriculum package was to develop a flexible platform incorporating a series of topics which were described on the menu as teaching chips.³² These topics represented the range of areas that were explored and elaborated after Clark, Williams and Digital Arts students had piloted the Electronic Music 105 course four times. Figure 5 illustrates the application menu (the chip board) and the range of topics included in this research project.

^{31.} These articles were first published in the Manitoba Music Educators Journal 1989,
Part I in the spring edition and Part II in the Fall edition.
^{32.} See Figure 4: HyperCard Application Menu , p. 74.





It was hoped that other teachers could use these ideas as a resource for upgrading their own particular music programs, either to construct full scale courses as was done at the West Kildonan Lab or to use the teaching chips as enrichment units within a more traditional program. Clark and this author shared the view that curriculum development was most useful and successful when it provided a broad multi-directional view of the field of study and allowed instructors wide scope for adapting and responding quickly and appropriately to the special needs of particular students and situations. This Introduction to Electronic Music continues to be the basis for instruction in the Digital Arts Lab and has constantly been revised and updated.

2. Why APPLE Technology?

A question which deserves consideration in any discussion the Digital Arts Project is why the program based itself in APPLE technology. The answer is, in fact, practical and pedagogical. In 1986, when hardware and software decisions were being made, APPLE IIes were in common use in the local elementary schools. This meant that any APPLE IIe computer purchased by the Seven Oaks Division could potentially serve a multi-use function. So, for practical reasons, an APPLE IIe was made available for this action research.

However, as the researchers in this project began to study the current developments in the computer world in 1985-6, the Macintosh technology appeared to have a great deal of potential and was incorporated into the program. When APPLE had first introduced the Macintosh in 1984, a big step forward was made in the area of user interface. The Mac's "user-friendly" graphic interface was operated by an external mouse and allowed many formerly scripted commands to be activated through a series of icons and protocols common to all Mac software. A variety of software was available for music composition, wordprocessing, graphic design and multimedia composition. A multimedia program, HyperCard, was bundled with the Mac, which in the early versions, made it possible to integrate text, graphics, and some sound and visual effects.

In the area of computer assisted composition, programs such as Professional Performer offered a very flexible and impressive array of multi-track recording and editing functions from the simple to the sophisticated. The Professional Performer has served as an all purpose format, suitable for novice as well as professional projects and has been used by both students and instructors alike. One outstanding advantage of this was that students started working in an adult composing environment which allowed for a wide range of ability, interests and skill development and which offered a great deal of scope for personal growth. This meant that teacher and students were able to speak a common composing language and that the teachers' best composing knowledge could be easily passed on to students.

So far as the pedagogical factors behind this choice of APPLE are concerned, the philosophy behind the APPLE technology has been very close to that of this action research continuum. The kinds of research activities undertaken by this company have centered on empowering the user, on discovery based, interdisciplinary approaches to learning, and on student centered, expressive and collaborative models for interaction. APPLE technology provided the flexible platform that this research required for a more eclectic mode of operation³³.

 $^{^{33.}}$ An outline of some of the APPLE's recent research activities is outlined in Appendix XI.

APPLE was judged to be the best technology available for the kinds of curriculum development being undertaken when the Digital Arts program was first introduced at West Kildonan Collegiate. To date, APPLE has also provided the kind of flexible, continuous learning environments that this action research continuum set out to find.

B. Profile of Program Development

Creative composition has been one of the common threads in the Digital Arts programs at West Kildonan Collegiate. Between 1988 and 1992, two distinct phases in project development emerged. During the first two years of operation, music composition was the primary mandate. Programs taught in the lab focused on music composition, sound design and production, and multi-track recording. Graphic design, research, publishing, animation and video production tended to be complementary components in project work. In the fall of 1990, there was a shift in focus. The Electronic Music courses (105, 205, 305) were renamed the Digital Arts (DAR). While DAR 105 kept a strong musical perspective, this perspective was no longer considered as just an end in itself, but as one component in a more complex form of composition.

This perspective grew out of experimentation between 1988-90 in the DAR 205/305 classes which took part in more interdisciplinary applications of digital music technology. Students in these levels of the

program had been involved in multimedia projects which included such activities as creating a promotional video for the Cooperative Vocational Education (CVE) Foods program and a promotional video of the Digital Arts Lab which Owen Clark used at a conference in Philadelphia. Through this type of project work, 205/305 students and teachers had attempted to connect the research being conducted in the lab with the surrounding school community and to explore cross-disciplinary music applications.

Over the course of two years a new exemplar began to emerge that has been the main motivating factor for this current thesis: the process of multimedia composing. It was through DAR 205/305 classes that a more broadly based interactive multimedia perspective was first approached. Multimedia composition encompassed not only collaborative research projects but also integrated applications of music, sound effects, graphic, animation and video.

1. Exemplar #7: Scholar's Workstation

The term multimedia composition has been used by APPLE researchers since the late 1980s ³⁴ to refer to any computer based composition activity which results in the combination of two or more of the following elements- text, music, sound effects, graphics, <u>animation and video- into one document. Early ELM projects which</u> ^{34.} Seann Ambron & Kristina Hooper have edited two volumes (1988, 1990) on educational applications of Interactive Multimedia which document this approach.

experimented with this style of composition, proved to be too broad in scope. There were too many new skills for students to acquire within the time frame available for the project. Through a process of trial and error, Clark and Williams developed a format which Clark named Scholar's Workstation.

Scholar's Workstation provided a more modest entry point into the world of multimedia production, yet still held true to the basic goals of Digital Arts programming, giving students a wider spectrum of media in which to explore, discover and develop their own ideas. This approach provided a highly flexible structure within which students could operate and through which teachers could participate in a manner that would not intrude on the integrity of the students' goals. Students were free to select their own topic and whatever media they felt comfortable with or wished to explore. Teachers were able to shift from the role of production director, which the large scale projects had demanded, to that of support and resource person for the students' efforts.

In presenting the Scholar's Workstation activity to students, a process similar to that of video production was adopted. Students were encouraged to design their own interactive multimedia project through the Scholar's Workstation format: for gathering, storing and organizing information; for developing a script in HyperCard; for elaborating that script with text, music, sound effects, graphics,

animation, video, laserdisk and CD-ROM examples; and for refining and synchronizing these elements into presentations for friends, family and classmates.

Students in the DAR 205/305 programs usually approached the Scholar's Workstation projects from an artistic perspective, featuring their area of personal interest or expertise, be it composition, animation or video production. For example, a guitar player in grade twelve, after watching several videos over the course of the year on how to improve his playing, decided to construct an instructional video on modes and to demonstrate several modes with improvizations of his own. Two other students whose main interest was animation designed a talking book for upper elementary aged children using the Macromind Director animation program. Other DAR 205/305 students used the Scholar's Workstation format for completing assignments in other courses such as English or Social Studies. Multimedia composition proved to be an interesting new tool for extending essay or aural presentation kinds of assignments.

2. Application Outcomes: Multimedia Composition

Thus the evolution of the Digital Arts programs can be clearly marked into two distinct phases: (1) music composition from 1988 to 1990 and (2) multimedia composition from 1990 to 1992. Scholar's Workstation became the main vehicle through which multimedia composition was elaborated. Another development which occurred in 1990 as a direct result of this shift in direction was the introduction by Owen Clark of another school initiated course, Music and Video Production. One of the biggest obstacles in the early interdisciplinary projects had been coming to terms with the complex webb of new technologies involved in video production. Further, students required not only expert instruction in audio, video, lighting and computer technologies, but also many hands-on, practical opportunities to plan, design and carry out these activities. The Music and Video Production (MVP) course was established to provide some of these opportunities and to act as a support for other performance programs such as Multimedia Ensemble and the drama productions. MVP students also participated in the Scholar's Workstation activities exploring more of the technical dimensions of multimedia composition and utilizing more of the laserdisk and CD-ROM technologies.

The Scholar's Workstation format has made it possible to alter the processes by which people, perspectives, ideas and media come together. For the individual student, composition shifted from being a solitary activity to a highly social one where difficult problem solving situations have most commonly been dealt collectively within the class community. Students have been encouraged to adopt a more intensive and multi dimensional process of developing, coordinating and refining their ideas. Given the performance type of programming from which these ideas evolved (Multimedia Ensemble), a more community oriented style of communication has been adopted. Individual presentations often have required support from several class members in order to connect all the media components together smoothly. In fact, students participated directly in each other's projects through all stages of development and presentation.

It is common practice within Canadian high schools that work involving the highest level of thinking is communicated in written form and shared by students with an audience of one, usually the teacher. The teacher, in turn, reads this work, comments on it, evaluates it, and returns the work to the student often without any direct verbal interaction. It has been the experience of both Clark and Williams that discussion is an important primary and ongoing dimension of developing and understanding meaning. It has been the goal of the Digital Arts program to promote discussion with students throughout the course of this project work and to bring the compositions of students into a more public forum where their efforts and creativity can be recognized and shared with the community. These Scholar's Workstation presentations have enabled the Digital Arts programs at West Kildonan Collegiate to showcase student projects and to provide a communication link between parents, teacher and students.

C. The Digital Arts Research Continuum

Although the curriculum development described in this document has been ten years in the making, the Digital Arts program at West Kildonan Collegiate represented not an end in itself but only a beginning. The ideas described here have simply opened the door to a vast universe of educational and cultural possibilities. The first step in exploring the implications and possibilities for future curriculum development has been to place the practical events described in Chapters I and II into the theoretical domain. Chapter III explores the relation between practice in West Kildonan Collegiate Digital Arts program and current curriculum theory. Through a process of connecting theory and practice, it is hoped that some insights will be gained for improving and refining the process of multimedia composition. It is felt that a more in depth account of this process would greatly enhance its potential as a multidisciplinary research tool.

CHAPTER III: CONNECTING THEORY AND PRACTICE

A. The Elusive Connection

This chapter looks at one of the essential problems within the field of curriculum study, bridging the gap between ideas and actions, between theory and practice. Set out in this chapter is the interplay of the theoretical and practical components which have been an integral part of the research described in this thesis. First, consideration is given to some of the general problems which arise in applying theory to classroom learning. Second, the traditional theoretical model for curriculum and instruction, based on the Tyler Rationale, which has dominated educational practice in North America for the last half century is examined, as well as the critical theory which has evolved in response and reaction to this model. Third, alternate theoretical and practical models for curriculum development and instruction are put forward. Finally, this chapter reflects on what has been learned as a result in the Digital Arts curriculum development project at West Kildonan Collegiate as a result of the merging of educational theory with classroom practice.

Stenhouse has commented: "I believe that our educational realities seldom confirm our educational intentions" [Stenhouse 1975, p. 2]. "Students in training (for teaching) often notice a gap between educationalists and the school not unlike that between Haig's headquarters and the mud in Flanders" [Ibid, p. 3]. Vast gaps between

theory and practice have also been an essential feature of this action research project. Moving forward and problem solving has required a continual interaction between these two elements. The experimental nature of the research and program development, described in Section I of this thesis, has required the forging of many new connections between people, ideas, classroom practice and technology. While the open-ended planning strategies used in the Digital Arts program allowed for a high degree of flexibility, they also added greatly to complexity in associating theoretical ideas with classroom practice.

Schwab [in Westbury & Wilkof (eds.) 1978 pp. 322-325] has offered the following explanation for problems such as these. Theory and practice are diametrically opposed phenomena. Theory derives its importance from its ability to generalize, systematize, and simplify. Practice, on the other hand, is defined by concrete, particular and often complex situations. Theoretical perception looks at the common elements among a range of situations and is " based on a few principles of focus and a large undifferentiated mass of background", while practical perception is centered on the unique, the individual and "revers(es) the process with undifferentiated mass brought to the fore" [Ibid, p. 325]. Thus, in Schwab's view, connecting theory and practice involves the bringing together of two highly contradictory phenomena. Combining theory and practice necessitates a series of delicate maneuvers, deciding what is to be included and what is to be excluded and basing these decisions both on careful attention to the practical context and "eclectic" applications of theory. For Schwab the act of connecting theory and the practice requires such a high degree of adaptability that it is as much as an art as it is a science.³⁵

A central feature of this research has been an eclectic application of educational theory to classroom practice. Theory is a critical component in this. The curriculum field in education represents a broad area of inquiry and an equally broad spectrum of theory, including images of curriculum as: course content, a planned sequence of activities, intended learning outcomes, cultural reproduction, personal experience, discrete tasks which can be measured by standardized tests, social reconstruction, and currere³⁶ [Schubert 1986, pp. 26-33]. The curriculum field also encompasses discussions of the philosophical, cultural and physiological foundations for learning, curriculum design, curriculum construction, curriculum

<u>development</u>, curriculum implementation or more generally ^{35.} Schwab's art of the eclectic is also based on the assumption that "Teaching which is coherent with theory often misses the practical mark" [Westbury and Wilkolf (eds.) 1978. p. 322]. This is "partly inherent in practical problem solving because there is no end..... partly due to the fact that theories of curriculum alone cannot tell us what or how to teach- these come out of concrete situations of: time, place, person and circumstance" [Ibid]. Thus Schwab's eclectic arts focus on " the capacity to match (and)... to adapt theoretical or disciplinary knowledge and perspectives to situational needs or interests, ...and the capacity to generate alternative courses of action and to anticipate the consequences of such action for moral good" [Schubert 1986, p. 297].

^{36.} Currere is a term used William Pinar [1981, p. 436] to describe a style of curriculum development and learning which is highly personal and autobiographical in nature and where learning is accomplished by individuals through personal acts of creating and recreating their own meaning.

curriculum engineering [Zais 1976, pp. 15-18].

An important debate within the curriculum field arises out of these broad ranging and often conflicting images and discussions. Should the curriculum process be one of cultural reproduction, of holding the status quo or should the curriculum process promote a fine tuning of the educational system through a slow series of curriculum reforms? Or, would the interests of curriculum reform best be served by more radical and far reaching innovations?³⁷

Both the pilot and the Digital Arts phases of this action research were aimed at addressing some of the basic weaknesses in traditional models of cultural reproduction in the creative arts. These weaknesses first appeared to the author in the early eighties while working in a practical context as an elementary music specialist at James Nisbet Community School, Seven Oaks School Division, Winnipeg, Manitoba. Many of the classroom teachers on the staff of the school were themselves active learners, constantly evaluating, retraining and upgrading their own skills. Across the spectrum of levels K-6, much time was devoted in Nisbet classrooms to concrete, "hands-on", creative activities which directly engaged students and which also 37. Zais [1976] has pointed out that the terms "improvement, change and revision "are often used interchangeably in the curriculum literature when in fact they are quite different entities. Taba [1962 p. 454 in Zais 1976 p. 19] has described curriculum improvement as "changing certain aspects of the curriculum without changing fundamental conceptions of it or its organization", while curriculum change relates to transforming "the entire curriculum scheme, including design, goals, content, learning activities, scope ...(and) value assumptions"

encouraged personal expression. Integrated, whole language, and interdisciplinary models for learning were common practice. For example, a level two mathematics lesson on fractions might involve baking cookies or a level six French lesson might approach the study the French Canadian culture through a day at Festival de Voyageur. Many of these teachers had confidence in their abilities to analyse problems, seek alternative methods and modify these methods to suit their students' interests and styles of learning. Problem solving was often approached in a collaborative manner between teachers and students and between teachers and their colleagues. Within this environment, a great deal of sharing of ideas, activities and theories of learning occurred. As a part of this staff, the author was frequently called upon to connect music activities with classroom themes and projects. It was during this time that many of the founding ideas for the Elwick pilot projects began to emerge.

What became apparent to the author while teaching at James Nisbet, was the great discrepancy between the models of learning being employed by teaching colleagues in the regular classroom and those prescribed within the elementary music curriculum.³⁸ It is the argument of this thesis that the traditional model for music instruction described herein can be closely associated with what is often referred to in curriculum theory as the Tyler Rationale. This chapter explores this model and some of the criticisms which have ^{38.} The traditional model for music instruction is addressed on pages 6-11.
been levelled against this vision of curriculum. These criticisms provide a basis for considering some of the alternate perspectives which have grown up since the Tyler Rationale was first published in $1949.^{39}$

B. CULTURAL REPRODUCTION AND THE TYLER RATIONALE

1. The Tyler Rationale

One can not help, upon reading Tyler's <u>Basic Principles of Curriculum</u> <u>and Instruction</u>, being struck by how current these forty-five year old ideas are and how they are still at the center of present debates on defining and reforming curriculum, particularly at the high school level. The original intent behind Tyler's 1949 Rationale was to outline the basic issues in the field of curriculum and instruction for his class at the University of Chicago. [Schubert 1986, p. 171]. According to a 1980 interview with Tyler, he "openly acknowledged that his 1949 rationale was an attempt to summarize and synthesize what had been said earlier by other curriculum writers such as Franklin W. Bobbitt,

W.W. Charters, John Dewey, Boyd H. Bode, Harold Rugg and Henry ^{39.} Jurgen Habermas [1971] has described three trends or paradigms within current theories of knowledge: (1) the empirical/analytical (technical), (2) the hermeneutic (practical) and (3) the critical (emancipatory) [in Schubert 1986, p. 181]. The traditional models for instruction such as the Tyler Rationale are associated with the empirical/ analytical, while the work of Schwab is focused on the practical, and the work of Kliebard, Mann, Zais, Eisner, Pinar, Greene, Grumet, Apple, Giroux is centered on the critical. This thesis is concerned with all three of these paradigms, in particular, using the practical and critical paradigms as a basis for developing substantive curriculum changes which move far beyond the empirical/analytical modes of instruction. Harap" [Ibid p. 172]. The underlying goal of Tyler's Rationale devising a common ground among many widely varying educational views of the late 1940s and the result of his theorizing was a very eclectic compromise.

Tyler's views were elaborated through the perspectives of four questions:

"1. What educational purposes should the school seek to attain?

2. What educational experiences can be provided that are likely to attain these purposes?

3. How can educational experiences be effectively organized?

4. How can we determine whether these purposes are attained?" [Tyler, 1949, p. 1]. Thus, objectives, experiences, organization and evaluation were presented as four underlying principles for connecting curriculum content with methods of instruction.

Despite its influence, Tyler's approach has drawn criticism over the years from two sources: one, consisting of criticisms arising directly from Tyler's writing and two, criticisms arising as a result of subsequent applications of Tyler's model.

2. Tyler and His Critics

Since 1949, Tyler's ideas have been the source of considerable controversy and debate within the field of curriculum study. Herbert

Kliebard [1970]⁴⁰ pointed out that Tyler's work represented a compromise position between competing perspectives within the academic community. In Kliebard's opinion, Tyler's process of simplifying and accommodating has led to some serious flaws and omissions. Kliebard has found himself at odds with Tyler's vision of the educational process. For Kliebard, the generalized nature of Tyler's model has left many social agendas hidden" or treated them as simply "and/or" propositions.

According to Tyler, "(e)ducation is a process of changing the behavior patterns of people... including thinking and feeling as well as overt action" [Tyler, 1949, pp. 5-6]. These changes were to be initiated in Tyler's view by educators through a series of rational scientific procedures for identifying and working on a wide range of social and personal needs. In turn these needs were to be measured against some preexisting psychological, academic and moral standards [Tyler, 1949, p. 7]. The gap between perceived needs and "acceptable norms" [Ibid p. 6] was Tyler's basis for emphasizing teacher initiated learning objectives.

It was Kleibard's contention that the selecting of learning objectives is, in practice, a far cry from the abstract and neutral procedure 40 Herbert Kliebard [1970] has offered, in this author's opinion, one of the most convincing and thorough critiques of the Tyler Rationale both as a philosophical document and as basis for program implementation within the American educational system over a twenty year period, including 1948 to 1970. For this reason, Kliebard's arguments are used extensively in this section of this thesis.

described by Tyler. To support his position, Kliebard offered this quote from Bode that "no scientific analysis known to man can determine the desirability or the need of anything" [Bode, 1927, pp. 80-81 in Kliebard, 1978, p. 265]. Needs, in Bode's view are defined by the community and are therefore highly subjective phenomena.

Kliebard has charged that Tyler has used "eclecticism to blunt criticism" and has "appeal(ed) to philosophy as a means for covering any deficiencies" [Kliebard, 1978, p. 266]. Tyler's treatment of the term philosophy gave it an aura of "objective unity". Further, Tyler advocated that philosophy was to act as a neutral filter for selecting objectives. The point raised by Kliebard was that philosophy is neither totally objective nor unity and consequently decisions must be made as to whose philosophy is be the basis for establishing "acceptable norms" and how objectives are be measured against these norms. "(I)t makes all the difference in the world what one's guiding philosophy is since that consistency can be measured as a sin or a virtue" [Ibid p. 267]. Kliebard thus charged that the wide acceptance of Tyler's ideas has rested more on their generic nature and less on conveying the kind of substantive content and issues required for developing curriculum. Thus what Kliebard has pointed out is that while eclecticism is an important dimension of developing theory, eclecticism on its own is not enough. Theoretical development requires close scrutiny and interaction with to the practical and moral dimensions of its application. As well and perhaps the most importantly, Kliebard has

denied that the role of curriculum development can ever be scientifically "neutral" as Tyler's model suggests. Curriculum development is grounded in the social and political realities of the communities in which it occurs.

C. Applications of the Tyler Model

The Tyler Rationale has proved itself to be one of the truly educationally resonant theories of this century. This has been due to three main factors.⁴¹ First, Tyler was able to process and simplify a large body of ideas into a form which was easily understood and applied to a wide range of educational activities by curriculum experts and classroom teachers alike. Second, subsequent to this 1949 publication, Tyler's Rationale took on a cultural life far beyond that which the author have initially envisioned. During the 1950s and 1960s, Tyler's four principles were adopted by researchers in the behavioral sciences. Later, in the 1960s and 1970s, these principles were used as a basis for educational reform in the United States in such programs as the Great Society, Head Start, Follow Through and Upward Bound. Third, the Tyler Rationale had a very powerful appeal to "common-sense" with its model of first describe what you want to accomplish; then work out how you will do it; and finally assess how scientific you. It's a common-sense model of personal decision-making applied to curriculum development.

^{41.} This paragraph relies heavily on information from Schubert 1986, pp. 172-3.

In fact, the application of the Tyler Rationale within the domain of behavioralist educational practice often diverged from Tyler's original intent. Tyler stated in the concluding paragraph of <u>Basic Principles of Curriculum and Instruction</u> that the development and employment of objectives, experiences, organization and evaluation was not meant to be a rigidly sequential formula rule process: "The purpose of the rationale is to give a view of the elements that are involved in a program of instruction and their necessary interrelations. The program may be improved by attacks beginning at any point, providing the resulting modifications are followed through the related elements until eventually all aspects of the curriculum have been studied and revised" [Tyler 1949 p. 128].

Yet, in spite of Tyler's intentions, his model has often come to be associated with rigid, top down, expert driven models which have strongly influenced educational practice in the last half of this century in North America. Where Tyler advocated some flexibility in making curriculum decisions, later applications of his model were aimed at rigid courses of action within a given academic discipline. "In discussions with Tyler on this matter, he emphasized that his categories are intended to be analytic topics and not necessarily prescriptive" [Schubert 1986 p. 189]. Yet, many of the subsequent applications of Tyler's model have been highly prescriptive. For example, it can be argued that the highly prescriptive work of such social behaviorists as Bloom [1956] and Pratt [1980] are a direct

outgrowth of the Tyler Rationale. "Bloom offered a taxonomic approach to the statement of learning objectives and an account of mastery learning that clearly aspires to scientific status, while Pratt [1980] draws on systems theory and explicitly describes curriculum planning as a form of engineering" [Reid 1993, p. 503].

Several other critical observations have been put forward against the applications of the Tyler Rationale from such theorists as John Steven Mann [1968], Robert Zais [1976], Elliot Eisner[1979] and Herbert Kliebard [1970]. Mann has argued that "(w)hile the assumptions embodied in the "Tyler Rationale" ...have contributed some orderliness to curriculum practice, they have not been especially fruitful in generating new areas of inquiry" [Mann 1968, p. 363]. The apparent neutrality of this model has lent it an aspect of internal completeness which has not served to develop curriculum as a field of study, but rather, the Tyler model has served the function of cultural reproduction, of preserving the status quo. Thus, over the last half century, Tyler's model has come to be associated with traditional, top down, and prescriptive teaching practices. New areas of inquiry when they have arisen have done so outside of and in direct opposition to the traditional teaching practices.⁴²

 $^{42.}$ As stated in footnote 35, these new areas of inquiry specifically include: Schwab's practical perspective, where practical considerations are given precedence over the theoretical and theory is viewed as a highly flexible tool for practical curriculum development; and the critical perspective which views curriculum development as a continuous evolutionary process toward increasingly democratic and liberating educational goals.

Robert Zais has commented on the enduring stability of the traditional teaching practices which have grown up around Tyler's model: "It is not surprising, therefore to find curriculum change, when it does occur, usually occurs only very gradually, and in response to historical circumstances. It is rare that wide spread, significant and lasting change has been brought about as a direct result of the efforts of professional educators. Attempts to change the curriculum are almost always vehemently resisted and individuals who engage in curriculum change should expect to assume the risks that accompany any attempt to reorder the society and its value structure" [Zais, 1976 p. 19]. The overall effect of the Tyler model on curriculum practice has been one of perpetuating and reinforcing a series of cultural practices by presenting these practices to the educational community in a factual apolitical manner. The goal in such a system is transmission and reproduction of ideas and not the development and growth of personal and collective creative expression. In effect, the process of curriculum development, when it incorporates elements of change, is a very political and often messy process and not the clean, clear-cut process that is suggested in the Tyler model.

Elliot Eisner has argued that traditional teaching practices tend to promote very narrow social and academic perspectives. For Einser⁴³, "the consequences of the behavioralist, positivist and scientific traditions" which have grown out of Tyler's model have been: (1) to dismiss problems that are not readily solvable in this mode as ^{43.} This paragraph relies heavily on information from Einser [1979, pp. 15-16].

"intellectually ill-conceived", (2) to focus on matters of management and control, (3) to be preoccupied with individual results from standardized testing, and statistical evaluation of test scores, (4) to ignore the role that students could play "in the creation of (their) own educational program(s)", (5) "to break up complex tasks into small" disconnected "microunits...and in the process render much of the curriculum meaningless to children", (6) to portray research as a "humorless", "dispassionate" and "devoid of the playfulness and artistry that is so essential to teaching and learning". Eisner has supported Schwab's view of importance of the artistic dimensions of learning with his concept of expressive objectives [Eisner 1979]. Through expressive objectives, Eisner has advocated the importance for other kinds of objectives within the curriculum; those which have no specific or intended outcomes and which are instead open-ended. personal and exploratory in nature [Schubert 1986, p. 194]. These expressive objectives provide students with critical avenues for personal and social development.⁴⁴

Kliebard [1970] has also critiqued the applications of the Tyler Rationale as providing only an abstract framework for curriculum and instruction which, in turn, has tended to promote highly decontextualized styles of learning. Planned objectives have become in practice the basis for evaluating outcomes and an effective means of ^{44.} "The best of science, language and social interaction is sparked by artistic vision. Curriculum content needs to be revitalized with an artistic spirit that beckons students to create life for themselves and an environment to live it in" [Schubert 1986 on Einser p. 228]. product control. Kliebard illustrated the difficulties of proposing that the objectives are also the ends. In practical terms, ends arise in the course of activity. "If ends arise only within an activity it is not clear how one can state objectives before the learning activity begins." [Kliebard 1970, p. 268]. Therefore, a learning process which only recognizes planned objectives as legitimate outcomes will miss "the most important consequences" of learning. [Ibid].⁴⁵ To Kliebard's way of thinking, such a mode of instruction which is programmed to exclude some of the most important dimensions and realities of learning, produces an educational factory [Ibid 1978, p. 270].

Decker T. Walker has offered another criticism of the Tyler model. Walker [1971] argues that curriculum development and implementation is not a straight ahead four step process of setting goals, planning, sequencing, and evaluating learning experiences carried out by a single researcher. In practice, the process for curriculum development and implementation has not been a unified or continuous one. Historically, developing and implementing curriculum have been carried out by different groups of people, who have not always sharing the same realities or the same goals. Curriculum development has traditionally been carried out by academic and

administrative committees while curriculum implementation, for the ⁴⁵. Kliebard [1970, p. 268] supports this view with this quote from [Dewey 1922, p. 233] "Ends arise and function within action. They are not, as current theories too often imply, things lying outside activity at which the latter is directed. They are not ends or termini of action at all. They are terminals of deliberation, and so turning points in activity".

most part, has been left to teachers and students. According to Walker, the homogeneous, abstract, intellectual and scientific approach which Tyler has put forward doesn't match the complex array of human realities involved in the curriculum process. The complexity of much of the problem solving which surrounds the curriculum process is compounded by the broad network of social factors which surround the whole curriculum process. It is Walker's view that the curriculum process would be better served by more naturalistic or qualitative forms of research which were cognizant of the situational diversity. According to Walker, the isolating techniques of reductionism (quantitative empirical research techniques) are inadequate: learning and the curriculum which promotes it must be viewed as part of a larger social situation and results produced by a broader interplay of factors. Thus, for Walker, it is more advantageous to approach the curriculum research process by "think(ing) of complex situations leading to other complex situations rather than isolated causes leading to isolated results" [Walker 1981, p. 291].

D. Reconceptualizing The Production Model of Learning

In response to the traditional, efficiency based, factory models for learning, Michael Apple [1990] has said, " I cannot accept a society in which more than one in every five children are born into poverty, a condition that is worsening every day. Nor can I accept as legitimate a definition of education in which our task is to prepare students to function easily in the" business" of that society. A nation is not a firm. School is not part of that firm, effectively churning out the "human capital" required to run it. We do damage to our very sense of the common good to even think of the human drama of education in these terms. It is demeaning to us as teachers and it creates a schooling process that remains unconnected to the lives of most students" [Apple 1990, p. xiv]. In Apple's view, the production model of learning offers an analogy inappropriate to the activities of developing and initiating curriculum. Shrouded in a cloak of abstract functionalism, the production model masks the highly subjective and political nature of the educational reform.

Michael Apple has been part of a movement in educational theorizing aimed at reconceptualizing curriculum and its role within society. This movement began in the mid-seventies with the writings of a very eclectic group of educational theorists which included Williams Pinar, Henry Giroux, Madeleine Grumet, Maxine Greene, James MacDonald, Dwayne Heubner, John Mann, Ross Mooney, Paul Klor, Ted Aoki, and Paulo Freire [Schubert, 1986, p 176]. Their ranks were made up of Marxist, feminists, phenomenologists, existentialists and postmodernists. In spite of this wide diversity in personal outlooks, Paul Klor [1980, p. 3] noted nine views commonly held by this group of theorists: (1) a holistic or ecological view of the interdependence between humans and their environment, (2) an evolutionary view of human culture within which individuals should be given the

opportunity to build their own knowledge and to contribute to this process of cultural development, (3) a view of personal knowledge as directly related to personal experience and the development of knowledge for each individual as a unique and autobiographical synthesis of experience, (4) a view of human experience as based in both conscious and subconscious or unconscious thought, (5) an openended approach to theorizing including existentialism, phenomenology, radical psychoanalysis, critical theory from the fields of sociology, anthropology and political science (6) a view of personal liberty as reflecting not only in actual or legal freedoms but also in personal awareness or "heighten consciousness" (7) a view of the end and the means in human action as interconnected phenomena and encompassing diversity, pluralism and many ways of knowing, (8) a preference for a more democratic society to be achieved through an emancipatory curriculum, (9) a need for a new language of learning to replace the languages of control and dominance present in traditional learning systems, "new languages forms...generated to translate fresh meaning, for example, metaphors" [Ibid, p. 4].

What William Pinar and the other reconceptualists effectively promoted was a renewed discussion and interest in reformulating the traditional model of learning through research and critical theorizing. This line of inquiry brought to the fore issues of inequality and human rights within the curriculum and was centered on critiquing and revising discriminatory practices involving gender, race, class and physical and mental ability.

Such researchers as Jean Anyon[1981] and more recently Jonathon Kozol [1991] have highlighted the disparate quality and style of education offered to students in lower socio-economic communities as compared with those in upper socio-economic communities. According to Kozol and Anyon, these discrepancies arise out of: (1) the unequal tax bases between communities with lower levels of effective funding for poor communities and (2) the unequal teaching and curriculum opportunities between rich and poor communities with the poor receiving more authoritarian, highly teacher directed learning experiences.

Recently, such researchers as Sherry Turkle and Seymour Papert [1990] have explored the discriminatory gender practices common to the fields of science, engineering and computing. These areas tend to be dominated by "highly abstract and rule driven" courses of study which are "associated with elitism and power and with the construction of science and objectivity as male" [Turkle and Papert 1990. p. 345].⁴⁶ The consequence is that few women succeed in these areas. Turkle and Papert equate the abstract and objective with a "hard" approach to curriculum which they claim is foreign to the thinking and problem solving processes of most women. They advocate a more concrete or "soft" approach, which is "flexible and ⁴⁶. Also see Gilligan and Noddings pp. 172-175 of this thesis for other views on feminist perspective in curriculum development and implementation process.

non-hierarchical, open to the experience of a close connection with the object of study"[Ibid, p. 346], as a highly legitimate mode of inquiry and as well more closely mirroring female thinking patterns.

Practices of age and ability tracking have been common to traditional systems of learning. The effect of this process has, in the opinion of such educators as Jeannie Oakes [1992], resulted in educational systems which are discriminatory and non-democratic. According to Oakes, tracking policies lead to inflexibility where students get stuck within a stream and are unable to alter the course of their academic experience. Judgements about intelligence are made about students through standardized testing that become entrenched and widely known within the school system. The effect is that hierarchical systems are set up within the school system which are based solely on academic achievement and often do not reflect the actual or potential artistic and social development of students.

McNeil [1986,1988] has similarly critiqued top down, traditional styles of education as leading to defensive teaching strategies on the part of the teachers. Traditional systems are centered on managerial styles of administration where the main goal is to effect a smoothly running educational operation. Teachers within this system are strongly encouraged to hold the status quo and maintain rigid classroom control. Knowledge in this traditional system becomes a form of control and, according to McNeil, teachers exercise this control through such curriculum practices as: (1) fragmentation-

limiting topics of study to lists of names and dates as a means of avoiding controversial issues [McNeil, 1986, p. 167]; (2) mystificationpresenting complex issues as unknowable, presented only as a series of terms or definitions given by the teacher in the form of notes for students copy down without encouraging students to think about or to interact with the material [Ibid, p. 169]; (3) omission- representing topics only from one point of view when many real life issues reflect in fact many perspectives [Ibid, p. 171]; (4) defensive simplificationoffering a standard motivation to students to keep things simple "it will not be difficult and will not go into any depth" [McNeil, 1986, p. 174]. McNeil describes the overall effect of this type of education as "exacerbating the split between personal and institutional knowledge"[Ibid p. 190]. What is taught in schools fails to connect with the personal experience of those involved. Both teachers and students are affected because neither are encouraged to incorporate their best knowledge into classroom activities. In McNeil's view the resolution of this conflict is central to the credibility and agency of the school as a progressive social force within society. Curriculum and classroom experience must connect with the best knowledge which both teachers and students bring to the classroom. This can only be done in learning environments where teachers and students have some power to incorporate their own knowledge and learning agendas into institutional practice.

Apple claims that the resurgence of conservative positions that developed in the 1980s in the United States is an attempt to regain...the power that was threatened by women, people of color and others... to regain a lost consensus over what counts as legitimate knowledge" [Apple 1990, p.xii]. "The current call to "return" to a "common culture" in which all students are given the values of a specific group- usually the dominant group- does not to my mind concern a common culture at all" [Ibid, p. xiii] This approach to educational reform is, to Apple's way of thinking, superficial and nondemocratic because it implies the setting aside the moral values for respecting and promoting cultural and personal diversity and as a consequence, ignoring the highly multi-ethnic fabric of North American society.

The reconceptualist perspective has thus provided a theoretical platform for addressing issues of gender, race, class, physical and mental ability, often ignored in older models of curriculum theorizing. Four concepts which have grown out of the work of the reconceptualists have had particular relevance to this Digital Arts research. First, knowledge is not a commodity to be simply transmitted from educators to students. Instead knowledge is process of personal construction and reconstruction. For learning to occur, it must connect with personal experience. Second, in keeping with the holistic or ecological view of curriculum development is the importance of community to the process of effective and democratic curriculum reform. This includes students, teachers, parents, administrators, politicians and the community at large [Lieberman and Miller 1990]. Third, the methods for developing curriculum which have been put forward by the reconceptualists and many subsequent critical theorists who have followed them emphasize the importance of action and ethnographic kinds of research [Klor 1980. p. 6]. Fourth, the process of linking theory and practice in the reconceptualist vision is grounded in the concrete. In this case, theory becomes an ever evolving phenomenon which must be sensitively interrelated with practical classroom learning.

E. Action Research And Program Development

Action research has been an integral part of the West Kildonan Digital Arts Project. "The linking of the terms action and research highlights the essential feature of this method: trying out ideas in practice as a means of improvement and as a means increasing knowledge about the curriculum, teaching, and learning...Action research provides a way of working which links theory and practice into one whole: ideas-in action" [Kemmis and Mc Taggart (1982) p. 5].

It has been frequently argued that educational research has had little to say directly to teachers. It has focused on large-scale samples, quasi-experimental design and broad questions of policy which have been difficult to apply at the level of specific classrooms. In fact, educational research has often served to disempower teachers, not least by forcing them to adopt practices which they did not understand and for which they were badly prepared to teach. In recent years, therefore, an alternate model of educational research has emerged, stressing Stenhouse's concept of "the teacher as researcher" [Stenhouse 1975]. In this approach, research is conducted by the teachers themselves, using problems which they find personally meaningful and important. Such research is usually qualitative rather than quantitative, small-scale rather than large-scale and experiential rather than social-scientific.

Action research provided the cooperating teachers in the Digital Arts project with a platform for a more democratic approach to curriculum reform because it placed students, teachers and administrators at the center of both development and implementation stages of this process. As well, action research encompassed many important realities of an innovative and empowering learning process. In the practical context of every day classrooms, those teachers who strive to improve the methods by which they connect learning activities with their own personal experiences and those of the students which they teach, are constantly required to interact in a unending flow of adaptation and change. Research is an important dimension of what good teachers already do within the school community; that being the constant searching out of new pathways along which to explore and develop knowledge. This involves discovering new ways of communicating and collaborating more sensitively with their students. Action research provides a important means for acknowledging, legitimizing and supporting the research that good teachers are already doing on an everyday basis within their classrooms.

Between 1988 and 1992, the focus in the Digital Arts project was on course based and classroom based curriculum development. It was done by two teachers working with students and administrators both at the school and divisional levels. This action research arose out of problems and issues which were initially identified by teachers but over time technical, theoretical, practical input came from many different sources.

The teachers took most direct responsibility for the curriculum development and implementation process. In the early stages of this project Clark and Williams learned to survive by viewing curriculum elaboration as a problem solving process which would generate a wide range of questions and issues. Over time, we also learned to evaluate problems in terms of long term, and short term solvability. While some problems could be dealt with quickly via technical adjustments or personal intervention, the answers to other more complex problems were unravelled bit by bit, one step at a time. Each step in this process necessitated a close interaction between theory and practice. The research described in this document has necessitated a continuous process of elaborating and extending a critical thinking space in order to develop the kind of flexibility to meet the constant parade of challenges that linking of new curriculum to student activity requires. The West Kildonan Digital Arts Project has exemplified many aspects of the method described in the action research literature by such theorists as Kemmis & McTaggart [1982], Carr [1986], Elliot [1988] and Walker[1985]. The strategies employed by teachers in this project are most closely reflected in this definition offered by Davis (1985).

" The process of Action Research is an interplay of:

- defining focus questions or issues
- theorizing and reflecting
- observing
- seeking and receiving feedback
- planning
- acting

in a pattern suited to your situation with the intention of understanding and changing your practice and/or content" [Ibid, p. 5].

While the Digital Arts project included all of the elements described by Davis, the sequencing of these elements occurred in a more flexible and non-linear manner. The activities of observing, formulating, reflecting, theorizing and seeking and receiving feedback tended to characterize early or initial phases of the curriculum development process described in this thesis. In the initial phases, problems, as they arose, were given open and careful consideration. Especially in

the case of complex problem solving situations,⁴⁷ this considering process was not a linear one and often involved defining a problem, reflecting, discussing, reading, personal and team theorizing, seeking and receiving feedback from students, administrator and experts in the area of digital technologies, which often led to a reformulation of the original problem and further reflection, discussion, reading and theorizing. This reformulation process has been, in the experience of Clark and this author, most critical to the problem solving process. If a problem is defined at face value from a given learning environment, it is often formulated within a conceptual framework which may be itself the source of the problem and as such may not provide the solution. Solutions to complex problems most frequently entail a period of moving out of or beyond a particular conceptual framework in order to find a fresh perspective(s) through which to move the problem forward. Thus action research, in its primary stages was a complex, highly flexible process of interlinking discussion, reading, personal and team theorizing and writing. This is where a team approach to curriculum development can be most powerful. In a core of interested and dedicated teachers, administrators and students working on a given problem, each of these people brings a wealth of personal experience, as well as the personal momentum of his/her own learning process to bear on the problem under consideration. Two teachers, Clark and this author, and three administrators, Stefanchuk, Saleski and Wiens, reading in many different directions and sharing

^{47.} One such problem which has received continuous consideration has been how to set up the Digital Arts Lab and all of the equipment in it for optimal accessibility, flexibility and to meet hanging program needs. Another complex problem which was the center of research over a five year period was that of multimedia composing.

their ideas, as well as students who willingly spent many extra hours working with the computers and video equipment to develop their ideas, formed the basis of a fairly effective problem solving team.

The final two stages described by Davis in the action research process, planning and acting, occurred in the Digital Arts project after many perspectives had been generated and considered. In turn, once the planning and the acting had been accomplished, these activities did not always produce absolute solutions but more often served to provide insights into a more extended and ongoing problem solving process. Given that these Digital Arts courses were taught between 1988 and 1992, many times to many different students, solutions to problem solving often had a short term direct applicability. Students with a wide range of ability and interests as they defined the projects were constantly challenging teachers to move in new directions.

The West Kildonan Digital Arts Project has not been one action research project, but rather a long series of projects which have resulted in three school initiated courses: Multi Media Ensemble, Digital Arts, and Music and Video Production. Between 1988 and 1992, three levels of each of theses courses 105, 205 and 305 were offered at West Kildonan Collegiate. The methodological and philosophical basis for this course development process has been very eclectic and cross-disciplinary. It has covered the gambit of theories of personal and cultural knowledge which include: art, science, anthropology, psychology, philosophy, politics, education, sociology, media and communication, aesthetics to name a few. Reporting on this program has been done in the forum of formal research work for Seven Oaks School Division, Apple Canada and in a more informal context of divisional and cross-divisional workshops and presentations in which students and their work have been a key element. As stated in the previous chapter this process of documentation has played an important role in the reflective processes of the cooperating teachers. It is through this writing that teachers were able to define and clarify conceptual frameworks and to communicate these ideas to the community at large. ⁴⁸

One distinctive feature of this project has been the particularly steep learning curve which has been required of both students and teachers. Actually doing and/or facilitating multimedia production requires a wide range of technical and personal know how. Further we were implementing a combination of strategies with this technology for which there were few or no precedents. Where technical problems were concerned, we were able to develop close relationships with some of the local equipment dealers which helped to ease us over a few of the rough spots.

Other distinctive features of this project have been the broad scope of the changes that were being implemented and the large capital expenditures which went into setting up this project. The direct consequences of these two elements were that it gave a much higher

^{48.} See APPENDIX II which outlines these documents.

social profile to the project within the community and placed even greater responsibility for accountability on all those students, teachers and administrator involved. It is to the division's credit that a flexible, teacher-based style of research was promoted and strongly supported by both the board and the superintendents. The very act of conducting such a large scale, capital intensive innovative project was in itself another action research project on the part of the board and the superintendents.

Of the curriculum images described on page 88, in the opinion of this research, the image which can be most closely be associated with this Digital Arts action research is the Pinar's image [1981] of curriculum as currere. The case study elaborated in this thesis has represents ten years of creating and recreating a new for vision of creative, artistic expression. This research views curriculum as a process of acting and not as a rigidly sequenced plan for instruction. In this process, action research has itself become a form of curriculum.

F. Lessons Learned From The Digital Arts Courses And Programming In General

This research began by arguing that not all artistic behavior is highly expressive and that traditional music instruction omits consideration of highly original and creative behavior in favor of strict protocols for re-creation and reproduction of the works of the great masters. Over the last decade, this research has sought out ways to introduce empowering strategies for learning and creative expression into creative arts programming. This has involved envisioning musical creativity as part of a broader interdisciplinary sphere of creative expression which has ultimately led to the exploration and incorporation of MMC techniques. MMC is by its very nature a interdisciplinary tool. It is the opinion of this research that MMC has the potential to be a very powerful research tool for a future generation of computer based researchers.

As Eisner [1982] has pointed out, the kinds of flexible, expressive behaviors which have typically been associated with the arts are increasingly being recognized as having resemblance to techniques used by creative problem solvers across many disciplines. Schubert [1986, p. 228] has described this view of curriculum in the following manner. Expressive behavior is not separate from the kinds of thinking upon which curriculum ought to be based. Instead, expressive behavior is an integral part of the pedagogical and developmental process. "The best of science, language, and social interaction is sparked by artistic vision. Curriculum content needs to be revitalized with an artistic spirit that beckons students to create a life for themselves and an environment to live it in" [Ibid].

In order to change radically a model for classroom interaction from a top down to a collaborative one, it is first necessary to change the social structures within which these interactions occur and then to change the subsequent processes for learning and expression. In the

context of this research, this has meant changing how: (1) research is conducted in the classroom, (2) information is collected and stored, (3) ideas are developed and presented. This also entailed altering the social structures within the classroom and the surrounding community. In essence, it was first necessary to alter the dynamics of how learning was to be accomplished before approaching the questions of what was to be accomplished.

Cuban [1988, p. 95] portrays the process of curriculum reform as a multi-level phenomenon including "first order reforms" and "second order reforms". Reforms of the first order are centered on "improving quality control" and involve increased expenditures, "new curriculum, higher standards for teachers, longer school days, more and better evaluation tools, efficient schedules, after school programs, career ladders and merit pay for teachers, better texts and smaller classes" [Ibid]. Second order changes require "altering the design of school" and encompass fundamental structural changes such as non-graded schools, open classrooms, vouchers, community-run schools, teacherrun schools, school based management, no attendance boundaries, open space schools" [Ibid].

This project has been concerned with both types of reform. Using Cuban's line of analysis, it was discovered over the course of this project that second order changes were fundamental to the development of significant first order changes. This research acknowledges that the technique of MMC is in itself a first order

change whose development was based on a strong base of second order reform, community based support. In other words, the development of a new approach in the Digital Arts required, first and foremost, a change in the social structures surrounding these programs. This was accomplished in the following manner.

First a community of students, teachers, parents, administrators and school board members grew up over time who shared the view that the creative arts programs should include creative personal and collective expression and that they should be closely connected to the learning space of the individual and to the best knowledge of the students, teachers and local community. In order for this to occur, local autonomy over curriculum development was required. It was through the vehicle of school initiated courses, that the programs described in this document came about.

Second, the roles of the teachers, students, administrators, and board members, within this milieu were shifted. Through this research it has been observed that empowerment is a two way street. It relies as much on giving power as it does in receiving power. Administrators and school board members supported a school based decision making model for curriculum development by actively creating policies to promote this position, providing funding and an on-going, high level of interest in this project. Both Board members and administrators took power and gave power over curriculum. Third, the teachers' function changed from administering top down curriculum structures to one of promoting the delicate balance between providing the right combination structure and freedom for creative expression. Encouraging creative research and expression required a balance of conceptual structure and personal choice. An essential component in defining this balance was a strong open line of communication between teachers and students and the community. Clear conceptual structures like those provided in exemplars described in Chapter I have given students and teachers useful platforms for operation, a consistent point of reference, basic skills, and helped to indicate some possible and appropriate courses for action.

Fourth, in direct contrast to the rigid conceptual structures embodied in traditional forms of music instruction, these conceptual structures described in this thesis were viewed as evolving. Students and teachers have been able to interact with these structures in a flexible manner, shaping and molding them to suit the flow of their ideas, the classroom context, and the intended audience. Through these flexible structures, students and teachers were able to incorporate their own experiential and creative knowledge.

The outcome of this process has been that students and teachers have learned to set their own learning objectives, develop and present their own ideas, and provide support and encourage those working within the classroom. In order for students and teachers to begin to be empowered, they were first given the power to make choices and to implement changes. In turn, both students and teachers provided each other with a flexible context for making choices, and for acting on those choices.

Multimedia composition (MMC) techniques have demonstrated to those involved in this project that composition is not just an artistic musical pursuit but it is a process which can engage many ways of knowing through the combination of a wide range of media. The incorporation of MMC into the Digital Arts programs has given prominence to a wider spectrum of creative venues (sound design, music composition, graphic design, animation, audio and video production) and provided many more ways for students and teachers to participate actively within the community of the school.

Finally, it is the argument of this thesis and the program on which it is based that not all artistic behavior is highly creative expression and that traditional music instruction omits consideration of highly original and creative behavior in favor of strict protocols for recreation and reproduction of the works of the great masters. In addition, this research demonstrates that artistic creative composition need not be an exclusive activity totally separated from other personal kinds of academic research and discovery processes. The technique of MMC which can incorporate both artistic and academic learning has the potential to be a very powerful research tool for a future generation of computer based researchers. Section II of this thesis explores in more detail what has been learned about MMC at West Kildonan Collegiate and what impact this could potentially have on future curriculum development within the creative arts as well as within other kinds of academic learning.

SECTION II: IMPLICATIONS AND POSSIBILITIES FOR MULTIMEDIA COMPOSITION

INTRODUCTION

Section II of this thesis explores how multimedia composition, as described in the preceding case study, has the potential to alter dramatically the manner in which meaning is constructed and communicated. As a process, multimedia composition offers the possibilities for new types of cross-disciplinary and multi-dimensional research and presentation that reach far beyond the creative arts. Chapters Four, Five and Six focus on connecting what has been learned about the application of multimedia composing in the West Kildonan Arts Project with current social, scientific and educational theory. This range of theory is viewed from three perspectives; (1) the social components in building meaning, (2) the personal components in building meaning, and (3) the integrating of the social and personal components in building meaning. Chapter Seven aims to develop a creative thinking space for future program development in the Digital Arts area and beyond. In particular, Chapter Seven focuses on the new and expanded communication opportunities which have recently emerged for computer assisted multimedia composition and on the possible changes in the roles for students, teachers and the educational communities in which these techniques are employed.

Both Section I and II of this thesis are viewed by the author as a reflective stage in an ongoing action research process The focus of this reflective process shifts between Section I and Section II. Section I of this thesis provides an historical overview and explanation of what actually happened in the action research continuum out which the Digital Arts program grew. This description has been accomplished through the linking of the community structures which supported this program and the classroom practices which formed an important part of this program development with social and educational theory, and current technical innovations. Theory has been linked to practice in order to elaborate some of the critical elements in the evolution of this program. One of the central aims in this linking process has been to trace, through a historical and analytical perspective, how the technique of multimedia composing evolved within the Digital Arts program . Thus, Section I of this thesis is focused on events which have already occurred. Section II is focused on looking forward, building on the lessons learned in the Digital Arts program and extending this author's critical thinking space beyond the 1988 and 1992 program practices toward future programming possibilities for multimedia composing. These programming possibilities are targeted at enhancing and extending democratic and empowering styles of learning for all those people working within the educational community including: students, paraprofessionals, teachers, administrators, curriculum experts, hardware and software developers, parents and other people living and working within the community.

It has been the experience of Clark and Williams that political realities of changing the social structure, which surrounds a given learning environment. rests, in part, on theoretical and concrete demonstrations or previews of that change. For example, before it was possible to establish the Digital Arts lab and program at West Kildonan Collegiate, it was first necessary to develop a vision for change within the community. This was done through a series of pilot projects which were showcased at all levels of the Seven Oaks School Division. First, teachers, students, administrators and parents embraced a vision for extending personal creativity and were willing to take the risks and provide the support and/or hard work necessary to learn and communicate with new tools. The reflective part of the action research process proved to be essential in developing and refining a viable and appropriate vision of what could be accomplished through computer assisted styles of creative composition. As stated in Chapter Three. part E, in the case of the Digital Arts research this reflective process has interfaced continually with observing, problematizing, reading, theorizing, seeking and getting feedback. The later stages of the research have involved reading, theorizing, seeking and getting feedback and have taken place over the last two years within an extended academic community of the Faculty of Education, University of Manitoba and has included, most directly, my advisor Professor Ken Osborne as well as Professor Sheldon Rosenstock.

Given the complexity of the multimedia composing process, it is the the opinion of this author that the vision in North America, which surrounds multimedia composing activities is in need of refinement and extension. Thus, Section II of this thesis is an exploration of, reflection on and synthesis of an wide range of relevant social, technical and educational theory with the explicit goal of extending this author's vision of the personal and educational implications for multimedia composing within the current educational system in Manitoba.

Multimedia composition, (MMC), has been an essential component of the Digital Arts program at West Kildonan Collegiate. As an innovation of the last decade, multimedia composition is far from a highly elaborated art form. Educational applications of this technique began in the late 1980s with such research projects as the Apple Innovation Centers in Canada and the Apple Classrooms of Tomorrow in the United States⁴⁸. Integrating electronic media into complex presentations is the new media kid on the educational block. The possibilities and options available within this format are in a constant state of transition, reflecting the radical advances within the computer industry toward faster, smaller and more powerful machines, better color resolution for monitors, higher quality sound and on-board CD-ROM systems. In the fall of 1993, both Apple and IBM released multimedia workstations. Apple's MAC LC520 features a 14 inch, high resolution color monitor, stereo sound outputs, built-in double speed

⁴⁸.When this research was being done, no detailed or current information was available from Apple Canada Education Foundation on projects which are presently underway in Canada. Some projects across Canada have recently been asked to submit information updating their present activities. So updated information should be available within the next year. For a more in depth account of ACOT research projects, see Appendix IX.

CD-ROM, 160 Mb hard drive, and 36 Mb RAM. IBM's EDUQUEST model 50 offers similar features with 212 Mb hard drive and 20 Mb RAM. Accompanying these technical advances, has been a dramatic reduction in cost. The educational price for the MAC LC520 is \$1,599 and for the IBM EDUQUEST model 50 is \$2,552 [Brady 1993].

A merging and revamping of the DOS/WINDOWS and MacIntosh technologies also is currently underway. Apple and IBM have made agreements to combine and upgrade the DOS/WINDOWS and MAC formats within a RISC-based PowerPC design thus making both formats available to users within one machine at an affordable price. In March 1994, APPLE released its Power MAC 6100/60 at a cost of \$2,209 which will run both DOS and System 7 software [Thompson and Ryan 1994, pp. 44-46].⁴⁹ This represents a significant development for personal computer users as they will be able to access a much wider range of software options. Also, this development will permit a single computer to service a wider array of integrated and multi use functions within schools and businesses.

This rapid evolution opens up the possibility for what David K. Cohen (1988) refers to as "adventurous teaching", where educators employing these tools are constantly called upon to move into uncharted territory. The learning curve is very steep and many formidable questions arise which are just beginning to be addressed.

^{49.} The prices quoted here are American prices. A Power PC has recently been purchased in Seven Oaks School Division for around \$3,500.
For example, what are the implications and possibilities for learning and communicating within interactive multimedia systems? What kind of environments are required for functioning effectively within these complex systems? Can educators promote these environments in their classrooms and if so, how? What do these kinds of environments imply for the process of teaching and learning, as it is conventionally understood and how will the roles and responsibilities of teachers and students be affected?

Program development during the period of 1988-92 allowed Clark and Williams to identify some key elements in the MMC process.⁵⁰ These elements are identified in Figure 6.

 $^{^{50}}$ Multimedia composition has included a wide variety of interdisciplinary studentinitiated projects, featuring varying combinations of music, sound effects, graphics, text, animation, video, CD-ROM and laservideo examples. A creative arts perspective was incorporated into researching, developing and presenting ideas in areas which were of particular personal interest to students. The result was that a major portion of the content for the Digital Arts projects was chosen by the students. As well, students were encouraged to move beyond simply reproducing, reorganizing and restating preexisting data to develop their own ideas through several media: audio, visual, textual . This often resulted in students creating their own soundscapes, music, drawings, animations, videos, short stories, essays and integrating these components into one formal presentation. The goal was to encourage students to produce more complex and multi-dimensional webs of meaning that would include a broader spectrum of their communication skills. This multimedia approach to constructing meaning allowed students the option to include their most powerful and well developed mode(s) of communication and use this mode as a spring board for creating a multi-mode communication system. In major project work, student were allowed to choose which modes they felt most comfortable in and into which new areas they wished to extend their knowledge. The teachers' role in this process was: (1) to help students define a project which was doable given time and equipment restraints, (2) to support students achieving their goals. Most classroom time was spent in one on one or small group discussions between students and teachers and much less on formal instruction.



Application of these elements within the Scholar's Workstation activity made it apparent that the strongest relationship between these elements is not a linear one. Further, these elements do not represent discrete steps. With a MacIntosh interface, these steps can be interrelated in a fluid, flexible manner as necessary throughout the entire project development, as Figure 7 illustrates.



It quickly became clear that interactivity is a very powerful factor in enhancing research and creative expression. At the same time, because so many options were opened up, interactivity became the most challenging aspect of the program. In the early stages of this project, the interactive potential between people, perspectives, ideas and media was so broad ranging that it was, at times, difficult to deal with, especially in the context of student-initiated projects and a wide range of media.⁵¹

Beyond identifying the five key elements and their interactive potential, it became clear over time that building meaning was the central connecting agent. The building of meaning encompassed all of the other activities and was the 'raison d'etre' for merging all aspects of multimedia composition. It is the questions, problems and goals upon which the research process is based that determine where information is collected, which information is selected as relevant, and how that information is saved, organized, interpreted and ultimately presented. Questions and answers are the superstructure and the process and media provide the infrastructure.

Section II of this thesis is focused on developing a more comprehensive view of building meaning in interactivity "rich" environments⁵². To that end, this study has been drawn outward to

^{51.} See pages 78 to 82 of this thesis for a more detailed description of student initiated projects.

⁵². The association with "rich" has been used by Jeannie Oakes [1986,1991,1992] and Howard Gardner[1991] in the context of rich educational environments where a wide range of student abilities are addressed in one lesson. Apple and IBM have also used this term in relation to technology rich (enriched) learning environments which are exploring the latest technology. This research has chosen to associate itself most closely with a people-centered view of learning rather than a technocentric one.

survey a broader spectrum of interdisciplinary inquiry. The aim here has been to look for ideas which have cultural resonance and which could in turn be related back to MMC.



Figure 8 underlines the intention of this thesis to reduce the potential for chaos inherent in a process of connecting so many varying elements by establishing some viable pathways for interrelating the key elements of MMC. On looking outward, it was discovered that the problems of interactivity, complexity and uncertainty were not unique to MMC. Rather these problems appeared fundamental to the broader consideration of how people, process, perspectives and media come together.

CHAPTER FOUR: INTERACTIVITY AND INNOVATION

" There's only so far we can climb up Jacob's ladder before we realize it's suspended from the ether of our imaginations and grounded in its truth." [Siler, (1990) p. 23].

At the heart of many twentieth century innovations are three powerful ideas: the belief in a dynamic universe; the belief in the connectedness of matter; and the belief in evolutionary diversity. Making sense of multimedia composing, exploring its implications and possibilities begins here with a consideration of a dynamic, interrelated and diverse universe. These ideas have had a profound impact on most fields of human action and inquiry: science, art, psychology, philosophy, politics, sociology, anthropology, social activism, research and communications techniques, and education. This impact has been twofold. A viable way has been offered through these ideas, first, for bridging large gaps between the known and the unknown, and second, for making applications to an almost infinite spectrum of problems from the microscopic to the macroscopic. Through these ideas, human theorizing has reached far beyond the world of concrete observations, of facts and figures, toward daring speculations and equally daring discoveries. For example, quantum physicists have envisioned a universe in constant motion, interconnected and filled with such complexity and uncertainty that it can be grasped only in probabilities. Yet the scientific application of this vision has made space travel, in our time, an almost everyday occurrence [Siler 1991].

To take another example, geneticists working on the micro-end of the scientific spectrum are presently unravelling the mysteries of the genetic codes inscribed within DNA. The cloning of a human embryo is no longer science fiction but a reality [Nichols 1993].

Psychoanalysts and some cognitive psychologists have expanded their horizons to include not only the conscious processes of the human mind but the unconscious as well. In their quest to decipher the concrete, abstract and affective processes that enable humans to evolve into complex social beings, there is presently great currency being given to the idea that human intelligence is also multifaceted. Instead of one intelligence and one potential, each person is in fact capable of many different dimensions of intelligence and many different kinds of potential for development [Gardner 1993 and Sternberg 1990].⁵³

 53 In some ways the work of Sternberg and Gardner has been an outgrowth of J.P. Guilford 's model on the structure of intelligence(1967). According to Sternberg [1990], Guilford set out 120 distinct abilities, (later in 1982 increased by Guilford to 150). which were "organized along three dimensions: operations (5), products (6), and content (4)...Because these dimensions crossed with each other, there are a total of 5 x 6 x 4=120abilities" [Ibid pp. 95-96]. Operations included cognition, memory, divergent production, convergent production and evaluation. Products encompassed units, classes, relations, systems, transformations, and implications. Content related to figural, symbolic, semantic and behavioral representations. In Guilford's method, "The set of abilities is commonly represented by a cube. The three dimensions of the cube are content, products and operations, and within the cube are little cubes corresponding to each of the 120 ways in which the content, products and operations can be crossed. For each ability, Guilford ha devised a number of tests purported to measure that ability" [Sternberg 1990, p. 96]. The critiqued offer to this theory was that it validity was undermined by attempting to quantify many elements of human intelligence which were not, in a scientific sense , reliably quantifiable.

Some philosophers in contemplation of Plato's World-Spirit problem or Descarte's Mind-Body problem have come to discuss the phenomenon of human knowledge as "a consciousness of relationships" or " a consciousness of symbolic movement", tracing these movements between concrete objects and experiences, on the one hand, and abstract cultural signs and symbols on the other. Action and movement have replaced static universal laws and principles as phenomena for inquiry [Sartre 1991].

The last century has seen great political and social upheaval with many diverse corners of the global population aspiring toward empowerment and political democracy. These radical changes, and the fierce conflicts which arise around them, have led some commentators to draw attention to what they see as the transformational and volatile nature of the nation state and the social institutions which support it, not only as part of our social heritage but directly and indirectly as an integral component of every day life. Whether one is directly involved in the war in Bosnia or merely watching Nelson Mandela acceptance speech as the new president of South Africa, effectively ending apartheid, on the evening news, political and social change is a constant reality. As well, in the last century, political democracy has proved itself to be won not only as an external struggle between fascism and liberation movements but as an on going internal struggle as well. Western societies have undergone some major transformations in the quality of the democracy toward which they aspire by paying equal attention to the equal rights issues

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of gender, race, class, mental and physical ability.

Some sociologists and anthropologists, in analyzing and comparing these transformations in human societies, have moved beyond the view of culture as only "artifacts" and "institutions" toward a conception of culture as the active dynamic force which gives societies their common purpose, organization and systems of communication [Harris 1974, Wagner 1981].

At the same time, it is clear that "every technology has its cost". A technical solution for one problem may at the same time be the source for new and more threatening problems. While global industrialization has generated unparalleled monetary wealth and technological development, short term, high growth oriented, industrial policies have stripped away valuable forests and produced toxic wastes which are dramatically eroding our global ecosystem [Suzuki 1989]. There is a growing awareness of the serious damage which can arise from static and quick-fix models of social planning and of the importance for long term, ecologically sensitive social policies.

As well the intellectual movement of postmodernism has incorporated many of the changes described above: the rejection of objectivity and universality, the emphasis on "discourse" as the shaping factor of reality, the acceptance of equally valid, multiple versions of reality, and the fear of the tyranny of the meta-narrative.

As a direct result of the cultural resonance of these beliefs in a dynamic, interconnected and diverse universe, there have grown up many ways of knowing. The simplistic representations, which I have offered here, do not do justice to the wide array of permutations and combinations of theory which has been generated from these three ideas. As each of these fields described above has developed outward and inward, it has been transformed by the intentions of its researchers. Each way of knowing provides a flow of momentary perspectives which are at one and the same time evolutionary, interactive and unique: evolutionary as they mirror a cultural reality which is itself in a constant state of transition: interactive in that as each field expands outward to study areas of common social concern it comes into contact with and must accommodate the conceptual structures of the other fields of inquiry; and unique in a dual sense of being reflective not only of the particular views of the field but also of the individuals and groups of individuals constructing meaning within that field.

The essence of the process addressed most directly in this section of this thesis, that of multimedia composition, is interactivity. This concept of multimedia composition arose out of an interactivity between the culturally resonant ideas of a dynamic, interconnected and diverse universe and those developers across many fields of inquiry as they sought to extend and refine the manner in which meaning was composed and communicated. Research and presentation which is multimedia-based, allows composers to access information, organize it, develop ideas, and present these ideas in formats which are increasingly wide ranging, flexible and non-static. Multimedia composing opens the door for the interconnecting of many different types of media (visual/graphic, textual and auditory) and many different perspectives (artistic, scientific, literary, historical etc.). The greatest challenge posed in this process is bringing the diverse elements of people, process, perspective and media into an empowering and meaningful association.

In considering the potentials for multimedia composing within the high school curriculum, three questions spring to mind:

- What are the quintessential elements relating to the production of meaning which arise from beliefs in a dynamic, interconnected and diverse universe?
- How do these elements relate to the composition of meaning in the multimedia format?
- What can educators say and do to enhance the composition and communication of high quality, personal and collective meaning via multimedia composition?

It is through the exploration of these questions that the implications and possibilities for curriculum development will be pursued.

CHAPTER FIVE:

QUINTESSENTIAL ELEMENTS IN ACTS OF MEANING

A. Introduction

Many social theorists, in coming to terms with the implications of their beliefs in an ever-changing, interrelated and complex universe, have given much consideration to the social and personal processes of constructing knowledge. Following Papert's research [1990,1993] in establishing and developing computer assisted learning, this thesis has chosen to use the term $Constructionism^{54}$ to describe a wide range of views and opinions which has appeared in the last century and which, in turn, has encompassed many paradigms of social thinking. This range of views can be seen as polarizing around two compelling concepts. The first is the Social Construction of Knowledge and the second is the Individual Construction of Knowledge. In the context of high school programming, each of these concepts derives its pedagogical power from how closely it mirrors the educational realities of the classroom. Individual teachers and students are brought into close association with one another in environments that are simultaneously structured and controlled by social forces originating outside the classroom walls. On the one hand, much of the activity within the classroom is prescribed by and from intentions which are not designed by students and teachers, and often do not reflect their personal interests or abilities. On the other hand, students and 54. See "Constructionism" in the terms and definitions in APPENDIX I for a more detailed description of this term.

teachers meet face to face, one on one, sometimes in direct confrontation and often with the awareness of a vast array personal differences and needs which define and shape their individualities.

Constructionism encompasses the central paradox presently being faced by educators; the juxtapositioning of individual and social protocols. For example, in facing continuous funding cutbacks to education, politicians, school board members, administrators, teachers and students are presently being forced to make some very difficult decisions affecting their individual needs as professionals and as learners. In particular, they have to wrestle with the question of how these needs are to be accommodated within the context of increasing demands of provincial curricula, increasing class sizes, shortened class periods, declining support services and reduction in special programming and new programming initiatives.

This section of the thesis explores the theories ranging between the social and individual concepts of knowledge and identifies perspectives which are especially relevant to this action research project because it is felt by this author that these theories embody much of the controversy and many important insight into the process of constructing meaning. This exploration is done in the full knowledge that each of the issues and perspectives raised in this section occupies substantial and well established fields of inquiry. A detailed and intensive exploration of each of these fields lies beyond the intent and scope of this thesis. Rather it is the goal of this research to highlight those particular elements which in this

researcher's opinion have particular resonance to the process of future curriculum development in the area of interactive multimedia composition.

Constructionist theory provides many useful insights into how individual and collective meaning is created. Complex problem solving situations often requires the interrelating of a large network of problems which in turn may be generically different. Within the one problem solving sphere it is often possible to identify and array of problems that range from the macro to the micro in scale. Further problems evolving in satisfactorily weighting and integrating these two contrasting forms of problems. The problem solving surrounding multimedia composing is just such a complex sphere of reference. Recognizing, supporting and encouraging individual creative and collective expression requires an appreciation of as well as facility in balancing the macro social elements successfully against the micro or personal elements.

The theoretical interplay between social and individual aspects of the construction of knowledge is compared in Figure 9 to the electrical field set up between two neurons. The analogy used in Figure 9 is an attempt to mirror the reality of the macro/micro dimensions of relating society to the individual by superimposing a macro Constructionist theoretical dimension onto a micro neuron field.

Figure 9 is viewed as a flexible platform. Those people noted in Figure 9 reflect those ideas which have had a important impact on this research and thus have been chosen as a direct result of this researcher personal experience. Other readers of this figure will undoubtedly be able to project a whole range of other players onto the neuron field which relate directly to their own experiences and interests.



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It is important to note that all of the theorists indicated in Figure 9, have derived their ideas from a consideration of both the social and individual forces shaping meaning. Location on this figure denotes participation rather than breadth of theorizing. Bowers and Piaget have

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demonstrated fairly polarized views on how meaning is constructed with Bowers holding a strong social constructionist view and Piaget a strong individual constructionist view. Many others like Hall, Vygotsky, Dewey, Bruner, Siler, Sartre, Apple, Giroux, Gardner, Kolberg, Noddings, Pinar, Grumet, Wagner, Jung have focused much more broadly on the interrelation of social and individual realities. Location on this figure then is intended to indicate the contributions made by each of these theorists that are significant for elaborating the process of MMC. If students and teachers are to be engaged directly in creating their own meaning, then this activity requires some useful perspectives on what unique elements each individual can be expected to contribute to this process and what socially determined elements will enhance or detract from this process.

Thus, Section II of this thesis means to reflect on theories of the construction and communication of knowledge and to use these theories as an important basis for future program development. While the Digital Arts programs at West Kildonan Collegiate have been heavily focused on the production of personal meaning, consideration has been also given to providing students with the appropriate technical and conceptual "know how" gained from researchers in academic areas such as philosophy, psychology, anthropology, sociology, media studies and education. The act of connecting current theoretical and practical knowledge with classroom practice has been an important part of the democratic decision making and problem solving process of the Digital Arts action research continuum. Through this process,

teachers and students have not only been able to bring their best knowledge to their personal project work but they have also consistently been challenged to upgrade their best knowledge to reflect the changing world around them. It is felt that the future of the Digital Arts program rests not only on a continuing community base of support but also on the abilities of those involved to be constantly updating and broadening their experience with and understanding of the MMC process. Section II is directed at exploring the more difficult, long term and open-ended questions⁵⁵ which underly the interaction of personal and social protocols in constructing and communicating meaning.

B. Constructionism: A Social Perspective

Traditionally, the prime function of education has been one of cultural transmission and reproduction. This has involved a deliberate attempt on the part of the educational system to socialize children into a dominant or "authorized" culture. Recent discussions of culture have cast doubt on the very notion of culture as understood in traditional education.

Theories supporting the social construction of knowledge have been developed by researchers across many fields of inquiry. These theories have been closely associated with the concept of culture and the $\overline{^{55.}}$ These questions, presented on page 127, are as follows: What are the quintessential elements relating to the production of meaning?: How do these elements relate to MMC?; What can educators say and do to enhance the composition and communication of high quality, personal and collective meaning via MMC?

processes which underly the development and transmission of cultural knowledge. Also included in the social perspective are a range of themes such as: (1) the dominance of socially defined cultural norms in shaping and communicating all knowledge; (2) the extent to which cultural innovation and the extension of knowledge are or should be rare and elite activities; (3) the complex and dynamic nature of culture as a social force; (4) the political dimensions of how culture and knowledge are defined; (5) those factors which inhibit or promote cultural change.

Theories favoring a social constructionist view have been offered by such sociologists as, Berger and Luckman [1966] and educational theorists such as , Bowers [1987, 1991]. Their main hypothesis is that all knowledge is based on socially defined protocols such as language, laws, and moral beliefs. Integrally woven into these protocols are systems of customs, symbols, and abstract concepts. From an educational perspective, these social constructs have their origin beyond the consciousness of the individual learner and must be transmitted to the learner by means of formal and informal interactions. Through these cultural structures- concepts, symbol systems, beliefs and languages- individuals make sense of the world around, shape ideas and then communicate these ideas via whatever media are available. The process of learning is a transformational one for individuals as their personal knowledge is shaped and reshaped in the learning process. Elaborating meaning is the result of an internalizing and externalizing of social constructs. The individual

consciousness and communication is reshaped by the cultural constructs.

While most proponents of social construction theories acknowledge the agency of the learner in absorbing cultural protocols, they hold that meaning is determined primarily by the cultural protocols and to a lesser extent, by the learner's intention to absorb and use them. This view of social construction also maintains that higher levels of creativity and cultural innovation are achieved by only a few participants within society and that most individuals in society are involved in a continuous cycle of cultural reproduction.

One theorist in the media studies area who has held strongly to a social constructionist view is Marshall McLuhan. While McLuhan[1964] pointed out "(t)he medium is the message" [p. 28], he also predicted a future where "(r)apidly, we approach the final phase of the extensions of man - the technological simulation of consciousness, when the creative process of knowing will be collectively and corporately extended to the whole of human society, much as we have already extended our senses and our nerves by the various media" [p. 19]. In this context, media are seen as mechanical or artificial processes and products of human interaction. Their functions within society are viewed here as a direct extensions of human intelligence. Further, the type of media in which humans choose to represent their thoughts becomes a framing factor which defines their messages.

Anthropologist, Edward T. Hall borrowed the term "extensions" from McLuhan's 1962 book, <u>The Gutenburg Galaxy</u>. [Hall 1976 p. 245]. Hall [1976] has elaborated the features and functions of these media extensions. " No organism can survive without altering its environment in some way... Altering the environment can be broken down into two complimentary processes: internalizing and externalizing. In man these processes can be adaptive mechanisms as well as controls." The human conscience is viewed by Hall as an internal mechanism while extensions comprise the externalizing mechanisms [Hall 1976, p. 27]. Thus, extensions are predominantly social conventions which give structure, shape and definition to meaning.

Extensions include a vast array of cultural phenomena such as language, writing, painting, publishing, music composition and the new media (MMC). These structures are used within societies " to solve problems, to evolve, to adapt at great speed without changing the structure of the body," to serve as a prosthesis for the disabled" [Hall 1976, p. 29], "to enhance a particular function of an organism" such as the use of a knife in place of teeth [Ibid p. 35], "to make possible the sharing of human talents that could be accomplished in no other way" [Ibid p. 37].

Hall categorizes extensions into generations. The primary or first generation extension is spoken language while written language represents a second generation phenomenon. "The spoken language is a symbolization of something which happened, could have happened or is in the process of happening, while written language is a

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symbolization of spoken language. "Extension transference (ET) is a term (Hall has) given to (a) common intellectual maneuver in which the extension is confused with or takes the place of the process extended " [Ibid, p. 28].

If this line of analysis were applied to digital applications, computers and the related technology which accompany them might comprise second and third generation extensions. In this process of extension transference, the new media have taken on a life of their own and are often viewed as a distinct entity, separate from humankind. "A variation of the extension transference (ET) theme is that if the ET process, in second and third generation extensions, has gone far enough, the first-generation extension is overshadowed and frequently viewed as though it had no structure" [Ibid, p. 30]. The implications here are that the transferred systems are sometimes seen as the only reality. Such problems as improving the efficiency and quality of the educational process can be naively perceived as solvable through strictly technological means. Situations such as this are potentially very dangerous, in Hall's view [1976]. Effective problem solving in the media area, for Hall, requires an awareness of the complexity and interconnected nature of social communication systems. Through the concept of extensions, he identifies an interlocking series of direct and indirect layers of media.

Further, Hall [1976] points out the reductionist nature of extensions. "No matter how hard it tries, the human race can never fully replace what is left out of the extension in the first place. Also, it is just as important to know what is left out of a given extension system as it is to know what the system will do" [Ibid, p. 37]. Some important questions arise out of Hall's work. If each medium has the capacity to capture only some dimensions of human experience, what implications will this have for constructing meaning when many media are combined simultaneously? If written language captures some qualities, graphic images and video images express other elements, and auditory modes such as spoken language, sound effects and music capture other elements, what effect will this have on the production and quality of meaning when these elements are used in combination?

For other anthropologists such as Marvin Harris and Roy Wagner, the cornerstone of social constructionist theories, the concept of culture, is constantly being invented and reinvented. Harris [1974] has been particularly interested in the propensity of researchers to define certain cultural groups by sensationalizing peculiar traditions without exploring the functions that rituals like "sacred cows" or aversion to eating pork have played or are playing within a given society. Appreciating human diversity requires a broader understanding of the rationale behind alternate modes of human behavior. A critical factor, in accommodating cultural change effectively, is the ability to separate those cultural traditions which are still vital to the integrity of a society from those which are less functional; more ceremonial or sentimental. A prime example of this is given by Papert [1980]. "Educators must be anthropologists (and)...work to understand which

cultural materials are relevant to intellectual development...There is a tendency for the first usable, but still primitive, product of a new technology to dig itself in. I have called this phenomenon... QWERTY " [Ibid p. 32]. When typewriters were first introduced the letters were placed on the keyboard in such a manner as to reduce jamming; the letters QWERTY were allocated to the top left hand corner of the keyboard. This jamming problem was solved a few years later but the QWERTY arrangement is still the norm. Papert points out that there are undoubtedly many other more rational ways of configuring a keyboard that would greatly enhance the ease of data entry. "[T]his symbolizes the way in which technology can all too often not serve as a force for progress by keeping things stuck " [Ibid p. 33].

Wagner[1981] has noted another interesting dimension of culture. Many aspects of our current concept of culture are an invention of social researchers. The defining of culture has often, in the early part of this century, been viewed as an academic, expert-centered pursuit. Social anthropologists in the course of their field work have invented cultures as they interpreted field experiences through their own social constructions. Other social systems have been interpreted through social constructions foreign to the culture being studied and for which there was often no cross-cultural equivalence.

More recently, the term culture has developed a life of its own outside the world of academia. There is a popular movement within North American toward more grassroots political definitions of culture. Over time, the influence of these movements has come to be strongly felt

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within the educational communities as well. Increasingly in Canadian society, different ethnic groups such as the French and indigenous peoples are asserting their rights as separate societies to determine their own cultures: which parts of their cultural heritage are to be preserved and what parts are to be open to change.

"As old borders and zones of cultural difference become more porous and eventually collapse, questions of culture increasingly become interlaced with the issues of power, representation and identity. Dominant cultural traditions once self-confidently secure in the modernist discourse of progress, universalism, and objectivism are now interrogated as ideological beachheads used to police and contain subordinate groups, oppositional discourse and dissenting social movements...Central to this debate is an attempt to articulate the relationship among identity, culture and democracy" [Giroux 1994 pp. 29-30].

The issues surrounding who should define culture and who should promote cultural change have had particular relevance to Digital Arts program at West Kildonan Collegiate. All of the research described in Section I of this thesis has been conducted in an educational environment which is highly multicultural, which promotes policies of gender equity in the classroom and the workplace, which is sensitive to problems of child poverty and child abuse. It is not uncommon in a Seven Oaks classroom, to find representation from ten or more ethnic groups. In response, the school division has promoted professional

and curriculum development which in the past has encouraged the examination of multicultural, class and gender related issues. As well, mentally and physically challenged students are being integrated directly into the public school system and have participated in the Digital Arts program. It has been the intent of the Digital Arts programs to realign creative arts programming with some of the more innovative and democratic professional and curriculum initiatives in the division. This has meant moving away from competitive, narrowly defined models of cultural transmission, away from the notion of one culturally correct response and toward a broader vision of human and media possibilities. Consequently, the Digital Arts program has encouraged a creative problem solving process that generates many diverse questions and many different and valid answers. The linking of interactive communication systems with personal and cultural diversity has been an important consideration in community based acceptance, support and participation in this program.

The concept of culture has more recently been extended to describe not only macro contexts in society but micro contexts as well. This includes such areas as protocols within a discipline, a field, a school or even a classroom. Cuban (1988), Darling-Hammond and Synder (1992), Gardner (1993), Goodlad (1984), Oakes (1991), and Lieberman (1990) represent a few of the many educational theorists who have adopted this view. In contrast to the traditional view of culture as a set of conventions originating from a sophisticated and powerful society beyond the walls of the classroom, these educators

hold the view that each person within society participates in a process of interacting with and changing culture. Cuban, Darling-Hammond et al view culture as a dynamic, interactive and diverse force within society which lends this concept an immediacy which is readily applicable to evolving interpersonal communication systems within large or small contexts. Where traditional views of culture in education center on transmission and reproduction of concepts established by experts outside of the classroom, dynamic views of culture are focused on the specific processes and contexts in which culture continuously evolving. Thus while common cultural concepts may be explored within an educational system, each particular learning context generates its own particular cultural characteristic and interpretation given the widely varying personalities, time and resources which may be brought to bear on the learning process. Where traditional systems are directed at achieving standardized outcomes for learning, Cuban, Darling-Hammond et al seek to acknowledge and promote a more complex, meaningful and diverse spectrum of learning outcomes.

Any attempt to elaborate a vision for computer assisted multimedia composition, requires consideration of what current research in educational technology is saying about the the effectiveness of computer based media systems in promoting learning. Thompson, Simonson and Hargrave [1992] have carried out a review of research on educational technology covering the period 1924 to 1990. A great debate has been raging in this literature over the last several decades as to whether new cultural innovations such as computer assisted

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learning systems have the potential to improve learning and communication. A central feature of the this review is the research findings of Richard Clark.

Richard Clark, in a 1983 study of the effects of computer based media on learning in the classroom, reported that "(t)he best current evidence is that media are mere vehicles that deliver instruction but do not influence student achievement any more than a truck that delivers groceries causes changes in our nutrition. Basically, the choice of vehicle might influence the cost or extent of distributing instruction, but only the content of the vehicle can influence achievement" [Clark 1983 p. 445].

Clark [1983] offers the opinion that this state of affairs is due to the inadequacies in the analytical techniques of media comparison studies used to substantiate claims of improved student performance. It is impossible according to Clark[1983] to compare apples with oranges. In Clark's opinion "media are delivery vehicles for instruction and do not influence learning"[Ibid p. 435]. He concludes that: "It is what the teacher does that influences learning" [Ibid, p. 456]. The teacher is responsible for establishing a cultural framework within the classroom and for providing the flexibility required for learning to be successful.

This thesis argues that, if the culture of the classroom for media based instruction, for example in creative arts area, is characterized by a traditional, teacher-centered, top down approach, the effects on students achievement will be very similar to traditional media based forms of instruction. This is due to the fact that in the traditional approach, the culture of the classroom is defined and interpreted by the teacher and the experts who design the learning objectives in the curricula and aimed at eliciting a similar and near uniform response from the students.

It has been the experience of the Digital Arts program that the culture of the classroom must first be changed before digital technology can have any radical effect on student and teacher learning. It is first necessary to change how curriculum is developed and how teachers and students work together, before the introduction of technology has a serious impact on classroom learning and collective performances.

Berger, Luckman, Hall, Harris, and Wagner portray culture as an extensive concept covering all aspects of human social behavior. Not only is culture a tool for identifying a unity within a given society- a certain set of customs, symbols and shared images- it also is an effective instrument for highlighting social differences. Culture is an inclusive and exclusive phenomenon. It contains the process by which human societies can come together and evolve. Therefore culture is a critical component in constructing and communicating meaning.

Not only has the social construction of knowledge perspective been used for description, analysis and prediction, it has also served as a basis for such critical educational theorists⁵⁶ as Michael Apple. His

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concern has been with the power structures within Western societies which block change and interrupt the development of what he defines as social democracy. Using Gramsci's concept of hegemony, Apple [1981, 1988, 1990] has criticized current traditional educational practices within the United States as discriminatory and intransigent. Apple has argued that power over what is considered knowledge, is class based. Apple [1981] follows Raymond Williams' interpretation of hegemony. "Hegemony is a whole body of practices and expectations; our assignment of energy, our understanding of man and his world. It is a set of meanings and values which, as they are experienced as practices, appear as reciprocally confirming. It thus constitutes a sense of reality for most people in society, a sense of absolute, because experienced (as a) reality beyond which it is difficult for most members of a society to move in most areas of their lives... we only understand an effective and dominant culture if we understand the real process on which it depends...the process of incorporation...Educational institutions are usually the main agencies of the transmission of the dominant culture" [R. Williams in Apple 1981, p. 114]. Apple and Williams point out that the social construction of knowledge is not unidimensional. They point out that society consists of different groups with different access to and control over power. In

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^{56.} The term "critical" in this context is intended to describe a paradigm of educational theory denoted by W. H. Schubert [1986 pp. 176-180] as critical praxis. One of the concerns of theorists working in this paradigm has been the systematic criticizing of the social structures within Western societies which are currently blocking progressive educational change. Included in this group of educational theorists are: William Pinar, Michael Apple, Henry Giroux, Madeleine Grumet, James B. MacDonald, Dwayne Heubner, Maxine Greene, John S. Mann, Ross Mooney, Paul Klor, Ted Aoki, and Paulo Freire.

particular, some groups are dominant, while others are subordinate. Thus, when considering the social construction of knowledge, Apple asks which group in society is dominant and whose version of reality is prevailing. For Apple, knowledge is a feature of power, in two ways. First, power confers the capacity to define what counts as important and high-status knowledge. Second, possession of this knowledge in turn consolidates and legitimizes the power of those who have it.

In Apple's view, the cultural protocols for knowledge are controlled by a socio-political elite and these protocols tend to support the position of that elite often to the detriment of other kinds of knowledge within a society. For example, this line of thinking can be applied to this Digital Arts research in the following manner. The academic discipline of music has been relatively slow in acknowledging the viability of computer assisted production of music on the grounds that synthesized sounds or tone colors were highly inferior to the sounds produced on acoustic instruments. Further, there has been a strong bias against accepting the vast array of new tone colors produced by digital techniques. These new tone colors have expanded far beyond traditional, well established acoustic sounds into a open ended spiral of innovation. As well, the musical genres in which this digital revolution has occurred, rock and jazz, are considered by the musical elite to be low level cultural forms with little intellectual or aesthetic merits.

Another controversial aspect of digital technology was the degree

of autonomy it afforded to novice musicians in developing their own unique sounds and compositions. Too many uncontrolled and untested variables were opened up which challenged the established musical authority and the long ingrained traditions, aesthetics and cultural practices involved in teaching music. The seat of power of these traditional protocols has rested in the upper echelons of the educational systems, the universities. Most of the accreditation boards in the music area are affiliated with universities such the Royal Conservatory of Music in Toronto is loosely affiliated with the University of Toronto and the Western Board in loosely affiliated with the University of Manitoba and Brandon University. Exams frequently take place across Canada in university environments. Universities assist accrediting boards by defining appropriate curriculum, setting standards for levels of development and providing examiners from their staffs to adjudicate levels of technical competence and aesthetic merit. While high school music courses can count toward a a grade 12 matriculation, students who wish to gain entrance to university music programs are best served if they have passed a certain level of examinations from recognized accrediting boards.

It has only been in the last six or seven years that many universities have begun to the recognize the vast potential for computer assisted sound design and composition within mainstream programming. Prior to this time, applications of this technology were viewed in the academic world as a highly abstract and experimental or as an inferior "Pop/Rock" phenomenon. What universities accept as knowledge has a very definite impact on what is acceptable knowledge at the high

school level. 57

It has been the experience of the Digital Arts program that curriculum innovation projects are often highly vulnerable within the educational community. This view is supported in the writing of Cohen[1988] and Cuban [1986, 1988, and 1991]. Such innovations as the West Kildonan Collegiate Digital Arts program are relatively isolated phenomena within the high school community. In times of economic recession, even the most progressive school division policies cannot block the tide of conservative cutbacks. In the 1992-93 school year cutbacks in transfer payments from the federal government in Canada had the trickle down effect of reducing provincial expenditures in education by sixteen million dollars. This translated in Seven Oaks School Division into elimination of twenty-one teaching positions at the high school level. The teaching staff for the Digital Arts area at West Kildonan Collegiate was reduced in the fall of 1993 from 1.75 teachers

^{57.} Lundgren[1981 in Giroux et al pp. 202-3] supports the position of Apple in his study of the "framefactors" which define and regulate learning experiences in the classroom. According to Lundgren, there are three systems which "constrain, govern and regulate the learning process:

¹⁾ the "goal system" which set a curriculum out in syllabus form along with recommendations for teaching, teaching materials, and textbooks [Ibid p. 205];

²⁾ the "frame system" which "includes everything that constrains the teaching process that is determined from outside" such as physical layout of the school, organizational mechanisms that determine class and school size, ability groupings, timetabling etc [Ibid p. 205];

³⁾ the "formula rule systems" which prescribe teacher duties, marking systems, rules of employment, and demands of competency"[Ibid, p. 205]. Lungren feels that "it is usual that these factors cannot be influenced by teachers or students and that the only way of influencing them is through the political process" [Ibid p. 205].

to .75. As well, there was a major shift in administration within the school with Dr. Salaski moving on to a superintendency elsewhere in the province. Digital Arts course were run during the 1993-94 school year by Owen Clark but the community which supported the action research at West Kildonan Collegiate had dispersed. This author will be taking up a new position in the fall of 1994 at Ken Seaford Junior High and will be participating in a middle years curriculum development project for "students-at-risk" currently underway there. Thus, the structures set out by Apple are tools for interpreting current political and economic realities. These structures arise out of a profound belief that educational practice within schools can be and should be improved.

On the other hand, the concept of hegemony has some serious limitations if applied in too general a manner. An overly simplistic treatment of the dominating cultural forces in society as a homogeneous unit could be quite misleading. During times of extreme social conflict, social groupings may become more polarized, while in more peaceful times, they may appear quite diffused. For example, in the last two fiscal years many teachers, administrators and board members have at times been forced, in the process of administering budgetary cutbacks, to act in ways which are against their personal and community based beliefs about how a school system should function. Yet in the process of administering provincial cutbacks, these professionals are forced at the local level to act in concert with the dominating conservative culture while at the same time not considering themselves a willing partner of that culture. Consequently, the participation by individuals or groups of individuals within a class in a society is a complex and dynamic phenomenon and those who seek to develop curriculum would be best be served by a model for planning which took this into account.

Henry Giroux [1990, 1994] has been involved in both the critical and reconceptualizing movements in education. He has explored the impact that new electronic technologies are currently having on global societies and has offered critiques of both modernist and postmodernist perspectives on cultural change.

In Giroux's opinion, the credibility and power of the great narratives upon which the modernist theoretical traditions of capitalism, socialism and communism are based and upon which traditional knowledge within societies has rested, has been undermined by "the diffusion of computer, scientific knowledge, advanced technology and electronic texts" [Giroux in Aronowitz and Giroux 1990 p. 60]. These narratives have employed one great way toward progress, through a rational process of scientific and technological change. But the realities of the capitalist and communist systems have been wrought with inconsistencies. The power base upon which these narratives has been centered has shifted from nation states to an international economic community. This has resulted in "legitimization of the privileged" class of individuals who operate beyond the jurisdiction of any one country [Ibid p. 114-115]. The assumptions of the social contracts upon which these great narratives are based, namely that the welfare of society as a whole will be considerably improved through strict adherence to one given political line, has not been born out in practice. For example, the association of eastern bloc or communist bloc countries has disintegrated and economic dominance has been achieved by the global economy. Closer to home, the great narrative of capitalism is that economic growth will increase employment and promote economic prosperity among the general population. Officially the provincial and Canadian economies are said to be showing an upturn. On the one hand, some large corporations are claiming higher levels of profits and on the other hand, these same corporations are simultaneously restructuring their operations and laying off all levels of employees including many highly skilled and upper level management people. Prosperity for some has not meant prosperity for all.

Giroux points out that the postmodernist view has coincided with radical global restructuring of the way in which culture is produced and consumed. "(T)he electronic production of information (has) radically alter(ed) traditional notions of time. community and history" [Ibid p. 115] and emphasized the importance of many ways of knowing, as well as experiential and artistic kinds of knowledge. In addition, Giroux contends that "electronic media are breaking down old boundaries and knowledge is moving away from the grand narratives". Further, "this new media accents and privileges diversity, locality, (and) specificity" [Ibid p. 60]. "Postmodernism points to a world in which the production of meaning has become as important as the production of labor in shaping the boundaries of human existence" [Ibid p. 116].

At its best, modernism has supported the rise of democracy and through technological media-based discoveries has extended the range, complexity and potential for human social and intellectual development. At its worst, postmodernism is so eclectic and diffuse that it sometimes appears to lack any consistent focus or direction. Postmodernist styles of teaching have come "perilously close to emulating the weaker aspects of liberal- progressive tradition in which teaching is reduced to getting students merely to express and assess their own experiences. In this approach, student experience becomes "unproblematic vehicle for self-affirmation and selfan consciousness"[Ibid p. 117]. Giroux's way of thinking То "(u)nderstanding the limits of a particular position, engaging in contradictory messages, or extending its insights beyond the limits of particular experiences is lost in this position" [Ibid]. Giroux proposes a linking of the best of both theoretical outlooks into a set of eclectic forward looking strategies for curriculum development which he has described as "border pedagogy" [1990] or "representational pedagogy"[1994]. This view has two main requirements. The first requirement is that "students be given the opportunity not simply to discover their hidden histories but to recover them" [Giroux 1994 p. 50] because history and social identity are closely intertwined. This can "involve rewriting relationships between identity and difference" [Ibid]. The second requirement is that educators need to become
sensitized as to how to build bridges in everyday culture between "the margins and the center of power" [Ibid]. "(T)his means providing students with those analytical tools to challenge those representations that produce racism, sexism and colonialism through the legacy of ethnocentric discourses and practices" as well as "an understanding of the new technologies of representation and how they are used to fix identities within relations of subordination and domination" [Ibid].

Giroux's theorizing {1994] is particularly relevant to interdisciplinary applications of multimedia composing because it further supports an eclectic vision of social and educational knowledge constituted through a democratic process and the interconnecting of diverse forms of thinking and expression. Students are encouraged in Giroux's vision of education to participate in a democratic process which sustains and promotes the conceptual and social frameworks upon which this respect for human diversity is based.

While social constructionists described in this chapter of the thesis have elaborated many useful perspectives on cultural interactivity and the social dimensions of building meaning, the agency of the individual is often left in the shadows. If learning is a transformational activity, then what role or roles does the individual play in effecting this change? A highly social constructionist view is unable to give an adequate account of individual creativity in cultural innovation or to account for many dynamic aspects of the development of human potential. Theorists exploring the individual construction of

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knowledge have directed their attention to these concerns.

C. Constructionism: An Individual Perspective

[1985] and Schubert [1986].

One of the leading exponents of the individual construction of knowledge in this century has been Swiss psychologist, Jean Piaget. In Piaget's view⁵⁸ each child is the central agent in building his (or her) own knowledge. The learning is achieved through discrete stages: sensorimotor, preoperational, concrete operational, and formal operational. This progression is made possible by an activity which Piaget describes as "conservation". Piaget uses the concept of conservation for articulating an important aspect of the process of transformation in learning. Each child develops knowledge structures through personal interaction with social constructs. Through the processes of assimilation, accommodation and conservation individuals acquire, utilize, and discard conceptual and symbolic frameworks in making sense of the world around them. The process of conservation is of particular interest to this thesis because it addresses one of the fundamental elements in multimedia composition, that being the bringing divergent elements into meaningful association. The Piagetian concept of conservation was intended to provides a framework for interrelating many different knowledge structures in complex problem solving situation. The process of maturity is marked in Piagetian psychology by an increasing ability retain and utilize more complex array of associations in the problem solving process. Thus, in 58. This section relies heavily on information taken from Papert[1990], Gardner

Piagetian terms each child or person is the prime agent in establishing these systems of association and ultimately in developing his/her own knowledge.

Piagetian theory lends strong support to curriculum initiatives such as multimedia composing which are aimed at bringing many contrasting elements into meaningful association through student initiated project work. In the process of multimedia composition, students define their own learning objectives and work in a flexible and cooperative manner dictated by their own interests and learning patterns to construct their own meaning.

Howard Gardner's [1985, 1991, 1993] work is a direct outgrowth of the Piagetian theories of child development. While Gardner supports Piaget's view of the evolutionary nature of human intellect, he has also pointed out some important limitations of Piaget's model. Gardner does not see the learning process as occurring in discrete orderly Piagetian stages. Instead, Gardner has noted overlapping between stages and consequently has characterized learning as a more continuous flow of development. Another limitation, according to Gardner, is the inability of the Piagetian model to account for the uneven development of cognitive abilities in different students. Piaget viewed human intelligence as a single entity. Gardner, on the other hand, accounts for the discrepancies of uneven development with his theory of multiple intelligences. His theory outlines seven different and distinct intelligences: logical-mathematical, bodily-kinaesthetic, bodily-spatial, linguistic, musical, interpersonal and intrapersonal. Uneven development occurs when any one intelligence or combination of intelligences become preferred mode(s) of operation and progresses ahead of the others. Gardner's main critique is that Piaget's work was centered only on the logical-mathematical extensions of learning to the neglect of the other six. Most importantly Gardner notes that the sense of self or intrapersonal knowledge is the guiding force in setting specific intelligences to specific tasks and in enhancing the process of synthesis.

Like Gardner, Robert Sternberg [1990] also sees intelligence as containing diverse elements, but he has charged that Gardner's theory " is too eclectic and too vague to assess for details" [Ibid p. 266]. In its place Sternberg has offered a triarchic theory of intelligence. Where Gardner's work has been focused on defining a range of human talents, Sternberg's theory is aimed at interpreting logical processes through a series of interactions between human intelligence and (1) " the internal world of the individual", (2) "the external world and the individual" and (3)"the mediating role of (personal experience) between the internal and external worlds" [Ibid p. 268].

Seymour Papert shares Gardner's interest in Piagetian theory and his concern regarding the missing affective elements. After five years at Piaget's Center for Genetic Epistemology in Geneva (1959-64), Papert "came away impressed by (Piaget's) way of looking at children as active builders of their own intellectual structures " [1980 p. 19]. Since then, Papert's research has focused on extending the Piagetian cognitive

model into the affective domain. Piaget "talk(ed) almost entirely about the cognitive aspects of assimilation. But there is also an affective component...As I came to know (Piaget) personally, I understood that his neglect of the affective comes more from a modest sense that little is known about it than from an arrogant sense of its irrelevance" [Ibid 1980 p.vii]. In Papert's opinion, there is a crucial interplay between the cognitive and affective domains of personality which facilitates transformations in leaning. Genetic propensities are brought into interplay with environmental factors through personal experience. Papert traces his own personal fascination with mathematics to an experience at an early age with differential gears. Mathematical learning over the next two decades, for Papert, was profoundly enhanced by his early ability to interrelate logical concepts with his concrete understanding of gear differentials. " First, I remember that no one told me to learn about gear differentials. Second, I remember that there was a feeling, love, as well as understanding in my relationship with gears. Third, I remember that my first encounter with them was in my second year... If any educational psychologist had tried to "measure" the effects of this encounter, he would have failed. A " pre- and post-" test at age two would have missed them " [Ibid p. viii]. Papert points to the direct connection between learning and the intellectual structures which have been gained from personal experience. These structures form "transitional objects" which allow the learner to interact within a given context and to connect that experiences gained there with his/her ideas.

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A Piagetian educational world has no explicit curriculum and no explicit teaching methods. Learning is an activity directed by the learner [Ibid p. 31]. Papert, however, has taken a more "interventionist" approach than Piaget. His research has moved beyond Piaget in two major respects, to elaborate "an interest in intellectual structures that could develop as opposed to those that actually at present do develop in the child, and to design learning environments that are more resonant with them" [Ibid p. 161]. This research is particularly relevant to the Digital Arts project at West Kildonan Collegiate because Papert sought to develop these intellectual structures and environments using computers as "transitional objects".

As stated earlier [p. 142] most of the theorists discussed in Section II of this thesis have developed their theories through a consideration of both the social and individual components of constructing knowledge. The last four theorists discussed in this section on the individual construction of knowledge have made considerable contributions to both areas. Consequently it is difficult to do justice to their views on the individual construction of knowledge separate from the context of the social import of their positions. While emphasis will be given to the individual aspects of constructing some explanation of the social will also be offered. This will provide a bridge into the integrated perspective on constructing knowledge which follows.

Any discussion of individualized education would be incomplete without reference to the work of John Dewey [1938, 1933]. In the early part of this century, Dewey was one of the leading proponents of learning as an empowering occupation. In order for this to be occur, education and personal experience had to be closely and sensitively connected. For Dewey [1938], when this connection between education and experience was made, then viable learning pathways were set in motion and when the connection failed to occur for students then learning experiences became "miseducative" and interrupted the flow of meaningful learning. Dewey's views on knowledge [1933] can be summarized as follows: (1) knowledge is based on a problem solving process; (2) in order for learning to occur problems must be "real" to the learner; (3) in the problem solving process, "social" knowledge can be useful to the learner; (4) there is a model for learning and thinking; (5) the model for learning espoused by Dewey was a scientific/experimental one; (6) learning is a social/cooperative activity, not just an individual one.⁵⁹ Two aspects of Dewey's theories are of particular interest to this research. First, while Dewey's theories of learning are heavily concerned with promoting effective interpersonal development through social democratic process, he provided a whole new way of critiquing a purely social constructivist viewpoint. He argued that traditional approaches to learning often fail to engage the attention and involvement of individuals whose purpose it was to educate. Further

 $^{^{59}}$ A good summary of Dewey's theory of knowledge has been offered by Osborne [1992 pp. 138-143]. Osborne has also offered some very valuable insights in his extensive wrtings on high school reform in Manitoba and the development of democractic process in classroom practice.

these traditional approaches often miss the mark in connecting educational activities with the realities, experiences, knowledge, perceptions of individual students. Second, his theories imply a shifting in the roles among those individuals involved in the educational community. For example, if major aspects of curriculum are to be negotiated between teachers and students and elaborated via extended project work then the lines of control and power will be seriously altered. Teachers and students move onto a different plain of interaction. Thus knowledge for Dewey implies not only knowledge of academic concepts, it also implies personal knowledge of how to interact socially in the problem solving process. This involves knowing how to negotiate, assist and support community based learning. In other words this requires experience in democratic process.

It has been the experience of the Digital Arts program that not only are empowering forms of learning, intellectual and political processes but they reflect a moral process as well. Democracy is not just a philosophical and political entity. Underlying a democratic mode of personal interaction is a moral agenda as well. Encouraging those in an educational community to interact in a negotiated and democratic manner requires a sensitivity to the underlying ethical considerations. The act of connecting education with the personal experience and actions of students as the use their knowledge within the surrounding community has heavy moral implications which reflect personal beliefs about the rights and potentials for individuals within the learning community. Democracy is not a static social phenomenon such as is reflected in the view that North American governments have already reached a state of absolute democratic association. Rather it is the opinion of this research that democracy like most other forms of human association is a continuous evolutionary process which is in a constant state of becoming in every country, province, city and classroom in which it is practiced. Encouraging democratic process within a community of learners, which is one of the central goals of Section II of this thesis, is a highly complex and dynamic process.

Lawrence Kohlberg was among those attracted by Dewey's ideas on personal learning and the democratic process. If personal development is contingent on social interaction then educators must be sensitive to the moral development of students and consciously work toward enhancing that development."(C)ommunity is (1)the number and variety of commonly shared interests in a group and (2) a certain amount of interaction and cooperative discourse with other groups. These two elements both point to democracy... A democracy is more than a form of government, it is a mode of living such that persons who participate in an interest have to refer their own actions to the actions of others" [Dewey, 1966 pp. 82-83 in Kohlberg, 1985, p. 39]. For Kohlberg [1978 pp. 36-37] Dewey's concept of democratic community was not only a political relationship but a moral one as well. The implications of Kohlberg's work are that knowledge and the process of constructing meaning have a powerful moral dimension. Following the ideas of Dewey and Piaget of continuous development, Kohlberg devised six stages of moral reasoning.⁶⁰ These stages are

summarized in Figure 10.

I. Perconventional Level:	stage 1-punishment and obedience orientation stage 2- instrument relevist orientation
II. Conventional Level: st	age 3- interpersonal concordance; 'good boy-nice girl' orientation

Kohlberg's stages are arrived at through a process of rational decision making based on an evolving concept of justice. This concept of justice was to be enhanced through educational intervention. More explicitly, what is extended in this process is the child's sense of community and his ability the act in a rational moral manner within an everbroadening social sphere [1985 p. 39]. Kohlberg's stages could be reinterpreted in the following manner as in shown in Figure 11:

Figure 11: KOHLBERG'S STAGES: as sense of community		
I. Perconventional Level:	stage 1- community of self; viewing social relations in terms of punishment or reward stage 2- community of self and immediate family/ friends; do unto others as they do unto you	
II. Conventional Level: sta	ge 8- community service with circle of acquaintance; pleasing and caring for others	
sta	ge 4- the good citizen of city, region; compliance with an abstract concept of authority	
III. Postconventional , Autorstag stag	onomous or Principled Level: ge 5- citizen of a whole society; a generalized view of the rights of the individual ge 6- universal community; fairness and equality for all	

 $^{60.}$ Figures 5 and 6 rely heavily on Kohlberg [1979] pages 50 and 51.

Application of Kohlberg's six stages of moral development would do well to take into account that Kohlberg's stages represent discrete, clear steps in a linear developmental path. The underlying assumption is that as students mature they will move beyond other more rudimentary levels of decision making, when it has been the experience of this author, they often function on many level simultaneously. Not all moral decision making requires consideration of the universal community. A more useful description of moral development might be that students as they mature develop an ability to reason morally on many different levels and that these levels instead of being discrete are highly interconnected throughout the lives of students and that effective moral decision making requires an ability to interrelate and priorize these modes appropriate to the situation under consideration. Therefore, not only is it important as Kohlberg argued in program research and implementation to have an awareness that moral reasoning is a developmental process and to connect curriculum with appropriate stages of learning in students, but it is equally important to realize that students, in order function successfully society, must learn to function on many levels of moral reasoning at one time. For example, in the course of student-initiated project work, students are often called on to interact in an extended problem solving process that goes beyond individual or small group activities. This sphere of interaction often involves setting aside personal goals to help other students or groups of students in the problem solving and presentation process. When students come to see

that there is a lot to be learned in supporting other students through difficult phases of project work or helping other students with the technical aspects of presenting their ideas. This requires the development of a level of maturity for balancing personal learning goals with supportive and enriching interaction with other people's projects.

Feminist educators like Carol Gilligan and Nel Noddings while accepting, in general, the validity of developmental approaches to learning, have expressed some strong reservations about many of the underlying assumptions, methods, and subsequent theoretical findings of Piaget and Kohlberg. According to Gilligan, "in Piaget's account (1932) of moral judgement of the child, girls are an aside, a curiosity to whom he devotes four brief entries in an index that omits "boys" all together because "the child" is assumed to be male ... Kohlberg's six stages that describe the development of moral judgement from childhood to adulthood are based empirically on a study of eight-four boys whose development Kohlberg has followed for a period of twenty years" [Gilligan 1982 p. 18]. Application of Kohlberg's stages of moral development to females has suggested that most women only attain stage three. The reason being that moral decision making by women is centered around nurturing and supporting relationships in a concrete context of family, friends and local community and apparently rarely rises to the abstract conceptual frameworks of stages four, five and six.

Gilligan denotes this paradox; "for the very traits that traditionally have defined the "goodness" of women, their care for and sensitivity to the

needs of others, are those that have marked them as deficient in moral development" [Ibid p. 18]. Women's decision making is based on women's rights [Ibid p. 149]. As these rights are expanded so are kinds of moral decisions that women become involved in making. To Gilligan's way of thinking, women provide another powerful perspective on moral judgement. For most women moral judgement is made in terms of conflicting responsibilities and is resolved via "a mode of thinking that is contextual and narrative" [Ibid p. 19]. Kohlberg bases his concept of justice on a perspective of conflicting rights between individuals and resolves moral judgements by means of "formal and abstract thinking" [Ibid p. 19]. When considerations of moral rights are combined with considerations of responsibilities, the resulting judgements "become more tolerant and less absolute" [Ibid p. 149]. Hence Gilligan argues for a recognition of the unique aspects of feminine moral thinking and the poverty of moral judgements based only on abstract issues of individual rights.

The feminist views of Gilligan and Nodding provides many insights when generalized on other relationships of inequality. Jean Baker Miller[1976] [in Gilligan (1982) p. 168] has offered this view of "relationships of temporary and permanent inequality". "In relationships of temporary inequality, such as parent and child or teacher and student, power ideally is used to foster the development that removes the initial disparity. In relationships of permanent inequality, power cements dominance and subordination and oppression is rationalized by theories that "explain: the need for its continuation" [Gilligan 1982 p. 168].

Digital Arts programming has shared Gilligan's concern about promoting learning environments that hold a temporary view of inequality and provide effective basis for critiquing and revising such practices which institutionalize inequalities. This has often proved to be one of the most challenging elements in the Digital Arts program. There was not one recipe which met the requirements of all situations, and teachers and students were constantly exploring new avenues for enhancing this constructionist learning process.

Nel Noddings [1988], in supporting a feminist constructivist view, has pointed out that the democratic, negotiated relationship between teacher and student set out by Dewey, while it is an inspiring, worthy idea, it is also a description of a mature relationship. Noddings poses the question of ' how do we get there from here?'. What Dewey is describing is not only a dramatic shift in political relations between teachers and students it is also a dramatic shift in moral relations. In her twelve years of teaching math, it has been Noddings' experience that most students do not walk in the door fully equipped to engage in this kind of a process. Democratic relations between teachers and students, and between students and their peers are based on trust, respect and interpersonal knowledge which are gained slowly, over time. Teachers and students progress gradually toward a mature constructivist phase by coming to know each other's hopes, dreams, talents, interests and most importantly through caring. As confidence is gained the roles can gradually shift. Nodding echoes the sentiments of Gilligan in stating that the key ingredient which will allow this shift to occur is establishing and maintaining caring relationship. Caring relationships are fundamentally different in quality from "fair" or "just" relationships because they necessitate a higher level of interactivity with, knowledge of and responsibility for people within a given context.

D. Constructionism and Multimedia Composing

It is through the ideas of democratic negotiation and caring relationships that the concept of interactivity "rich" composing can be extended beyond mere consideration of method, into the realm of the personal interaction and community. Dewey's ideas provide a target, an objective, and the work of Kohlberg, Gilligan and Noddings provide some conceptual frameworks for getting there. Translated into the practical context of the Digital Arts program, it was first necessary to change the quality of personal interactions and expectations within the classroom from the top down model of instruction, common to many high school creative arts programs, to a consultative and cooperative one. This kind of change in teaching/learning relationships did not happen in the Digital Arts program over-night. Instead, this change in environment evolved gradually as teachers and students came to know each other and to develop strong lines of communication. This change had a big impact on how individual learning occurred in the classroom. An important dynamic in this process was a shifting of the line of responsibilities for initiatives,

content and problem solving from the teacher to a shared, negotiated one between teachers and students. From the first day of class, teachers and students developed together personal and collective goals for learning. These goals served to clarify the understanding for teachers and students of their individual interests, experience and intentions and to translate these elements into a learning environment which connected with the best knowledge of both students and teachers.

Translating these concepts into the Digital Arts program of democratic and caring relations between teachers and students required a constant high degree of flexibility and interaction. As well it involved, especially in the initial stages, a steep learning curve for both teacher and students. At the beginning of each course, teachers took a more direct leadership role in promoting student based initiatives, a positive and supportive working environment and, where necessary, introducing concepts and modelling the techniques and procedures required to get student project work underway. For example, most students in the Digital Arts 105 course had no previous experience in music composition or with much of the technology involved. Teachers provided some introductory activities for students and gradually, as their projects began to take shape, students became increasingly independent in elaborating their own ideas. In this kind of environment, personal dynamics were in a constant state of evolution. All individuals in this environment were required to learn continuously on many levels at once: (1) social- developing personal ideas in a

community context and helping others develop their ideas which often entailed playing many roles at the same time; (2) creativeplanning and following through on artistic compositions; (3) technicalacquiring an understanding of how to operate equipment, software and how to link different media together for presentations; (4) academicinteracting with different kinds of hardcopy, CD-ROM and laservideo databases, selecting information and organizing it to support a line of logic. Each new project designed by students offered new challenges in the social, creative, technical and academic areas for teachers because each student explored different configurations of content, equipment and software. What was necessary for both students and teachers was to be able sustain interest and initiative in long problem solving situations. Dewey has argued that "(t)o be genuinely thoughtful, we must be willing to sustain and protract the state of doubt which is the stimulus to thorough inquiry, so as not to accept an idea or make positive assertions of a belief until justifying reasons have been found" [Dewey 1933 p. 15]. In the case of the Digital Arts program this involved encouraging students to move beyond the line of least resistance, beyond fast easy solutions to develop more complex webs of meaning. Again, it was found that learning to sustain a longer period of uncertainty in research was a gradual process for both teachers and students, which was best approached first in the context of simple, straight ahead and short term activities and later extended into longer more complex problem solving situations.

E. Constructionism: An Integrated Approach

The preceding survey of the components of constructionism does not support the view that the social and individual dimensions of knowledge can be isolated from one another as discrete elements. While some theorists concern themselves more with one area than the other, the general view is that there is a high level of interaction between the social and the individual dimensions of constructing meaning.

Social construction theories have proved to be great tools for describing, analysizing and criticizing both current and historical cultural practices. But on their own, social construction theories leave " a cloud of unknowing " [Huebner 1975, p. 219] around the individual learner. At their most extreme, they mystify and obscure many personal issues, and present an alienated and almost automated view of human development. E.T. Hall's concept of extension transference is a prime example of how media and technological developments are falsely treated as having a viability beyond the human intelligence which created and interacts with them on an daily basis. The effect of this is that an illusion of objectivity and neutrality is created around the use of these elements within society which masks the underlying human elements of opinion and power.

On the other hand, theories of the individual construction of knowledge allow opportunity for exploring the interpersonal and intrapersonal dimensions of learning. At the same time, the individual

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perspective acknowledges a universe of complexities and potentials, and the importance of personal agency in constituting and reconstituting knowledge. But in its extreme form, individual constructionism can lead to a type of professional myopia. Mandated curricula, isolated classrooms, and rigid timetabling constraints tend to act as overwhelming compartmentalizing forces which draw students and teachers ever more tightly into intensive decontextualized learning experiences where academic, social and political agendas are hidden. Curriculum change cannot be effected without an open discussion of the social and political agendas which block change. As well, it has been the experience of this project that success in the area of school based curriculum is highly dependent a democratic process for consensus and on a resulting network of social support. As stated earlier in both Sections I and II of this thesis, teachers and students have been involved at all stages in this program development process in discussions, presentations and performances within the classroom, the school, the school division, the city, the province and with other educators across Canada and the United States.

The action research surrounding the Digital Arts program, leads to the conclusion that an integrated approach to constructionism, which actively pursues both the social and the individual perspectives on learning and communicating, is a necessary one. The connecting agent in the MMC process is building meaning. In order to facilitate this process, one needs a creative thinking space around the concept of

the "Construction of Meaning". To avoid the historic epistemological associations that constitute "knowledge" as a set of absolute, universal and static structures, the word "meaning" has been used to replace the word "knowledge". "Meaning" has a less pretentious morphology including both the rational and the affective; the individual and the collective; fluidity and flexibility. In short, constructing meaning, as a common element of all human experience, has played and continues to play an central role in a dynamic, interconnected and diverse universe. Incorporation of both the social and individual aspects of constructionism grows directly from a concept of culture as an inclusive and exclusive process. Intrinsic to the democratic process is the element of continuous negotiation and renegotiation. Acknowledging this social/individual dichotomy, will lend MMC curriculum development cultural resonance, and develop a problemsolving process which incorporates many perspectives and many powerful way of thinking. These many ways of thinking will be promoted in MMC by providing students and teachers with access to a wider range of media and a wider variety of roles to play in constructing meaning.

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CHAPTER SIX: MULTIMEDIA MEANING

" No knowledge is entirely reducible to words and no knowledge is entirely ineffable...An important part of becoming a good learner is in learning to push out the frontier of what we can express with words." [Papert 1980 p. 96].

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A. Some Practical and Theoretical Considerations For The Construction of Meaning

Engaging students in research based on their own interests and intentions is an adventurous teaching and learning practice. It is commonplace in the initial phases "of pushing out the frontiers " of our knowledge to find vast and often seeming unfathomable gaps between present location and future intention. Frequently in individualized project work the teacher is doubly in the dark. Although students may discuss their project intentions in detail with the teacher and their peers, the teacher only comes to understand these intentions over time as the project evolves. If students are to be encouraged to develop a personal voice, then the authority of that voice must rest, at least in part, on images reflecting their own personal experiences and beliefs. It is often difficult for a teacher to provide the same firm foundation as a resource person if there is only a peripheral understanding of the students' images and intentions. What follows are some useful perspectives⁶¹ for helping students to bridge these research gaps through a process of discovery and transformation. Figure 12 illustrates this connection.



1. Perspectives and Links to Digital Arts

a. Perspective #1: Seymour Papert

Over that past two decades, Papert has been actively researching constructionist modes of learning with elementary age children. In the

^{61.} The term "perspectives" is used extensively throughout Chapter Six of this thesis to highlight the process of extending a creative thinking space for the area multimedia composing. "Perspectives" has been chosen because this term has a positionality which is felt by this author to useful in denoting the transition of views required in this complex problem solving process for moving into and exploring new conceptual frameworks.

context of "LOGO environments" [Papert 1980 p. 11], children have been invited to use the computer as a "computational object-to-thinkwith" [p. 11], and to solve problems of their own devising by programming. Initial experiments in the late seventies, described by Papert in Mindstorms, made use of a "computer-controlled cybernetic animal, the Turtle" [Ibid p. 11]. A new computer language, LOGO, was created by Papert and his fellow researchers at MIT's Media Lab which was easy to use and through which problem solving for students became more concrete. Initially, children were involved in design projects such as programming the Turtle to draw a house or a flower. Through these design projects, Papert explored other ways of knowing beyond the traditional "facts" or "procedures" such as "learning how to learn,...learning how to construct meaningful frameworks for acting and for thinking about acting" [Ibid p. 135]. These other kinds of learning he saw as an outgrowth for each child of "getting to know an idea, exploring an area of knowledge, acquiring a sensitivity to distinctions that (formerly) seemed ungraspably subtle." [Ibid p. 136].

Papert [1980] outlines some of the strategies used by the researchers to help students bridge the gap described in Figure 12. First, the children were asked, "What do you already know that could help you to solve this problem?' It was the explicit intention of the research to connect problem solving to the personal knowledge of the learner. For example children approaching the problem of drawing a flower already knew how to program such geometric shapes as circles,

squares, and rectangles. What they had to figure out was how to alter size, position and angles. Second, when students reached an impasse researchers encouraged students to break problems down into "mindsized bites". Constructing a flower could be broken down into the operations that students already knew how to perform. Third, an important dimension of this kind of discovery learning is making mistakes. Through a trial and error technique of "debugging", students were able to experiment with altering their programs to achieve the desired results. Along the way, there were often many highly useful and unforeseen learning outcomes which could be applied in future design projects. Two children in attempting to connect arcs to make a flower petal discovered how to create a bird in flight. Fourth, all of this problem solving was done in an environment where researchers and children collaborated, discussed ideas and shared information. the researcher did not provide answers to the children's questions but instead offered methods by which children could solve their own problems. Children were coached on strategies for "play(ing) Turtle" [Papert 1980 p. 58].

Papert has attempted to move away from "dissociated" styles of learning in which geometry might be taught as a series of abstract facts and procedures. Instead, researchers on the "Turtle" project promoted "syntonic" learning environments that: were "continuous with well-established personal knowledge"; "empowered learners"... (provided just the information necessary to their project); and dealt with topics that had "cultural resonance" and would be meaningful within a "broader social context" [Ibid p. 54].

Self-transformation in learning was approached through the following model. When "roadblocks" occurred, Papert described the possible outcomes in the following way: "New knowledge often contradicts the old and effective learning requires strategies to deal with conflict. Sometimes conflicting pieces of information can be reconciled, sometimes one or the other must be abandoned, and sometimes the two can both be kept around " [Ibid p. 121]. A learning continuum is predicated on constantly making one of these three choices and then acting upon that choice.

Essential to Papert's vision of constructionism are the elements of design and interactivity. Students are the "architects of their own learning." Harel and Papert [1990] relate these ideas to the work of David Perkins [1986] and D. A. Schon [1987]. For Perkins, "In the designing process...the problem's meaning is not given by the problem itself; rather the designer imposes his meaning and defines his own goals before and during the process. The goals and sub-goals may change over that period of time, and keeping track of these changes is of central interest when the design task is not for the purpose of "getting it right" but is instead aimed at producing something useful through the use of creative and critical thinking" [Harel and Papert 1990 p. 45]. To this end students participating in the Instructional Software Design Project undertaken by Harel and Papert (1987-88) at James Hennigan Elementary School, Boston, kept Design Notebooks.

Briefly at the beginning of each design session, grade fours wrote down their programming and design ideas and the related problems which they experienced in elaborating these ideas. In designing instructional software on a theme of teaching something about fractions, grade four students were able to trace the progress of their ideas through making the kinds of choices illustrated earlier by Papert[1980].

Another important element of a constructionist view of learning is the element of open-endedness. "Schon [1986] is interested in how different designers impose meaning on a given open-ended problem, and how they overcome constraints (created by themselves or given as part of the problem they solve) and take advantage of unexpected outcomes. This interactive process requires a high level of reflection and develops the ability to "negotiate" with situations in "as needed'" creative ways" [Harel & Papert 1990 p. 45-46]. Interactivity is characterized in this design process as a continuous interplay between planning, acting, and responding to unintended outcomes. For Papert, the processes of "debugging" and dealing with unintended learning outcomes in general requires either reconciling, abandoning, or simultaneously accommodating multi perspectives.

b. Link #1: Discovery Process and Outcomes

A constructionist view of learning turns the Tyler model for curriculum development on its head. Where the Tyler model [Tyler 1949] is intent on directing students swiftly and skillfully toward intended learning outcomes with as little muss and fuss as possible, the constructionist agenda allows for and even encourages unintended learning outcomes. In the Tyler model, which Papert and Harel [1990 p. 20] aptly label "Instructionism", learning is assumed to have occurred when the intended outcome has been reached. The fewer unintended outcomes in this system the more efficient it is. In Constructionism, the path to learning is paved with unintended learning outcomes. Unintended outcomes are fundamental to achieving intended outcomes and simultaneously expanding each person's field of reference for future problem solving.

c. Perspective #2: Todd Siler [1990]

Most of Papert's work has been centered on learning through logicalmathematical constructions. Other modes of academic and artistic inquiry present other problems, which have not been directly addressed by Papert.

Todd Siler[1990] provides some useful ideas on problem solving, once a student project has been formulated, a learning gap identified, and the problem broken down into "mind-sized bites". Researchers seek to make sense of the unknown by relating it to what is already known or can be discovered through reflection and interaction with other relevant ideas. What the researcher is trying to establish is a meaningful relationship or series of relationships between the known and the unknown. Underlying each research project is a shadow of a relationship (or set of relationships), which is intuitively felt by the researcher. The goal is to discover and translate these intuitive relationships into concrete forms, such as media. The process of elaborating relationships is built on the selection and synthesis of appropriate analogies or metaphors. The process of constructing metaphors is described by Siler as "metaphorming". In his vocation as an artist-scientist Siler has been associated with the CAD Lab, Department of Mechanical Engineering, MIT, first as a PhD student and presently as a visual artist.

Siler has identified two types of metaphorms: isomorphs and processmorphs. Isomorphic relationships occur when objects, images or concepts have the same structure. For example if two skin cells, taken from a human hand, were compared under a microscope they would be similar design in cell walls and cytoplasm while at the same time each cell might show unique characteristics of pigment, or texture. Similarly, if one were to analyse a theme and variations written by J.S. Bach, structural similarities might exist between the theme and each variation in terms of harmonic relationships, tempo, meter, number of bars. At the same time each variation would encompass unique features of melody, rhythmic devices, transposition of key and so on.

As the name implies, processmorphs define relationships between objects, images or concepts which exhibit a similar process. Processmorphs are particularly useful in building relationships

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between vastly differing phenomena. For example, a branch of science which is currently of great interest to Siler is neurocosmology where scientists are dealing with the far edge of a dynamic, interconnected and diverse universe of ideas. In striving to extend the bounds of human knowledge, neurocosmologists are asking such hard-nosed questions as 'How is mankind ever to make great leaps forward without first gaining greater insight into the workings of the human mind?' " (If) the brain is what it creates... then the brain imposes its dynamics on everything it creates" [Siler 1990 p. 17]. In turn, the universe we think we perceive is really a "brain-universe". Siler points out that if there is a relationship between human perception and the universe, then potentially some aspects of the brain-universe relationship may be processmorphs. The human mind may mirror similar processes which enable it to exist within the universal system. Scientists have recently theorized that neutrinos are a fundamental element connecting matter within the universe. "Neutrinos are massless, chargeless elementary particles that are extremely hard to detect" [Ibid p. 53]. Astrophysicists are presently using a measurement of neutrino flux as one of two observations for " judging the depth of solar mass" [Ibid p. 53]. "Neutrino particles distinguish themselves from photons in that they have visibly distinct anti-neutrino particles" [Ibid p. 259]. Therefore scientists know of their presence by observing the behavior of the anti-neutrino particles. "Many physicists and engineers are currently planning to build an extremely sensitive neutrino telescope" [Ibid p. 259]. Scientific thinking is not all fact and figures. Siler's example indicates the metaphysical nature of scientific problem solving especially prevalent in the early stages of theory

building.

d. Link #2: Discovery Process and Sustainability

Two important insights come out of Papert and Siler. First, Papert's LOGO "microworlds" are effective environments for student-initiated projects based on relatively simple mathematical programming problems such as drawing a flower. All of the concepts needed to solve problems can be explained within his LOGO environment. Papert's microworlds are also applicable to some aspects of the MMC. Activities such as animation or music composition closely correspond to microworlds. Student researchers become actively engaged in a MacroMind environment or a Professional Performer environment. The complicating factor is that MMC requires the linking together of many microworlds. For the more complex and ambiguous agendas set out by high school students, Siler's concepts of isomorphs and processmorphs are useful conceptual tools for designing metaphors.

Of particular interest to this study has been consideration of how such a wide array of intrinsically different microworlds and their related media can be brought together into an effective coalition. It takes a great deal of maturity on the part of the students to move between microworlds, cope intelligently and sensitively with unintended learning outcomes, and at the same maintain a consistent development of meaning.

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Not only is maturity called for on the part of the student but also on the part of the educators in encouraging reachable targets. One important aspect in setting such targets is not only a vision of what could potentially be done but an in depth understanding of what can be done, given the existing computer based media available in the lab. Teachers and students were actively involved together is a developing the process of MMC. MMC was not a well establish communication process but a highly experimental one. In order to maintain some element of continuity in this building process, it was first necessary to build on what teachers and students within the classroom community already knew how to do. As Dewey[1933] has stated, it is very difficult to be creative when one is first immersed in a totally new and foreign environment. Thus the role of the teacher was to encourage students to identify a creative working space that combined some known elements with some new ones. Approaching problem solving in these new areas most frequently became a highly social and interactive process involving a large portion of the students in the class. When a particularly difficult problem arose in the course of project work and the student who was in charge of the research was at an impasse, it was very common for many members of the class to sit down together with the problem and work it through, often from many different directions until a workable solution was arrived at. Maturity was called for on the part of the teacher to be able to identify short term problems and accept the long term ones with a positive approach toward their eventually solvability.

There has also been an interesting dichotomy set up between the views of eloquent proponents of MMC and our experience in the Digital Arts classroom. John Sculley, currently chairman of the board of Apple, has addressed educators in the following manner: "Imagine a classroom with a window on all the world's knowledge. Imagine a teacher with the capability to bring to life, any sound, any event. Imagine a student with the power to visit any place on earth at any time in history. Imagine a screen that can display in vivid color the inner workings of a cell, the births and death's of stars, the clash of armies, and the triumph of art. And then imagine that you have access to all this and more by exerting little more effort than simply asking it to appear... The (educational) environment builds on technologies already emerging from the corporate and academic research centers. Powerful computers, high-speed telecommunications ... CD-ROM and videodisc will provide the hardware platforms....And a new breed of multimedia storytellers, enchanters and guides will build pathways and superhighways through banks of information and libraries of sight and sound" [Sculley in Ambron & Hooper 1990 p. vii].

John Sculley's vision of the future opens a door on a vast room of opportunity and those involved in the Digital Arts project at West Kildonan Collegiate have taken the first steps through this door and are currently looking for a safe place to stand without falling through the ceiling. This task of elaborating an educational perspective on MMC is in the very formative embryonic stages within the educational community. This thesis is in part an attempt to demonstrate that many of the most influential and edifying exemplars for MMC are coming from outside the public education system and outside the academic discipline of education. It is in this spirit of eclecticism and innovation that this narrative continues.

Combining Hall's concept of media extensions with Siler's concept of metaphorms could yield some fruitful results. If media extensions are reductionist in nature and therefore capture only a portion of an idea or experience and if different media capture different aspects of that experience, then the bridging mechanisms for building relationships between media would have to take a step beyond both isomorphs, and processmorphs- acknowledging null or negative relationships. That being the case, each medium adds specific components which the others cannot. Media elements are not directly related to one another. It is only through the context of a designer's problem that they bear association to one another. In the spirit of Hall 's extensions, media must be sewn together from a thread of meaning which can only be partially represented. This partial representation is the result of two factors: (1) the reductionist nature of the media extensions in capturing the designer's vision and (2) the fact that, beyond being the products of human invention, media on their own have no direct relationship with one another. For example, graphics are intrinsically different in import from text or animation, music, sonic environments. Such challenges as, 'Media could be linked by time or physical location', could be countered with 'Time of what and physical proximity to what?' The answer could only be some designer's context; some designer's sense of the world. The very act of trying to

link media out of the context of the human mind is and the composers intentions, in Hall's terms, an act of extension transference or in the words of Jean Paul Sartre [1990] an "illusion of immanence". When the process and the products of constructing meaning are separated then they take on an illusionary qualities of generality and neutrality. The effect is to depersonalize what is in the opinion of this author a highly personal, social, and often nonneutral process. The essence of such qualities of time or physical proximity is the positionality of the person who perceives them.

On these grounds, there is much room for debate with McLuhan on whether "the medium is the message". The message and the media are two interlinking elements in the communication process. Meaning is the framework of interrelationships that are constructed by the researcher and the medium is a tool used to develop and translate those relationships into coherent communications. The source of this meaning is grounded in personal experience and often unique creative combinations of conceptual frameworks.

The message is not a static entity in a constructionist environment. Construction of the message is done in MMC as a result of constant interplay by the researcher between concrete computer programming operations, abstract thinking and the community of learners in which this project takes place. In the process of building and translating, the message is changed as it intersects with other insights generated from unintended outcomes. e. Perspective #3: David Perkins

David Perkins[1989] distinguishes five characteristics for understanding of artistic and scientific meaning: (1) relations, (2) coherence, (3) standards of coherence, (4) generality, (5) openendedness [Perkins 1989 p. 111]. These five characteristics set the stage for effective metaphors or metaphorming. In effect, Perkins is establishing a metaphorical environment. Relations refers to the kind of relationships that can be designed: "symbol-experience, causeeffect, form-function, part-whole, symbol-interpretation, and examplegenerality" [Ibid p. 114]. An important aspect of understanding a metaphor lies in "appreciating how (something) is "placed" in a web of relationships that give it meaning" [Ibid p. 114]. Meaning is contingent not only on identifying a single relationship but also in acquiring the sensitivity to place that relationship into interlocking systems of languages and symbols which surround it. Coherence refers to "building a web of relations coherent in itself and the world outside the organism" [Ibid p. 115]. Standards of coherence are highly contextual and differ between art and science. " A poem may be full of paradoxes, but a theory of physics had better have none" [Ibid p. 115] Generality has to do with translating the perceived relationships into media as in the case of the artist with his/her brush. Open-endedness is seen as a property of all understanding. When will understanding be complete? Never, probably. [Ibid p. 116].

f. Link #3 Meaning, Metaphor and Media

Perkins' ideas provide more depth to the concept of metaphors especially if the process behind the designing of metaphors includes some ongoing interplay between concrete and abstract operation. The location of "generality" within the sequence of characteristics, #4, as described by Perkins, is noteworthy. This positioning makes logical narrative sense but it doesn't describe how the 'artist with his brush' develops this 'web of relationships'. Do these relationships unfold before the artist begins to paint or do they unfold as the artist interacts with the canvas? In MMC the quality of interaction between the processes of building meaning and the other five phases described in Figure 6 is a continuous one.

g. Perspective #4: Jerome Bruner

"The anthropologist, Clifford Geertz, likens the process of acting in culture to that of interpreting an ambiguous text" [Bruner 1991 p. 90]. Essential to interpreting an ambiguous text, for Jerome Bruner, are the cultural protocols and structures of language. Bruner, a psychologist, has devoted much time over the past thirty years to "making sense" of language [Bruner 1991]. Breaking with the narrow constraints of the cognitive revolution [Ibid 1990 p. 2-6], Bruner has moved his psychological inquiries into an interdisciplinary forum, incorporating philosophical, anthropological, sociological, historical and educational viewpoints. Bruner criticizes "the Cognitive Revolution

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for abandoning meaning making" as its central concern, opting for "information processing" and computation instead [Ibid p. 137]. The cognitive tradition in the last fifty years has, in Bruner's view, decontextualized or micro-contextualized the process of meaning making. Given " the pluralism of modern life and the rapid changes it imposes"... "all one can hope for is a viable pluralism backed by a willingness to negotiate differences in world- view". For researchers, this willingness is reflected in an"open-mindedness... to construe knowledge and values from multiple perspectives without a loss of commitment to one's own values. Open-mindedness is the keystone to what we call democratic culture." Bruner further adds that "I take the constructivism of cultural psychology to be a profound expression of democratic culture. It demands that we be conscious of how we come to our knowledge and as conscious as we can about the values that lead us to our perspectives. It asks that we be accountable for how and what we know" [Bruner 1990 pp. 29-30]. For Bruner optimal learning environments are those that promote many ways of knowing, Effective problem solving makes use of many perspectives that are closely interconnected with global realities.

There are three other areas of Bruner's theorizing that are relevant to Digital Arts programming. The first has to do with the qualities of social interaction that enhance the development of language in children. The second involves a discussion of effective communication. And the third has to do with the unique aspects of disciplinary knowledge.

Bruner finds much merit in Berger and Luckmann's[1966] and Vygotsky's [1978] theories of the social construction of knowledge and has used these perspectives as a springboard for studying how children become effective communicators. Through a process of personal and interpersonal meaning making, children acquire the linguistic symbols (metaphors) from the cultural environment which surrounds them. These linguistic symbols are internalized and made sense of through a process of social discourse between children and their peers, and between adults and children. What gives these cultural symbols "clout", within the children's sphere of consciousness, is the quality of interaction, "discourse" which the child encounters in social milieu where these cultural symbols are introduced. For Bruner [Bruner & Haste 1991 pp. 20-21], discourse is significant for the following reasons. Adults provide "scaffolding" in the form of supportive environments and knowledge of appropriate conceptual structures, or rules of practice such as rules of grammar. Through social interactions, "meaning is negotiated" and, in time, the child comes to understand various extensions and complexities of meaning. Discourse, over the long run, acts as a medium for the "transfer of cultural representations" [Ibid p. 21] .

The acts of meaning, in Bruner's view, are elaborated through a narrative process. Personal "voice" is contingent on: 1) " actions directed toward goals (initiated and) controlled by agents", 2) "a sequential order be(ing) established and maintained- that events be

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"linearized" in a standard way", 3) "a sensitivity to what is canonical and what violates (the rules) in human interaction", 4) "something approximating a narrator's perspective" - personal voice [Bruner 1990 p. 77]. In Bruner's view, without these elements effective communication cannot take place.

In his earlier research, Bruner [1960, 1966] focused on the applications of language in Western culture. Included in Bruner's concept of language are rules of grammar and contextual application. As anyone who has ever tried to study a foreign language is well aware, the rules of grammar are not coterminous with cultural literacy. Instead rules provide only a structural frameworks which house a vast array of metaphors. Appreciation of meaning rests also on understanding the social context in which the array of subtle and sometimes complex images, relationships and symbols is used. Bruner, in addressing the social extensions of meaning, views conventional discourse as divided into many separate disciplines of inquiry, each promoting distinct protocols for solving problems which in turn are supported by language that reflects highly situational extensions of meaning. Bruner has advocated a view of instruction that features the diverse and transactional aspects of language. This view is grounded in the belief that acting in culture requires knowledge of culture. The most powerful scaffolding which expert learners (teachers) can offer in support of novice learners (students) is one which takes into account both the general import and specific disciplinary import of language.

The work of Bruner is wide ranging and intersects with many of the central concerns of this thesis. His research in cultural psychology has covered how people, process, and perspectives come together in acts of meaning. The fundamental constituents of meaning making are personal agency, perspective and voice. These qualities are highly dependent on open-mindedness, cultural discourse, knowledge of and sensitivity to multi-disciplinary language structures and narrative construction. " (I)t is conceivable that our sensitivity to narrative provides the major link between our own sense of self and our sense of others in the social world around us. The common coin may be the forms of narrative that the culture offers us" [1987, p. 94].

h. Link #4: Meaning and Narration

Dialogue has been one of the central features of Digital Arts program development. Teachers and students have engaged daily in one on one and group discussion. Verbal interaction has proved to be a very powerful mode for supporting research and development techniques, defining problems, assessing information, selecting relevant ideas, organizing and developing a theme and integrating media, up to and including the final presentation of ideas. Through this interactive discourse, perspectives and techniques, relevant to the project, for interpreting and building metaphors have been introduced. MMC opens the door not only for combining the unique perspectives of a wide range of media but also the opportunity to incorporate many different multi-disciplinary perspectives. The message created in MMC reflects the narrative process described by Bruner [1990]. But MMC also opens up the options for a multinarrative process and leaves the researcher flexibility to develop a wide range of materials, integrate many pathways of meaning, and have those pathways available during presentations. Interactivity extends to all facets of the MMC process. The construction of meaning does not end once the presentation is rehearsed and ready to go, but extends even into a presentation itself. Audiences may be engaged in making critical determinations on how a presentation will proceed. Ultimately the final construction of meaning on the project is negotiated between the audience and the researcher as the presentation unfolds.

Helping students construct effective metaphors in MMC requires not only an awareness of the structural elements, rules and protocols for media but also of the effect which varying combinations of these elements will have on the style of presentation. Mutli-disciplinary or interdisciplinary construction requires a consciousness of the import that different styles languages and symbol systems have and the discrimination to select modes for the central narrative or theme which supports the meaning being created. This requires a sensitivity to the fact certain styles of presentation within society have been commonly linked with certain kinds of media. For example, academic presentations are characterized by a rigid adherence to highly logical, strictly focused textual forms of hard copy- books, research papers, essays- as well as some audio or audio-visual kinds of media. The aural and written text in academic presentation rigidly controls the flow and internal consistency of ideas. On the other hand, creative artistic presentations while often including text, have been traditionally linked with more open ended, affective forms of audio visual media which have included music, painting, graphic design, animation, and video to name a few. Keeping this difference in mind is especially important when the traditions for combining open-ended creative artistic styles and academic styles of presentation are presently in such a primary and formative stage. Adding animation, music and video effects to a research paper brings the affective and academic modes of communication into a new association for students and opens up a whole new area for discussion for students and teachers.

Bruner focuses on language not only as a tool with which students may develop personal voice but also as the framework through which teachers introduce ideas and methods to their students. His views on language and instruction reflect a critical perspective similar to the work of Jean Anyon[1981] on the hidden curriculum and of Dwayne Heubner[1975] on the need to develop new associations for language in the process of curriculum development. How teachers use language has a direct effect on students' ability to act within a given context. For example, it is difficult to encourage and validate creative independent problem solving in highly prescriptive language. Scaffolding for creative problem solving calls for less intrusive modes of discourse

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which leave students more scope for making choices and acting.⁶² "Reciprocal relationships exist between language and environment. Language can be used to create new environmental conditions and new environmental conditions can lead to new language" [Heubner 1979 p. 265]. "The task of the theorist is to lay bare the structure of his(/her) being-in-the-world and to articulate this structure through the language and the environmental forms that he(/she) creates" [Ibid p. 269]. Linguistic development has also been an integral part of the action research process described in this thesis as in apparent from this author consistent use of footnotes and the extensive the list of terms offered in Appendix I.

Equally important in MMC is an appreciation of the unique contributions which each individual brings to composing and presenting. David Perkins states that the "arts are a way of understanding the whole system" ...(and) must be viewed "with the whole person and not just from say from an art history point of view" [Perkins 1989 p. 122-123]. Understanding creativity in students requires of teachers an appreciation of the unique components of each learner's personal voice: the experience, images and perceptions which support his/her ability to choose, act and express personal ideas and feelings. In order to accomplish this effectively, educators require an appreciation of the whole person and the unique attitudes of mind which students bring to the undertaking.

^{62.} As well, Ross Mooney [1975] has given much consideration to the problem of language as it relates to elaborating and talking about curriculum. This research is very sensitive to the difficulties in trying to depict an interactive multimedia research format in a linear narrative way as is required in a thesis format.

i. Perspective #5- Howard Gardner Revisited

In considering the unique aspects of individual human behavior, Gardner has arrived at a synthesis of ideas after thoughtful reflection on the theorizing of the last century. Gardner defines intelligence as "the ability to solve problems, or create new products, that are valued in one or more cultural settings" [Gardner 1985 p. x]. Learning is a process of understanding and to that end, teaching should promote understanding. In Gardner's opinion, the essential qualities of human individuality are the result of a complex set of interactions between genetics, natural environment and culture [Ibid 1985 p. 36]. These three factors interact in such a total and dynamic manner that is impossible to isolate completely the effect that any one of them might have on individual development. Further, Gardner has set out two biological concepts and one sociological concept against which this interaction can be measured. "Canalization (is) the tendency of any organic system to follow certain developmental paths rather than others" [Ibid p. 37]. The genetic code of the DNA is an "exquisitely timed" mechanism that tends to promote individual developmental paths. "Plasticity" [Ibid p. 38] is the ability of an organism to regenerate or find alternate paths for development if one path is injured. For example, a crayfish has the ability to grow a new limb should it happen to lose one. Or, (from my personal teaching experience), most elementary children are incredibly emotional resilient. If they have a bad day at school, they have the ability to bounce back quickly. "Crystallizing experiences"[Ibid p. 387] are those

highly affective experiences by which an individual designates preferred modes of intellectual operation. As described earlier, positive interaction, at an early age, with differential gears helped to engage and sustain Papert's interest in mathematical thinking.

These three concepts of canalization, plasticity, and crystallizing experiences, are useful for setting realistic parameters for transformational learning.⁶³ Students are not only empty vessels waiting to be filled up with cultural knowledge. The kinds of educational interventions which can be reasonably considered are those that recognize and respect the unique developmental pathways of each student, the potential areas for interactivity and transformation, and those crystallizing experiences which have been or could critical in defining for students what, how and to whom they can communicate.

j. Link #5 : Microworlds versus Macroworlds

An important consideration in student-initiated project work is the

⁶³ Transformational learning is viewed by this author as that kind of learning which connects with the real experiences of the learners, is "educative" in the Dewey's sense of the word [Dewey 1938 p. 25] and thus results in a substantial or significant change in the learners perspective and/or ability to solve problems. This process involves the internalizing and making sense of new experiences and new conceptual frameworks and externalizing personal meaning constructed from those experiences via whatever media are available. This involves a four level interaction with information of " take it, use it, transform it and share it". Transformations may include a wide range of responses from radical personal synthesizes involving major shifts in personal perspectives to a smaller series of insights and critical observations which are reflected in a longer term complex problem solving processes such as MMC.

question of where that work is to be carried out. One of the main criticisms which can be directed at Papert's vision of constructivism is that not all learning can be done in the context of LOGO-type microworlds. Papert and his associates selected the relevant, culturally important ideas and brought them into a highly controlled laboratory for learning. This was done directly through the primary and secondary extensions of (1) languages of computer programming and mathematics and (2) the cybernetic "Turtle". But, these microworlds offered a very limited depth of perspective. While microworlds are useful for some kinds of basal elementary problems, they do not reflect the breadth of resonance that conceptual structures have in the larger social context. For Gardner, profound understanding is a result of placing learning in the real world. Through projects like "Spectrum"(1984) and institutions like the "Key School" (as well as through several other projects in 1993 pp. 66-67), Gardner [1991. 1993] has explored programming which draws learning directly outside the classroom and into the community. In the case of "Key School", students, teachers, administrators and parents sat down together and decided on four apprenticeships that students would undertake in the community during the course of the year. Half the school day was spent on school based learning activities and the other half of the day was devoted to apprenticeships out in the community. The main values of this program were described by Gardner as follows: "I believe that rich environments like children's museums, apprenticeship in and out of school, assessment in context, and

teaching that provides diverse entry points⁶⁴ and models are all likely to bring about fuller and less misleading forms of understanding....I recommend the adoption of multiple perspectives and stances that stimulate students to examine a phenomenon from number of different points of view" [Gardner 1991 pp. 226-27]. The diverse entry points mentioned by Garner include: (1) "a narrative entry point" via "a story or narrative about the concept in question"; (2) "a logicalquantitative entry point" using numbers "or deductive reasoning; (3) "foundational entry points" looking at "philosophical or terminological facets of the concept"; (4) an "esthetic approach" incorporating music

64. Gardner uses the term "entry points" to indicate the modes through which the learner is brought into contract with new concepts and ideas. These modes parallel the five of the seven intelligences which Gardner has outlined in his writings [1985, 1991, 1993]. In effect, Gardner is attempting to expand on the flexible processes which good teachers already use. The rationale behind the entry points described by Gardner is to provide teachers with a middle ground between text book based learning (where there is one approach for all students) and totally individualized forms of instruction. Students are encouraged through this process in Gardner's approach to research and construct meaning from many different points of engagement and in turn to develop an understanding about curriculum content which is multidimensional. The technique of multiple entry points stands in direct opposition to traditional teaching practices. McNeil [1986] has critiqued these practices as promoting standardization and managerial values over educational goals. This is done through a combination of of "defensive teaching strategies" [Ibid pp. 157-190] which she describes as: (1) omission presenting complex social issues only from one perspective , thus lending an unreal neutrality to controversial historical events such as the Vietnam war; (2) simplification- where the teacher attempts to win over the students with an "I'll make it easy for you" approach; (3) fragmentation- explaining complex historical issues through lists of people and events; (4) mystification- where teacher explains so little of a complex concept, such as just giving a brief definition of federal budgetary deficit spending that students develop little understanding of the concept in question. The result of this traditional system is that classroom knowledge becomes separated in students' minds from real knowledge and they consequently disengage from this learning process. What Gardner is proposing is alternate modes of engagement which will actively connect classroom learning with personal experience.

or art; and (5) an "experiential approach" based on the belief that students" learn best through a hands-on approach" [1991, pp. 245-46].

MMC in an interactivity rich environment makes use of all of these approaches in bridging the student-identified and student-designed research "gaps". These entry points are not only pedagogical techniques but an integral part of the process of how students come to compose effectively in a multimedia format.⁶⁵ Both students and teachers are actively involved in constructing narrative meaning, computer programming based on logical-mathematical relationships, extending the scope of their theoretical and technical knowledge, designing and composing music, graphic designs, animation, video, all by means of a very concrete hands-on approach to learning.

As described in Part II, some attempts were made in the 1989-90 school year to extend the Digital Arts program out into the Winnipeg professional artistic community through the Co-operative Work experience courses at West Kildonan Collegiate. Our first attempts were not successful. Understandably, the unionized structure of professional theatre in Winnipeg was unable to provide the kinds of interactivity available in the Digital Arts lab. One student in particular, working backstage at a local theatre, found himself limited to loading

^{65.} Multiple entry points are an essential feature of the MMC process. Once students have selected a research topic of personal interest to them, they proceed to explore this topic from a number of directions through data bases such as hard copy, audio, video, CD-ROM, laserdisc as well as calling upon their own personal experience and the experience of other knowledgeable people in the field. This process of exploration is the basis for the collecting of relevant information, creating graphics, animations, videos, writing music and creating soundscapes.

and unloading heavy equipment off of trucks. It has been this author's experience that those apprenticeships which could be linked most effectively to Digital Arts programming and which were thus the most valuable ones, occurred in amateur and in school-based projects. As such, they did not qualify for the Cooperative Work Experience program. This was how the Music and Video Production [MVP] course came into existence in 1990. Students then had two opportunities to apprentice; one for course credit in MVP and the other on a strictly volunteer basis as opportunities within the school, division and surrounding community presented themselves.

k. Perspective #6: C. G. Jung

Carl Jung's interpretation of the human personality compliments Gardner's three principles which define human evolution: genetics, culture and environment. While Gardner's ideas are rooted in cognitive traditions, Jung's beliefs about the evolution of personality grow out of the psychoanalytic traditions of human psychology. These two perspectives appear to have very different starting points in their study of human personality. Gardner's theorizing has centered on identifying one aspect of personality, human intelligence, which he breaks down into seven separate entities. Further, Gardner seems to want to follow the Piagetian convention of defining human personality mostly in terms of intellect, though he reaches toward a new definition of intellect equal in complexity to the term, personality. Jungian analysis begins from the other end of the personality

spectrum with consideration of the whole person. The potency of the Jungian perspective is that it does not sidestep many of the ambiguous, complex issues about human potential but addresses them directly from multiple perspectives: cultural, historical, moral, artistic, social, personal and psychological. Further, Jung's studies focused on a more generalized contemplation of intrapersonal development as it relates to images, beliefs, emotions, dreams, and conceptual structures. Contrary to popular belief, Jung contended that a person is whole to begin with. Through a continuous process of "inner and outer actions" the personality becomes more elaborate or "differentiated". The internal process of differentiation is accomplished through an interplay between the conscious, the personal unconscious and the collective unconscious. The unique aspects of the individual rest in the spontaneous way that this interplay unfolds. Jungian theory traces the effect that the external social elements have on personal differentiation.

The connecting or unifying element in this process is the psyche. Through the "conscious", a person thinks, feels, senses, has intuitions and interacts with the external world. The "unconscious" is the repository for all those aspects of the psyche which are not accommodated with in the conscious. [Hall and Norby 1973 p. 35] The contents of the unconscious have been identified as clumps of feeling or ideas which can be triggered by word associations or a vast array of other external or internal mechanisms. Within both the conscious and the unconscious are unique personal images, feelings and associations which relate directly to the personal condition and experiences. The collective unconscious, the deepest and most inscrutable layer of personality is genetically determined⁶⁶. Through extensive travel and cross-cultural studies in Europe, Asia, China, Africa, and North America, Jung identified some cultural constructs or images which he found to fundamental to all cultures [Jung 1963]. These images which he labeled as "archetypes" included: birth, rebirth, death, power, magic, hero, child, the trickster, God, demon, the wise old man, earth mother, the giant. In traveling and reading he found a constant reemerging of these images [Hall& Norby 1973 p. 41-42].

Cognitive and psychoanalytic psychology are based on very different beliefs about how transformations of personality are affected. As pointed out by Bruner, many cognitive psychologists tend to isolate and target certain areas of personality for development and proceed to effect change without much consideration for cultural meaning or for the socio-historic implications of their interventions. Jung's theories take these ideas a step beyond by indicating the limitations of teaching practices which aim at transforming one part of the personality without a sensitivity to the effect that this change may have on the whole personality⁶⁷. This kind of approach is very common when cognitive psychology acts in concert with instructionism. Psychoanalytic interventions require that transformations be founded

^{66.} One may also argue that it is difficult to separate out genetic from cultural and environmental factors.

 $^{^{67.}}$ This approach reflects the goals of cognitive psychologists to be more scientific in their study of the human personality and to emulate the protocols of narrowing the field of operation, and isolating dependent and independent variables.

on choices made by the individual learner not just in the context of "microworlds" but in the context of their whole personality. Only in this way, can people effect a coherent change, which, in concert with the other aspects of their personality, can enhance knowledge of self and prevent the personality from breaking up into competing, disjointed systems. "Personality can never develop unless the individual chooses his own way, consciously and with moral decision" [Jung, 1981 p. 174].

Jung's ideas on creativity bear serious consideration in the context of MMC. Jung has astutely pointed out that "Creative life always stands outside convention" [Ibid p. 140]. Whether these conventions be the highly personal ones or more broadly based cultural ones, involving students in creative learning experiences introduces varying degrees of risk and uncertainty. "What is it, in the end, that induces a man to go his own way and to rise out of the unconscious identity with the mass as out of a swathing mist? Not necessity, for necessity comes to many and they all take refuge in convention. Not moral decision, for nine times out of ten we decide for convention likewise. What is it, then, that inexorably tips the scales in favor of the extra-ordinary?... It is commonly called vocation: an irrational factor that destines a man to emancipate himself form the herd and from its well-worn path. [Ibid p. 175]. It is this author's opinion that personal growth and transformational kinds of learning involve varying degrees of risk taking, of going against conventions both personal and social and of sustaining brief periods of vulnerability. It is argued in this thesis that

unless learners are able to sustain periods of personal vulnerability, then they will very passive and inept participants in the cooperative learning and presentation techniques. What is required is that successful risk taking needs to be recognized as integral part of the culture of a classroom and a school environment which is supported by caring interpersonal relationships. Those students who have a sense of vocation and the confidence to share their ideas freely and to make their own personal and creative problem solving process transparent and accessible to other learners have much to offer collaborative production and presentations that arise out of classroom activities.

I. Link #6: Personal Pathways to Development & Expression

In our experience with Digital Arts students, creative learning is not a one dimensional occupation. David Perkins' view of art, described earlier, is that art, in order to be understood, must be viewed with the whole person and not just from one perspective [Perkins 1989 p. 122-23]. A holistic approach is also critical to the success of creative/artistic project work. An important consideration in Digital Arts classes has been sensitivity to the fact that not only are teachers engaged in adventurous practices but so are the students with whom they work. If students are going to effect the personal changes required to cross their research gaps effectively, then they require ample opportunity to internalize and externalize their ideas and to consider their choices for acting within their complete circle of consciousness. Such techniques as collaborative learning create a safe environments for change. The informal and continuous format for

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dialogue, which is an important feature of collaborative learning, can provide support, nurturing and, when required, critical interaction.

The inclusion of exceptional or special needs students into MMC programming has amplified our awareness of the range of the research gaps defined in the student project proposals. It has also increased our awareness that these "gaps" be defined to facilitate transformations which will ultimately augment students' confidence in their ability to learn, to use that knowledge collaboratively within the classroom environment and not to traumatize them or force them to abandon their projects before they are completed. What we have tried to encourage has been manageable targets⁶⁸ and creative personal problem solving within a safe and supportive community of the classroom.

As an example of what this involves, Papert [1980 p. 118] describes working with one grade 6 student, Deborah, who had some problems with learning. When she was first introduced to playing Turtle she was shown the LOGO commands for FORWARD, RIGHT and LEFT. All that Deborah did was to program the Turtle with RIGHT 30. When she was shown other procedures she listened patiently and then announced that she didn't want to do it that way. In her own good time, Deborah exhausted her interest in RIGHT 30 and was ready to explore much more adventurously into the Turtle microworld. This example shows that positive attitudes toward creative and independent learning are 68 See page 175 of this document for clarification of manageable or reachable goals. sometimes attainable only after older and well established feelings toward learning are given a chance to evolve. Self-initiated learning is grounded in the intentions of the student. Given a caring and positive atmosphere it is possible for students to overcome other wellestablished feelings. It is as important to discovery learning to develop one's concept of one's self as a learner as it is to interact with disciplinary conceptual structures.

m. Perspective #7: Lev S. Vygotsky

The terms, learning and development, are often used interchangeably in describing a dynamic educational process. Lev Vygotsky, in his theory of the zone of proximal development has added some interesting and relevant insights into the relationship between these two concepts. It was Vygotsky's view that "learning and development are interrelated from the child's very first day," but over time these two functions become differentiated [Vygotsky 1978 p. 84]. Educational practice, from Vygotsky's point of view, has traditionally equated learning with educational development. Vygotsky has indicated that there are two kinds of development which can potentially be measured in schools. One type, "actual development" can be assessed through testing what a child actually knows or can do independently at any given moment in time. What the child can do independently is a reflection of those mature aspects of his/her cognitive process. Another important element in evaluating child development is assessing what a child can do in supported problem

solving environments where there is assistance from adults or other children. These assisted situations are indicators of a child's potential development and provide insights into what areas of the child's intellect are presently immature and evolving. The "zone of proximal development is the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" [Ibid pp. 86-87]. Thus it was Vygotsky's finding that "developmental processes do not coincide with learning processes. Rather the developmental process lags behind the learning process; this sequence then results in zones of proximal development" [Ibid p. 90]. Further the developmental process and the learning process "are never accomplished in equal measure or in parallel. Developmental learning never follows school learning the way a shadow follows the object that casts it" [Ibid p. 91].

To Vygotsky, writing in the early part of this century, the relationship between these two processes was confounded by the fact that the human intellect was not a single entity as Binet and Piaget had proposed but was instead multifaceted. As a result, development and learning formed a complex set of relationships spanning across the intellectual spectrum. Actual development and learning could exhibit uneven maturation and evolution levels with this spectrum.

Finally, in Vygotsky's mind, learning is a concept of historical import which can to identify past accomplishments or those skills which are presently operationally mature. In addition, the zone of proximal

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development can be used as a forward looking device for indicating those skills which are in the process of maturing.

n. Link #7: Pathways and Potentials

One of the objectives of Digital Arts programming has been to provide students with a wide array of opportunities for exploring and identifying areas of personal potential. These areas rise out of following up on areas of personal interests, assessing new technology, discovering new research and communicating opportunities, exploring new aesthetic experiences, having new chances to collaborate and become part of a community of people having fun, and working together toward a series of common goals through the use of individual, small group and large group projects. Those involved with this program have felt that personal ability should be measured not only by what you know and where you've been but also by what you are presently striving to learn and where you intend to go from here.

There is much to be learned for Vygotsky's educational theories. Vygotsky was an advocate of teacher student collaboration, yet allowing space for teacher direction. While the Digital Arts program has supported more open-ended, discovery-based style of learning, there have been some important overlapping elements.⁶⁹ Vygotsyky's concept of the zone of proximal development highlights the salient features of transformational learning: the value of supportive interpersonal relations in personal development, and the importance of considering not only present knowledge but also development paths which are currently under construction. Learning and development form a interactive cycle in developmental paths, where what is learned forms the basis for asking Papert's question of "What do you already know that could help solve the problem at hand?" and leads directly to "What do you need to find out that is not already known?" and "Can what is known provide a springboard for discovering what is unknown?". In Vygotsky's opinion, interpersonal relationships are the most critical element in transmitting culture. While Vygotsky makes a convincing argument for the social constructivist point of view, there

⁶⁹ The kind of discovery based learning described in this document is not without teacher intervention. What has been different from a traditional approach to instruction has been that first and foremost teachers no longer had all the answers and were actively learning alongside the students because of the constant evolutionary nature of the MMC, and the continual influx of new equipment, new software and software undates. Teachers consciously made an effort to provide students with more opportunities to make choices, to explore areas of personal interest, and to develop their own ideas. As discussed earlier in this thesis, teachers were very aware of the importance of language in framing assignments and drawing students into this action research project. As well, it should be stated that direct teaching did occur in the Digital Arts program, when new equipment or concepts were being introduced in class, simply because it was not possible given the time constraints of the course to approach all activities with a discovery based approach. Often the instructions provided in technical manuals were difficult to understand , not always designed with MMC purposes in mind and , on occasion, included serious errors. Some direct teaching allowed teachers to deal with these problems quickly and allowed students more time to focus on the creative aspects of their research projects.

is still one fundamental element in the transformational process which has yet to be addressed. How are the elusive intrapersonal personal aspects of transformative learning to be approached? Jean Paul Sartre devoted much of his artistic and academic career to consideration of this problem.

o. Perspective #8: Jean Paul Sartre

Interactivity rich environments have been explored in this thesis from three general perspectives: socio-historic, interpersonal and intrapersonal. Over the course of his life, Jean Paul Sartre gave serious consideration to all three of these areas. From his position as a writer/philosopher, Sartre has contributed a rich multi-disciplinary synthesis of ideas which provide a political, philosophical, historical, and artistic perspective on the social and personal construction of meaning. How Sartre contextualizes the individual in society and the intrapersonal which constitute acts of personal processes transformation are of special interest to this research. His theories along with those of such other existentialist writers as J.L. Merleau-Ponty, Albert Camus and Simone de Beauvoir offer a unique integration of socio-historic, interpersonal, and intrapersonal perspectives. In Sartre's earlier works [1953, 1968] he developed the following vision of human reality.

From Sartre's point of view, "for human reality, to be is to act, and to cease to act is to cease to be" [Sartre 1953, p. 476]. Included in

Sartre's concept of action is the element of choice. Underlying this view of action is the moral belief that all humans are born with the innate right to choose. As individuals grow and develop, they increasingly come into contact with society and interact with social knowledge through continuous intentional acts of choosing (praxis). All action is preceded by intentions which generate options or choices. Freedom is exercised by choosing one of the options. "We shall never apprehend ourselves except as a choice in the making" [Ibid p. 478]. Once a choice has been made and the action completed, the act or event becomes separate from and hence alienated from the individual. The action passes beyond the intent and the being beyond the action. The action is further transformed in Sartre's view by other circumstances over which the individual has no control. These other influences he labels the "practico-inert".

Freedom to choose is an innate and potential ability of humankind and as such its development can be severely limited, blocked or at time in history directly taken away. Power structures within society have historically limited and in some cases severely disabled the rights of individuals or groups of individuals to choose. Each individual operates in a "zone of freedom" [Ibid 1968,p. 5]. These zones of freedom are determined by class.⁷⁰ "The truth of man is his work and wages. For

^{70.} Since 1943 when <u>Being and Nothingness</u> was published, Sartre was writing from a radical Marxist perspective. Issues of power within this philosophical outlook at that time, were dealt with through the concept of "class". More recently the strict Marxist concept of "class has been criticized as outmoded because it does not take into account considerations discrimination based on issues of gender, race, religion or physical and mental ability.

example in a society where everything is bought, the possibilities of culture are practically eliminated for the worker if food absorbs 50 % or more of his budget" [Ibid p. 93].

According to Sartre, zones of freedom are defined by a process of alienation. Not only are individuals eventually alienated from personal acts of meaning, but when their rights are taken away by social forces outside of their control, a form of double alienation occurs. In 1949 a sign appeared on the walls of Warsaw which was directed at the workers. "Tuberculosis slows down production." Sartre cites this as a case of double alienation. The individual workers were not even in the configuration; not even allowed to mediate between the disease and the forces of production.

Beyond these political perspectives, Sartre has further stated that individuals are inherently historical because they actively participate in events and create objects. As Grumet[1981] has pointed out, the event and the meaning of the event are two separate entities. Meaning is rooted in a new act of choosing at a different moment in time and from a different perspective. Thus, meaning is in a constant state of evolution.

For Sartre, the nature of the event is such, that at the point of action variables come together to effect a synthesis or a transformation. The result of which is that one can never go back into history and exactly recreate or duplicate the event because the whole is nor equal to the

sum of its parts [Ibid 1968 p. 28]. The variables can never be exactly reenacted. It is better, in Sartre's opinion, to approach history to learn attempt to rediscover what can never be fully than to rediscovered[Ibid p. 165]. Sartre sees research as not only a forward looking project. The essence of social scientific research for Sartre is a regressive/progressive activity. Research is regressive in the sense that the individual researcher is separated by time and location from the event for which she/he seeks to find meaning. At the same time, this method is a progressive exercise as the researcher draws what is known of the past into the present and seeks to make sense of it (to establish some relationships, devise metaphors). The choices from which meaning is generated are heavily influenced by present consciousness and present intentions. Value free action is an impossibility in this process.

p. Link #8a: Research Method

A regressive/progressive movement is integral to any research process, even that of MMC. Within each person's "zone of freedom" there are unique acts of consciousness and creativity. Recalling what is known is not an act of straight transference. But instead, past knowledge takes on a new dimension and a new extension of meaning once it is recontextualized at a different moment in time, in a new developmental situation, and onto a new problem, that being the student-initiated research gap. q. Perspective #8a: Sartre (continued)

In a later work [1991], published posthumously, Sartre has used the perspectives of phemonenology and experimental psychology to develop a <u>Psychology of the Imagination</u>. In this book, he outlines in detail a theory of how the individual constructs and communicates meaning and the kinds of transformations which are incorporated in these processes. Sartre has approached this transformational nature of constructing and communicating meaning in a thoroughly philosophical style which offers several interesting insights for the MMC process.

1. Principle I : Certainty versus Uncertainty

Sartre's theory [Ibid 1991] holds that individuals respond to external objects and events by making sense of these phenomena through the many different layers of the human consciousness. External phenomena are internalized by means of a series of substitutions. These substitutions are, in nature, synthetic, reductionist, dynamic and part of a flow or movement. There is a quality of knowledge that can be associated with each level of substitution.

The first level of consciousness is that of the "image". Sartre uses the example of a real chair which comes across an individual's field of vision. The person is aware of an image of a chair. This image is characterized by Sartre as a spontaneous response, where the visual senses interplay instantaneously with structural knowledge. This image comes "in a lump. No risk, no anticipation: only certainty" [Ibid p. 13]. "An image could not exist without the knowledge which constitutes it" [Ibid p. 81]. Nothing new can be learned from an image because it reflects nothing more than present consciousness [Ibid p. 13]. An image is a synthetic act which includes certain structures of knowledge, a certain intention and an act of belief [Ibid p. 16]. Images form the basic data upon which more complex relationships are constructed.

Perceptions comprise the second level of human consciousness in this theory. They are a synthesis of images gained slowly over time through which the individual begins to establish a comprehensive set of relationships between the elements in the images of a chair such as a brown finish, four legs, a high back, and wicker seat. What is learned is learned so through perception. Perception is a very open-ended activity where there are an infinite number of relationships which can be perceived. But only some of these relationships are absorbed. The process of perception is like an "apprenticeship" with the external object, where its essential qualities can be collected, analysed and interpreted [Ibid p. 10]. A survey is then conducted to find the most suitable structure within the consciousness to describe this particular set of relationships [Ibid pp. 8-14]. This survey leads to a third level of consciousness in which perceptions are linked with a more generalized concept, in this case, the concept of chair, which can in turn be transformed into a linguistic symbol or word, chair.

Sartre points out some conditions of knowledge which are attached to all three levels. Images, given their spontaneity, reflect a certain knowledge. It is Sartre's opinion that we can be tricked by our perceptions but never our images because images reflect only present consciousness. Perceptions, concepts and symbols reflect uncertain knowledge and probability because their internal applications are based on open ended data which are never totally encompassed and therefore perceptions qualify as quasi-observations. Further the process of substitution between levels reflects a generalizing reductionist trend which further undermines their connection with certainty. It is the view of this research, that these ideas point to a paradoxical relationship between the rationale given by traditional instructionists for measuring conceptual consciousness as if it were certain knowledge with standardized testing, and Sartre's description of personal conceptual knowledge as uncertain, reductionist and relating only to a range of probabilities. It is because personal conceptual knowledge cannot encompass all knowledge that it has positional properties. Sartre argues that knowledge is part of every aspect of human consciousness and in doing do is given position and perspective. These positional properties of personal knowledge account for one important quality of human diversity. Placing Sartre's ideas for the positionality of consciousness in the context of Gardner's three elements for defining human diversity- genetics, natural environment and culture- could provide a resonant synthesis of ideas.

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2. Principle II: The Illusion of Immanence

The fluidity of movement between the levels of image, perception, concepts and symbol provides an impetus toward concepts and symbols and tends to elevate the status and legitimacy of symbols and concepts in the transformative process. This elevated status gives the illusion that the relationship between external objects and cultural concepts is a direct or additive one. The processes of imaging and perceiving are often hidden and overshadowed by conceptual and symbolic knowledge. The illusion of a direct link between external objects and theoretical concepts, for Sartre, adds up to an "illusion of immanence".

This phenomenon has a close affinity to the condition of double alienation because the agency of the individual to mediate between external objects and internalized cultural concepts is circumvented. The result is that cultural theory is envisioned as the critical and almost exclusive variable to the construction of meaning. In Sartre's terms this adds up to social determinism.

It is the argument of this thesis that encouraging students to develop a personal voice is an illusionary pursuit if students and teachers do not have a clear idea on exactly how they can interact in both concrete and abstract manner between external objects and social theory. In the context of MMC, personal voice is built first and foremost on interacting by means of three activities: first, imaging; second perceiving; and third, conceptualization.

3. Principle III: The Importance of the Concrete in Personal Perspective

Seymour Papert in his LOGO microworlds has demonstrated the effectiveness of concrete interactions in enhancing developmental pathways. One might ask the following question in the context of Sartre's theories: What is the role of the concrete in the synthesis of higher level knowledge? And why is it so important?

In Sartre's <u>Psychology of Imagination</u>, the concrete represents a platform for or an indicator of direct personal interaction with external reality. Through this direct interaction knowledge is established on a base of personal images. Further, these images are irrational, spontaneous associations with conceptual knowledge. An array of images when juxaposed, provides a series of perceived relationships which are then linked to concepts and symbols. In each of these substitutions some aspect(s) of reality will be represented. These aspects will also be affected by the character of the concepts with which they are associated. Therefore without the concrete there exists only an illusion of immanence and the result is a vague consciousness. "To be vaguely conscious of an image is to be conscious of a vague image" [Ibid p. 20]. This statement sheds a very powerful insight into why top down models of transmission in teaching are not always successful. If instructors are ignoring and down-playing the

importance of active involvement on the part of the students and if the subject matter being taught is not consciously connected to what the students already know, then all the students may gain from this academic exercise are vague images. Vague images, if they are typify the overall interaction between teachers and students which one might find in intensive content-based survey courses, will not add up to an empowering or developmental educational experience.

4. Principle IV: The Agents of Substitution

The preceding three principles, Certainty versus Uncertainty, the Illusion of Immanence, and the Importance of the Concrete, have been used to outline some of the basic elements and flow in internal or inward phases of constructing meaning. Underlying this inward flow are the affective agents of intention, beliefs and feelings. "Affective consciousness crosses all fields of knowledge...(A) consciousness of knowledge which is at the same time consciousness of feeling is not part knowledge and part feeling. A consciousness is always transparent to itself: and therefore must be at one and the same time entirely knowledge and entirely affectivity" [Sartre 1991 p. 102].

Once images and perceptions have metamorphasized into concepts much of the fabric these first two levels fades away. What remains behind are the affective impressions. Concepts and symbols in and of themselves have an independent form and may be retained in the conscious. Those elements which remain in the conscious have internal resonance and are therefore meaningful to the individual.

Of central interest in this psychology of the imagination is the process of externalization; how images can be created in the conscious and communicated. The critical agent in this process, described by Sartre, is the "imaginative consciousness" [Ibid p. 18]. The imaginative consciousness is a spontaneous and creative force whose function is to go out in search of its object into the realm of perception and to "maintain and sustain the sensible qualities of the image by continuous acts of creation" [Ibid p. 20]. In an externalizing creative process, an image/object is the result of interplay between conceptual and affective knowledge. Feelings, intuitions and intentions, looking for equivalence, are directed toward concepts. In this instance "concepts act as analogues for perception." [Ibid p. 23]. In this manner an image or series of images are constructed. Intentions, beliefs and imaginative consciousness are agents for initiating the transformation of affective knowledge into internal images. Imaginative consciousness acts as an agent for "filling in the blanks", elaborating the image through a series of interactions with affective, conceptual and symbolic consciousness. At this point, the internal image can substituted into media form, as for example in a graphic design.

Sartre also deals with the act of communication between a creator and an audience. Considerations of audience are a very important feature in constructing meaning. Sensitivity to audience is an important factor in selecting concepts and symbols, and in drawing the creator into a premature imagined dialogue with his audience. Audience or the community, which is receiving the communication, dictates important dimensions of disciplinary approach, style, and affective tone.

The community or audience come into contact with a different type of external object, the graphic design; for example a sketch of a tree. The sketch "occupies an intermediary position between the internal image and a sign"[Ibid p. 40] and as a result calls for interpretation on the part of the viewer. "At the mere hint of representation all knowledge (of the viewer) descends upon (the sketch) to interpret it" [Ibid p. 42]. The collection of lines which comprise the design are animated through the movement of the eyes along the lines of the sketch. Images of the lines are animated in perception until the arrangement of the lines can be linked with a concept or symbol. In any attempt to construct meaning "(the viewer) intends direction on the image" [Ibid p. 47]. The practice of engaging an audience occurs when audiences are drawn into interpreting the gap between the sketch and the concept or sign. Therefore knowledge, when viewed in the whole context of a human consciousness, continuously involved in making meaning, is dynamic, interconnected and diverse symbolic movement.

r. Link#8b: Discovery Process and Empowerment

There are many convincing arguments presented by Sartre in this approach to the psychology of the imagination which support the essential elements of MMC: discovery learning and developmental research and communication. Of particular importance to this thesis, are the ways in which these processes can be enhanced. Through a synthesis of the culturally resonant ideas presented above, three features have emerged are critical to the promoting and enhancing of interactivity rich environments: (1) a caring, knowledgeable social interface that supports the development of appropriate affective attitudes and conceptual knowledge; (2) a sensitivity to multipositional dimensions of knowledge; (3) an awareness that the quality of personal and ultimately collective voice is contingent not only on social knowledge but also on personal images and perceptions by which each individual or group of individuals interpret and extend these structures as E.T.Hall has so aptly said," beyond culture". Each time an individual interacts with a cultural concept, that concept is given application in a different situation, a different place in time and from a different perspective. CHAPTER SEVEN: PROACTIVITY IN INTERACTIVITY "RICH" ENVIRONMENTS

"Think of it, there standing before the educator (are) being(s) partially hidden in a cloud of unknowing. For centuries the poet has sung of (their) near infinitude; the theologian has preached of (their) depravity and hinted at (their) participation in the divine; the philosopher has struggled to encompass (them) in his systems, only to have (them) repeatedly escape; the novelist and the dramatist have captured (their) fleeting moments in never-to-be-forgotten esthetic forms; and the man (or woman) engaged in curriculum has the temerity to reduce this being to a single term-"learner" [Huebner 1975, p. 219].

The Digital Arts project at West Kildonan Collegiate has proved, for the educators involved, to be at one and the same time an exciting and a humbling experience. Rather than addressing our efforts to fine tuning our teaching skills through a series of minor readjustments, we have undertaken, gradually and steadily over a ten year period, a radical alteration in our whole approach to teaching. This has resulted in our moving far beyond the limits of traditional music instruction and into a multi-disciplinary approach to learning. Finally, in doing so, we have ourselves become learners and no strangers to Huebner's "a cloud of unknowing". Not only have the teachers and students in this project become more active learners but we have been required by the interdisciplinary nature of our objectives to take on many other roles
as well. This section looks more closely at the implications that these shifting roles have for those most directly involved in this project.

Nel Nodding has observed that "Constructivism is a postepistemological position. The standard questions of epistemology cannot be answered- or even reasonably asked- from this perspective" [Noddings 1990 p. 18]. She recommends that "traditional epistemological language" be set aside because constructivism is best approached as a "cognitive position and methodological perspective" [p. 18]. The preceding chapter has directly addressed the cognitive as well as other cultural dimensions of the construction of meaning. This section proposes some methodological reflections. Given the diverse nature of the students and teachers and their particular interests and talents that have been combined in a wide range of projects, MMC methodology demands flexible platform for thinking and working. This flexible platform compliments not only people and interests but also the current trends in technological development.

The Introduction to this thesis described the computer as being at the center of the current technological revolution. Papert provides insight into why this is the case: "The computer is the Proteus of machines. Its essence is its universality, its power to simulate. Because it can take on a thousand forms and can serve a thousand functions, it can appeal to a thousand tastes" [Papert 1980 p.viii].

Figure 13 summarizes the current educational applications for computers, drawn from personal experience and from a review of the Figure 13:

Computer Assisted Instruction (CAI)

Aim: To program and evaluate the students.

Metaconcept: Instructionism

The computer is used as supplement to:

• top-down, teacher dominated models driven by provincially mandated curriculum

- broad ranging survey type course formats
- lecture style teaching and practice and drill assignments emphasizing memorization, comprehension and reproduction
 heavy use of prepackaged programs created by outside experts
- questions and answers are generated
- by curriculum

• curriculum focused on presenting other people's ideas about a field of inquiry (ie. math

EDUCATIONAL TECHNOLOGY Current Computer Applications

Aim: Creating "technology rich" environments to enhance learning by means of:

- drill & practice
- tutorials
- instructional games
- simulations (ie. dry labs)
- · problem solving
- spreadsheets
- wordprocessing
- data-base management & processing
- animation
- graphic design
- manipulation of scanned photo & video images
- video editing
- accessing CD-ROM & Laserdisk
- music composition
- multi track recording
- sound design
- multimedia composition
- multimedia presentation
- software design
- networking(ie. LAN, SchoolNet, Email, AppleLink).

Computer Based Learning (CBL) or Computer Assisted Learning (CAL)

Aim: To encourage students to be the programmers and evaluators. Metaconcept: Constructionism. Computer is used as a tool by students and teachers to:

- construct their own knowledge
- explore areas for personal development

• generate questions by interacting together in a collaborative manner

- develop their ideas personally and collectively by employing a broad range of skills which are-
- (1)intellectually and artistically challenging,(2) multi perspective & interdisciplinary, (3) approaching problem solving as a complex activity, that may generate many different and valid insights and solutions.

relevant sources.⁷¹ All but two of these functions are currently in use in the Digital Arts Lab. As yet simulation and networking have not been features of the program. Also included in Figure 13 are summaries of the two main metaconcepts addressed in this thesis: "Instructionism" and "Constructionism". The idea for framing this analysis with these two metaconcepts comes from Harel & Papert [1990] and Papert [1993].

These terms are defined in the following way. "Instructionism...is to be read more on an ideological and programmatic level as expressing that the route to better learning must be the improvement of instruction" [Papert 1993 p. 139]. "Constructionism" is Papert's personal improvisation of the constructivism originating from cognitive psychology. The reason for this change in terminology was that Papert's method is more interventionist that Piaget's view of constructivism and he advocates the importance of indirect teaching methods. Thus Papert wanted to distance himself somewhat from the Piagetian model. "Constructionism is built on the assumption that children will do best by finding for themselves the specific knowledge they need; organized or informal education can help most by making sure they are supported morally, psychologically, materially and intellectually in their efforts. The kind of knowledge that children

^{71.} In order to identify and select which of the thousand computer functions, indicated by Papert, are or could potentially be relevant to educational applications of MMC, a survey was made of the following sources: Ambron & Hooper [1988, 1990], Apple Classrooms of Tomorrow Reports #6-11[1990], R. Azarma [1991], J. Barker & R. Tucker [1990], L. Casabianca [1988], M. Greenberger [1990], I. Harel [1990], V. Makrakis [1988], S. Papert [1993], A. Reynolds & R. Anderson [1992], T. Scot, M.Cole & M. Engel [1992], R. Taylor[1980], A. Thompson, M. Simonson, & C. Hargrave [1992], and Colins [1991. need most is the knowledge that will help them get more knowledge" [Ibid p. 139].

The approach taken to constructionism in this thesis has not been a purist one. It has been This author's experience that on occasion direct teaching has been beneficial especially is situations where a new topic, project, skill or piece of equipment is being introduced to the whole class. Direct teaching has also been useful when many or all of the students are encountering the same problem over and over. A few minutes of direct teaching can minimize the difficulties in coming to understand a new technology. Teachers and students are then freed up to move on to the exciting things. Direct teaching has been also useful for reinforcing the necessary technical procedures which provide the conceptual basis for students to work independently, to help each other and to collaborate.

Earlier in this thesis, Nodding's views on the evolutionary nature of collaborative relations between students and teachers were cited [Noddings 1988]. It is her opinion that some direct teaching is not only justified but necessary and that this can done without compromising the integrity of constructionism and long as it is undertaken within an caring atmosphere of temporary inequality and where steady progress is continually being made toward empowering students.

In the context of the Digital Arts project at West Kildonan Collegiate,

empowerment has been viewed in the following manner: (1) the ability to interact effectively within a community of learners, develop and express ideas within a more complicated multidimensional process; (2) the opportunity to take on different roles and appreciate different perspectives and different ways of knowing; (3) the ability to identify, focus on and sustain a meaningful research project; (4) the chance to grow in self worth through knowledge of self and extending self in an interactivity rich environment; (5) the ability to relate what is learned back into the surrounding community in meaningful and caring way; and (6) responsibility not only to self but to a larger community. Thus it has been through the Digital Arts program and the process of multimedia composing which grew out of this program development that this author was able to put these ideas of empowerment into practice. Students engaging in multimedia composing were given the opportunity to direct their own learning within a supportive classroom environment. This process included setting their own goals for creative expression and learning, and then working in collaboration with teachers and other students through a developmental problem solving process toward these goals. Goals in MMC were defined and interpreted in such a manner that they allowed for a discovery based and improvisational approach to composition which could take advantage of both intended and unintended learning outcomes.

The process of multimedia composing thus provided students and teachers with a new and extended set of tools that for constructing meaning which included developing their ideas through interacting with and integrating audio, video and computer based text, graphic and animation capabilities. Creative composition was accomplished through the interrelating of several or many different media, thus opening the door to a greater combination of perspectives or positions of experiencing, interpreting and describing. Further a wider array of resources such as video information available in CD-ROM and laserdisc libraries, has created increased opportunities for researchers to access and utilize video data in researching and presenting their ideas. Thus more positions or perspectives, both intellectual and aesthetic, about the world around are available to be incorporated into the research process as well as many more ways through which composers and writers can to interpret and express their ideas.

In the Digital Arts program, it has been shown that the positionality of the researcher is critical in shaping the quality of meaning. Positionality is also important in defining depth of range in meaning: How many different social views will be taken into account in interpreting personal and social phenomena? How many different media will be used to develop and express the composers interpretation? It is the opinion of this research that quality of meaning can be enhanced through recognition and validation of personal voice and that depth of range can be promoted through many ways of knowing and many ways of expressing personal images. In Figure 14 the computer functions set out in Figure 13 have been transferred into some potential roles within the educational community. An attempt has been made to illustrate the different zones of freedom which exist between the institutionalized roles of traditional applications of computer assisted instruction (CAI) and the expanding roles of computer based learning (CBI) or computer assisted learning (CAL). A comparison is drawn in Figure 14 which provides an example of the differing levels of interaction for students, teachers, administrators curriculum experts, and software developers between CAI and CAL environments. Limitation of space and readability prevented the inclusion of some other key player in Figure 14. This thesis also wishes to acknowledge a similar dichotomy in roles between the two milieus with other key players such as parents and local community-based resource people such as business people, professionals, senior citizens, as well as hardware developers.

One the most important distinctions between instructionism and constructionism is that each looks at the learning process from a different vantage point. Underlying these positions are two opposing beliefs about the agents of learning. Instructionism envisions the teacher, teaching techniques and curriculum as the prime agents for promoting learning and it measures its success by how closely specific learning outcomes are achieved by students. Fenstermacher [1986] points out that most research in curriculum has been done from this perspective. What is missing from this configuration is the agency which the student himself/herself brings to the task of "studenting". Constructionism on the other hand is intent on assisting learners along their own developmental pathways. The position of the teacher, teaching techniques and learning outcomes within that context are



evolutionary in nature.

Instructionism supports a view of curriculum development as a scientific process of simplification, renewal, "back to the basics" and a fine tuning of existing, status quo teaching practices. The Tyler Rationale, upon which the instructionist views of curriculum development are based, is a model for curriculum reform and not fundamental curriculum change. The Digital Arts program at West Kildonan Collegiate has represented a substantial change approach to the creative arts curriculum at the high school level. It has been this author's experience that curriculum change is not the neutral philosophical process described by Tyler to be accomplished by one curriculum expert but instead requires widespread community involvement to develop and sustain it. Curriculum change is dependent on a common vision and purpose and high level of interactivity among all those people indicated in Figure 14.

Through Figure 14, it is possible to foresee a very new, exciting and interconnecting world of opportunities opening up for all those involved in the educational process. Given the connectibility of the computer these opportunities seem to stretch far beyond the walls of classroom and schools far out into an ever expanding communities of culture and consciousness.

Technological extensions reveal the inner workings of both the human mind and body. "Many of man's extensions really are expressions of his

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basic nature, but we also learn that man has many basic natures" [Hall 1990 p. 36]. Hall's extensions are a long range historical device for illustrating how human consciousness has extended itself over time. Through this expansion outward, pure thought or one's innermost thoughts are amplified by the primary extension of spoken language and the secondary extension of written language.

If progress is to be made in the area of computer assisted composition, it may also be necessary to see that viewing this phenomenon only from a broad ranging historical perspective may tend de-emphasize and to mask some important elements in the current technological revolution. There are two limitations which Hall's view presents to a forward looking perspective. Hall's definition of extensions has a highly generalized and almost universal import which when strictly applied a specific curriculum context tends to camouflaged other more current historical perspectives. When Hall's extensions are applied in a more limited historical context such as the West Kildonan Collegiate Digital Arts project some interesting relationships surface. If a primary extension is defined by it direct relationship to pure thought then it is possible to envision other modes of expression which presently function in direct relationship with pure thought, such as written expression, or inputting data into a computer via a keyboard. Once language has been mastered it may not always necessary to speak in order to express ideas. The link between pure thought and spoken language may be a developmental pathway which can be circumvented once other media forms have been mastered. The computer has the potential to function as a concrete

interface between pure thought and media expression and as such qualifies to be a primary extension.

The second limitation of Hall's view of extensions is that in <u>Beyond</u> <u>Culture</u> he uses it only to describe linguistic extension. What if extensions were applied to Gardner's multiple intelligences? It would be possible to envision many primary extension of pure thought: for a dancer- movement, for an artist- a paint stroke, for a neurosurgeon- a microprocedure, for an athlete- winning a race, for a musician- playing a new song on a synthesizer and so on. What the computer might allow us to do is to extend to the range of effective primary extensions, and to develop more sophisticated, multi-positional perspectives about ourselves and the world around us.

John Goodlad [1988 p. 179-180] related the following quotation by Bruner to a dream he had as a child. "A curriculum is more for the teacher than it is for pupils. If it cannot change, move, perturb, inform teachers, it will have no effect on those whom they teach" [Bruner 1977 p. xv]. Goodlad continues "I do not know why these words bring back a dream, but they do. I was very young, perhaps seven or eight; it was summer, and the moon was full. The moon was full in my dream as well and so it was difficult to determine which was dream and which was not; the whole was in glorious color... There were six great horses, more magnificent than the Budweiser sextet, pulling a glorious chariot. The whole stopped win the field, just a few feet from my bedroom window, gleaming and shining brilliantly in the moonlight. I was sitting in the carriage, but I was watching myself sitting in the carriage, achieving what had eluded and so frustrated F. Scot Fitzgerald: the ability to be dancing in the ball simultaneously watching himself dancing in the ball. But it was a dream" [Goodlad p. 108].

With the assistance of the computer, I believe that Goodlad's dream may just come true and that in the future we will be able to play many roles almost simultaneously. With the computer as interface it is currently possible, given the appropriate accompanying technology, for students to experience all of the roles listed in Figure 13. Many of them can be played interchangeably, in close proximity to one another. The computer itself can take on many roles and interchange these roles with students as necessary. It is possible to compose a song one minute and listen to it played back the next. This flexibility to be both the producer and consumer, both the performer and the audience, both the teacher and the one who is taught, allows us to see our ideas from many directions almost at once. As Vygotsky and many other have rightly pointed out, interaction is essential to personal development. It is the opinion of this research that, in the context of interactivity rich environments, we are only just beginning to explore our personal and collective potentials.

CONCLUSION

Through the case study in Section I, this thesis has attempted to provide an overview of a problem solving process initiated in the creative arts area in Seven Oaks School Division between 1983 and 1992. This has involved tracing a series of the research questions and school and community curriculum initiatives. All those involved in these curriculum innovation projects have shared a view of learning and curriculum as a dynamic, complex and multi dimensional process. The transformational nature of curriculum and learning, around which this research has been focused, has centered on connecting curriculum development with the personal experiences of teachers and students, as well as connecting current social and educational theory with classroom practice. As shown in the preceding chapters, the assumptions and approaches of the Digital Arts program are consistent with a developing body of theory and research in education and other related disciplines.

The action research proved itself over a ten years period to be a highly adaptable, flexible and fluid basis for conducting research. The open-ended assumptions upon which this technique is based facilitated a steady flow of research questions and research opportunities. Also this technique was easily adapted to a wide range of research questions from the macro to the micro contexts, to a diverse and constantly changing community of learners, to a wide spectrum of research methods from individual projects to large committee based inquiry involving an extended team of teachers and administrators as well as teacher and student exploration of forms, techniques and procedures. Action research supported a multidimensional perspective for connecting theory with classroom practice. In addition, it has been this author's experience that empowering, multi-dimensional learning and communication can be arrived at only through the kind of flexible, creative and democratic platform offered by such techniques as action research.

Thus, one of the aims in the researching and the writing of this thesis has been to reflect on this flow of ideas and practices. Many aspects of this curriculum process have shown strong resemblance to weavers' art in constructing an elaborate tapestry. Selecting powerful and culturally resonant ideas, concepts, themes and perspectives has mirrored the weavers dilemma in searching out and choosing the most beautiful, brightly colored and appropriate materials for discovering and articulating the images of present plans. These images have been shaped not only by present intentions, but past experience and future hopes as well.

In this thesis the ideas of a dynamic, interconnected and diverse universe, of constructionism and of multimedia composition have been the "woof threads" and the many many ways of knowing offered by such by the social and educational theorists described here have been the "warp threads". The interrelating of ideas, practices and perspectives has revealed dynamic patterns, some of which have reoccurred over and over again in a vast array of themes and variations.

The weaver analogy is particularly significant to this research because curriculum development is an artistic as well as academic pursuit. It is imaginative as well as practical; it implies many new beginnings as well as many acts of closure. All those who participate in "the community of learners" engage their creative imagination in making sense of and acting within the world around them.

Sartre has pointed out that in reaching out to make sense of the world, a gap is established between what is known and what we seek to know. Acts of transformation are bridged with metaphors and images which are translated and retranslated through many ways of knowing from the concrete to the abstract and back again. As Clifford Geertz has said" acting in culture (is like) ...interpreting an ambiguous text."[Bruner in Bruner & Haste 1991 p. 90]. It is the ambiguity and agency to interpret which draw learners in and provide the opportunities for empowerment. Artistic and academic techniques offer transitionary perspectives for acting within an ambiguous context.

Section II of this thesis has explored both theoretical and practical aspects of composing in the ambiguous context of MMC. One of the main problems which underlies this style of composition is the coming to terms with interconnecting artistic and academic/scientific forms of inquiry within the scope of one research project. Todd Siler

has offered the following view of this procedure. "Art teaches science to go inward for questions; to explore ambiguity; to trust uncertainty; to exercise one's freedom to communicate without fear. Science teaches art to go forward for answers; to challenge conclusions; to exploit precision and consistency in exploring its insights. Art questions. Science answers. The two are mirror images of one another...To separate art from science is to misunderstand the process of questioning and answering in this reflexive relationship. To integrate art and science is ... to understand the unity in this process [Siler 1990 p. 368]. Multimedia composition when applied in the constructionist milieu offers a concrete and exciting opportunity for exploring this connection.

Like the weaver summoned away when the cloth in only half done, this research project comes to a conclusion. What has been accomplished after ten years of action research is only a beginning. It has been the intention here to be cognizant of both the inclusive as well as exclusive components of this research exercise. What has been included here is a historical accounting for the one particular interactive multimedia program, the Digital Arts program at West Kildonan Collegiate and an attempt to place this innovation in a wider artistic and academic context. What is excluded in this exercise are definitive answers. It is hoped that the ambiguities and the questions raised by this research will engage the attention of other learners in this area and encourage an interaction which will help to promote a concept of interactive learning which is takes into account two fundamental presencesprocesses of culture and the individuals who seek to capture and transcribe their feeling, images and ideas by means of these constructs.

Moving beyond the traditional, top-down models for education requires an awareness of two key ingredients of these models; one, highly controlled expert-driven, teacher-centered definitions of content, and two, the narrowly defined and rigidly controlled roles for personal interaction within the educational community. In order to counter effectively traditional models for education, this author's vision requires changing these two ingredients in the following manner. Establish broader, more culturally relevant framework of ideas on what constitutes a quality education. Reorganize how people, perspectives, ideas and media come together within the community. Accept a vision of truth as a process of becoming rather than as an established set of facts. Further, encourage an image of truth as it is revealed by individuals and groups of individuals acting together. Each person or group of people has the potential to reveal some substantial portion of truth within a given context and a given truth-seeking process. Acting in good faith is society means accepting and acting upon this responsibility for developing, refining and presenting personal and collective interpretations of the surrounding world.

Many of the ideas about collaborative and empowering learning expressed in this thesis are not new. What is new currently is the opportunity for how these ideas may be brought into a more meaningful and democratic association with technology.

The horizons of human consciousness and theorizing are expanding rapidly in many directions and on many levels at once which range from theorizing about the smallest particles and associations upon which the known universe is based to pushing back the frontiers of what have historically made up the concept of infinity. Figure 15 visualizes the extended concept of culture, which was developed in Section II of this thesis. Culture, in this author's vision is an historical as well as a forward looking conceptual tool which includes not established social protocols but encompasses an expanding universe of personal and interpersonal possibilities. A vast number of highly accessible communication networks have been rapidly appearing on the last several decades which have given new meaning to the old maxim, "Proximity is everything". Telecommunication systems have helped to extend a sense of proximity beyond actual whole-body physical location to location via telecommunication and satellite transmission of personal thought patterns which includes many of the same potentials for verbal and visual spontaneity and interaction as total physical proximity.

When traditional styles of teaching venture outward beyond the public education system, the quality of interaction of these systems is geared mainly toward transmitting established cultural information and cultural reproduction. Traditional television, films, videos, lecture styles of teaching are predicated on a kind of marginal consumer style of learning and less on extensive participation in an extended sphere



Figure 15: A View of an Expanding Community and Cultural Universe

of cultural interaction. If learning is to connected to the "real" world then it can not ignore the potential which current global communications offer for challenging learners to develop their vision for personal interaction, researching, and communicating. This author's vision takes into account the outstanding opportunities which lie ahead for all kinds of learnersstudents. teachers. paraprofessionals, parents and the general community, curriculum experts, software and hardware developers. Figure 15 illustrates the some of the views that educators can bring curriculum development process, visualizing many different perspectives for perceiving, discussing and presenting new concepts to students. Figure 15 offers this author's vision many challenging perspectives, points of view and many possibilities for multimedia research, composition and presentation.

From the perspective of Figure 15, traditional models for curriculum are commonly based on a very narrow field for cultural interaction which is centered most directly on the culture of formal education and to a lesser extent on the culture of self. From a multimedia perspective, Figure 15 presents an infinite spectrum of ways in which empowering and democratic forms of learning can take place. What is needed for this to occur is for all kinds of learners to "seize the moment" and take a proactive role in uncovering, extending and interpreting a whole new adventure in community interaction and cultural development. This will require a continuous engagement in cultural elaboration on the part of a broad network of dedicated people, participating, communicating and growing together.

The final comment on this creative enterprise is deferred to someone of much greater authority. "I think that only daring speculation can lead us further and not the accumulation of facts. " [Albert Einstein in a letter to Michael Besso, October 8, 1952 in Siler 1990 p. 358].

APPENDIX I: TERMS AND DEFINITIONS

1. CAD- Computer Assisted Design- is a 3-D graphics and animation technique used in architecture and engineering for modelling and simulation structural design elements. Such software as AUTOCAD, DESIGNCAD can bring a blueprint to life and to allow the planners and builders to preview and experiment with design features before actual construction.

2. CAL-Computer Assisted Learning- is used by this author to characterize computer based learning techniques which promote a higher degree of interactivity, programming and creativity on the part of the learner and place emphasis on a common practice of computer as tool and tutee over the more top down models of instruction such as CAI.

3. CAI- Computer Assisted Instruction- is a term which is connected to "a view of teaching and learning grounded in the training and achievement of preset objectives" [Scott, Cole and Engel, 1992, p. 207]. This approach to computer education may include tutorial, drill and practice, instructional games, modeling, simulations, and problem solving [Reynolds and Anderson, 1982, p. 162].

4. CBL- Computer Based Learning- a global term used to indicate a whole range of practices within educational technology (ET) which include CAI (computer assisted instruction), CMI (computer managed

instruction), and CSLR (computer supported learning resources) [Reynolds and Anderson, 1982, p. 153].

5. CD-(DA) Compact Disk-(Digital Audio). " The laser encoded optical read-only dis(k) originally introduced to the consumer market as a storage medium for digital audio and since extended for use with digital data and digital video" [Greenberger, 1990, p. 240].

6. CD-ROM- Compact Disk Read Only Memory- is a peripheral device which can be interfaced with a computer or more recently in the case of the Apple's MAC LC 520 and IBM's EDUQUEST Models 30, 40 and 50 (released September 1993) an internal component of a computer. This format uses CDs as a computer storage medium and can handle 550 megabytes of data or other mixed media (both audio and video) on a 5-inch floppy disk'. Introduced in 1987, 'this format can accommodate large data bases. For example, the complete Encyclopedia Britannica has been released on one disk'. [HYPERMEDIA, 1988, I(I), p. 88]. CD-ROM can serve as an information source for multimedia based research and can also be integrated into computer controlled audio/video presentations.

7. CMI- Computer Managed Instruction- techniques for managing information about learners' performance through computer testing, record keeping and prescription. This evaluation process is carried out with the help of spreadsheets, word processors, and data bases. The computer scores and analyses tests, stores test scores, and includes files for objectives, and levels of difficulty. In effect the computer performs the function of " an electronic gradebook" [Azarmsa, 1991, pp. 34-37].

8. CONSTRUCTIONISM- This concept used by Seymour Papert is an outgrowth of Piagetian constructivism. After having worked with Piaget for several years (around the early 1960s), Papert was greatly influenced by Piaget's ideas. In his work at MIT, Papert has extended this concept to include a more interventionist approach. Instead of allowing students to explore the LOGO microworld unhampered, an essential ingredient of Papert's research strategies has been interaction with knowledgeable peers or other adults. This is the rationale that Papert has used to justify the slight variation in terminology from constructivism to constructionism. This document has chosen to adopt a vision of constructionism which is quite close to that of Papert's and to use this concept as a major tool for reflecting on the implications and possibilities for Digital Arts programming.

9. CONSTRUCTIVISM- Psychologist Jean Piaget devised a theory for explaining cognitive development in children. This theory was based on the premises that children construct their own knowledge and that in this maturing process, each child proceeds at an independent pace through a series of definable stages or levels beginning with the concrete and moving toward the abstract levels of thinking. This theory has continued to enjoy a wide popularity in the field of psychology and has been integrated into many of the child centered and learning centered approaches to education.

9. CPU- Central Processing Unit-is "the place where the computer coordinates the receiving of data, combines and compares numbers, and sends output to the screen, printer and any number of peripheral devices" [Clark, 1990, MacMIDI Dictionary].

10. CULTURAL CONSTRUCTIVISM - is a phrase used by Scott, Cole and Engel [1992] to describe their unique perspective on the Piagetian theory. "By contrast, a cultural constructivist approach assumes not only an active child but an equally active and usually more powerful adult in interaction (we are speaking of educational settings). Moreover, cultural constructivism emphasizes that all human activity is mediated by cultural artifacts, which themselves have been constructed over the course of human history" [Ibid p. 191].

11. CSLR- Computer Supported Learning Resources- "any form of computer support or function that supports learning other than those that teach: communications, data base, hypermedia and expert systems" [Reynolds and Anderson, 1982, p. 175].

12. DIGITAL ARTS- is a term used by Clark and Williams in this action research to indicate the process and products of a creative research and development within interactive multimedia format. The Digital Arts incorporate a range of composition and presentation techniques which may include one or a combination of digital media for collecting and organizing research info, scripting, and developing music, graphics, animation and video. One or more of the media in this process reflect a form of personal creative expression on the part of the author(s); for example original music, interpretations of info in scripts, graphics, animations and videos.

13. ET- Educational Technology- is a general term used to define all aspects of the inclusion of technology within educational systems such as "process, people, ideas, devices, organization for analyzing problems, and devising, implementing, evaluating and managing solutions to those problems [Thompson, Simonson & Hargrave 1992 p. 2].

14. GUI- Graphic User Interface- is "a mouse driven user environment for personal computer that includes features such as windows and icons on a bit-mapped display" [Greenberger, 1990, p. 242].

15. HYPERCARD- "An object oriented programming system for the Macintosh computer developed by Bill Atkinson. HyperCard uses scripted messages, user-added commands, an English-like programming language called HyperTalk (designed by Dan Winkler), and virtual cards with automated fields and buttons to provide broad interactive functionality, including animation, fast search, special effects and drivers for audio and video" [Greenberger, 1990, p. 242].

16. HYPERTEXT and HYPERMEDIA- "Hypertext is a system for

building up text electronically, allowing it to be viewed in arbitrary (nonlinear) fashion while moving from one association to the next. Hypermedia generalizes the concept to other forms of media, including stores of pictures, sound recording and video" [Greenberger, 1990, p. 242].

17. IM- Interactive Multimedia- "User control of sound and video by means of computer, often at the desktop. More generally, using the computer to integrate sound, video, and animation with text and graphics. Someday this integration might involve using, if not the full sensorium, significantly more of the sensory apparatus" [Greenberger, 1990, p. 242].

18. INTERACTIVITY- In the computer context, Greenberger [1990] defines this term as follows. "In the everyday sense, interactivity is open-loop control, where a programmed system is directed by the user... it is an ongoing conversation between system and user. Mutual and simultaneous activity where both participants may be working toward a common goal, where either can interrupt the other without crashing the operation, there is limited ability to anticipate, no default path, and there is the impression of an infinite data base" [Ibid pp. 242-3]. The concept of interactivity is central to the development of the Digital Arts program and in this context refers to the ability of a user to converse continuously over extended periods of time with people and as well as preprogrammed and programmable digital media for the purposes of creating, refining and presenting ideas.

19. INTERFACE- "The means of interaction between two devises or systems that handle data by different codes or formats. A shared boundary or storage buffer between two device,s systems or programs. The environment presented by personal computer to its user" [Greenberger, 1990, p. 243].

20. ISDN-Integrated Services Digital Network- "A (international) digital telephone network...designed to carry all forms of data, including digitally encoded voice and video" [Greenberger, 1990, p. 243].

21. LASER- "An electromagnetic source capable of producing infrared and visible light" [Greenberger, 1990, p. 243].

22. LOGO- is "a high-level interactive language, based on LISP" [Wold and Hunter, 1984, p. 185] which is "a high level language used in artificial intelligence applications and research" [p. 182]. LOGO was developed by Seymour Papert at MIT's Media Lab as a communication tool in his experiments with a constructivist style of learning environment. LOGO was the language which children used to program a cybernetic "Turtle" while designing graphic shapes based on geometric designs [Papert 1980]. "LOGO is now a powerful system and a family of languages" [Greenberger, 1990, p. 243] and is currently used by Papert's Epistemology and Learning Group at MIT in Project Headlight at James Hennigan Elementary School Boston and in the Science and Whole Learning Project (being conducted across the U.S., the former U.S.S.R, Chile, Bulgaria and Japan) [Harel, 1990, pp. 17-18].

23. MACINTOSH- is a line of computers developed first in the 1980s by a Division of APPLE Computer Inc. This line was unique because the CPU and the monitor were combined into one highly portable box and also the MAC was "the first computer to offer a graphic user interface (GUI) to a broad class of users" [Greenberger, 1990, p. 244]. The early black and white models included the MACPLUS, the SE, the Classic, later were expanded into larger differentiated and color formats of the color Classic, MAC II, MAC si, Centra and most recently the LC (Performa), Quadra and the Powerbook [Mello 1993, p. 19-20].

24. MIDI- Musical Instrument Digital Interface- is "a world wide industry standard language that allows computers and (electronic) musical equipment from different manufacturers to communicate. MIDI is a serial interface that sends or receives digital words of binary code at the rate of 31.25 KBaud" [Clark, 1990, Mac MIDI Dictionary].

25. MMC- Multimedia Composition- APPLE's Multimedia Lab has developed, The Visual Almanac, which includes a selection of compositions constructed with the tools in this program. The projects include: "Oral Report, Visual Poem, Visual Crossword Puzzle, Interactive Story, and Interactive (restaurant) Menu" [Ambron, 1990, p. 73]. These activities use the MAC computer to link text, sound and graphics into a personal multi mode composition. The West Kildonan Digital Arts program has integrated original music, sound effects, graphic designs, animations and videos as a mode of personal creative expression and to accomplish research which incorporates many perspectives and many ways of knowing. This format of composing offers an unexplored universe of possibilities for continuous multi dimensional communication.

26. Music synthesis is the process developing sound electronically by means of a series of oscillators, filters, envelopes and amplifiers which modify the three main qualities which shape sounds: pitch, timbre and loudness. When a musician purchases an acoustic instrument, the sound or tone color of that instrument is mostly predetermined by the manufacturer. With the advent of synthesizers and sound samplers, sound is no longer a given or a "what you hear is what you get " proposition. It is possible for musicians to interact with the preset sounds developing them according to their personal skills and aesthetics. A new art form, sound design, has emerged from age of music synthesis. Many top named performers employ professional synthesists to help create the unique kinds of sounds which they require.

27. OPEN LOOP or OPEN SYSTEM- is "in process control, a semiautomated system that allows or requires the intervention of a human operator" [Greenberger, 1990, p. 244].

28. PERIPHERAL- "A device connected to a computer which is not

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necessary to its operation but will enhance its operation. A printer, an external disk drive, a CD-ROM player and a Laservideodisk are examples of peripheral devices" [Clark, 1990, Mac MIDI Dictionary].

29. PROTOCOLS- "a set of rules for communicating between devices, specifying, for example, how information is addressed, sent, received, and read over a network"[Greenberger, 1990, p. 245]. This concept has also been used in this document to describe the linguistic and other interpersonal and cultural conventions which are the basis for constructing and communicating meaning.

30. SAMPLING- Musicians use digital sampling techniques for the collecting sounds from an external source - live via microphone or electronic via audio cable, digitizing them and assigning these sounds to a key or elaborating the pitch over a range of keys. Sampled sounds can be accessed from a digital keyboard. Further, sophisticated samplers such as the Roland S50 or 550 can be used to significantly alter and redefine any sampled sound and store that sound on 3 1/2 inch disk for future reference. In this manner it is possible to build up vast libraries of sound which can be retrieved with a "slip of the disk".

31. SCANNING- "The representation of an image electrically as a series of horizontal lines formed by moving a sensor across the image from left to right repeatedly while moving from top to bottom of the page" [Greenberger, 1990, p. 246]. Scanning is accomplished with the aid of a peripheral device such as the Abaton 300 Color Scanner. A

picture or text is placed on the scanning field and entered into the computer via such software programs as Adobe Photo Shop where it can then be transferred to MACROMIND DIRECTOR animation program for further editing and development.

32. SCHOLAR'S WORKSTATION- is a format used in the Digital Arts program at WKCI for research, development and presentation. This concept relates directly to multimedia composition. Students are encouraged to design their own interactive multimedia projects and to use the Scholar's Workstation format: for gathering, storing and organizing information; for developing a script in HyperCard; for elaborating that script with music, sound effects, graphics, animation, video, laserdisk and CD-ROM examples; for refining and synchronizing these elements into presentations for friends, family and classmates.

33. SMPTE- Society for Motion Pictures and Television Engineers who have initiated in 1969 a standard time code for communicating location in time for film, video and audio events. A "striping" system assigns a number to each frame of video, film, or audio, thus coding this information onto a track on the tape. The numbers track elapsed hours, minutes, and seconds and frames from any chosen point on the tape (eg. 01-42-26-13). This process allows exact synchronization of sound and visual effects and delicate editing operations [Clark, 1990, MacMIDI Dictionary].

34. VIDEODISK- is "a generic term describing a medium of video information storage which uses thin circular plates, usually primarily

composed of translucent plastic, on which video, audio, and various control signals are encoded, usually along a spiral track. Optical disk systems use a laser beam, to read the surface of the dis(k)" [HYPERMEDIA, 1988, 1(1), p. 9].

APPENDIX II: TIME LINE

- I983- September- Joanne Williams appointed to position of music specialist, Elwick Community School and the beginning of Elwick Band program, forerunner to the Multimedia Performance Ensemble.
- 1984- February- Owen Clark visited Elwick as part of the Artist in the School Program sponsored by the Manitoba Arts Council.
 April- Workshop with Elwick Band for Seven Oaks Music Specialists - " Upgrading the Elementary Music Program".
- 1984- September- a proposal was submitted to John Wiens, superintendent for curriculum development Seven Oaks School Division for formal status as a divisional sponsored research project. Recognition granted.

October- proposal submitted to the Hilroy Fellowship, "Development of the Elementary Music Curriculum".

1985- January- divisional Multimedia Ensemble established February- a parent support group was set up, an application made to the Manitoba Arts Council and an Art Venture B grant was awarded for Owen Clark to participate in as an artist in residence.

March- Elwick Band performed at University of Manitoba with the School of Music's Percussion Ensemble.

April- Elwick Band performed at the divisional Festival of the Arts.

September- Elwick Band expanded into Multimedia

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Performance Ensemble and a creative arts team was set up at Elwick.

October- proposal submitted to the Hilroy Fellowship-"Bringing Elementary Music into the 80s"; Williams and Clark presented at SAG (provincial teachers conference) with Elwick Multimedia Ensemble "Acting in Concert".

March- creative arts team received Hilroy Fellowship;
 performance by Multimedia Ensemble of "EEK!" for the Seven
 Oaks School trustees; article published in The Manitoba
 Teacher 64(3) "Elementary Music: Is There Life After Orff?"
 March-April- Multimedia Ensemble student and Williams gave
 seven workshops with Jamie Oliviero (in two evening
 programs) at Society for Manitobans with Disabilities

April- Feature on Elwick music program in Roland User Magazine, 4(1); Elwick Multimedia Ensemble performance of "EEK!" and Divisional Multimedia Ensemble performance of "Catching The Light Just Right" at divisional Festival of the Arts.

June- Video project-filming for Elwick Multimedia Ensemble and Divisional Ensemble at Maples Collegiate theatre.

October- Elwick Multimedia Ensemble performance of "Powers That Be" at Elwick and the Winnipeg Art Galley -Manitoba Composers Festival.

November- Williams gave workshop for Music Ed. students, University of Brandon on "Synthesizers in the Classroom".

1987- February- Began Divisional Composition Project with six students ranging from grades 5 to 12.

March - Elwick Multimedia Ensemble and composers performed at the Manitoba School Board Trustees Conference; Williams gave workshop in St. Boniface School Division on "Synthesizers in the Classroom".

April- Divisional Composer Project presentation at Seven Oaks Festival of the Arts.

May- proposal submitted by Williams and Clark for developing a Music Composition/Multimedia based program at the high school level to the superintendent department; Williams appointed to the staff of West Kildonan Collegiate. September- Set up a Parent Liaison Committee at West Kildonan Collegiate. Obtained a Art Venture B grant from the Manitoba Arts Council for Clark to participate in the program as an artist in residence. Established a Multimedia Performance Ensemble at West Kildonan Collegiate.

1988- **January**- proposal was submitted by Clark and Williams to superintendents to set up an electronic music lab at West Kildonan Collegiate.

> **February**- Williams, Pat Stefanchuk and John Wiens made presentation to the school board re: music lab proposal. **May**- the lab was approved; Williams and Clark set about planning for courses, lab layout, equipment.

> **August**- Williams in consultation with Clark drafted "The West Kildonan Music Project- School Initiated Courses" which was submitted to the coordinator, superintendent, school board and the provincial department of education.
September- Music Lab opened at West Kildonan; three new courses initiated: Electronic Music 105, Electronic Music 205 and Multimedia Performance Ensemble; submitted proposal to APPLE Canada Education Foundation-"West Kildonan Music Project".

October- Williams and Clark presented at SAG conference " Music Synthesis and Computers in the Classroom".

December- Received word that APPLE Canada had accepted West Kildonan Digital Arts project as an Apple Innovation Project.

1989 January- Equipment arrived from APPLE.

March- Williams and Clark presented at Roland Canada Symposium, Vancouver for teachers on classroom applications "West Kildonan Music Project: Building а Music Synthesis/Digital Arts Curriculum fro High School" and for dealers on what teachers need from dealers " West Kildonan Music Project: Dealer Support in Establishing a Music Synthesis/Digital Arts Lab."; article submitted to Manitoba Music Educators Journal which appeared in spring edition "Music Synthesis and Computers in the Classroom Part I - Why Bother With This Technology?"; Clark presented at MANACE 20/20 Conference, Winnipeg.

July- Clark taught at University of Manitoba Summer Arts Institute.

September- Submitted "Music Synthesis and Computers in the Classroom Part II" (overview of West Kildonan program

applications) to Manitoba Music Educators Journal which appeared in fall edition.

October- Clark presented at Small Computers in the Arts Conference in Philadelphia.

May- Clark presented at Music Fest '90.

1990 **July**- Research completed and submitted for APPLE Canada Education Foundation. "Introduction to Electronic Music-A HyperCard Application".

> **September**- Renamed Electronic Music courses- The Digital Arts to reflect wider scope of interest; Clark started another school initiated course Music and Video Production; Williams and Clark were presenters in a workshop sponsored by the Seven Oaks Teachers Association on "The Digital Arts".

> **October**- Clark presented at MacWorld Expo Toronto; between 1990/91 Clark gives Music Technology Lecture Series-(six lectures) at University of Manitoba.

1991 **January** - Clark presented at Music Technology Fair, Moorhead State University.

March- Clark presented at the Professional Musicians College, Winnipeg, Manitoba and the Mennonite Brethren Bible College.

May- workshop and dinner given by the Digital Arts students, Williams, Clark and Rosalene Saleski (principal) for the coordinators, superintendents and school board trustees at West Kildonan Digital Arts Lab; Clark presented at the Canadian League of Composers Conference.

August- presentation by Clark at the National Institute, National Conference, Winnipeg.

October- Clark presented at SAG Conference, Winnipeg, Manitoba on multimedia composition.

1992- February- submitted article "The Music Scholar's Workstation: A Flexible Platform for Interactive Learning and Multimedia Presentations" to Hypernexus: Journal of Hypermedia and Multimedia Studies which appeared in the spring edition. 2(3); presentation by Clark at the Manitoba Association of Principals Conference.

> July- Clark presented at the Music Technology Summer Workshop, University of North Dakota, Grand Forks, N.D

APPENDIX III: Exemplar #1- The Twelve Bar Blues





<u>APPENDIX IV</u>: Exemplar #2- Large Percission Ensemble adapted from an arrangement by Owen Clark







There were ten work stations:

• five equiped with Roland D20 synthesizers which contained their own digital recorders

• one equiped with a Roland electronic piano and a moveable Mac Plus computer

• a percussion work station witha Roland electronic drum set, PM16 pith to MDI converter driving a Yamaha RX5 drum machine

• a guitar station with a Fender guitar, Roland GK1 synth driver, and a GM70 pitch to MIDI converter driving an MT32 synthesizer

• a sampling station with a Roland S50 sound sampler

• a keyboard station with a Yamaha DX7.

There was also a Master control station with a Tascam M224 tweny-four channel mixing board, a TEAC four track reel to reel tape deck, Yamaha NS19M Studio model near field monitor speakers, a DSP128 patch bay, a Roland S550 sampler, a Yamaha DX7 II synthesizer, Opcodes StudioPlus MIDI interface and a Macintosh SE computer with twenty meg hard drive.

All workstations operated on headphones for individual use and were patched through to the master control station for group demonstration and interaction. MIDI network allowed for access to all synthesizers in the room for large projects.

	Α	В	С	D	E	F	G	Н	1	J	Γĸ	L	M	N
1	Station	Master	1	2	2 3	4	5	6	7	8	9	10	11	12
2	Mac II	1.	T	Τ	Τ	Γ	Γ	Γ		Γ	T	Τ		1
3	Mac IIsi	1		Τ	Τ	Γ				Γ	T	T		•
4	Mac SE30		Τ	Г	Γ	Γ	•			T	Γ	1	[
5	Mac SE		Γ	Τ		ŀ			•	•	•	1		1
6	MacPlus		Γ	Γ						Γ	Γ	1.		
7	Laserwriter IINT printer	•										Γ		
8	Imagewriter II printer		Ν	E	Т	W	0	R	Κ					
9	Roland D20 synthesizer		•	•	•	•			٠					
10	Roland D5 synthesizer											•		
11	Roland S50 sampler													•
12	Roland S550 sampler	•												
13	Fender Strat MIDI guitar													•
14	Roland Juno 106		<u> </u>				•			٠				
15	Yamaha DX7										•			
16	Yamaha DX7IIFD	•												
17	Roland HP100 Piano												•	
18	MiniMoog synthesizer							•						
19	Yamaha RX5 Drum machine	•												
20	Roland MT32 synthesizer										•			
21	MIDI Interfaces													
22	Opcode MIDI Interfaces	•	•	٠	•	•	•							
23	Southworth MIDI Interface								٠					
24	Apple MIDI Interfaces									٠	•	•		•
25	Sony 8mm Editor												•	
26	Sony TV monitor												•	
27	Sony 8mm camera												•	
28	Sony 900 projector	•												
29	Computer Display													
30	Kodak Data Show LCD								•					
31	Radius Videovision Card	•												
32	Teac 4 track tapedeck	•												
33	Sony double bay cassette	•												
34	Power amplifier	•												
35	Patch bays	•												
36	Reverb/Delay EFX	•												
37	Speakers	•												
38	Turntable	•			T		T		T					
39	Tascam 24 ch. mixer	•			T	T	Τ	T	T				T	
40	Korg KMX122 line mixer				T	T	T	T	T			•		•
41	CD-ROM		w	h	9	r	e		n	e	e	d	Ð	d
42	Laserdisc		w	h	9	r	e	I	n	e	e	d	Ð	d
43	Abaton 300 Color Scanner				T	T	T	1	T					•

APPENDIX VIII: West Kildonan Digital Arts Lab Setup-1992

APPENDIX IX: ACOT Overview

ACOT- APPLE CLASSROOMS OF TOMORROW⁷²

as of 1990:

Dr. David Dwyer: program manager and principal scientist Wayne Grant: R & D manager and senior scientist Keith Yocam: senior scientist and manager in charge of

teacher development

Rick Borovoy: educational technology engineer Mary Fallon: communications manager

Gina Funaro: Experimental Learning Centers specialist

Jacqui Giddings: site manager for Longitudinal Research Centers

Loree Vitale: business manager

Connie Troy Downing: area associate⁷³

Address: Apple Classrooms of Tomorrow

Apple Computer, Inc.

20525 Mariani Avenue

Ms: 76-2A

Cupertino, California, 95014

Telephone: (408) 974-2941 Fax: (408) 974-9793

^{73.} During the spring of 1993 APPLE streamlined its operations by cutting back on two thousand employees across its operations in the United States. As a result the ACOT porgram has suffered a serious decline in staffing which left those people still involved in the research in a very difficult position trying to manage a one third increase in ACOT projects across the United States.

^{72.} APPENDIX IX relies heavily on unpublished summaries obtained from APPLE in July 1993 and on published ACOT Reports #6-#11.

ACOT PHILOSOPHY:

Ground Rules:

1. information technology in the service of learning.

2. mutually benefiting collaboration of corporations,

universities, school districts and other technology providers.

3. ACOT sites restricted to research and not for marketing products- "Even photographs and participants are restricted from promotional use of products."

General Paradigm:

- 1. learner-centered.
- 2. interdisciplinary.

3. constructivist- students learning how to build their own knowledge.

4. teachers as mentor-no longer just lecturer.

5. computer is an additional media which is: interactive, integrates info, fluid (text \Rightarrow graphs, numbers \Rightarrow pictures), expands and compresses time, simulates travel (a trip to the moon)- a powerful way to teach inquiry, analysis and problem solving.

Format: (38 R & D projects and 45+ACOT teachers)

(Steve Palmer sales rep. for secondary schools Sacamento, CA. says 55 sites this year)

- 1. Experimental Learning Centers (ELC)
- 2. Longitudinal Research Centers (LRC) (3).

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Technologies:

MAC, Apple II PC's, laserdisk players, voice recorders, CD players, video cameras, scanners, modem and on-line communication services.

Software:

word processors, databases, spreadsheets, graphics and page layout programs, HyperCard, multimedia composing, digital image processing and simulation software programs.

Outcomes:

students as more effective communicators, new tools for assessment such as portfolios.

Future Areas of Inquiry:

- 1. media rich composing
- 2. simulation
- 3. collaborative learning

CURRENT RESEARCH TOPICS:

I. NETWORKING

a) Orange Grove Middle School-Tuscon, Arizona (LRC)

"Wireless Coyote" project-wireless local area networking with penbased portable computers.

b) See a) of Digital Image Processing.

c) Blue Earth School, Minnesota- global telecommunications and multi- culturalism

II. SIMULATION and THINKING SYSTEMS

a) Orange Grove School (LRC) grades 6-8, 485 students, 31 teachers and 17 T.A.'s.

b) Bronx High School Of Science, N.Y.

exploring thinking system → STELLA- simulation software,
HyperCard, MacWrite II and Lab View tools for thinking.
c) SIMBASE project-Henry M. Gunn Senior High- Palo Alto CA. use of simulations to improve student understanding and skills in scientific inquiry.

d) ENVISIONING MACHINE- ACOT and Prof. Jeremy Roschelle, UC Berkeley, learning by doing-"meaning alignment" -testing in schools of San Francisco.

e) Probabilities/Fractal Geometry- Profs. Eugene Stanley and Trunfio, U of Boston- testing in Weston High, Newton High, Belmont High.

III. ARCHITECTURE & LEARNING

New Jersey Institute of Technology- studying how architecture influences learning, pedagogical development and the interactive use of technology in:

- a) Stevens Creek Elementary (LRC)- Cupertino CA.
- b) Orange Grove Middle School (LRC)-Tuscon, AZ.
- c) West High (LRC)- Columbus Ohio.

IV. CD-ROM DATABASE IMAGING IN EARTH SCIENCE

JEDI Project- Joint Education Initiatives

a Partners project with- William Greenwood U.S. Geological Society,

USGS, National Aeronautics and Space Administration, National Oceanic and Atmospheric Administration including:

a) Nazlini Boarding School- Ganado, AZ.

b) Edison High School- Stockton, CA.

c) Centennial High School- Meridian, Idaho

d) Margaret Brent Middle School- Helen, Maryland

e) J.T. Baker Intermediate School- Damascus, MD.

f) Worthington High School- Worthington, Ohio

g) Brandon Valley Middle School, Brandon South Dakota

h) plus 10 more schools in Virginia and other in Washington and Wyoming.

V. DIGITAL IMAGE PROCESSING (DIP)

Educational applications similar to those used by space scientists and bio-medical scientists exploring the impact of DIP on science learning- how it changes motivation and cognition including: a) 32 teachers in AZ. - ACOT and Richard Greenberg, U of AZ. b) plus others in New Mexico, California, Ohio, Minnesota, and

Texas.

c) 2 teachers at Gage Elementary, Abraham Lincoln Prep. School in San Diego.

d) 1 teacher-Mayo High School in Rochester N.Y.

e) 6 teachers- Aztec, Corales, Farmington, Las Cruces and Silver City.

f) West High-Columbus Ohio (LRC).

g) San Jacinto Junior High- Midland, Texas.

VI. MULTIMEDIA COMPOSING

a) Stevens Creek Elementary - Cupertino original (LRC).

b) MAC MAGIC project- Davidson Middle School, San Rafael, CA:
using MULTIMEDIA WORKS created by ACOT 7, Lucas Filmsextensive MM tool to aid students in: research, creation, analysis, synthesis of info, with text graphics, full motion images and sound.
c) Education Development Center in Boston- using video as an aid in assessment for teachers-development of a coherent math learning system.

d) West High- Columbus, Ohio (LRC)- assessment tools: portfolios, testing collaborative learning, problem solving and critical thinking.
e) Lester Demonstration School, Memphis Tennessee-holistic language arts program of 90 students, 3 teachers and a coordinator.
f) Ohio State Bank Street College of Ed. - assessment.
g) UCLA, Institute of Research Learning-assessment.

VII. LEARNING THROUGH PERSONAL DISCOVERY

Applies to almost all projects.

VIII. COLLECTING and ORGANIZING DATA

a) TABLETOP- Fletcher Elementary School, Cambridge, MA. ACOT with Chris Hancock of Technology, Education and Research Center exploring how children build and use data to enhance scientific inquiry.

b) "COMPUTER-SUPPORTED INTENTIONAL LEARNING ENVIRONMENTS" Huron School, Toronto- ACOT with Marlene Scardamalia and Carl Bereiter of OISE- integrated information systems-database-encyclopedia, dictionary, tools for drawing etc. c) Cornell, U of N.Y.- new tools for collecting, managing, analysizing, and displaying qualitative data.

IX. TUTORING

a) West High- Columbus, Ohio- new software facilitates learning math concepts and intelligent tutor in physics.

b) Clear Creek High School- Clear Creek, Texas.

ACOT with Prof. Bowen Loftin, U of Houston, and NASA- creating and testing and intelligent physics tutor.

X. TEACHER TRAINING

a) DIP workshop and collaboration via telecommunications ACOT with Richard Greenberg, U of AZ.

b) Dodson Elementary School- Hermitage Tennessee using technology as a catalyst for teacher development with 86 students-gr. 3-4, 3 teachers and a coordinator.

XI. INTERACTIVITY

a) in general-all of the above.

b) in particular-Steven's Creek Elementary, Cupertino.

c) ACOT with Prof. Jeremy Roschelle UC, Berkeley

meaning-alignment in science- interacting to replace faulty concepts about velocity and acceleration with accurate ones.

d) West High- Columbus Ohio (LRC)- interactive MM resource on circulatory system- interactive use of technology.



multiple MIDI channels and play multiple patches simultaneously.

DRUM MACHINE



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Faculty of Education ETHICS APPROVAL FORM

To be completed by the applicant:

Title of Study:

The Design, implementation and Implications of Digital Arts Programs in West Kildonan Collegiate, Leven Oaks School Division #10, Upg. 1 Name of Principal Investigator(s) (please print): DANNE M. WILLIAMS

Name of Thesis/Dissertation Advisor or Course Instructor (if Principal Investigator is a student) (please print):

KEN OSBORNE

I/We, the undersigned, agree to abide by the University of Manitoba's ethical standards and guidelines for research involving human subjects, and agree to carry out the study named above as described in the Ethics Review Application.

Signature of Thesis/Dissertation Advisor or Course Instructor (if required)

Signature(s) of Principal Investigator(s)

To be completed by the Research and Ethics Committee:

This is to certify that the Faculty of Education Research and Ethics Committee has reviewed the proposed study named above and has concluded that it conforms with the University of Manitoba's ethical standards and guidelines for research involving human subjects.

S.B. STRAW UNIVERSITY OF MANITOBA

Name of Research and Ethics Committee Chailperson

Myset 31

Signatury of Research and Ethics Committee Chairperson

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