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Effect of Electronic Portfolio Assessments On The Motivation And Computer Interest of Fourth And Fifth Grade Students In A Massachusetts Suburban School

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By

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We hereby certify that this dissertation, submitted by Paul V. Montesino, conforms to acceptable standards and is fully adequate in scope and quality to fulfill the dissertation requirements for the degree of Doctor of Philosophy.

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A preliminary causal-comparative study was conducted in an elementary suburban school in Massachusetts to investigate the impact of electronic portfolio assessments in student's intrinsic motivation and computer interest.

The target population were two groups of fourth grade and two groups of fifth grade students for a total of 77 subjects. They were trained and introduced to electronic portfolio assessments, a program which lasted for the entire school year. The students used HyperStudio, a multimedia software program developed and marketed by Roger Wagner Publishing, Inc.

It was the intention of the elementary school program directors and teachers that students would take a proactive and self-administered approach to the management of portfolios.

Participants were tested before initiation of the program and post-tested six months later using the "Children's Academic Intrinsic Motivation Inventory" "(CAIMI)," a Likert scale test developed by Adele Eskeles Gottfried, Ph.D. at California State University, Northdridge.

They were also given a pre-test and post-test computer interest Likert scale inventory adapted from a test named Moe Computer Educational Survey "(MCES)." This test was developed at South Dakota State University by Daniel J. Moe as part of his research and graduate work. The MCES test was used to determine if there had been a change of computer interest by girls after participation in the computer-based electronic portfolio assessment program.

The motivation and interest pre-and post-test results were analyzed with t-tests ($p < .05$ for motivation, $p < .01$ for interest). There were no significant treatment effects. There were score increases at the lowest level of the motivation pre-test scoring level but no increases at the highest pre-test scoring levels. Thirty-four students (48 percent) showed an increase in intrinsic motivation scores, while thirty-seven students (52 percent) showed no change or experimented a decrease in scores. As a result, it was concluded that other factors, including subject maturation and teachers' skills in identifying and working intensely with the students who displayed symptoms of initial low motivation may have contributed to the increases.

The study was inconclusive because it did not provide evidence to support the hypothesis that there was a change in intrinsic motivation or interest of all the students as a result of their participation in the electronic portfolio assessment program in the Massachusetts suburban elementary school. For confidentiality reasons, fictitious names were used to describe the suburban locality and the experimental school. The locality was named Bestborough and the school site Pioneer.

[Key words: authentic assessment, behavior, cards, efficacy, electronic portfolio assessment, identification, interest, internalization, intrinsic motivation, learning, motivation, multimedia, portfolio assessment, self-regulated learning, stacks.]

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My advisors at Nova Southeastern University, particularly Dr. Steve Terrell my dissertation committee chair, have been most encouraging and helpful. Dr. Kathleen Buckley, member of my dissertation committee and "supervisor" and "client" of my research project has been an inspiration. Her cooperation, enthusiasm and interest showed me a window to elementary education that has given me the impetus to continue to help schools and teachers in the use of educational technology. There are many who unfortunately can not be mentioned by name because the space is insufficient.

Teachers, staff and students at the experimental school have made me proud of their association and work. The memory of my parents deserves a brief but no less important mention. My father died a few months before this dissertation was finished. I am sure that he knew that some day it would be completed. To him, his memory, integrity, love, confidence and friendship is dedicated this work.

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Chapter I

Introduction

Background

"If we teachers are going to teach critical thinking skills, we must plan and conduct our instruction in a careful manner... In addition, we must be able to measure the impact of our instruction," (Stiggins, Rubel and Quellmalz 1988, p. 4). The above statement is not new. The concern those words articulate is often expressed by teachers in educational institutions at all levels and by the administrative staff of Departments of Education at the local, state and federal levels. The choice of the measure can be an important component if it impacts the home values of some communities, a subject that can find its way into heated political debate.

Assessment is a broad term that indicates an instrument or process that measures some skill or attribute (Donahue, Boston Public Schools, 1995). There are three general types of assessment: norm-referenced, criterion referenced and performance assessment.

Performance assessment is task specific and gives information about what a student knows in a particular curriculum area; i.e., reading or social studies. Within the performance assessment category we find a list of assessment practices that fall under the somewhat overlapping definition of authentic and portfolio assessments (Paris and Ayres, 1994). When the students participate in these assessment techniques they take a more active role in self-development and self-evaluation and the practice presents interesting educational possibilities of student self-empowerment and motivation (Meyer, 1992).

Authentic, Performance and Portfolio Assessments

A brief review of test-based assessment methods describes a common characteristic. Educational researchers and teaching authorities design them with little or no participation on the part of the student. This is not to say that those other methods are totally ineffective or that successful assessment methods ought to be designed and administered by the students alone. However, “students will themselves select material of an appropriate difficulty level and attend to it in a fashion that will most effectively foster their intellectual growth," (Nicholls, 1983, p. 211). Participation of a student in his or her educational vision and design is paramount in a classroom environment that motivates the student. Ames and Archer (1988) commented on the importance that students develop ways of thinking and strategies that can help to process information, plan study activities, monitor their attention, and sustain a motivation for learning.

The development of authentic and portfolio assessments has become the educational answer to the question of student participation in his or her learning and its corollary: intrinsic motivation. Intrinsic motivation comes from within the student, not from outside. Learning depends almost entirely on events occurring spontaneously within the students so that the behavior of the teacher is almost irrelevant (Brophy, 1983).

Meyer (1992) developed a comprehensive definition of these new techniques. He defined authentic as a generic term that describes a type of assessment that concentrates on the ability of the student to demonstrate his or her skills in a specific educational domain over time.

The student in the authentic assessment model conducts the periodic conference with his or her teacher to determine which work from the student's portfolio will be submitted for joint assessment purposes. The student chooses the components of the discussion. The assessment is considered authentic because its many facets are complex and have the following characteristics: stimuli, task complexity, locus of student control, motivation, spontaneity, resources, criteria, standards and consequences. The student develops most of the work to discuss as he or she sees fit. Authentic assessment, in summary, is the contextual environment where the content of performance assessment takes place (Meyer, 1992).

Performance assessments, subsets of authentic assessments, are the environment where the student completes or demonstrates the behavior that the assessor desires to measure without interference. These student reports and responses represent the performance assessment outcome itself. Typically students collect, store and display all relevant issues, reflections and responses in an individual portfolio (also called folder). The term portfolio assessment reflects that characteristic.

Paris, et al. (1994) described portfolio assessments as self-regulated and challenging where instead of “failure” the term “non-success” is used frequently. In this paradigm learners are risk-takers who anticipate difficulties, errors and failures in the normal course of acquiring new knowledge and skills.

McCombs and Marzano (1990) report progress in the use of self-regulated learning, but "warn of growing confusion about relationships between metacognitive, cognitive, affective and motivational processes," (page 51). They later pose a challenge. "What is needed, from our perspective, is a focus on the self as generator of will and motivation to engage in self-regulatory learning processes and activities," (page 52).

Most of the literature reviewed in the preparation of this report considers portfolio assessments to be the most significant development in education during the past few years. Pott (1993) and Hamilton (1995) conducted research studies of the Grady System, a computer-based portfolio assessment program. The opinion of educators, parents and students has been recorded extensively on both studies. The findings are discussed in the literature review chapter of this dissertation.

The study presented in this dissertation takes a different approach and tries to determine if intrinsic motivation was affected by participation in a similar program through time. Much of the evidence that has linked different goal orientations with specific motivational processes has been amassed from laboratory studies and not from research in ongoing classroom settings (Ames and Archer, 1988). Adele E. Gottfried, in a published article about the CAIMI test she developed and published in 1984 expressed the opinion that measurement of children's motivation was indeed a worthwhile endeavor.

The issue of motivation is present in areas of student computer interest as well. The teachers who were involved in the pilot portfolio assessment program subject of this dissertation suggested a simultaneous research on gender issues related to computer use, particularly girls' interest. The teachers' concern is supported by the research and literature

available. Women's exclusion from technological work has always been a major focus in research on gender and technology (Henwood, 1993).

A 1994 study at the University of Pennsylvania conducted by Jerry A. Jacobs (1996) reports that only 29 percent of the recipients of undergraduate degrees in computer science were women, down from 37 percent in 1985. That 8 percentage point decrease represents a 21 percent drop. Other science fields reported in the same study fared no better. The two issues, motivation and interest in computers, were the two constructs studied in this research.

Relevance, Significance or Need for the Study

We are at the threshold of a new millennium: the year 2001 is just around the corner. There is a growing generation of children and students who will live another seventy or so years into the next century (U.S. Census Bureau) and will participate in the new technology whether they want to or not. Recent research confirms the potential of educational technology to improve student's attitudes about themselves and about learning (Interacting Educational Systems, 1996).

Successful teachers of the future will have to be able to use technology to leverage their successes, and they will have to derive satisfaction from an arms-length relationship with students:

> "They might have to accept the fact that those satisfying moments of today--that moment when you look into a student's eyes and realize the child has understood a key concept--might be exceedingly rare in the future. A computer screen may be the only witness to that expression of Aha! (Clark, 1995, p. 22).

The Office of Planning, Research, and Development of the Boston Public Schools

issued a blueprint report in 1995 which outlines the position of the school system regarding assessment and reporting technologies to promote academic excellence.

Currently "every student is not required to be pre- and post-tested with a norm-referenced instrument" by the State. "Portfolio and performance assessments are encouraged" across the board (Donahue, Boston Public Schools, 1995, p. 13).

We must take a second look at the title of the Boston document to start visualizing another need for the study of this dissertation research. That title not only includes the word assessment but the word reporting as well. The latter does not go without the former. The Boston mandate is specific about this issue. "The Massachusetts Comprehensive Assessment System (MCAS) will generate a wealth of information relative to student academic achievement. It is crucial that reporting systems be developed to provide useful information to a wide variety of audiences in a timely manner," (Donahue, Boston Public Schools, 1995, p. 33).

Portfolio assessments, as will be shown in some of the literature reviewed, involve a considerable use of time and other physical resources. There are storage facility requirements for filing school work produced by the students. There are also teacher training needs that seem to conflict with, rather than replace, other teaching responsibilities (Herman and Winters, 1994).

There are concerns from students' parents for an unfamiliar technique that they have never seen. Last, but not least, as pointed out by the Boston School System report, there are different reporting and communication requirements with the various constituencies of students, teachers, parents and school administrators. The assessment language has clearly

changed.

One of the concerns of teachers and administrators that the literature review will support, is the large amount of time and space required for administration of the portfolios. It is precisely in these areas where the large volume of computer storage becomes important. Making portfolios efficient and accessible will make them functional and easier to operate in the classroom (Grady, 1996). The technology to do the job exists today in the particular brand of software that was evaluated in this research and in other available competing commercial products. That availability offers the potential to solve the time, space, reporting and communication dilemma if used creatively.

Many of the school systems that are considering the implementation of portfolio assessments have developed at least some basic level of computer technology infra-structure and a certain degree of computer acceptance.

From a technical point of view, implementation of electronic portfolios in some cases may be simple: upgrading some of the existing equipment, adding a scanning, audio-video or photo recording device, choosing software and training the participants. In other cases the commitment and investment may have to be more significant.

The main area of interest must focus on the recipients of this new effort-- the student. Are electronic portfolios good or even better for the students? There is no educational effort worth its name if in the end it does not benefit the learner. This is where the research of this dissertation is most helpful. Educators need to know if this huge investment in technology and time will produce the ultimate result--educating our children.

Corno and Rohrkemper (1985) point out that the time has come for research on

motivation to learn in the context where it is perhaps most elusive--the classroom. One of the more striking discoveries in educational literature is that of a steady decrease in children's motivation for learning in school during the elementary years (Ryan, Connell and Deci 1985).

Statement of the Problem Investigated or Goals Achieved

The main purpose of this research was to gather pre-test and post-test scores in the motivation of the participants in a portfolio assessment program. After scoring both tests, gain scores were computed, recorded and tested to determine if motivation had significantly changed.

School systems now considering computer-based technology to improve the learning skills of their students will be able to make an educated and important decision: how much they are willing to invest in order to give those students the use of computer-based assessments as an aid to improving their motivation to learn.

The findings could be of particular benefit to those inner city school systems where motivation is a critical component that has been missing in the educational process. The researcher realizes that other socio-economic factors affect motivation in those situations, factors that are outside the scope or beyond the control of this study or its participants. The researcher also believes that the impact of portfolios alone is a subject worthy of research.

As mentioned previously in this report, there have been other studies that measured attitudes, perceptions and opinions of teachers, students and parents towards portfolio assessments, including specific computer-based versions. Those studies, described in the literature review, have made a positive contribution to the cosmetic evaluation of that type

of learning measurement. Much has been learned about overall perception of those programs.

Research Questions

The questions addressed by this research revolve around the issue of student motivation and girls' computer interest.

Is there any way to increase intrinsic student motivation? If so, is the use of a different student assessment method the way to increase the level of that motivation? Is the use of electronic portfolio assessments the vehicle for that level of increase?

Is there any way to increase computer interest in girls? If so, is the use of electronic portfolio assessments the way to increase the level of computer interest in girls?

Barriers and Issues

There is not much literature available in the area of portfolio assessment research and less in the subject of electronic portfolio assessments. Much of the former is being debated; the latter still unshaped and mostly untested. As demonstrated in the literature review section of this dissertation report, the jury on portfolio assessment is still out. Results are sketchy and not much has been investigated and reported simply because not much has happened. It is just too new and certainly not widespread.

There are numerous reasons for this situation. There is the usual reluctance to try new ideas. The we-have-never-done-it-like-this-before syndrome is real. It has been said that people get offended by what they do not believe and afraid of what they do not know.

Portfolio assessments are not well known and when they are known not easily or properly articulated and defined. Much work remains to be done before claims as to the

accuracy and usefulness of portfolio assessments can be supported (Herman and Winters, 1994).

There have been other ideas in the field of education which became the fad of the moment and inexorably the fade of the time (Popham, 1993). An example of this type of movement was the so-called "discovery" method of teaching that became popular in the 1960's and trickled to almost nothing in the 1970's. Portfolios are suspect of the same malady (Worthen, 1993).

It seems that other states in the country have made some inroads in the portfolio assessment area and its electronic version. However, much more has to be done and researched if educators are going to reach a validated consensus. Vermont and Kentucky are examples of states that have pursued the implementation of portfolio assessments with some degree of controversy if not of confirmed success (Donahue, Boston Public Schools, 1995).

The concerns and issues surrounding portfolio assessments are many, one of which include lack of familiarity with the process on the part of educators and parents. Educators reject them because they never used them to teach and rate. Parents are uncomfortable with portfolios because they were never rated or graded with them.

Also, there does not seem to be consistency in the willingness of teachers to try new and challenging teaching strategies throughout their lives. Buckley (1989) concluded that newest teachers barely mentioned challenging work. The notion of challenge became more important at the next age and experience levels. The issue became less important at the latest age and experience levels. She equated the idea of challenging work and change in the

study. Other writers concur:

> "Initially excited and motivated to teach, to challenge and motivate the children in their classrooms, teachers tell us of how the external pressures of standardized curricula, competency tests, and other manifestations of a culture obsessed with achievement have robbed them of autonomy and creativity with respect to teaching and had a negative impact on their interest and effectiveness in the classroom milieu (Ryan, et. al. 1985, p. 46).

The time it takes to administer a portfolio program on a day to day basis can also be overpowering. Authentic, individualized assessment can become unwieldy. Many years of different type of work (multimedia), storage and accessibility are necessary (Grady, 1996).

There is the usual cost to implement new technologies within already stressed school budgets. There are also demands by many communities of the use of so-called high-stakes grading systems that are linked to the politics and economics of home values and tax structures.

In most cases where this researcher has been able to document the literature reviewed, portfolios have been mandated and implemented from the legislators down to the school levels. Pressure from administrators to make sure students perform up to standards is just one kind of pressure that teachers experience (Covington, 1983). The literature review supports this point. The research completed will allow objective and empirical analysis and evaluation by educators, politicians and the interested public at large.

In the research described in this dissertation the electronic portfolio assessment is starting from the bottom up. The assistant superintendent of a suburban school system authorized the fourth and fifth grade teachers of a typical and progressive elementary school in the district to commence an electronic portfolio assessment program. The goal articulated by the school was to consider future expansion of the program to other schools in the

community.

There are limitations to how much can be learned from what people say. To understand fully the complexities of many program situations, direct participation in, and observation of the program may be the best evaluation method (Patton, 1980).

This preliminary study was limited in size and scope to only one elementary school for one school year. The number of grades involved was also small. One of the major barriers to this particular work was the limitation that the researcher was not able to manipulate the variables or choose the elementary school involved within the district.

The groups were conveniently in existence before the research started. The school administration decided the composition of the groups involved, not the researcher. The availability of the student body for this work, while gracious and appreciated, was still outside the researcher's control in its original formation.

Elements, Hypotheses, Theories, or Research Questions Investigated

The elements, or construct, investigated were intrinsic motivation and computer interest. The students' grade standings during the project were ignored. Standardized and authentic assessments are different. The senior teaching administrators at Bestborough and the teachers at Pioneer felt uncomfortable with the use of previous standardized test results as a baseline for the new system. That was a position not altogether different from the one established by many educators quoted in the literature review.

The Moe Computer Educational Survey (MCES), although intended to be used to test computer interest changes in girls, was also given to the boys. The teachers participating in the Electronic Portfolio Assessment program had theorized that girls might

develop a healthy attitude about computers after participating in electronic portfolio assessments. The students were unaware of the gender related issue in the research.

No change of computer interest in girls would indicate that the presence of computers in the portfolio assessments was not the vehicle to increase the anecdotal and empirical waning interest about computers and science by girls as documented (Jacobs, 1995).

There were two hypotheses tested in this research. The first hypothesis was that the results support the theory of a significant change in intrinsic motivation as a result of the participation in electronic portfolio assessments. The null hypothesis was no support for such theory as a result of the participation in the program.

The second hypothesis to be tested was that the results support the theory of a significant change in the interest about computers displayed by girls participating in the study. The null hypothesis was that there was no evidence of such support.

If the research supports the hypothesis that girls showed a significant change in interest it would be possible to focus on the test items where that change is detected. If the findings are not definite, they may point to future areas of research in this subject.

Limitations and Delimitations of the Study

As explained before in the Barriers and Issues section of this report, there is not much literature available in the area of portfolio assessment research. There is less in the subject of electronic portfolio assessments. These systems are microcomputer-based with the ever evolving personal computer itself only in the marketplace less than seventeen years. The subject is just too new.

One of the major barriers in this particular work researched was the limitation that the researcher was unable to manipulate the variables. The Bestborough School System has a total of seven schools covering all K to 12 levels. There are approximately 3,100 students in the school community and only 77 of those students participated in the portfolio assessment experiment.

The study was exploratory and the generalization of the local results will have to be evaluated with utmost care. It is also possible that a similar citywide study, involving a larger number of students will be done eventually.

Another issue beyond the control of the researcher was the potential impact that computer availability at home could have on the subjects involved in the study. This information became available through the second computer interest test. The impact of availability of home computers is subject to controversy and other studies have been contradictory or inconclusive.

In a study that took place in Indiana, known as the Buddy System, students with and without school-provided home computers did not show significant improvement in learning abilities. Fourth graders, however, grew in self-esteem and self-confidence when they used computers in their homes. In this study there was a negative correlation between the level of progress in school work and the availability of computers (Miller and McInerney, 1995). Additional information about this study will be provided in the literature review section.

With one exception, there were home computers reported by all the Pioneer students who participated in this research. The report was not surprising. Median income in Bestborough is approximately $72,000 per annum. (Source: U.S. Census Bureau). It was reasonable to anticipate a high percentage of home computers.

The degree of parental involvement in the education and the computer abilities of these children was also beyond the control of the researcher. A higher median income suggests greater intellectual ability and parental participation in the development of their children and this interest must have some effect in the intrinsic motivation of these students.

The research agreement by this writer with the city of Bestborough was simple: the researcher requested and received permission to test by himself, or have access to tests results, and then report the impact of electronic portfolios on the motivation of Pioneer's fourth and fifth grade students.

The fourth and fifth grade students and their teachers would be participating in electronic portfolio assessments for the first time. The software product chosen by the school after evaluation and analysis of several packages was HyperStudio. The choice was based on local technical infra-structure reasons, none of them qualitative. For a description of the software please see Appendix A- HyperStudio.

Another initial limitation of the study was the fact that participation in the portfolio assessment program was not a parental choice, but participation in the research was. This meant that the population under study could have shrunk if sensitive or worried parents did not allow their children to participate in the research program in its entirety.

Fortunately for the researcher, this fear did not materialize. Initial indications were that parents, who knew informally of the school system's plans for portfolios and the associated research, would be supportive.

One of the delimits of the study under the researcher control was his possible active participation in the experiment. The researcher offered to participate in the training of the Pioneer teachers and the rest of the Bestborough teachers in the future when and if the program expands, but not with the students.

The researcher observed the students doing some of the portfolio work and assisted in minor technical-related training issues in the classroom, (i.e., scanning documents), but with no involvement in motivational or cognitive related tasks. It was important that the researcher did not fulfill the hypothesis prophecy one way or the other by intervening inappropriately in the process being studied.

Experimental bias affects results when the researcher's expectations have an impact on the subjects' behavior and hence the outcome of the experiment. One form of experimenter bias occurs when the researcher affects his or her subjects or is inaccurate in evaluating their behavior because of previous knowledge concerning the subjects (Maxwell and Delaney, 1990).

Another limitation beyond the control of the researcher was the fact there were only a few validated published tests available for administration in each of the constructs. This meant there was no abundance of validated alternatives to either the CAIMI or MCES tests.

Student performance evaluation would be limited to their responses to the questions of those two specific tests, not to standardized motivational or computer interest tests accepted nationwide.

The portfolio assessment procedures used by the fourth and fifth grade teachers in the Pioneer school are indigenous. They lack a formalized acceptable standard by which they can be measured and generalized, so the results anticipated or expected cannot be clearly defined.

Chapter II

Review of the Literature

Assumptions

The amount of electronic portfolio assessment and general portfolio assessment literature available is limited. The following assumption was made when the literature was reviewed:

Any literature that supported or criticized the use of authentic and portfolio assessment was considered literature that supported or criticized the use of electronic portfolio assessment as well.

Historical Overview of the Theory and Research Literature

Like any subject in most fields of human endeavor, the available literature on the two main constructs and related peripheral issues of this dissertation varies from prolific to scarce. Writings about motivation, rooted in early psychological and educational research, abound.

There are articles about assessment, but not much about portfolio assessment. The computer-based version of the latter, because it is a component of the recently exploding information age still in full bloom, is almost nil.

The amount of literature available in all the subjects mentioned is a reflection of maturity, controversy or technological complexity of the topics, and they are all subject of interest to educators and researchers. The issue of intrinsic motivation in education represents a good example.

Intrinsic motivation is one of the most important, if not the most important, of the two constructs of the dissertation research presented in this paper. The literature researched treats intrinsic motivation from many different angles of interest to educators. This interest reinforces the value of the construct for the research being done in the Bestborough school system. Gottfried (1985) comments that academic intrinsic motivation is a significant factor concerning children's educational functioning.

Corno (1992) comments that, besides motivation, the question of volition should be addressed as well. To do something of one's own volition is to do it by one's own resources and sustained efforts independently of any external sources of pressure. The statement equates intrinsic motivation with inside volition.

There are at least two well-known points of view about the onset of intrinsic motivation in a student. One is behaviorism.

Skinner (1968) the famous psychologist, sets a distinct behavioral tone of discussion about motivation. In "The Technology of Teaching" some of the points discussed relating to motivation are the variables that he calls "contingencies."

He defines those contingencies as: (1) an occasion upon which behavior occurs, (2) the behavior itself and (3) the consequences of the behavior. In much of the other literature reviewed, contingencies appear as part of the motivational formula in more than one article, clearly indicating a behaviorist position of the authors.

Skinner describes teaching as an arrangement of contingencies of reinforcement. To the famous behaviorist, intrinsic motivation is outcome and product, not input. The contingency variable triad mentioned above forms a close definition of what teaching is all about and what must occur externally to develop the (internal) interest on learning.

Skinner explains three teaching theories: 1) Learning by doing emphasizes the response; 2) learning from experience, the occasion upon which the response occurs; and 3) learning by trial-and-error, the consequences. The implication of this definition in support of environmental techniques, of which electronic portfolio assessment may be one, is discussed later on.

Of particular interest in the same book is the way the author poses this question and related answer, "Can we afford to mechanize our schools? The answer is clearly Yes," (page 27), supporting the use of automated devices and methods in learning.

These methods and procedure devices provide immediate reinforcement to the student and learning results in the desired outcome. Skinner, trying to explain why teachers fail, says--"we should multiply teacher-student contacts with films and television. We should design new curricula," (page 93).

Coming from a man writing in the 1960's it was a rather visionary and revolutionary technological statement that has gained strength and acceptance in the nineties. In a section of the same book entitled "Telling and Showing," the author asks--

"Why not take advantage of children's natural endowments (curiosity, love of knowledge and inherent wish to learn) and simply bring the student into contact with the

world he is to learn about? What is missing, technically speaking, is positive reinforcement."

In the behaviorist's world, positive reinforcement is a motivational tool. Congratulating students for having done well at a self-initiated educational activity is likely to promote feelings of competence and intrinsic motivation (Deci, Vallerand, Pelletier and Ryan, 1991). An electronic portfolio developed by a student using a computer generates prompt and immediate feedback that may be congratulatory if the effort was successful.

A few paragraphs later we read that "educational theorists have concluded that the teacher cannot really teach at all but can only help the student learn. The teacher is a midwife, only showing the student what he has already been shown or told," (p.107-108). Self-instruction, computer-based or not, may be accepted as a behavioral learning practice because is self-reinforcing motivation.

Perceptions of autonomy and competence are fundamental to intrinsic motivation. The meaning attributed to various events occurring in the classroom elicit those perceptions. Ames and Ames (1985) consider that these events can be perceived either as informational (providing feedback about student competence) or as controlling (providing feedback about the degree of choice or autonomy in the situation).

Skinner does not waste an opportunity to garner forces in his behaviorist battle--"Only by turning to the behavior which is said to show the possession of these [devouring curiosity] can we search effectively for conditions which we may change so that students will study more effectively," (page 146).

Later he continues, "The diligent and eager student comes to class, studies for long periods of time, enters into discussions with his teachers and other students, and is not distracted by extraneous reinforcers. He does all this, not because he possesses the trait of industry or has a positive attitude toward his education, but because he has been exposed to effective contingencies of reinforcement."

Electronic portfolio assessment practitioners may be comfortable with this statement because the multimedia nature of the portfolio has positive reinforcing connotations in the educational settings where it is used.

Maslow (1970), another famous psychologist, takes a different tack in explaining motivation and its source. His humanist theories are important to compare with Skinner's because together they represent most of the entire spectrum, albeit opposed, of motivation.

The impact of electronic portfolio assessments in motivation is acceptable according to the definition of either theoretician. In other words, the electronic curriculum, as a positive reinforcer, can have an effect in intrinsic motivation whether we are a behaviorist, or intrinsically through discovery, a humanist. In "Motivation and Personality" (page 22), Maslow states that "the study of motivation must be in part the study of the ultimate human goals or desires or needs."

He is also of the opinion that ends in themselves are far more universal than the roads taken to achieve those roads. In taking this position he becomes clearly anti-behaviorist. Gottfried (1985) agrees with Maslow (1970) when she comments that intrinsically motivated students show lower extrinsic orientations to school learning. Predominantly the students show less desire to do school work than to receive external rewards. Maslow sees a peculiarity about motivated behavior. He thinks it may serve as a kind of channel through which other conscious or unconscious purposes may express themselves.

He argues that any theory of motivation must take into account other factors, including not only the environment but, within the organism itself, the role of cultural determination. Here we perceive how motivation is defined as a mix of the individual and his/her environment (the student and his/her curriculum may be another way of saying so) and at the same time but individually controlled and expressed.

Ames and Ames (1985) concur. The key dimension of intrinsic motivation is self-regulated learning, which refers to the ways students process (e.g.; monitoring, transforming) information and other forms of cognitive content.

To support this thesis in Maslow's own words, "we must certainly grant at once that human motivation rarely actualizes itself in behavior except in relation to the situation and to other people," (page 28). He states that any purely behavioral theory needs situation theory to give it any sense at all. This is clearly additional ammunition against behaviorism.

Maslow adds that a motivation theory based on existing drives rather than on goals or needs also needs a strong situation theory if it is to succeed. He adds: "however, a theory that stresses constant fundamental needs finds them to be relatively constant and more independent of the particular situation in which the organism finds itself. Sound motivation theory must then take account of the situation, but must never become pure situation theory," (page 29). In this statement, although acknowledging the importance of outside influences, he continues to stand on anti-behaviorist ground.

Maslow continues, "it seems to me quite clear, in spite of near universal acceptance

of the contrary by psychologists, that not all behaviors or reactions are motivated, at least not in the ordinary sense of seeking need gratification, i.e., seeking for what is lacked or needed," (page 30).

He adds that "people in our society (with a few pathological exceptions) have a need for adequacy, for mastery and competence, for confidence in the face of the world, and for independence and freedom," (page 45). The most stable and therefore most healthy self-esteem, he claims, is based on deserved respect from others rather than on external fame or celebrity and unwarranted adulation.

Herbert and Sassenrath (1973) agree. The theory of achievement motivation, they claim, is concerned with identifying the variables which influence performance in an achievement-oriented situation.

An achievement-oriented situation is one in which (a) an individual anticipates unambiguous knowledge of his results or performance, (b) the individual is largely responsible for the success or failure of the outcome and, (c) the situation contains some degree of risk. They pose as undeniable the value of self as the main agent in human development as opposed to external stimuli.

Self-actualization, as Maslow described his now classic Instinctive Needs theory, is born here. He describes cognitive capacities (perceptual, intellectual, learning) as a set of adjustive tools, which have, among other functions, that of satisfaction of our basic needs. Deci, et. al. (1991), comment that self-determination theory makes an important distinction which falls within the class of behaviors that are intentional or motivated.

There is a need to know and understand in late infancy and childhood, they add, that is perhaps even stronger than in adulthood. Also, the gratification of the cognitive impulses is subjectively satisfying and yields end-experience. Insights are usually a bright, happy, emotional spot in any person's life, perhaps even in the person's life span.

Grosnickle and Thiel (1994), writing for the National Association of Secondary School Principals point out that nearly everyone who works with youth decries insufficient motivation. They state, "a student who is unmotivated is not only a source of frustration, but is seen to be wasteful of talent and potential," (page v).

Motivational factors can have pronounced and far-reaching effects on children's learning and performance. They determine such critical things as whether children seek or avoid challenges and whether they persist in the face of obstacles; in short, whether children actively pursue and master the skills they value and are capable of mastering (Dweck and Bempechat, 1983).

Ryan, et. al. (1985) agree. "One of the more striking discoveries in educational literature is that of a steady decrease in children's intrinsic motivation for learning in school over the elementary years," (page 16). They further comment disapprovingly on our directing most of the efforts in the research of intrinsic motivation toward the explication of negative environmental factors. They blame those factors for generating the loss of intrinsic motivation or for the enhancement of intrinsic motivation following cognitive evaluation theories alone. These cognitive theories are grouped by the authors in three clearly labeled behaviorist practices that are extrinsic in nature.

They welcome the emerging number of findings relating achievement and intrinsic motivation. Internalization of children's motivational attitudes according to both writers becomes a significant component of future self-regulation and self-administration.

In support of the self-determination paradigm, the researchers report results that reveal a significant decrease with both age and grade in the degree of extrinsic regulation reported by children. This may indicate a move towards intrinsic motivation and development of the self as an administrator.

Grosnickle, et al. (1994) agree. Today, more than ever, educators are challenged to analyze, translate, and apply findings from educational research to situations in the school and classroom. Teachers, administrators and school staff members are asked to close the gap between research and practice. Motivation is one area that should be addressed in greater depth.

The problem of achievement motivation transcends the traditional domains of instruction and curricular technology and calls for broad changes in society's view of the nature and mission of schools (Covington, 1983). The seeds to try new teaching methods are planted here.

Self-regulated learning is defined as the highest form of cognitive engagement a student can use to learn in classrooms. It is an effort put forth by students to "deepen and manipulate the associative network in a particular area (which is not necessarily limited to academic content) and to monitor and improve that deepening process," (Corno and Rhorkemper, 1985, p. 60).

“Self-discipline, self-control, and self-motivation appear to depend on the student being guided to assume ownership or self-responsibility for their own efforts, attitudes, and consequences,” (Grosnickle, et. al. 1994, p.26).

It is clear from the above and similar statements that cooperative learning and self-management, rather than being opposing forces in the education formula, are factors related to each other. Both factors affect motivation to learn. Why is this so important? Covington (1983) brings none other than Sigmund Freud into the argument. Freud stated, "for thought is not the slave of impulse to do its bidding....What intelligence has to do in the service of impulse is to act not as its obedient servant, but as its clarifier and liberator.. intelligence converts desire into plans,” (p.139).

Suddenly, connected by Covington's Freudian interpretative remarks and Maslow's self-actualization opinions, Freud and Maslow appear to share a similar motivational goal if not foundation. Covington defends his interest from concerns about too much emphasis on motivation with the description of two cognitive situations.

“They are new developments that have occurred within the last decade that deserve critical review. One such occurrence attempts within the information-processing tradition to integrate motivational concerns within a cognitive framework. At the same time, in a parallel but separate development, theories of human coping and defending have evolved sufficiently to allow for a more balanced, integrated treatment of motivation and condition,” (page 140).

And supporting, willingly or not, Freud's previously quoted expression, Covington adds,

“a constructionist view of humankind serves this purpose well.”

This view holds that individuals create their own subjective realities and act upon them. "The individual seldom needs anyone to tell him when he succeeds or fails because he sets his own standards of performance. At first these standards are likely to be modest, relatively easy to achieve, but he moves always towards standards more difficult to achieve,” (page 141). Self-management and self-improvement appear again.

Ames and Archer (1988) found that students' perceptions of classroom climate were related to specific motivational variables that have significant implications for the development of self-regulated learning. Those perceptions operate as well as a long-term involvement and interest in learning (i.e., a mastery-oriented achievement pattern).

Cognitions are motivated in that they serve a larger goal. The goal of creating personal meaning for one's experiences, or as variously expressed by researchers, the need to establish and maintain a sense of identity, or to achieve mastery of one's environment (Covington, 1983).

Like many others in the literature, Covington establishes the connection between cognition and motivation by saying that basically they appear to be influenced by the very motivational factors they have been invoked to explain. The statement suggests that motivation comes first and cognition second in the learning sequence.

Sometimes writers define intrinsic motivation in contrast with its opposite, intrinsic fear to succeed. Individuals of low self-esteem often reject success because they believe they will have to repeat successful performances in the future, but feel they can not.

Covington concludes: "This lack of confidence is reflected in the tendency to ascribe success to external elements such as good luck or to the presumed benevolence of a teacher," (page154).

Brophy (1983) comments on the insufficient amount of classroom research available to inform teachers' decision making relative to promoting student learning and motivation. He expresses disappointment with findings indicating that the research does

not translate directly into classroom practice. He credits the role of teachers with setting up the appropriate motivational level. Whether the researcher comes from a behaviorist or a humanist background, motivation is a construct worth exploring in education.

Hughes, Redfield and Martray (1989) pointed out that academic achievement motivation is not the same as overall concepts of achievement motivation. They also added that academic achievement motivation is a component of the construct of achievement motivation which in turn is a component of the more general construct of motivation.

The writers developed a children's academic motivation inventory with the intention to provide a measure of academic achievement motivation. Attempts to predict academic achievement, they thought, have seldom included measures of academic achievement motivation. They were also concerned about previous tests which showed between 44 percent to 75 percent of the variability in standardized achievement based academic achievement test results cannot be explained. Their position on standardized achievement testing gives support to the Pioneer school teachers' decision not to take them into account as a baseline for this research.

Sample questions of the test developed by Hughes, et. al. (1989) never published commercially are enclosed in Appendix B of this report. It is clear from their efforts that they consider measuring academic achievement motivation an important educational effort.

Adele Eskeles Gottfried (1985) agreed. In the three studies presented in her paper she demonstrates the significance of academic intrinsic motivation for children's education. She found that academic intrinsic motivation was positively correlated with children's school achievement and perceptions of academic competence. She also found that it was

negatively correlated with academic anxiety.

She added that the role of subject domains in academic intrinsic motivation has been unexplored and mentions that intrinsic motivation is an important educational goal. Her research measurement, a test named "Children's Academic Intrinsic Motivation Inventory (CAIMI) was later published commercially. It is available to researchers and educational specialists. The published version of that test was used to measure the motivation of the fourth and fifth grade students in the Pioneer school before and after exposure to the electronic portfolio assessments. Further public information about the test, its validity and reliability, is provided in the Methods Section of this report.

The Self, Motivation and Learning

Paris and Ayres (1994), provide the accepted definition of self-efficacy as the perceptions and feelings that one is capable and competent to effect a particular outcome. The literature reviewed mentions frequently the role of self-determination and self-administration in education and its impact on learning. McCombs and Marzano (1990) define self-regulated learning as the outcome of choosing to engage in self-directed metacognitive, cognitive, affective and behavioral processes and skills.

The term efficacy is relatively recent in education literature. It generally refers to a person’s specific beliefs about their ability to perform certain actions or bring about intended outcomes (Ames and Ames, 1985). “In the research definitions, self-regulated learning encompasses goal-setting (motivational) and goal protecting (volitional) behavior,” (Corno, 1992, p. 74).

It is Maslow (1970) again in defining his Self-Actualization theory who states that satisfaction of self-esteem need leads to feelings of self-confidence, worth, strength, capability, adequacy and usefulness. Grossnickle, et. al (1994) discuss this issue. They consider student motivation to learn can increase and survive if students learn self-management and self-improvement skills that affect motivation to learn. The document states that "self-discipline, self-control, and self-motivation appear to depend on the student being guided to assume ownership or self-responsibility for their own efforts, attitudes, and consequences," (p. 26).

The characteristics of self-regulated learning according to Paris and Ayres (1994), include all of the following:

1) selecting own goals to pursue.
2) the need for increasing challenge.
3) knowing how to use the resources available in class.
4) collaborating with other students.
5) construction of educational meaning.
6) full awareness and orchestration of learning.
7) positive consequences of classroom activities.

The development of electronic portfolio assessments satisfies all of these criteria.

Dweck and Leggett (1988) are in agreement with the "education-self" relationship. They comment that outcomes indicating the adequacy of one's attributes will raise and maintain self-esteem. They also believe that locus of control on one's educational life is an

important concern.

Numerous investigations have suggested there are relationships between children's locus of control, self-concept, and achievement motivation (Arbuckle and MacKinnon,1988, p. 126).

There has been growing confusion about relationships among the cognitive, affective and motivational processes in learning (McCombs and Marzano,1992). They think that this confusion leads to a neglect of the critical role of the self as agent in self-regulated learning. Both writers define individual will as a "self-actualized" state of motivation. They define skill in the domain of self-regulated learning as an acquired cognitive and metacognitive competency developed with training and practice. According to the model they developed in support of these definitions the students will reject as irrelevant the task at hand if they see that it does not match self-goals.

"Performance on a task, then, is not solely a function of the extent to which an individual possesses the necessary metacognitive and cognitive strategies. If a task is judged as irrelevant in terms of learned or conditioned goals or is perceived as a threat to self-beliefs and evaluations, it may be totally rejected" (p. 60). And later on, "self-appraisal and self-management judgments make up the skill and will of metacognition," (p. 62).

Corno (1992) reports on research in relation to motivational and volitional characteristics of students who take responsibility for their own learning and performance in school. The role of self-regulated learning is amply explained in the research.

She adds that self-regulated learners understand their own thoughts and emotions to a point where they can control them while the learning process takes place. At the same time they can adopt goals and attitudes of responsibility towards their work.

"Sudden realization that the work is not so hard, coupled with a student's sense that he or she simplified it, is a positive and powerful way to gain satisfaction with performance," (page 70). The connection between motivation and self-administration is obvious in those words.

In her conclusions Corno states that she based the research she reports in the study on individual information. She also suggests additional work to evaluate effects on student motivation, volition and other constructs under varied systematic conditions in the classroom. Rudel (1994) makes the point that to promote true student motivation one must make students responsible for their own learning, help them develop their own internal yardsticks and offer them choices.

Of interest to the research conducted in this dissertation is the work of Towler and Broadfoot (1992) regarding self-assessment. They believe that involving children in the assessment process is a natural extension of the child-centered approach towards learning characteristics of primary education. The sharing of responsibility recommendation includes assessment and record-keeping.

Deci, et. al. (1991) and Ames and Ames (1985) believe that self-determination theory makes an important additional distinction that falls within the class of intentional or motivated behaviors. They make the distinction of intrinsic and extrinsic motivation within self-determination and the role played by Internalization. The concept of contingencies previously mentioned in this dissertation (page 26) appears again in their work.

In agreement with Skinner (1968), Internalization is defined as a process through which the regulation of the student's geography learning becomes internal no longer requiring external contingencies. This is a clear behaviorist concept but one that does not conflict with the internal motivation principles either.

The writers lament that people involved in the educational process find it disconcerting that most of the current educational structures and practices are experienced as controlling. Those practices also have negative consequences for the development of autonomous self-regulation. The literature about portfolio and electronic portfolio assessments that follow present a welcome and refreshing choice.

Covington (1983) states that when people compete satisfaction comes to depend not so much on bettering one’s own previous performance but instead on doing better than others. Marzano, Pickering and McTighe (1993) point to at least three factors which have contributed to the demands for assessment reform. They are changes in educational goals, relationship between assessment, teaching and learning, and the limitations of the current methods of recording performance and reporting credit.

They point to performance assessment as a variety of tasks and situations in which students receive opportunities to demonstrate their understanding, knowledge, skills and habits in a variety of educational contexts.

Seeley (1994) writes that traditional educational measurement courses teach only to record and report numerical scores. Researchers and educators, on the other hand, encourage teachers to use multiple assessment measures of the type found in authentic and portfolio assessments. "Most of the portfolio projects,” she adds, "include some form of

self-assessment so that students can see how the quality of their work has evolved," (pages 4-6).

Paris and Ayres (1994) report that educators around the world have enthusiastically embraced the use of portfolios for student assessment during the past five years. These portfolios are used at all grade levels, elementary, high school and university. All core academic subjects are included. The researchers point to self-regulated learning as one of the main reasons for this interest from teachers.

Evidence of assessment performance consists of two features: processes and perceptions. Processes consist of rough drafts of children's writing, strategy assessments and teachers' observations about the students. Perceptions include students' self-reports of attitudes, motivations and academic progress. These documents are not all inclusive. They are basically representative samples of their diverse work and thinking. The main strength of personal portfolios according to the two writers is the role of students deciding what will and will not be included in their portfolios. This self-directed quality is at the heart of authentic assessments.

Meyer (1992) describes a scenario in which students develop all the papers in a portfolio with as much or as little time allocated to each item as the student sees fit. That is a true example of portfolio and authentic assessment. The important educational difference between the two is the degree to which the student controls his or her portfolio. The "self" component of the example defines as authentic assessment what would be simply a portfolio if only the teacher controls the process. In order to be effective a portfolio should also be authentic, in other words, the student should be able to regulate and control the

portfolio.

Portfolio assessment is not or was expected to be free from controversy. Not all educators see the portfolio as an alternative means of documenting assessment. Many educators are of the opinion that assessments are a more laborious means to arrive at an academic grade (Hamilton, 1996).

Popham (1993) reports on the high costs of authentic assessments. He regrets the tendency by educators to call for more authentic assessments as a simple attempt to eliminate current assessment pressures by disparaging the competition. This opinion, he comments, should not hide the fact that any form of constructed-response assessment has a high cost. Scoring of student-made responses takes more time. Most important, these scores require highly trained scorers, not just computerized scoring scanning machines. Labor, he maintains and no anecdotal evidence questions, is more expensive than equipment.

The writer issues a warning that, unless authentic assessment interest is translated into actual assessment practices within the next few years, it may pass into history along with other educational fads.

Madaus and Kellaghan (1993) report on the British experience with Authentic assessment and the implications of that experience for a similar effort in the United States. They take for granted that standardized tests have adversely impaired the educational system. They also believe, on the other hand, there are practical, technical and basic infrastructure issues that have to be resolved before authentic assessments are deployed on a large scale. Program management problems identified as potential weaknesses are the following: staff allocation, space use, and classroom management.

Other disruptions arise from school day rescheduling, canceling meetings and activities or reallocating other resources. Cost is mentioned again but the main concern is teachers may become defensive and concentrate on simple basic skills, not more complex tasks that are truly representative of a good education.

Worthen (1993) believes several key issues will affect and determine the future of alternative assessments (portfolios and authentic). One such issue is conceptual clarity. Regarding all types of assessment, he cites little coherence to the concepts and language being used in written and oral discourse about all types of assessment. He also sees little or lack of formal internal self-criticism amongst proponents of alternative assessments. He also sees with concern this lack of other-sided points of view within the alternative assessment "movement."

Another concern expressed is the lack of public support and involvement by a large and well-informed cadre of professional educators. He finds it hard to imagine a successful large-scale performance assessment taking place without the cooperation of teachers. A similar first hand experience was found in the Pioneer school. Without the enthusiastic cooperation, creativity and dedication of the teachers at Pioneer it would have been impossible to proceed with the research reported in this dissertation.

"If we want to pursue these new modes of assessment, we cannot do so on the mere conviction that they are better," Worthen continues (page 448). He can not accept simply a holistic analysis of the technique.

He shows concern about some of the potential benefits espoused by its proponents: the ability to allow flexible and diverse assessments tailored to individual students.
The concern is that too much flexibility and individuality may undermine the entire assessment movement by rendering its results too variable.

Dunbar, Koretz and Hoover (1991) discuss quality requirements of complex performance assessments. They acknowledge that there is the risk of losing contextual understanding of classroom work when portfolios pass from this year's to next year's teachers. The solution suggested is strict quality control of a type not usually found or needed for classroom assessment. This quality control requires consistency across raters and across similar tasks rated and also across tasks that vary in content but represent the same domain. The writers conclude that the nation is on the brink of another wave of reform unprepared to undertake it with sufficient quality control.

They take issue with those who believe that authentic assessment does not require strict quality control evaluation. They also warn of its consequences and insist on quality control as a way to avoid a potentially dangerous educational environment.

Despite the above concerns, many writers continue to vouch for authentic and portfolio assessments as a valuable educational practice and insist that teachers must receive sufficient training and support. Abruscato (1993) adds, “if teachers feel that this project is just another directive from above, it is doubtful that the level of attention needed to create and maintain a portfolio system will ever be achieved,” (page 477).

Khattri, Kane and Reeve (1995) report that research is beginning to show the effectiveness of performance assessments as an effective instructional tool when teachers receive support. They found a simple change in the format of assignments and assessments is not sufficient to increase student motivation. They believe that the content must be challenging as well.

"Portfolios --and other assessments that involve teachers and students in some form of record keeping-- provide the structure for documenting student work and progress on an ongoing basis. Such methods also provide teachers and students some measure of control over assessment tasks," (page 82).

The above statement is another example of the role of self in portfolios.

Herman and Winters (1994) cover the quality issue as well. They concur with findings that support the notion favoring portfolio assessments. They also caution that technical quality, equity and feasibility for large-scale assessment purposes are vital.

Equity is a particularly thorny issue. There is a growing gulf between schools in affluent schools and inner cities. We are in danger of drifting into "third-world" education, where a two-tiered school system maintains the social status quo (Press, 1993).

Dunbar, et. al. (1991) express the same fear regarding technical quality. He warns against portfolio advocates who oppose measurement experts who want to apply strict measuring techniques to a new educational practice that is by definition immeasurable. All writers conclude, however, that most of the technical issues confronting portfolios can be addressed if portfolio tasks are closely specified and highly standardized.

Hill, Kamber and Norwick (1994) comment that involving students, peers and parents in portfolio assessments will assist in making portfolios more meaningful and manageable. They open their article with a statement indicating how teachers, after teaching

using portfolios, will probably wonder how they ever went without them.

Paris and Ayres (1994) list the following features of authentic assessment that must be part of portfolios: (pages 7-9)

1- It is consistent with classroom practices.

2- It has instructional and curricular validity.

3- It collects diverse evidence of student's learning from multiple activities over time.

4- It promotes learning and teaching among the participants.

5- It reflects local values, standards and control.

6- It becomes high-stakes because it establishes motivational orientations for lifelong learning, and not simply short-term academic goals designed to yield high test scores.

The Theory and Research Literature Specific to the Topic

Not surprisingly, electronic portfolio assessments have become the computer-based versions of portfolio and authentic assessments. The consistency of software procedures and high density of their storage devices makes the computer an ideal processor, archive and communication device. In addition, the computer is an appropriate and effective medium to connect the portfolio work of students from grade year to grade year.

The literature on electronic portfolios that exists is associated with doctoral dissertations related to pilot research projects that revolve around limited constructs. Hamilton (1995) reported on a research whose primary purpose was to determine if the

perceptions of teachers using the Grady System differed from teachers not using any computer-assisted program in early childhood. The Grady System is a computer-assisted assessment program. Teachers felt strongly that the parents' understanding was enhanced. Teachers' attitudes expressed in a self-report were also measured here. Their opinions were positive.

The study took place in a U. S. Department of Defense supported school in Germany. The researcher recommended development of a study of other computer-assisted portfolio assessments in elementary schools. This study, she comments, should be broadened to extend to other school systems that are non-military in structure. Out of this suggestion originated the interest of the research presented in this dissertation.

Pott (1993) performed a similar study of the Grady System. This research investigated the perceptions of students, teachers, parents and school principals. She studied perceptions, goal setting, student enjoyment, reflective learning and effectiveness of the method. The responses were opinions collected from the participants indicating that the students felt motivated to improve their reading and writing. The researcher issued a recommendation for a longitudinal study starting with first grade and ending with sixth grade. General intrinsic motivation was not investigated in the study.

A related issue to the use of computer-assisted instruction is the concerns expressed by educators and researchers about computer use attitudes. Gos (1996) claims that today a substantial number of students and workers are computer anxious. He suggests that middle and high school teachers may be the ones with the power to change that trend.

He thinks that computer anxiety will not disappear as computer experience becomes

more universal and believes such anxiety is created (learned), not a birth defect waiting to be healed.

"If students with computer anxiety tend to drop out of the education scene before college graduation or to choose majors where, with some degree of effort, they can avoid computers altogether, their options are severely limited. The goal then, must be to make our students' early computer experience as pleasant as possible." He concludes, "It is clear that the problem needs to be dealt with before we create a new underclass consisting mainly of computer illiterates," (page 275).

Soloway (1996) adds strength to the above statement when he says that "teachers must be part of any systematic plan for integrating computing and communications technologies into the classroom," (page 11). The often-mentioned evidence of women's lack of interest in computers is anecdotal, but empirical evidence in the literature reviewed also exists.

Jacobs (1995) comments that many studies have examined women's under representation in engineering and the sciences. He documented trends in sex segregation of college majors from 1948 through 1980 for all levels of higher education and in 1984 as well. During this time, new fields, such as computer science or environmental science and technology, had become part of the curriculum so it was not a matter or novelty or lack of familiarity with the technology.

In his opinion, the analysis of the sex composition of computer science bachelor degrees granted from 1980 to 1990 reported by the National Center for Educational Statistics is disappointing. In 1980, females represented 30.2 percent of computer science graduates. The percentage went up to 36.8 in 1985 and then down again to 30.0 percent in 1990. Jacobs presents a more somber picture when he looks at the intended majors of

entering freshmen in college as reported by the Cooperative Institutional Research Program. "The results show that, indeed, male and female students do arrive at college with different plans of study in mind." (page 89).

The writer of this dissertation report is currently teaching required basic computer science courses for college students. He collected anecdotal evidence supporting the theory that some young women are inclined to avoid the computer altogether. Fifty percent of a group of freshmen students of both sexes reported in a non-scientific survey that they considered themselves "survivors" of computer technology through high school.

Quoting from another author, Jacobs maintains that "some studies connect the issues of math and science to broader patterns in education and society," (page 169). He believes lack of interest in computer science starts early in the educational cycle of young girls. He also thinks development of computer-based curricula may become an important tool in fostering that interest as early as possible. Electronic portfolio assessments are good candidates for the definition of "computer-based curricula" and researching its impact a sound endeavor, although it is probably not the only one.

Murray (1993) developed an interesting gender related theory. "The Production and process of making technology," he concludes, "is also gendered and if unchallenged strengthens links between prevailing conceptions of masculinity and making technology," (page 72). He also suggests that the organizing of computer software work and the vocabulary of motive employed in so doing are closely related to prevailing masculine conceptions of work and technology. He closes his discussion by drawing on other people and his own work arguing that there is strong and "naturalized" cultural connection

between masculinity and science and technology. Whether we subscribe to this finding, the question is: how do we change it?

Baroudi and Igbaria (1995) found that “women in the Information Systems profession tend to be employed at lower levels of the organization, make less money, and have greater intentions to leave the organization,” (page 181).

One of the goals of the literature review effort was to find information regarding the impact of home computers in the motivation of the students participating in the research study. The town of Bestborough is a middle- to high-income community where the presence of computers at home was anticipated by the researcher. There was concern that a large number of computers in their homes could have influenced the results of this study.

One of the articles reviewed was a report on a large-scale implementation of a home/school computer project named "The Buddy System.” This Indiana project was initiated to determine if there was an effect on the achievement of fourth and fifth grade students who were given a computer to take home (Miller, et. al., 1995). The students gained substantial access to computer technology in both the classroom and home.

This experiment incorporated computer-assisted instruction and telecommunications within daily class work and assigned homework in 19 selected schools across the state of Indiana. It was hypothesized that positive attitudes toward learning, the self-concept of the learner, student time on learning tasks and the amount of parental involvement in the student's learning would improve student’s scores.

Interestingly enough, the comparison group not receiving extra computer resources outperformed the treatment group. It is important to point out that the educational program

did not consist of self-administered computer portfolios where the student controlled his or her own destiny.

The implications, according to the writers, were that the study did not obtain any evidence to support gains in achievement scores by the students who had computers at home. The writers believe total immersion in technology may affect favorably student motivation, self-esteem and parental involvement.

The key words are "total immersion" and "computer-assisted" instruction. Electronic portfolio assessments, as defined in the present research at the Pioneer school, represent a self-administered use of computers where the student plays a central and responsible role. Sporadic use of computers at home was considered incidental. Infrequent use of computers at home does not represent a total immersion process similar to the one described in the Indiana case. This reported research did not represent a total immersion.

Summary of the Literature Reviewed

The literature reviewed pointed to several components that together represent important educational issues. First, there was the reported importance of intrinsic motivation in the classroom and the learning process. Then there was the question of intrinsic motivation versus extrinsic motivation and its significance, whether the psychological analysis is behaviorist-based or not.

Second, the literature clearly shows that the role of self in the educational process is of paramount value to sustainable learning results. This self-administration, reflection and control was found to be one of the benefits of authentic assessments and portfolios. The literature reviewed highlighted the risks associated with portfolios. The potential of

electronic portfolio assessments in an increasingly technical society was also reported. Last, but not least, gender issues associated with the use of computers and technology were raised. The literature reviewed did not support the theory that availability of home computers was a significant factor. The evidence of home computer use was contradictory and inconclusive.

Altogether, the literature creates a foundation for additional research involving portfolios and computer technology in the classroom.

The Contribution this Study Will Make to the Field

The contribution this study will make to the field is twofold. It will provide information about the impact that an electronic portfolio assessment curriculum will have in the motivation of the students who participate in it. Educators will be more confident in the technology, not as a supplement to the principle of portfolio assessments use, but as a main educational tool.

The results will provide succor to overworked teachers with an indication of the realistic level of relief they may expect to obtain from the computer technology. This is important because record-keeping and reporting are so much a part of portfolio assessment administration and communication.

Concerning computer interest of girls, the research will help determine if the technique provides young girls with an incentive to pursue additional computer-related activities. The result perhaps will be the creation of an educational environment which may eventually generate career interests in the field. The long term benefit to our educational system can be invaluable. Above all, it will benefit the girls involved in the research project.

last, but not least, this dissertation itself contributes additional literature to a field that is new and unexplored.

Chapter III

Research Methodology

Overview

It was clear in the literature reviewed and conversations with several experienced teachers and school administrators interested in the subject that controversy regarding portfolio assessments was substantial. The empirical evidence on its electronic or computer-based version is mostly based on subjective criteria. Surprisingly, a dearth of empirical research exists. Of eighty-nine entries on portfolio assessment topics found in the literature over the past ten years, only seven articles either report technical data or employ accepted research methods (Herman and Winters, 1994).

Measured responses and opinions from students, parents and teachers were positive (Hamilton, 1995; Grady, 1996), but opinions are external, their motives subject to interpretation and speculation. Hamilton (1995) found no significant differences between the attitudes of teachers using a computer-assisted assessment portfolio program and the attitudes of teachers not using any.

It became evident that the best way to shed light on the subject and assess the impact of any electronic portfolio assessment was to look objectively for specific measurable constructs within the students themselves. To accomplish that goal the research in the town of Bestborough (not a real name) measured intrinsic motivation and computer

interest before and after students were involved with electronic portfolio assessments. This effort was critical if the Bestborough School Committee, which expressed public interest in the portfolio technology, was to embark in a massive electronic portfolio assessment program citywide.

It was also agreed with the teachers that this study would not involve cognitive constructs. The use of intelligence tests or any other recognized standardized testing inventories would have lacked validity in the untested waters of electronic portfolio assessment. Using those tests would feed the controversy surrounding the use of portfolios. The shift to portfolio assessment acknowledges that students are more than GPA's and test scores (Grady, 1996). Teachers need less information about percentile rankings and more information about student performance (Abruscato, 1993).

There was no interest on the part of the educators involved in this research to correlate standardized testing with electronic portfolio assessment results.

Research Method(s) Employed

Research can be historical, descriptive, correlational, causal-comparative and experimental, Gay (1992). Historical research involves the study and explanation of past events. Descriptive research involves a description of the way things are in the present. Political surveys are a good example of that type of research. Correlational research attempts to determine whether and to what degree there is a relationship between two or more quantifiable variables.

Causal-comparative research attempts to establish cause-effect relationships in group comparisons where the alleged "cause" or independent variable as it is called, is not

manipulated. Experimental research also attempts to establish cause-effect relationships in group comparisons where the alleged "cause" is manipulated.

The study conducted in this dissertation research was a causal-comparative quantitative analysis. Specifically, it was a preliminary causal-comparative analysis of the within-subjects variety of two groups of fourth and two groups of fifth graders who were exposed for the first time in their education to the use of electronic portfolio assessments, the independent variable. A within-subjects analysis looks at the same groups of individuals before and after exposure to a particular treatment. There were two dependent variables in the study, intrinsic motivation and computer interest.

Two fourth and two fifth grade groups of students, seventy-six students between the ages of nine and ten years, were given a pre-test in intrinsic motivation. Seventy-seven students of the same four groups were given a pre-test of computer interest before the electronic portfolio program officially started.

At the end of the school year seventy-three students were given an identical test in intrinsic motivation. Seventy four students were given an identical test in computer interest. The research goal was to determine if there had been any significant changes on the dependent variables. The number of students in the post-test varied from the number of students in the pre-test for several reasons.

Some students were absent on the post-test date, others had chosen to exercise their rights not to continue participating in the research, the lack of responses in others invalidated their tests. The number of drop-outs for the previous reasons was negligible. In

the end, seventy-one students were scored for motivation and seventy-three for computer interest.

The study was limited to the Pioneer school (not a real school name), and was exploratory in nature. The school administration accepted the proposal for testing and research described here because it believed it was important to gauge the results of the electronic portfolio assessment program as soon as possible.

This decision meant that testing and evaluation of the two constructs selected were going to proceed in the pilot school whether the researcher presented and published the findings or not. The researcher assumed a low-key profile during the project and took other precautions to avoid biases associated with the familiar Hawthorne effect which may invalidate research studies. The length of time between tests is the reason why this researcher believes that the Hawthorne effect did not affect the validity and reliability of the study. The amount of time elapsed between the pre- and post-tests at the Pioneer school, six months, was long.

At the time of the post-tests portfolios had become a routine part of the educational environment and not an attention getting effort by the students. Not until they faced the post-tests did the students realize that someone was watching to keep changed scores.

At the start of the study the researcher, teachers and administrators considered and discussed the possibility of pre- and post-testing a control group of fourth or fifth graders from another school in the community who were not participating in the electronic portfolio program. The option of a control group at the Pioneer school itself was not even considered

because the population would have been too small.

The control group idea was dropped immediately. There was a conviction within the school administration that teaching styles and other local issues, including the so-called John Henry effect, unrelated to the electronic portfolios, could have affected the validity of any comparison between both groups. Even if intact groups are randomly selected, the possibility exists that the experimental group is in some important way different from the control group, and/or from the larger population (Maxwell and Delaney, 1990).

The idea of measuring the impact of an electronic portfolio program in the motivation of students in the pilot school and its absence in the control school would have been extremely difficult to sell to the Bestborough community. Bestborough is a city where the presence of computers in their schools is considered positive and vital. The researcher could not avoid remembering a conversation with a staff member of another school in an unnamed suburban Massachusetts city where this research was first proposed and rejected. A teacher had expressed her strong opposition to portfolios on the belief the technique had all the characteristics of a socialist program.

The study in Bestborough was considered exploratory and viewed as an experimental upward step in the educational ladder. The study was not a competitive effort between different local schools, one of which was deprived of the new technology and could conceivably be dubbed a "loser."

The Bestborough school system staff, not the researcher, selected the experimental student population and grade levels. The universe consisted of five elementary schools available in the city. Once the school was selected, the Principal of Pioneer was approached to ask for her participation. After accepting the program idea the Principal contacted the fourth and fifth grade teachers in the school and asked for their participation. After the teachers accepted the idea a letter was sent to the parents of the students involved asking for their permission. The project then started.

The Instruments

The students received two pre-tests and two identical post-tests. One of the first pre- and post-tests consisted of a Likert style questionnaire test published under the name of Children's Academic Intrinsic Motivation Inventory (CAIMI). Adele Eskeles Gottfried, Ph.D. developed the test in 1985. The test measuring reading, math, social studies, science and general intrinsic motivations was given to 141 fourth to seventh graders when originally developed.

There were other tests available that are relevant to the discussions on motivation in education. One is the Academic Self-Regulation Questionnaire (ASRQ), (Ryan and Connell, 1989). The other is the Academic Motivation Scale (AMS), (Vallerand, et al. 1989). The ASRQ measures primarily students in late elementary and middle schools. It includes external, introjected, and identified forms of extrinsic motivation as well as intrinsic motivation.

In addition, in the ASRQ test students are asked to explain and endorse the degree to which various reasons given are true, --the most important characteristic for not using

this particular test in the Pioneer study. The AMS (Vallerand, et al. 1989) was designed for use with college students and did not apply to the age range of the students involved in this study. The CAIMI was the first instrument developed to measure children's academic intrinsic motivation in a comprehensive manner across school subject areas. It was preferable for this research for its simplicity, its commercial availability from publishers and because it measured intrinsic motivation exclusively without further probing the responses.

There were other reasons of validity and reliability for the purpose of this research, reasons that appear extensively in the 1992 issues of Tests in Print and the Mental Measurement Year Book. CAIMI's correlation in test re-test reliability over a 2-month interval was high .66 to .76 ($df = 83$, $p<.01$) in one developmental study, and .69 to .75 ($df =136$, $p<.01$) in another.

The introduction to the manual of the published test reads: "The Children's Academic Intrinsic Motivation Inventory (CAIMI) was specifically developed to measure academic intrinsic motivation in upper elementary through Junior High School students (grades 4-8). The CAIMI measures academic intrinsic motivation separately in the subject areas of reading, math, social studies and science and also provides a measure of general orientation (motivation) toward school learning."

The CAIMI inventory may be individually or group administered within an office or classroom setting. The inventory consists of self-reports on 44 questions. The 44 questions comprise 122 items and five scales. Each specific motivation scale (i.e., math) contains 26 questions. The general motivation scale contains 18 questions.

High scores in the CAIMI correspond to high academic intrinsic motivation. That concept is defined as "enjoyment of school learning characterized by an orientation toward mastery, curiosity, persistence and the learning of challenging difficult and novel tasks," (Gottfried, 1985).

Low scores correspond to low academic intrinsic motivation. That concept is characterized by "little enjoyment of learning, an orientation toward accomplishing easy rather than difficult tasks, little curiosity for school learning, little interest in task mastery and low persistence," (Gottfried, 1985).

Twenty-four of the twenty-six questions in each subject area requires a response on the basis of a 5 point Likert scale ranging from strongly agree to strongly disagree. The remaining two items require a forced choice between an intrinsic and non-intrinsic response.

The CAIMI is a copyrighted commercial publication. No actual test questions have been provided in this report to show as samples. Similar questions from an unpublished motivation test appear in Appendix B.

All General Motivation items require responses on the basis of a 5 point Likert scale ranging from strongly agree to strongly disagree. For approximately fifty percent of the items high intrinsic motivation is indicated by agreement. For the other fifty percent high intrinsic motivation is indicated by disagreement. Scoring procedures accommodate that method.

The CAIMI is used with fourth through eight grade children who must be fluent in English (as were all the students at Pioneer). The vocabulary and the response format are

appropriate for children across a broad achievement range as demonstrated by the lack of difficulties encountered or expressed by the Pioneer school children during testing. The researcher purchased the test booklets from an authorized independent commercial test publisher.

Another pre- and post-test of a thirty-two Likert style computer interest inventory adapted from a test named Moe Computer Educational Survey (MCES) was given to the students. This test, created by Daniel Moe at South Dakota State University, is not available commercially. The test was designed to determine whether children's attitudes and interests concerning computers and computer science vary by gender, residence status (in town or in the countryside), grade level, and computer usage levels.

Because the students in the Pioneer school live in a community with similar characteristics the residence factor was of no particular interest. Only the issue of gender was of interest to the teachers in the Pioneer school who had requested this test.

The instrument is an adaptation from the books, Attitude Toward School K-12, Instructional Objectives Exchange, 1972, and Conducting Educational Research, B.W. Tuckman, 1972. Mr. Moe developed the test in South Dakota State University under rigid validity and reliability standards established by the University professors who supervised their first use in a local research designed to support a master degree thesis. The original research involved a population of 277 students.

Computer interest testing at Pioneer was done with a view to determine gain scores. That simple goal provided additional support to the use of this test for the purpose intended in this research. It is uncertain whether the MCES test will be published commercially. No

other computer interest tests were available, either published or unpublished. The researcher of this dissertation obtained permission to use and report the MCES test personally from its author Mr. Daniel Moe.

All the questions in the MCES test used in this research appear in Appendix C. This is only the second time that the MCES test has been used in an educational setting. Some of the questions of the original MCES test were eliminated in consultation and agreement with the teachers and administrators of Pioneer after the words were considered irrelevant to the learning environment at Pioneer. An example of this type of question was a reference to "computer center" that applies to universities or businesses but not to elementary schools where computers sit anywhere in the classrooms.

Pioneer has no “computer center” as that term is used in the Data Processing industry to describe an isolated room where computer equipment is in a restricted area for protection from intrusion or other environmental hazards. At Pioneer two or three computers, connected through a local area network, sit in each classroom. There is also a twenty-computer lab located on the second floor of the school where the teachers conduct computer classes. The electronic portfolio assessment training took place in this lab. The lab has no walls and is easy to access by the student and teacher population at Pioneer. The physical arrangement lacks all the characteristics of a “computer center” as that term is known and used.

Another modification to the MCES test was the description of one of the five Likert style responses. In the CAIMI test the choice for a neutral response was "don't agree or disagree.” The MCES test used the word "neutral.” This difference between both tests was

confusing and inconsistent. By changing the word “neutral” in the MCES test to conform with the CAIMI test description of "don't agree or disagree" the students had a consistent range to choose between the terms “strongly disagree” and “strongly agree.”

There are five sub-scales in the MCES test:

Learning (L): Defined as an expressed tendency to approach rather than avoid computer learning related activities.

Interpersonal (I): Defined as having a favorable attitude towards teacher interpersonal relationships in regard to the computer.

Mode of Instruction (M): Defined as having a favorable attitude toward aspects of teacher instructional behavior in regard to the computer.

Personal (P): Defined as one’s personal attitudes towards the computer.

Social Structure and Climate (S): Defined as a favorable attitude toward the social structure and climate of one’s school in regard to computer utilization.

Different questions of the test address the various sub-scales individually. The question numbers comprising each sub-scale appear at the end of the MCES test in Appendix C. This research considered exclusively the effect of electronic portfolio assessments in computer interest of girls as measured by the above five sub-scales.

Questions are scored by means of a Likert scale response value ranging from 1 (strongly disagree) to 5 (strongly agree). Several questions are negatively worded and their values reversed. For all the questions in the subscales a higher mean reported indicates a higher interest and a lower mean indicates a lower interest.

Specific Procedures Employed

In November of 1996, the researcher presented a description of the electronic portfolio assessment program to a regular meeting of the Bestborough School Committee. These public meetings are usually televised by the local cable station as this particular meeting was.

In late November, the Principal of the Pioneer School signed and sent a letter to the parents of the fourth and fifth graders in the school announcing the upcoming research and requesting permission to allow participation of their children in the program.

"Educators will tell you that you don't want to collect data in the schools before Halloween (October 31) because the school year is just getting started and the kids aren't quite fixed in the patterns that will be maintained later in the year," (Patton, 1980, p. 107).

Because the motivation and interest research was of the low-risk type, the letter, enclosed as Appendix D, requested a negative response only. The school had used a similar approach before. The results had been satisfactory. The parents were given an option to allow their children to participate in the study but not in the use of electronic portfolios. No

parents refused participation of their children in the research.

This level of participation was not surprising. The town of Bestborough has a high number of well-educated people. The 1994 median income was $72,336, one of the highest in Massachusetts. There were 7,640 households and the median home value was $321,000. In 1996, at the time of this research, the population was approximately 20,323 inhabitants. (Source: U.S. Census Bureau).

The Bestborough school system population has a total of 3,077 students distributed in one high school, grades 9 to 12; one middle school, grades 6 to 8; and five elementary schools, grades K to 5. There is an elected School Committee; an appointed School Superintendent; an appointed Assistant Superintendent of Curriculum and Technology; seven School Principals; 210 teachers and an unreported number of teaching assistants and teacher substitutes. The Pioneer school project was familiar to all of the above individuals either officially or unofficially.

The school itself is in a three-story classroom building. The fourth and fifth grade students share part of the third floor of the building. The two groups of fourth graders are located on the northern side of the building. They are separated from each other by a wide open space, a low portable partition and several computers, printers and a scanner.

Each group operates independently from the other under the direction of its own teacher. The two groups of fourth graders share enough space to consider themselves not only part of their individual classes but part of a larger fourth grade group as well. There are no walls separating the students from the adjacent hall or from each other.

The two groups of fifth graders are on the southern side of the same floor of the building separated from each other by a large fixed partition. Large partitions separate the two classrooms from the hall as well.

A wide hall separates the fifth graders from the fourth graders and from each other. Each group operates independently from the other under the direction of its own teacher. The two groups of fifth graders do not share enough space to consider themselves part of a larger fifth grade group, although there is close communication between the two groups on an on-going basis.

During the electronic portfolio assessment program, each group acted independently from each other in terms of training, direction and portfolio design

The Pre-test

To facilitate the research process, the actual testing took place in the students' own classrooms and was conducted by each teacher under remote administration and supervision of the researcher. The CAIMI and MCES tests were done during the same week, but not necessarily within the same day. The students recorded the test date, students' names, gender, age, birth date, school name, grade and teacher names on each test booklet.

During administration of the tests the teachers read to the students the CAIMI instructions from the CAIMI manual supplied with the test booklets by the publisher of the

test. Please refer to a copy of these instructions in Appendix E. The emphasis of the instructions was on the personal opinion nature of the inventory not that there was a right or wrong answer.

Some of the teachers preferred to administer the MCES and CAIMI tests on the same day, others a few days later. As in the CAIMI test, emphasis on the MCES test was placed on the personal opinion nature of the test not that there was a right or wrong answer.

After pre-testing was completed each CAIMI booklet was coded with a reference control number that eventually replaced name identification of each participating student. This coding assured confidentiality. The student names in the MCES and CAIMI tests were matched and the CAIMI reference control number was assigned to each MCES test name.

The teachers never learned of the students' pre-test results either individually or as a group. There were several privacy reasons for this precautionary step. One of them was to fulfill the confidentiality agreement reached with the school and the parents on behalf of the subjects. Another reason was that the purpose of the pre-test was strictly to establish the baseline for comparison with the post-test after treatment. There was no intention to identify lowly- or highly-motivated individuals who might have scored low or high in the tests due to reasons beyond the scope of the research. These reasons could include students' personal attitudes or difficulties towards testing. To do otherwise would have personalized the research inappropriately.

Last, but not less important, to avoid unusual experimental bias pressures, the teachers were left to work under their own pedagogical instincts, devices and normal

teaching conditions.

From the researcher's point of view the teachers also offered a potential Hawthorne effect risk. Disclosing the pre-test results might have been counterproductive and given them a sense of a starting unpleasant or unacceptable baseline. This situation could have encouraged corruption of the research even unknowingly or unconsciously. The decision not to share the pre-test results, by the way, met with no opposition from this highly dedicated and professional group of teachers.

A confidential database of students' names and related reference control numbers was created and retained by the researcher at this time. This effort facilitated matching the pre-test scores with the post-tests for grade group, gender and quartile comparison.
After the administration and scoring of the post-tests the researcher removed and destroyed all connections between student names and test booklets.

The Portfolio Treatment

After-pre testing the students and teachers began the training and use of the HyperStudio electronic portfolio software system. Description of the Hyper-Studio system appears in more detail in Appendix A of this dissertation report. Technical staff experienced in teaching techniques and in the computer technology itself trained the teachers and students in the use of HyperStudio. The teachers encouraged the students to create the content of their own portfolios.

A description of the components in the portfolios of each grade appears as Appendix F and G, respectively, in the Appendix section. The teachers developed the overall concept and general content of the portfolios. This effort was intended to make sure

the portfolios were consistent school wide, a technical quality recommendation previously mentioned in the literature review section. The long-term success of assessment and related reporting systems depends on the involvement and expertise of classroom teachers. Training and support, therefore, are crucial components of the assessment system (Donahue, 1995).

Hill, et. al. (1994) developed a list of items that must be included in a portfolio:

1- Define the Portfolio's purpose.

2- Teach Students to self-reflect.

3- Structure portfolio reviews.

4- Make time for peer evaluation.

5- Regularly share portfolios with parents

6- Give yourself time.

Hamilton (1995) surveyed teachers who participated in an electronic portfolio assessment project. He found majority agreement in the opinion that the student and possibly other educators, along with the teacher, should decide what goes into the portfolio.

Because the teachers devised the portfolios in an exploratory basis they did not share the results with the parents at this time. Specific student reflection cases appear in two portfolio samples enclosed as Appendices H and I. They are typical examples of the students' work, one boy and one girl.

The students suggested and created the specifics of each individual portfolio providing the needed and wanted self-administration characteristic of the program. To provide the development of self-regulated learning our self-as-agent framework suggests

interventions be directed at two dimensions: the learner and the learning environment (McCombs and Marzano, 1990). The students in the Pioneer research exercised great creativity and care to make sure they included in their portfolios those items which were truly representative of their educational experience and accomplishments.

The Post-test

Post-tests took place in June of the same school year, six months after the pre-tests. This length of time between tests eliminated any biases associated with recall. The routine long-term association with portfolios in the classroom reduced the probability of having a Hawthorne effect.

The same pre-test procedures of test administration, location, information and confidentiality issues were used during the post-tests. It was at this time that the students reported whether they had a computer at home. Only one of the students answered in the negative. The researcher did not try to define the word computer or the computer platform, Windows or Macintosh, available at home.

This waiting period until completion of the post-test before asking the computer question was intentional. It was meant to avoid stimulating any unnecessary effort on the part of parents or students to obtain similar technology at home and to influence the results of the study going on.

Multiple treatment interference can occur when the same subjects receive more than one treatment in succession. The limited size of the population under this study required strict participation in school-based electronic portfolio assessment development as defined by Pioneer.

Formats for Presenting Results

After administration of the CAIMI and MCES tests, individual student identification numbers and related scores were entered into computer ASCII text files. Those files were used as data input to the SPSS/PC+ Base System (DOS version 5.1) statistical software package where the data was processed for analysis.

There were several types of statistical general tests conducted:

1- Statistical analysis of the CAIMI and MCES Pre-tests scores to establish the baseline for testing the hypothesis after the electronic portfolio treatment.

2- Statistical analysis of the CAIMI and MCES Post-tests scores to set the new basis for testing the stated hypothesis.

3- Comparison of the results obtained in the Pre- and Post-tests for testing the hypothesis.

All SPSS/PC+ parameter commands used in the research appear as Appendix J to this dissertation. The following statistics appear in tables and graphs in the Data Analysis or Appendix sections of this dissertation report:

Pre-tests Scores: A table is presented of each construct for the four elementary grade groups and the entire population with Mean and Standard Deviation. Kurtosis and Standard Error, Skewness and Standard Error, Range with Maximum and Minimum values, Standard Error of the Mean and Variance were obtained using SPSS/PC+. They were used in the interpretation of the data. Several histograms also appear as part of Appendices K through N.

As previously indicated, General and Math Motivation were the only two constructs

related to the portfolio program evaluated and reported from results of the CAIMI pre-test. A Correlation and a Regression Correlation coefficient between those two CAIMI constructs were generated to validate and confirm the positive correlation of the CAIMI pre-test at Pioneer as claimed by the author of the test.

The Learning, Inter-personal, Mode of Instruction, Personal and Social Structure sub-scales, related to gender in the MCES test, were evaluated and reported.

The student scores in the CAIMI pre-test were ranked into percentiles as prescribed in the scoring section of the CAIMI administration booklet. These percentiles were ranked into four quartiles. Mean and Standard Deviation, Kurtosis and Standard Error, Skewness and Standard Error, Range with Maximum and Minimum values, Standard Error of the Mean and Variance of each pre-test quartile and their paired post-test scores were obtained. Mean and Standard Deviation are reported for evaluation and analysis.

Post-tests Scores: There is a table also for each construct for the four elementary grade groups and the entire population with Mean and Standard Deviation. Kurtosis and Standard Error, Skewness and Standard Error, Range with Maximum and Minimum values, Standard Error of the Mean and Variance were also computed for analytical purposes. Histograms also appear in Appendices K through N.

As previously indicated, General Motivation and Math were the only two constructs related to the portfolio program evaluated and reported in the CAIMI post-test. A Correlation and a Regression Correlation coefficient between the two CAIMI post-test constructs were done to validate and confirm the positive correlation of the CAIMI post-test at Pioneer as claimed by the author of the test. A table is available elsewhere in this

document indicating how the students in each pre-test quartile performed in the post-tests and what the changes mean. This effort was critical to arrive at the conclusions reached in the study.

The Learning, Inter-personal, Mode of Instruction, Personal and Social Structure sub-scales as related to gender were the constructs evaluated and reported in the MCES test. The Mean and Standard Deviation of the post-test scores related to each sub-scale were calculated and reported. T-tests of the pre-test and post-test CAIMI and MCES scores were also calculated and reported.

Resources Used

There were considerable human and technological resources available for this research. At the human resources level there was the Assistant Superintendent of Curriculum and Technology in the Bestborough School System who initiated the program assisted by this researcher.

The Bestborough School Committee and School Superintendent provided approval, moral and philosophical support. There was also the participation of the Pioneer school Principal, the four Pioneer teachers in charge of the four groups of students and the technical teaching staff in Bestborough who did the Hyper-Studio training. Last, but certainly not least, were the seventy-plus fourth and fifth grade students who participated in testing and developing of the portfolios.

There were many hours of training and portfolio development in the research so time was also a resource used frequently, particularly during teacher and student training,

testing, portfolio creating, reviewing and sharing.

At the technological level there were computer hardware and software resources of approximately 30 Macintosh computers connected through a local area network and housed within the four classrooms and one lab of the Pioneer school. There were four printers and two scanners used in that environment and then there was the HyperStudio multimedia software itself used to develop the portfolios. The schools in Bestborough licensed the HyperStudio software from Roger Wagner Publishing, Inc., the developer and publisher of HyperStudio.

The researcher used three computers at home and one computer network at work in college to support the research work and documentation. One of the computers was a Macintosh Power PC similar to the computers used at the Pioneer school.

WORD, EXCEL and ACCESS, the word processing, spreadsheet and database software products, respectively, from Microsoft Corporation were processed in an IBM-compatible computer for the record-keeping and documentation phases of the study. SPSS/PC+ Base System (DOS version 5.1), the Statistics micro-computer program from SPSS Inc. was the software of choice for the data analysis phase of the study. This work was done in an IBM PS/2 micro-computer.

The Bestborough School System Technology Office provided a licensed copy of the HyperStudio multimedia software available to the researcher. The software was used while local training and the research were taking place. This step facilitated understanding and

communication between teachers and the researcher. In order to familiarize himself with the application software the researcher developed his own Apple computer-based sample Portfolio during the study. Once the research was over, the researcher returned the software to the Bestborough technology office and deleted his copy from the researcher's Macintosh computer.

The student test material consisted of one hundred and seventy booklets of the CAIMI test purchased from a publisher of psychological measuring tests. One hundred and seventy copies of the MCES computer interest test were reproduced locally by the researcher in a photocopying retail store.

Reliability and Validity

Reliability and validity are important considerations in any test. According to Adele Eskeles Gottfried the reliability of the test is substantial. The differentiation between general and subject areas of the test was the product of scientific and practical considerations during construction of the test.

The focus of the CAIMI was to develop an instrument tapping the construct of academic intrinsic motivation. The author predicted and obtained both positive and negative correlations, indicating convergent and discriminant validity. She found that:

(a) Academic intrinsic motivation was positively related to school achievement,

(b) Academic intrinsic motivation was negatively related to academic anxiety,

(c) Academic intrinsic motivation was positively related to children's perceptions of their academic competence,

(d) Academic intrinsic motivation was positively related to teacher's perceptions of students' academic intrinsic motivation and, finally

(e) Higher academic intrinsic motivation was associated with lower extrinsic orientation.

The reliability of CAIMI is substantial. Gottfried established internal consistency and test-retest reliability with the test. The internal consistency reliability coefficients (alpha) for CAIMI scales in two of the studies, Studies 2 and 3 reported by Ms. Gottfried were:

		CAIMI Scales				
Study	N	Reading	Math	Social Studies	Science	General
2	260	.90	.89	.91	.90	.80
3	166	.92	.93	.93	.91	.83

The researcher correlated the General and Math motivation scores of the pre- and post-tests at Pioneer to determine if the results were consistent with Gottfried's reliability and validity reported coefficients.

No validity or reliability scores are publicly available for the MCES test. Gary Steinley and Carl Edeburn, professors at South Dakota State University took the

responsibility of addressing strict validity and reliability procedures as well as readability during construction and administration of the original MCES test instrument.

When pre- and post-tests are given, the main objective of the researcher is to observe the gain scores. The amount and significance of the change from point A to point B is what interests the researcher, making the issue of validity and reliability important but less critical at that point in time.

Only the gain scores of the MCES test were of interest. No effort was necessary to deal with the reliability and validity of the test beyond the evidence provided by the original involvement of the professors at South Dakota State University claimed by the test author, Mr. Daniel Moe. The consistency and statistical analysis of the results of the two MCES tests proved this decision right. There are letters in the original study signed by those professors indicating their professional opinion regarding validity and reliability of the test.

Daniel Moe developer of MCES, found in the original developmental study that students had experienced a loss of interest in computers as they moved from the fourth to the fifth grade. This was an interesting result which will be discussed and revisited in the Results section of this dissertation.

The issue of validity and reliability goes beyond the tests. That is a requirement of the student population under study as well. The students at Pioneer never participated in electronic portfolio assessments or Hyper-Studio the multimedia software. This lack of exposure assured a first-time exposure to the treatment.

The students were familiar with the Macintosh computer but not beyond the usual low-key routine effort used in most elementary school classrooms where those particular

computers are in use.

There is another educational issue related to the Bestborough school system, or any other for that matter, that may affect validity and reliability of a study if not carefully monitored. The local characteristics of each school and the difference in teaching styles or experience may impact the results. That reason was given by the Bestborough and Pioneer school administrators and staff involved with this project as their major opposition to the use of a different school in the same town for control purposes. This important point has been addressed previously in this report.

The fourth and fifth grade teachers worked closely together for one school year under the direction of a school Principal who was dedicated to the same educational interest. Their creativity and teaching practices gave the location of this research a level of consistency favorable to the validity and reliability needed to be generalized to the rest of the population in the Bestborough community under study.

Summary

The fourth and fifth graders at the Pioneer School were pre-tested with the CAIMI and MCES tests, trained and educated using electronic portfolio assessments and post-tested using the CAIMI and MCES tests again. After spending nine months with their students, the teachers rated them using a Likert scale of 1 to 5 to describe lowest and highest motivated students as they saw it. Gain scores of the tests were recorded and evaluated statistically to determine if there was a change in motivation and computer interest.

Chapter IV

Results

Introduction

This chapter consists of the analysis of the data generated by the pre- and post-tests of the Children's Academic Intrinsic Motivation Inventory (CAIMI) and the Moe Computer Educational Survey (MCES) tests.

All the fourth and fifth grade students at the Pioneer School were pre-tested, exposed to the Electronic Portfolio Assessment Program and then post-tested as planned using the two tests chosen. The data generated by the tests was then evaluated and

reported as explained in the following sections. The results were checked statistically against the stated hypothesis of the research questions.

Data Analysis

In the analysis of the raw scores of both the CAIMI and MCES tests each student's score in the pre-test was paired with his/her score in the post-test. Visual appreciation and comparison of the pairs may be obtained by checking the student identification (ID) numbers and the corresponding scores in Appendices O through T.

General and Math Motivation- Children's Academic Intrinsic Motivation Inventory (CAIMI)

After the CAIMI pre- and post-test results were available the General and Math motivation scores were tallied and entered into the appropriate computer files using the SPSS/PC+ statistical analysis software. The various measures of central tendency for each of the grade sections were calculated, gathered and summarized. They appear in Table 1 and Table 2 respectively.

Table 1

Fourth Grade Motivation Analysis

		Pre-tests scores		Post-test scores	
Group	n	X	SD	X	SD
Section One:	17				
General Motivation		72.29	7.10	71.76	8.71
Math Motivation		100.82	15.40	95.41	19.69
Section Two:	18				

General Motivation	68.89	10.38	67.33	9.78
Math Motivation	94.11	19.61	94.67	16.39
All Sections: 35				
General Motivation	70.54	8.98	69.49	9.41
Math Motivation	97.37	17.76	95.03	17.80

The highest General Motivation score any student could attain in the tests was 90 and the highest Math Motivation score any student could attain in the tests was 124. The dispersion of the motivation scores around the Mean of the fourth grade students was essentially unchanged in the pre- and post-tests.

Table 2

Fifth Grade Motivation Analysis

		Pre-tests scores		Post-test scores	
Group	n	X	SD	X	SD
Section One:	18				
General Motivation		67.78	9.06	67.44	6.34
Math Motivation		91.00	22.60	89.44	17.45
Section Two:	18				
General Motivation		67.00	8.74	67.28	6.28
Math Motivation		100.00	13.98	99.50	12.42
All Sections:	36				

General Motivation	67.39	8.78	67.36	6.22
Math Motivation	95.50	19.07	94.47	15.77

The decrease in the dispersion of the post-tests of fifth grade students may be an indication of increased stability of the General and Math motivations in that grade after treatment.

Table 3

All Participating Students Motivation Analysis

n=71

	Pre-test scores		Post-test scores	
	X	SD	X	SD
General Motivation	68.94	8.96	67.28	6.28
Math Motivation	96.42	18.33	94.75	16.68

Four histograms of the scores shown above appear in Appendices J through M.

Additional tests of the data presented in Table 3 were carried out. Tests of the correlation and regression correlation of the General Motivation and Math tests were conducted. The goal of the correlation tests between the General and Math Motivation scores was to determine if the positive correlation between the CAIMI General and Math motivation sub-scales claimed by the author of the published test held true for the student population at Pioneer in both the pre- and post-tests.

The correlation tests between the pre- and post-tests are presented in Table 4.

Table 4

Correlation Between General and Math Motivation

n = 71 , df = 70

	Pre-tests	Post-tests

Two-tailed Correlation Coefficient (p <.01)	+ .91	+ .70
Regression Correlation Coefficients	+ .64	+ .63
Slope	+1.31	+1.59
R Squared	+ .41	+ .40

Both positive correlation coefficients between General Motivation and Math at the Pioneer School coincided with the positive correlation claimed by the author of the CAIMI test confirming its appropriateness as an instrument to measure these students.

A *t*-test of significance for non-independent samples pairing the students' tests with the teachers' ratings and a *t*-test of significance pairing the pre- and post-test CAIMI motivation and math scores were carried out. Although there were four class groups involved in the project, there was actually one pre-test and one post-test group whose sub-groups were essentially the same before and after the treatment. The *t*-test was appropriate and as a result it was concluded that there was no need to do an analysis of covariance between the pre- and post-test group scores.

. A *t*-test correlation coefficient between the Motivation and Math scores showed a positive General Motivation pre- and post-test correlation of .80 and a positive Math pre- and post-test correlation of .77. This means that the pairing of the scores of both tests had been effective in decreasing the variability of the mean differences.

The Mean *t*-test of the General Motivation pre-test was 68.94 and the post-test was 68.52; the mean *t*-test of the math pre-test was 96.42 and the post-test was 94.87.

The *t*-test scores of all students with n-1=70 degrees of freedom were as follows: Motivation pre- and post-test .65; Math pre- and post-test 1.09. All *t*-values were below the

t-test critical values table of 1.66 to 1.67 required to reject the null hypothesis. Having failed to get that table value, the null hypothesis that there was no significance difference between scores could not be rejected. The separate t-test values obtained in the comparison between the pre- and post-test scores of the General and Math Motivation scores of each grade section appear in Table 5.

Table 5

T-test values for paired samples of Pre- and Post-Test Scores ($p<.05$).

Fourth Grade (df=34)	t-value
General Motivation	.85
Math Motivation	1.02
Fifth Grade (df=35)	**t-value**
General Motivation	.03
Math Motivation	.50

Again, the t-values for each of the grades were below the t-test critical values table of 1.66 to1.67 required to reject the null hypothesis. The null hypothesis that there was no significance difference between scores could not be rejected.

Other

There was an additional test of the same data provided by the scores to determine if there were any other characteristics of the results that might be of interest to the research. The baseline pre-test students' scores and their corresponding post-tests were ranked into CAIMI score quartiles.

The quartile Mean and Standard Deviations were calculated. The result of that analysis appears in Table 6.

Table 6

General Motivation

Quartile Mean (X) and Standard Deviations (SD) of All Students

		Pre-test Scores		Post-test Scores	
Group	n	X	SD	X	SD
Quartile 1	20	57.75	7.82	60.90	8.15
Quartile 2	22	69.18	1.62	69.41	4.63
Quartile 3	20	74.85	1.60	71.40	5.51
Quartile 4	9	80.11	1.69	76.89	5.82
All Students	71	68.94	8.96	68.41	7.97

Evaluation of the absolute changes in the Means of each of the pre-test quartiles suggests that the bottom rung of the motivation ladder experienced a positive increase in the

scores of General Motivation after treatment, while the students at the top rung of the motivation ladder went the other way. Dispersion around the population mean was also the greatest at that level.

The general motivation scores of all students were ranked into two groups: gainers and losers. There were 34 students who experienced a score gain (increase) in their intrinsic motivation, while 37 students showed a loss (decrease) in the scores.

The result of that analysis is as follows:

Table 7

General Motivation

Gain and Loss Mean (X) and Standard Deviations (SD) of All Students

			Pre-test Scores		Post-test Scores	
Group	n	%	X	SD	X	SD
Gainers	34	48	65.12	10.19	69.59	10.25
Losers	37	52	72.46	5.85	67.54	5.25
All Students	71	100	68.94	8.96	68.41	7.97

A similar analysis of the Math scores generated the results shown in Tables 8 and 9.

Table 8

Math Motivation

Quartile Mean (X) and Standard Deviations (SD) of All Students

		Pre-test Scores		Post-test Scores	
Group	n	X	SD	X	SD
Quartile 1	19	71.71	15.29	78.37	15.66
Quartile 2	19	96.42	3.63	92.53	10.70
Quartile 3	21	107.57	2.79	101.86	10.91
Quartile 4	12	116.00	3.51	112.50	5.87
All Students	71	96.42	18.33	94.75	16.68

As happened with the General Motivation results, the changes in each of the pre-test quartiles suggest that the bottom rung of the Math Motivation ladder experienced a positive increase in the scores of Math Motivation after treatment, while the students at the top rung of the Math motivation ladder went the other way. As happened to the General Motivation scores, dispersion was also the greatest around the Mean of those at the bottom scoring group. The implications of these results, which are in line with the positive correlation between the General and Math Motivation scores, will be evaluated later in the Conclusions Section of this report

The Math motivation scores of all students were ranked into two groups: gainers and losers. There were 29 students who experienced a score gain (increase) in their math motivation, while 42 students showed a loss (decrease) in the scores. The result of that analysis is as follows:

Table 9

Math Motivation

Gain and Loss Mean (X) and Standard Deviations (SD) of All Students

			Pre-test Scores		Post-test Scores	
Group	n	%	X	SD	X	SD
Gainers	29	41	88.02	22.63	97.34	19.65
Losers	42	59	102.21	11.85	93.17	14.10
All Students	71	100	96.42	18.33	94.75	16.68

Findings

The analysis of the data generated by the CAIMI pre- and post-tests presented above suggest that only some of the students who participated in the electronic portfolio assessments experienced an increase in General Motivation (48 percent) and Math Motivation (41 percent). A larger number of students did not experience any increase in General Motivation (52 percent) and Math Motivation (59 percent).

As a result of these statistical findings, there was partial but no universal support to the original hypothesis that there would be an increase in the level of intrinsic General Motivation after students' participation in electronic portfolio assessments.

The increase in the second construct, Math Motivation, was partially but not universally supported in the original hypothesis as well. Because of these results, the null hypothesis that there had been no effect in the Math Motivation of the students could not be rejected.

The measured gains on both constructs were obtained by the least motivated students. The highest motivated students did not seem to increase whatever high level of measurable intrinsic motivation they had to begin with. Some students even scored lower. There are possible explanations which will be discussed in the Conclusions and

Implications Sections of this report.

The reasons which come to mind right now are normal student maturation. Teachers' efforts to correct whatever motivation deficiencies they could have measured and detected in their students from the beginning of the school year may be another.

Maturation is easy to comprehend. Lowly motivated students have more room to grow in the motivational ladder than highly motivated students. The latter could also have been suspicious or impatient with the CAIMI testing process. The teachers' possible efforts to improve the motivation lot of their students is also understandable.

Computer Interest -Moe Computer Educational Survey (MCES)

The MCES pre- and post-test sub-scale scores were separated into the two gender categories. The various measures of central tendency by gender for each of the sub-scales appear in Table 10.

Table 10

MCES-Computer Interest

Mean (X) and Standard Deviations (SD) of All Students
Boys (n=33) Girls (n=40).

		Pre-test Scores		Post-test Scores	
Sub-scale	%	X	SD	X	SD
Learning: Maximum 30					
Boys	45	21.82	4.82	22.24	4.26
Girls	55	21.97	3.98	20.37	4.16
Interpersonal: Maximum 20					
Boys		13.33	1.98	13.45	2.12
Girls	13.02	2.92	13.52	2.88	
Mode: Maximum 10					
Boys		6.82	1.36	7.06	1.61

Girls	7.10	1.53	7.05	1.82
Personal: Maximum 50				
Boys	37.73	7.13	38.33	7.25
Girls	35.42	5.57	34.77	5.94
Social Structure: Maximum 25				
Boys	18.94	3.35	19.15	2.67
Girls	19.55	3.11	19.65	2.78

The various *t*-values appear in table 11. The *t*-test correlation coefficient between the scores of the four sub-scales showed positive correlation between pre- and post-tests. This positive correlation means that the pairing of the scores of both tests had been effective in decreasing the variability of the mean differences. The Mean and F-ratios of those *t*-tests also appear in Table 11.

As the result of those F ratios and *t*-values obtained for 72 degrees of freedom, the null hypothesis " there were no significant changes in computer interest," could not be rejected.

Table 11

MCES-Computer Interest

t-tests for paired pre- and post-tests

Construct	*t*-values	df (2)	Correlation	F Ratio	F Prob
Learning:	1 . 39	72	.52	2.04	.0230
Interpersonal:	- . 99	72	.37	2.51	.0096
Mode:	. 44	72	.47	3.80	.0016
Personal:	. 13	72	.63	2.45	.0040
Social Structure:	-. 37	72	.32	1.16	.3319

No significant differences between the pre- and post-tests were found at $p<.05$ and $p<.01$ levels.

Another two-tailed *t*-test of the sub-scales in the MCES test by gender was done, this time using a ninety-nine percent level of confidence ($p<.01$). At that more strict level (99 percent), the test showed no significant change in either sub-scale for either gender.

The Learning and Mode sub-scale scores of the MCES test were broken down by grade. The various measures of central tendency were as follows:

Table 12

MCES Computer Interest Analysis

		Pre-test scores		Post-test scores	
Group	n	X	SD	X	SD
Fourth Grade	38				
Learning Sub-scale		22.26	4.88	22.24	4.04
Mode Sub-scale		7.29	1.47	7.50	1.35
Fifth Grade	35				
Learning Sub-scale		21.51	3.72	20.11	4.32
Mode Sub-scale		6.63	1.37	6.57	1.74
All Students	73				
Learning Sub-scale		21.90	4.35	21.22	4.28

Mode Sub-scale	6.97	1.45	7.06	1.61

A t-test analysis of the Learning and Mode sub-scales of each grade produced the following results:

Table 13

T-test values for paired samples of Pre- and Post-Test Scores ($p<.05$).

Group	
Fourth Grade (df=38)	*t*-value
Learning sub-scale	.05
Mode of Instruction sub-scale	-.96
Fifth Grade (df=35)	*t*-value
Learning sub-scale	1.69
Mode of Instruction sub-scale	.19
All Students (df=72)	*t*-value
Learning sub-scale	1.39
Mode of Instruction sub-scale	-.44

The *t*-values of the Fourth grade group is well below the floor *t*-value in the table of critical values for 38 degrees of freedom at the 95 percent degree of confidence. The 1.69 *t*-value of the Learning Sub-scale in the Fifth grade student group however is a borderline value in the table of critical *t*-values at $t=.05$. The *t*-value in the table at 35 degrees of freedom is 1.697 for 30 degrees of freedom and 1.684 for 40 degrees of freedom. As a result, an additional t-test was done to determine if there was any significance to that result.

The scores of the fifth grade students were broken down by gender. The results were as follows:

Table 14

Fifth Grade Learning Sub-scale analysis

Mean and Standard Deviations

		Pre-test scores		Post-test scores	
	n	X	SD	X	SD
Girls	23	21.39	3.64	18.87	4.28
Boys	12	21.75	4.03	22..5	3.40

T-test values for paired samples of Learning Pre- and Post-Test Scores ($p<.05$).

Fifth Grade	*t*-value
Girls (df=23)	2.15
Boys (df=12)	-1.43

At 23 degrees of freedom, the *t*-value of 2.15 is well above the 1.71 value of the table of critical *t*-test values at $p<.05$. Although this is a significant *t*-value, the Mean and Standard Deviation of the post-tests are lower than the same measures of the pre-tests. This value indicates a significant decrease in interest of girls at the higher grade. As a result, the hypothesis that girls experienced an increase in computer interest after participating in the electronic portfolio assessment was not supported. The null hypothesis could not be rejected.

Summary of Results

The scores of the pre- and post-test CAIMI and MCES inventories were analyzed using the SPSS/PC+ Basic System statistical package. Mean, Standard Deviations and *t*-tests of the scores were obtained. The population, n=71 in the CAIMI test, n=73 in the MCES test was adequate for the tests. Almost half of the population scored higher and the other half the same or lower. However, the results indicated no significant differences between the CAIMI pre- and post-tests at the 95 percent level of confidence and in the MCES tests at both the 95 percent and 99 percent level of confidence. The hypothesis that there had been changes in the students' motivation and computer interest as a result of participating in the electronic portfolio program was not supported and was rejected. The null hypothesis that there had been no changes was not rejected.

Chapter V

Conclusions and Recommendations

Summary

The motivation hypothesis of this study that there would be significant changes in the level of motivation of the students who participated in an electronic portfolio assessment program was not supported. As a result, the null hypothesis could not be rejected.

The computer interest hypothesis of this study that there would be significant changes in the level of computer interest in girls who participated in an electronic portfolio assessment program was not supported. As a result, the null hypothesis could not be rejected.

The results of the research indicate that some of the students (41 percent) who

participated in the electronic portfolio assessment program experienced an increase in intrinsic General and Math Motivation scores, while the majority (59 percent) did not or experienced a decrease.

The largest increase in motivation was experienced by the students who had originally scored at the bottom of the four quartiles. This fact is an indication that perhaps the electronic portfolio assessment effort may work to the students' advantage when used as a remedial tool. It is also conceivable that normal maturation of the nine-and ten-year old students who participated in this program may account for the positive change in the lowest scores. After all, common sense indicates that the students at the bottom of the motivation pyramid had more room to grow than did the ones at the top.

The teachers were probably aware of and sensitive to the motivation level of the students. This knowledge could have an effect as well. The teachers, consciously or unconsciously, might have doubled their efforts with the lower motivated students and could have succeeded in raising their level of motivation. This commendable effort would have been consistent with their overall educational mission.

The intensity of the electronic portfolio program is not measurable in discrete values. It is possible that a significant increase in the intensity of the portfolio assessment effort could have had a greater impact. There is no empirical evidence however that this is such a case. After all, the Pioneer school teaching staff still relies on traditional methods of standardized testing as well. More about this issue will be discussed in the Recommendations Section of this report.

No significant increase in the interest and attitudes of girls in the various sub-scale

components of the MCES test was detected. The variance of the Mean scores of each measured sub-scale in the test and the maximum score attainable in each sub-scale remained basically the same between the pre- and post-test. In one particular sub-scale the decrease in interest was significant. These findings coincide with those of Mr. Moe, the author and creator of the MCES test. He detected a decrease of interest as the years went by particularly in girls. The consistency of these findings have tremendous implications for the value of computer use in girls' attitudes regarding computers.

Except for the Mode of instruction sub-scale, as measured by its slight although not statistically significant variance, most other MCES sub-scales did not indicate a high level of interest before or after the program. This finding could be an indication that the cosmetic characteristics of a multimedia electronic portfolio assessment program are their greatest asset. After all, there is anecdotal evidence that students these days are familiar with colorful graphics via television and movies since early infancy. This result would support the subjective findings of previous research studies by Pott (1993) and Hamilton (1996) regarding participants' opinions about the use of computer-based portfolio assessment.

Implications

After the Pioneer school project ended, one of the teachers, speaking on behalf of the others, wrote the researcher with a summary about their portfolio experience reading as follows:

> "It is a great way for children to reflect on their math progress in a format they love. Every one of the children loved going to the computer lab and could hardly tear their hands away from the keyboard for instruction. They learned how to use HyperStudio quickly, and much was learned by sharing with each other. Someone would learn to use a particular task and others would like it and use that same skill in their own stack."
>
> "The stacks allowed for creativity and self-expression in ways that paper and

pencil do not. The process also reinforced metacognition and writing skills. It was easy to learn what was important to the student by reading these reflections. I printed two of the children's portfolios for you," (These samples appear in Appendices G and H).

It is clear from the content of this note that the students enjoyed the process. That was a finding not much different from others reported in the electronic portfolio literature reviewed elsewhere in this document. It is also clear that the only measurable increase in intrinsic motivation was the one reported in the post-test scores of the lowest motivated students. The highest motivated students in the pre-tests failed to show any increase in the post-test.

Khattri (1995) wrote in one school some students reported that performance assessments were better suited to low-performing students (meaning that the assessments did not require much intellectual effort).

These findings may cause an after-the-fact backlash by the Pioneer teachers and others in that community against the use of electronic portfolio assessments because the results were inconsistent across the board. After all, even if educators and child psychologists think that electronic portfolios are the answer to their problems, not all students require remedial work.

If we accept the notion that all students enjoyed the portfolio work as indicated by these teachers and found empirically in other studies, then it is evident that the technology has some positive benefits. The comment by the teachers also confirms the literature reviewed that portfolios require a lot of attention and much technical expertise and resources. Those are two commodities that are not frequently found in some of our

educational institutions.

Involvement in this project was new for the students as well as the teachers and there was a typical learning curve. Teachers need more time to perfect the techniques and to be able to articulate all there is to say and do in this new method of teaching and learning. The schools and communities will have to understand exactly what this technology means. It was apparent during the one school year study that the cultural characteristics of the locale provides an important context for its development.

In her summary note to the researcher the teacher indicated that "we had many computers freeze quite often. Some work was lost and many users were frustrated." It is different to use computers in class for routine one-time purposes and the intensive and continued use required by electronic portfolios. Some significant steps in the quality of available hardware and software technology must take place before electronic portfolios can be implemented in large scale in our schools.

In the area of motivation it was inconclusive to support the hypothesis that the electronic portfolio assessment technology by itself was a motivator across the board. The implications are clear. The benefits of the computer-based portfolios may reside in its general portfolio assessment component, not just its electronic nature. If that is so, then the only benefit of the electronic computer is its ability to resolve the portfolio assessment massive storage and reporting requirements. This benefit alone would be a panacea for those teachers who find that particular limitation of current portfolios

daunting.

As for the computer interest test, the implications seem to confirm what Moe (1984) found when he developed this test and what other writers have expressed. The masculine identity of computers has been discussed previously. In Science, Technology and Masculinity, (Murray, 1996) writes that "the production and process of making technology is gendered and if unchallenged strengthens links between prevailing conceptions of masculinity and making technology,"(page 72).

There was a related question in the MCES test which described how boys used computers in the Pioneer school (Please, refer to Appendix C). Question number seven reads: "In my school boys tend to dominate using computers." One of the girls from the Pioneer school chose to ignore the required Likert style response and wrote the following statement instead: "I don't want to touch this one." For obvious confidentiality reasons the researcher could not find out what she actually meant, but it shows that the issue is real, although in what direction is anyone's guess.

The implication for educators is that use of the electronic portfolio assessment technology by itself for one school year alone may not be sufficient to alter attitudes by girls about computers. The mean and standard deviation of the pre- and post-test scores were not extremely low to begin with, but they were not high either; and, most of all, did not change significantly.

Recommendations

In the study reported in this dissertation, motivation and computer interest were the dependent variables and the electronic portfolio assessment program was the independent variable. The researcher did not attempt to cross-evaluate the dependent motivation and computer interest variables.

It is advisable to do that type of analysis in future studies, to find out how the beginning motivation level in a student will support the notion that the various sub-scales in the MCES or similar computer interest tests are affected is a worthwhile effort. Although the data was available to this researcher, the work could not be attempted without complicating and delaying the study committed with the Pioneer school. Just knowing how girls score based on their level of intrinsic motivation might help those educators interested in a gender-free information system society that develops and flourishes. That study should be made.

One of the components that was visibly missing in this experiment was parental input, particularly at the planning level. The parents should understand what electronic portfolios represent beyond the technological glitter. Intellectual or moral support from the home front is always acceptable in all educational endeavors. It is also important that parents be involved beyond accepting participation of their children in a portfolio program. The researcher received no inquiries regarding the study.

Electronic portfolios involve a shift not only of teachers' attitudes but on parental opinions as well. If parents have never been exposed to electronic portfolio assessments then there is a better reason for their becoming involved now. In addition, the parent-student interaction while the program is running is an important reinforcement. The

problem of achievement motivation transcends the traditional domains of instruction and curricular technology and calls for broad changes in society's view of the nature and mission of schools (Covington, 1983). Social systems like schools are difficult to revolutionize (Press, 1993).

"The easiest lesson to grasp from a decade of significant infusion of technology into American schools is that technology by itself does not transform schooling. Changing schools requires changing all elements of school practice and organization simultaneously: school organization, curriculum, assessment, technology and the learning environment." (Pearlman, 1993). "Changing schools," he adds, "requires changing all elements of school practice and organization simultaneously--school organization, curriculum, assessment, technology, and the learning environment," (page 47).

Some writers, Hawkins (1993), suggest that while it is true that technology can support significantly enhanced learning conditions, its mere presence does not assure that it will always do so. Electronic portfolio assessments by themselves are not the answer. All the members of the educational formula must participate actively: parent, student, teacher, administrators, and even those institutions who, although not directly involved at the elementary levels, will be their ultimate beneficiaries--colleges and universities.

The latter are, by definition, research entities. It is recommended that an inventory of electronic portfolio assessment courses in the Departments of Education of our institutions of higher learning be undertaken. The implications of such study should be evaluated and reported. It is important to ask the following questions: Is portfolio assessment a required field of study for college-trained educators? How about electronic portfolios?

The overall impression obtained in this research study is that electronic portfolio

assessments are worth a try. The fact that the students showed enthusiastic support and interest in the technology goes beyond measuring tests. The reflections of the nine-year old boy who created one of the portfolio examples shown in Appendix G are a revelation of maturity. “I also like,” he wrote, “that I got all but one question right, and that the one I got wrong helped me understand powers of 10 better. This quiz also improved my rounding, estimating, and multiplying skills.”

Additionally, 48 percent of the students showed a score increase in General Intrinsic Motivation. While it is not certain whether other factors could have contributed to the change, additional analysis should be done in a wider scale to determine the reason for the increase shown in the research. The longitudinal study should cover not only one school year but should also cover the transition through higher grade levels as well.

There is a great need to increase the level of technological expertise and resources in elementary schools. Hardware and software have to be made available in large quantities. Quality of both components is critical, as is the amount of intensive training time that has to be invested with teachers and students. The availability of skilled staff who are available to support the program on demand is vital. This effort will require a shift in the educational paradigm.

Sherritt and Basom (1996) made a good comparison between the working needs of the industrial and the information age. They propose that changing family structures, global

economic standards and interdependence, accelerating technological development, economic and employment changes and the change in the faces of Americans due to immigration, create a tremendous need to change. So change we must, they assert.

One of the most noticeable benefits of the electronic portfolio assessment activities reported by the teachers was the increase in cooperation and sharing by the students. This is an area that could be subject to further studies. Vandenberg and Ginzberg (1996) found no evidence that the use of collaborative software (i.e., Lotus Notes) in organizations did increase the level of cooperation and collaboration substantially unless that spirit was there from the start.

It is possible that substantial cooperative educational experiences by students at earlier ages might soften the competitive nature of a society preoccupied by standardized testing measuring. That experience may contribute to an increase in the cooperation needed by a society that is becoming interdependent.

The positive interdependence of the cooperative group enhances mutual benefit, responsibility, obligation, and investment resulting in shared identity, common fate, and joint celebration (Ames, and Ames, 1985).

The question of female interest in computers remains unresolved. It appears that Jacobs (1995) was right when he proposed that interest by women in scientific endeavors will not change until other societal issues of gender discrimination and prejudice get resolved.

If women continue to consider the computer as a masculine toy they will be turned off by the technology (Murray, 1993). Use of electronic portfolio assessment should include

gender-free components intentionally designed with that purpose. Alison and Bruce (1993) have suggested that the introduction of so-called expert systems cannot be regarded as neutral with respect to gender. Expert systems are computer-based knowledge databases which provide automatic answers to common questions about a specific subject. They lament the lack of women's point of view in the development of such systems.

Last, but not least, the impact of electronic portfolio assessments in minority communities should be empirically investigated. It is important that technology not become a have and have-not resource. Discrimination in higher education and employment will continue or perhaps worsen in other subtle new deviant ways. Inner city school systems should look closely at this technology and should make every effort to measure its possibilities.

Equity is and will continue to be an important issue. The equity of electronic portfolio assessments deserves continuing scrutiny. Research to date suggests that patterns of performance on portfolios mirror those on traditional measures in terms of the relative performance levels of disadvantaged or minority students (Herman and Winters, 1994). Electronic portfolio assessments have the potential to become an equalizer. It is up to us as educators and researchers to look into the technology and determine if it truly delivers. Our children deserve no less.

Appendices

APPENDIX A: HyperStudio.

The following description of HyperStudio comes from text provided by two books. One was HyperStudio 3.0 In One Hour, by Vicki F. Sharp, published by ISTE Publications, Eugene, Oregon. The other was the HyperStudio Reference Manual provided by Roger Wagner Publishing, Inc., El Cajon, California.

What is HyperStudio:

HyperStudio is a Macintosh computer-based software product created By Roger Wagner, President of Roger Wagner Publishing, Inc.

The software produces a computer file similarly to a stack of three-by-five inch index cards that is connected through links with other files to make a portfolio. HyperStudio "is an authoring tool that lets the author develop an electronic stack of cards that contain buttons, graphics and text."

"The user clicks on the buttons to move from one card to another or to initiate other actions. The cards can be used for all types of instructional purposes, such as teaching a foreign language or touring a city. You can use paint tools to create a picture on a card, and you can add clip art and text."

"You can add sound to the card by recording your own voice or using prerecorded sounds."

The Bestborough School System was a licensed user of HyperStudio and Macintosh computers and the Pioneer School teachers chose HyperStudio as the software for their electronic portfolio assessment experiment because of its simplicity and availability. HyperStudio, however, does not advertise as or purports to be an electronic portfolio software product.

Computer Systems Requirements:

HyperStudio requires a Macintosh computer with a hard disk drive and at least two "megabytes" (million bytes) of total Random Access Memory (RAM) if used in a MAC OS System 6.0 version. It requires four megabytes if used under MAC OS System 7.0 Operating System. It can run on networks such as AppleShare, Corvus, Digicard and the Josten's Integrated Learning System as well. Installing the complete version of HyperStudio requires 15 megabytes of free space on a hard disk.

The memory requirements of a specific HyperStudio session is dependent on the size of the "stacks" of "cards" created by the users. Storage requirements also depend on the

size of the stacks of cards created.

The next section of this appendix entitled "Basic Terminology" offers a full description of what constitutes a stack of cards.

HyperStudio allows users to collect sound, graphic, text and video samples. It is not a structured system, thus allowing complete flexibility of design to the student as opposed to other menu-driven electronic portfolio assessment computer programs. The previous statement is quantitative, not qualitative. No inference should be made that one system is preferable to the other.

Graphic exhibits may be scanned documents using an Apple Color OneScanner ©. They can also be PICT. files recorded using a digital camera.

Basic Terminology:

A "card" is the basic working space of HyperStudio. Representing the equivalence of a three-by-five inch card, the card is where the text, graphics, sound and other multimedia are recorded.

Cards are linked and filed together in "stacks" of as many cards as needed. All cards of a stack reside in Random Access Memory (RAM) when a stack is used. The greater the stack of cards the larger the RAM required at the time. This can present a problem if the particular computer happens to be short of RAM and/or it does not have the ability to use memory enhancement software like virtual memory.

Appendix B:

The Children's Academic Motivation Inventory
Sample Questions of unpublished test
Table 2: Measurement and Evaluation in Counseling and Development
October 1989, Vol. 22

by Kevin R. Hughes, Doris L. Redfield, Carl R. Martray.

Sample unpublished test. Motivational Test with sample questions similar to CAIMI, the published test used in the measurement of the students in the Bestborough School System. Questions must be answered Yes or No by the students.

Sample Test Item Number: Question

5 I have the ability to do well in school.
6 I work hard on most school assignments.
7 I set goals for myself.
9 When I do well on a test it is usually because I studied hard.
10 If I really try hard, I can do most things even if they are difficult.
11 I usually complete an assignment before starting on others.
12 I work towards goals.
13 I would like to accomplish something I think is important.
14 I feel embarrassed when I receive the highest grade on a test.
15 I dislike school.
17 I like it when teachers have us do new and different things in class.
18 I usually keep working on a problem until I solve it.
20 School is important to my future.
21 When I do poorly on a test, it is usually because I do not have the ability to do

well.

22 My best friends think that school is important for success in life.

25 I try not to let it show that I study hard for tests.

29 I do not try to do as well as I can in school.

31 Doing well in school is important in life.

32 Most of the time I am successful on tests.

34 When I have some assignment to do, I usually start in and keep working until it is completed.

36 I usually do not try to do as well as I can on tests.

41 I do not like it when my teacher tries new ways to teach things.

42 I make as many friends as possible.

43 A good education is one of the most important things in life.

44 When I make bad grades in school, it is usually because I am not very smart.

45 No matter how hard I try, I usually make low grades.

47 I get tired of doing the same things in school day after day.

49 Almost all of my classes are boring.

50 The person who has the most control over what grades I make is me.

52 I like having several different teachers.

53 My best friends study hard in school.

57 My best friends do well in school.

58 I would rather have the same teachers all day than have to change classes.

60 I like teachers who make us try new things.

Appendix C:

The MOE Computer Educational Survey (MCES). This test developed by Daniel J. Moe, University of South Dakota, is a Likert Type test consisting of 36 questions. The scale of responses can be from Strongly disagree, with a value of 1, to Strongly agree, with a value of 5. In some cases, when measuring the results, the value of the scale is reversed to indicate the appropriate attitude towards the particular question.

Computer Interest Test

Test Date:_____

Student name:_____
Grade:_____

Confidentiality Control No._____

Please circle the statement with which you agree most.

1	2	3	4	5
Strongly disagree	disagree	don't agree or disagree	agree	agree strongly

1) I like computers because they seem to be interesting.

1	2	3	4	5
Strongly disagree	disagree	don't agree or disagree	agree	agree strongly

2) The school has too many rules for working with computers.

Strongly disagree don't agree agree strongly
disagree or disagree agree

3) In the past I have spent more than 5 hours in a week either at home or at school using computers.
Strongly disagree don't agree agree strongly
disagree or disagree agree

4) My family encourages me to use computers.
Strongly disagree don't agree agree strongly
disagree or disagree agree

5) I probably would hate doing homework using computers.
Strongly disagree don't agree agree strongly
disagree or disagree agree

6) The teacher makes using computers very interesting to me.
Strongly disagree don't agree agree strongly
disagree or disagree agree

7) In my school boys tend to dominate using computers.
Strongly disagree don't agree agree strongly
disagree or disagree agree

8) I think that there is too much pressure when working on computers.
Strongly disagree don't agree agree strongly
disagree or disagree agree

9) I enjoy talking to my teacher about computers after class.
Strongly disagree don't agree agree strongly
disagree or disagree agree

10) I enjoy working on puzzles on computers.
Strongly disagree don't agree agree strongly
disagree or disagree agree

11) I enjoy trying to solve difficult problems on computers.
Strongly disagree don't agree agree strongly
disagree or disagree agree

12) I like the challenge of working with computers.
Strongly disagree don't agree agree strongly
disagree or disagree agree

13) I would be interested in knowing more information about computer subjects.
Strongly disagree don't agree agree strongly
disagree or disagree agree

14) I often feel rushed and nervous when I work on computers.
Strongly disagree don't agree agree strongly
disagree or disagree agree

15) My friends of the same gender have a positive attitude towards computers.
Strongly disagree don't agree agree strongly
disagree or disagree agree

16) I am very interested in what goes on around the computers in my school.
Strongly disagree don't agree agree strongly
disagree or disagree agree

17) The teacher is impatient when I don't pick up information about computers.
Strongly disagree don't agree agree strongly
disagree or disagree agree

18) I would rather play games on computers that are new to me than play games that I already know.
Strongly disagree don't agree agree strongly
disagree or disagree agree

19) The teacher encourages me to think for myself concerning computers.

Strongly disagree don't agree agree strongly
disagree or disagree agree

20) If I had a computer at home, I would use it often.
Strongly disagree don't agree agree strongly
disagree or disagree agree

21) I would like to go to a video-arcade more than 3 times a week.
Strongly disagree don't agree agree strongly
disagree or disagree agree

22) The teacher seems interested in the things I do on the computer.
Strongly disagree don't agree agree strongly
disagree or disagree agree

23) I would like to attend a computer camp or workshop pertaining to computers.
Strongly disagree don't agree agree strongly
disagree or disagree agree

24) Each morning I look forward to coming to school so I can work on computers.
Strongly disagree don't agree agree strongly
disagree or disagree agree

25) The teacher likes working with me on the computer.
Strongly disagree don't agree agree strongly
disagree or disagree agree

26) I have a positive attitude towards computers.
Strongly disagree don't agree agree strongly
disagree or disagree agree

27) I enjoy using computers.
Strongly disagree don't agree agree strongly

disagree or disagree agree

28) I believe that computers are mainly for boys.
Strongly disagree don't agree agree strongly
disagree or disagree agree

29) My plans for the future, when I grow up, include computers.
Strongly disagree don't agree agree strongly
disagree or disagree agree

30) I do my best in working with computers.
Strongly disagree don't agree agree strongly
disagree or disagree agree

31) Computers are important to me because I find many of the things I learn are useful.
Strongly disagree don't agree agree strongly
disagree or disagree agree

32) I might be more interested in computers if they were more related to the skills I will need when I grow up.
Strongly disagree don't agree agree strongly
disagree or disagree agree

For scoring purposes, the Question Numbers in the above test were broken down into the following sub-scales by its author:

Learning	Numbers 5,10,11,12,13,23.
Interpersonal	**Numbers 9,17,22,25.**
Mode	**Numbers 6,19.**
Personal	**Numbers 3,4,20,21,24,26,27,29,30,31.**
Social Structure	**Numbers 1,8,14,15,16.**
Following the author's suggestion, the following questions were ignored	**Numbers 2,7,18,28,32.**

End of Test

Note: In the post-test, a factual question was added to the test to determine if the participants had computers at home.

Appendix D:

Sample letter to parents:

Bestborough Public Schools
Bestborough, Massachusetts

Pioneer School
Number Street

Dear Parent(s) and/or Guardian(s):

The fourth and fifth graders will be afforded the opportunity to take part in an electronic portfolio project this year. We would like to ask your permission to have your son or daughter participate in some pre and post assessments related to this project.

Students who are participating will be asked to complete the Children's Academic Intrinsic Motivation Inventory (CAIMI) and a separate computer interest assessment. The students will take part in this data collection in December and again towards the end of the school year. Each inventory will take approximately 30 minutes and will be conducted during regular class time. The questions at both data collection sessions will be similar. The assessment is intended to measure changes in motivation and interest related to computer usage.

Your child will in no way be penalized if you choose not to have him/her participate. Participation in the study is not a requisite to be part of the electronic portfolio assessment system to be used in their classes.

Children will not put their names on the assessments and in no way will their responses impact their school evaluations. The information will, however, be available to a Ph.D. candidate, who will analyze the student responses before and after the electronic portfolio assessment project and provide us with feedback.

If you have any questions or would like to speak to the Ph.D. candidate, please contact me. This is an exciting project and I am looking forward to getting it underway.

Thank you for your support.
Pioneer School Principal

Appendix E:

Children's Academic Intrinsic Motivation Inventory (CAIMI)
© Adele Eskeles Gottfried, Ph.D.

Administration Instructions:

Inventory materials:

This is a 44 question self-report inventory.

The forty four (44) questions comprise one hundred twenty two (122) items and five(5) scales (please see enclosed directions page), four of which measure intrinsic motivation in the subject areas of reading, math, social studies and science, the fifth measuring intrinsic motivation as a general orientation toward school learning.

There are twenty six (26) subject area scale items. Twenty four (24) of these questions require a response on the basis of a 5-point Likert scale ranging from strongly agree to strongly disagree. The remaining two (2) require a forced choice between an intrinsic and nonintrinsic alternative.

There are eighteen (18) general scale items all requiring a response based on a 5-point Likert scale ranging from strongly agree to strongly disagree.

Caution: The CAIMI should not be used with children who are not fluent in English.

Test Administration Instructions

Instructions and practice items are to be ***read aloud*** by the administrator. The **children then complete** the inventory on their own.

One hour should be allocated to allow sufficient time to distribute and collect materials, and to allow adequate time for administration.

1- Instructions (to be read aloud)

"I am interested in finding out what you think about school. The reason I am interested is so I can discover more about what you like and what is most interesting to you.

You are about to read some sentences and be asked if you agree or disagree with them. There are no right or wrong answers to any of the questions.

I only want to find out what you really think and ask you to give the best answer that you can.

It is important that you answer on your own. Give your own answers.
Remember, this is not a test with right and wrong answers. This is a survey. Please wait for directions before you begin answering the questions."

2- **Distribute** CAIMI **booklets and pencils**.

3- **Read directions** from the CAIMI booklet.

4- **Answer any student questions** at this point.

5- **Read** following statement after reviewing instructions:

Stop after you finish number 42 and we will go on together from there. Remember, there are no right or wrong answers. Go ahead and begin.

Thank you.

INSTRUCTIONS FOR ADMINISTRATION OF THE POST-TEST

Students have good memories and may wonder why they are taking the test again.
It might be helpful to explain to them that we want to measure any changes in their opinions since they took the previous survey and that THERE WAS NOTHING WRONG WITH THEIR PREVIOUS RESPONSES!
End of CAIMI description and instructions.

APPENDIX F:

Fourth Grade Portfolio Items

The following items comprise the items included in the electronic portfolios of the fourth grade students at Pioneer.

Electronic Portfolio Assessment Components
Fourth Grade

	Number of cards
Letter of explanation and photograph of child	one
Table of contents	one
NCTM standards (Please see Appendix F.1 below)	one
Math Journal page with reflection	two
Homework (problem) with reflection and explanation of style	one
Test with corrections and reflections	one
Open-ended question	one
Group problem solving	one
Personal Choice	one
Create a card	one

Above is a suggested starting list. Each category will have the same background.

APPENDIX F1:

National Council of Teachers of Mathematics Standards for Grades K-4

1. Mathematics as Problem Solving
2. Mathematics as Communication
3. Mathematics as Reasoning
4. Mathematical Connections
5. Estimations
6. Number Sense and Numeration
7. Concepts of Whole Number Operations
8. Whole Number Computation
9. Geometry and Spatial sense
10. Measurement
11. Statistics and Probability
12. Fractions and Decimals
13. Patterns and Relationships

APPENDIX G:

The following items comprise the items included in the electronic portfolios of the fifth grade students at Pioneer.

Electronic Portfolio Assessment Components
Fifth Grade

1. Letter of introduction and photograph of child. 1 card
2. Table of Contents. 1 card
3. Reading Log selection / or project (reflection about selection). 2-3 cards
4. Math page with commentary / evaluation. 2 cards
5. Science / Social Studies projects (with video?). 2 cards
6. Personal choice. 1 card
7. Reflections of Grade 5 and the future. Written piece with art work. 2 cards

End

Appendix H:

Boy's portfolio 1

page 2

page 3

page 4

page 5

page 6

page 7

page 8

page 9

page 10

page 11

page 12

Appendix I:

Girls Portfolio 1

page 2

page 3

page 4

page 5

page 6

APPENDIX J:

SPSS/PC+ Statistics

The following SPSS/PC+ Basic System commands were executed at various points during the Data Analysis phase. The file name, file content, data list field parameters and SPSS/PC+ commands used are presented. The names of the fields in the data list are self-explanatory mnemonics.

1) File name:STUDENT1

File content: CAIMI math and general motivation pre-test scores

Data List: STUDENT 1-4 (2) CLASS 6-8 (1) GENDER 11 MATH 16-18

MOTIVA 21-22

SPSS runs FREQUENCIES / VARIABLES = MOTIVA

/HISTOGRAM MIN (0) MAX (90)

FREQUENCIES / VARIABLES = MATH

/HISTOGRAM MIN (0) MAX (125)

DESCRIPTIVES VARIABLES = MATH MOTIVA /

STATISTICS ALL.

EXAMINE VARIABLES = MATH MOTIVA BY CLASS.

CORRELATIONS VARIABLES = MATH MOTIVA

/STATISTICS=1.

PLOT / FORMAT REGRESSION /PLOT MATH WITH

2) File name: STUDENT91

File content: CAIMI math and general motivation post-test scores

Data List: STUDENT 1-4 (2) CLASS 6-8 (1) GENDER 11 MATH 16-18

MOTIVA 21-22

SPSS runs: FREQUENCIES / VARIABLES = MOTIVA

/HISTOGRAM MIN (0) MAX (90)

FREQUENCIES / VARIABLES = MATH

/HISTOGRAM MIN (0) MAX (125)

DESCRIPTIVES VARIABLES = MATH MOTIVA /

STATISTICS ALL.

EXAMINE VARIABLES = MATH MOTIVA BY CLASS.

CORRELATIONS VARIABLES = MATH MOTIVA

/STATISTICS=1.

PLOT / FORMAT REGRESSION /PLOT MATH WITH

MOTIVA

3) File name: MCES01

File content: MCES computer interest pre-test scores

Data List: STUDENT 1-4 (2) CLASS 6-8 (1) GENDER 10 LEARN 12-13

INTPE 15-16

MODE 18-19 PERS 21-22 SOCIAL 24-25.

SPSS runs: FREQUENCIES / VARIABLES = LEARN

/HISTOGRAM MIN (0) MAX (30).

FREQUENCIES / VARIABLES = INTPE

/HISTOGRAM MIN (0) MAX (20).

FREQUENCIES / VARIABLES = MODE

/HISTOGRAM MIN (0) MAX (10).

FREQUENCIES / VARIABLES = PERS

/HISTOGRAM MIN (0) MAX (50).

FREQUENCIES / VARIABLES = SOCIAL

/HISTOGRAM MIN (0) MAX (25).

DESCRIPTIVES VARIABLES = LEARN INTPE MODE PERS SOCIAL/STATISTICS ALL.

EXAMINE VARIABLES = LEARN INTPE MODE PERS SOCIAL BY GENDER.

EXAMINE VARIABLES = LEARN INTPE MODE PERS SOCIAL BY CLASS.

4) File name: MCES91

File content: MCES computer interest post-test scores.

Data List: STUDENT 1-4 (2) CLASS 6-8 (1) GENDER 10 LEARN 12-13 INTPE 15-16

MODE 18-19 PERS 21-22 SOCIAL 24-25.

SPSS runs: FREQUENCIES / VARIABLES = LEARN

/HISTOGRAM MIN (0) MAX (30).

FREQUENCIES / VARIABLES = INTPE

/HISTOGRAM MIN (0) MAX (20).

FREQUENCIES / VARIABLES = MODE

/HISTOGRAM MIN (0) MAX (10).

FREQUENCIES / VARIABLES = PERS

/HISTOGRAM MIN (0) MAX (50).

FREQUENCIES / VARIABLES = SOCIAL

/HISTOGRAM MIN (0) MAX (25).

DESCRIPTIVES VARIABLES = LEARN INTPE MODE PERS

SOCIAL /STATISTICS ALL.

EXAMINE VARIABLES = LEARN INTPE MODE PERS SOCIAL

BY GENDER.

EXAMINE VARIABLES = LEARN INTPE MODE PERS

SOCIAL BY CLASS.

5) File names: MCESCOM1, BOYCOM1, GIRLCOM1

File content: Computer interest pre- and post-test scores for all students combined and boys and girls separately.

Data List: STU 1-4 (2) CLA 5-7 GEN 8 LEARN0 9-10 LEARN1 11-12

INTP0 13-14 INTP1 15-16 MET0 17-18 MET1 19-20 PER0

21-22 PER1 23-24 SOC0 25-26 SOC1 27-28.

SPSS runs: DESCRIPTIVES VARIABLES = LEARN0 LEARN1 INTP0

INTP1 MET0 MET1 PER0 PER1 SOC0 SOC1 / STATISTICS

ALL.

T-TESTS PAIRS = LEARN0 LEARN1.

T-TESTS PAIRS = INTP0 INTP1.

T- TESTS PAIRS = MET0 MET1.

T-TESTS PAIRS = PER0 PER1.

T-TESTS PAIRS = SOC0 SOC1.

6) File name: MATHQUA1

File content: CAIMI Math pre-test scores by quartiles with corresponding posttest scores.

Data List: QUARTIL 1 STUDENT 6-9 (2) PRETES 11-15 (1)

POSTTE 21-23

SPSS runs: FREQUENCIES / VARIABLES = PRETES POSTTE.

/HISTOGRAM MIN (0) MAX (125).

DESCRIPTIVES VARIABLES=PRETES POSTTE /

STATISTICS ALL.

EXAMINE VARIABLES=PRETES POSTTE BY QUARTIL.

T-TEST PAIRS = PRETES POSTTE.

7) File name: MOTIQUA1

File content: CAIMI General Motivation pre-test scores with corresponding post-test scores.

Data List: QUARTIL 1 STUDENT 6-9 (2) PRETES 11-15 (1)

POSTTE 21-23

SPSS runs: FREQUENCIES / VARIABLES = PRETES POSTTE

/HISTOGRAM MIN (0) MAX (90).

DESCRIPTIVES VARIABLES = PRETES POSTTE /

STATISTICS ALL.

EXAMINE VARIABLES = PRETES POSTTE BY QUARTIL.

T-TEST PAIRS = PRETES POSTTE

8) File names: WINER001, LOSER001

File content: CAIMI pre- and post-test General Motivation scores of students who experienced either an increase or a decrease in scores.

Data List: QUARTIL 1 STUDENT 6-9 (2) PRETES 11-15 (1) POSTTE 21-23.

SPSS runs: FREQUENCIES / VARIABLES = PRETES POSTTE

/HISTOGRAM MIN (0) MAX (90).

DESCRIPTIVES VARIABLES=PRETES

POSTTE/STATISTICS ALL

9) File names: GAINMAT1, LOSEMA01

File content: CAIMI pre- and post-test Math Motivation scores of students who experienced either an increase or a decrease in scores.

Data List: QUARTIL 1 STUDENT 6-9 (2) PRETES 11-15 (1)

POSTTE 21- 23.

SPSS run: DESCRIPTIVES VARIABLES = PRETES POSTTE/

STATISTICS ALL.

10) File names: MOTIQ401, MOTIQ501

File content: CAIMI pre- and post-test General Motivation scores of students by either fourth or fifth grade for comparison.

Data List: QUARTIL 1 STUDENT 6-9 (2) PRETES 11-15 (1)

POSTTE 21-23

SPSS runs: FREQUENCIES / VARIABLES=PRETES POSTTE

/HISTOGRAM MIN (0) MAX (90)

DESCRIPTIVES VARIABLES=PRETES POSTTE

/ STATISTICS ALL. EXAMINE VARIABLES=PRETES

POSTTE BY QUARTIL.

11) File names: MATHQ401, MATHQ501

File content: CAIMI pre- and post-test MATH Motivation scores of students by either fourth or fifth grade for comparison.

Data List: QUARTIL 1 STUDENT 6-9 (2) PRETES 11-15 (1) POSTTE 21-23.

SPSS runs: FREQUENCIES /VARIABLES=PRETES POSTTE.

/HISTOGRAM MIN (0) MAX (125).

DESCRIPTIVES VARIABLES=PRETES POSTTE

/ STATISTICS ALL.

EXAMINE VARIABLES=PRETES POSTTE BY

QUARTIL

12) File Name: MATHQ402, MOTIQ402, MATHQ502, MOTIQ502

File Content: Pre- and Post-test Math and Motivation Scores by grade.

Data List: CLASS 6, TESTA, TESTB,

SPSS Runs: T-TEST PAIRS=TESTA TESTB

13) File Name: STUDEN02, STUDEN92

File Content: Pre- and post-test MATH or MOTIVATION Scores

Data List: CLASS, GENDER, MATH, MOTIVA

SPSS Runs: FREQUENCIES / VARIABLES=MATH MOTIVA

/HISTOGRAM MIN (30) MAX (90)

/HISTOGRAM MIN (30) MAX (130)

DESCRIPTIVES VARIABLES=MATH

MOTIVA / STATISTICS ALL

EXAMINE VARIABLES=MATH MOTIVA

BY CLASS.

End of the SPSS commands.

Appendix K: Histogram 1

Appendix L: Histogram 2

Appendix M: Histogram 3

Appendix N: Histogram 4

Appendix O:

Raw Scores

Children's Academic Intrinsic Motivation Inventory (CAIMI) PRE-TEST

These are the CAIMI raw scores of the students at PIONEER. The ID numbers were assigned to assure confidentiality and no connection to student rank or alphabetic order should be implied. The same ID numbers were assigned to students in the pre-test and post-test in order to analyze specific scores. The first ID digit indicates grade.

ID#	SEX	READING	MATH	SOCIAL SCIENCE	SCIENCE	GENERAL MOTIVATION
4.1	GIRL	94	94	97	98	71
4.2	BOY	71	98	98	102	70
4.3	BOY	77	107	87	96	69
4.4	GIRL	90	74	55	114	70
4.5	BOY	102	111	113	113	82
4.6	BOY	93	101	97	110	73
4.7	GIRL	88	100	73	112	77
4.8	GIRL	102	104	98	103	75
4.9	BOY	[eliminate		]		
4.10	BOY	111	111	97	114	75
4.11	BOY	109	124	114	116	76
4.12	BOY	118	118	118	115	81
4.13	BOY	85	76	85	84	57
4.14	GIRL	93	93	105	105	70
4.15	BOY	81	71	75	87	56
4.16	GIRL	104	104	105	104	72
4.17	BOY	94	112	102	103	79
4.18	GIRL	74	116	79	114	76
4.20	GIRL	100	52	99	100	62
4.21	BOY	95	109	86	110	77
4.22	BOY	85	83	84	87	65
4.23	GIRL	95	95	95	95	63
4.24	BOY	108	109	109	109	78
4.26	BOY	90	92	90	92	72
4.27	GIRL	120	113	114	114	69
4.28	BOY	92	94	77	84	62
4.29	BOY	92	92	96	96	71
4.30	GIRL	68	45	62	63	34
4.31	GIRL	116	115	116	116	74
4.33	BOY	98	99	99	101	69
4.34	GIRL	111	117	116	115	73
4.35	GIRL	94	103	96	109	71
4.36	GIRL	69	96	96	93	82
4.37	GIRL	111	105	87	90	69
4.38	BOY	101	79	104	118	71
4.39	BOY	77	96	96	95	78
5.1	BOY	108	101	109	102	75

5.2	BOY	82	71	85	82	53
5.3	BOY	99	106	102	107	76
5.4	BOY	82	94	103	110	68
5.5	BOY	96	88	89	80	59
5.6	BOY	104	109	112	102	69
5.7	BOY	110	111	113	104	75
5.8	GIRL	66	67	86	99	63
5.9	GIRL	104	120	112	119	79
5.10	GIRL	85	109	97	109	66
5.11	GIRL	78	80	85	87	56
5.12	GIRL	98	110	99	104	76
5.13	GIRL	82	50	79	74	70
5.14	GIRL	105	105	105	108	82
5.15	GIRL	109	86	104	106	66
5.16	GIRL	62	38	32	98	49
5.17	GIRL	93	107	116	116	70
5.18	GIRL	89	86	93	92	68
5.19	BOY	91	87	94	97	64
5.20	GIRL	107	110	97	101	66
5.21	GIRL	97	111	101	100	68
5.23	GIRL	98	107	96	115	77
5.24	GIRL	74	80	64	91	44
5.25	GIRL	116	112	116	116	75
5.26	GIRL	84	94	86	89	57
5.27	BOY	101	113	115	105	60
5.28	GIRL	99	107	97	106	80
5.29	GIRL	61	98	89	103	61
5.30	GIRL	82	85	92	98	61
5.31	GIRL	83	91	93	92	64
5.33	BOY	66	106	74	102	70
5.34	BOY	77	116	96	115	74
5.35	GIRL	81	116	83	93	65
5.36	GIRL	102	65	111	113	76
5.37	BOY	102	101	100	82	71
5.38	GIRL	106	101	75	117	73

APPENDIX P:

Raw Scores

MOE Computer Educational Survey (MCES) PRE-TEST

ID#	SEX	LEARNING	INTER-PERSONAL	MODE	PERSONAL	SOCIAL STR	IGNORED
4.1	GIRL	22	10	7	33	20	13
4.2	BOY	26	13	7	35	15	16
4.3	BOY	16	13	4	27	15	16
4.4	GIRL	17	14	8	40	17	19
4.5	BOY	23	15	7	45	23	18
4.6	BOY	21	15	6	43	21	18
4.7	GIRL	24	14	8	36	24	11
4.8	GIRL	24	12	8	33	23	11
4.9	BOY	[this score has been deleted on purpose]					
4.10	BOY	25	17	6	50	24	22
4.11	BOY	28	14	10	47	24	13
4.12	BOY	28	16	9	45	25	18
4.13	BOY	22	13	8	33	20	19
4.14	GIRL	23	13	8	35	21	11
4.15	BOY	26	15	8	40	21	15
4.16	GIRL	19	13	9	35	17	12
4.17	BOY	25	17	9	40	20	19
4.18	GIRL	22	16	8	41	22	14
4.20	GIRL	23	17	7	37	21	11
4.21	BOY	22	13	6	37	15	15
4.22	BOY	14	13	6	33	15	16
4.23	GIRL	22	15	8	30	16	10
4.24	BOY	28	17	4	49	17	14
4.25	GIRL	20	14	6	28	18	15
4.26	BOY	17	13	7	31	12	14
4.27	GIRL	30	5	10	35	22	19
4.28	BOY	15	15	6	32	18	20
4.29	BOY	14	12	7	30	18	11
4.30	GIRL	24	15	6	35	16	16
4.31	GIRL	28	19	8	42	24	14
4.32	BOY	26	15	8	36	20	13
4.33	BOY	12	12	5	25	17	11
4.34	GIRL	26	13	9	39	23	9
4.35	GIRL	12	12	5	16	13	13
4.36	GIRL	29	13	9	44	25	16
4.37	GIRL	22	14	8	36	17	16
4.38	BOY	29	13	7	46	25	14
4.39	BOY	21	14	8	32	16	13
5.1	BOY	25	11	6	46	22	11
5.2	BOY	21	12	6	35	21	14
5.3	BOY	26	14	6	37	19	11
5.4	BOY	22	14	7	36	20	14

5.5	BOY	22	12	6	43	20	17
5.6	BOY	22	12	8	32	22	13
5.7	BOY	27	11	5	47	18	23
5.8	GIRL	21	10	8	33	17	11
5.9	GIRL	24	10	7	33	14	9
5.10	GIRL	19	11	5	26	17	12
5.11	GIRL	19	12	5	27	18	14
5.12	GIRL	20	10	7	30	22	9
5.13	GIRL	19	13	5	41	19	15
5.14	GIRL	28	20	6	43	22	14
5.15	GIRL	28	7	7	40	23	13
5.17	GIRL	27	17	9	42	21	17
5.18	GIRL	22	14	6	32	13	15
5.19	BOY	21	10	7	30	20	17
5.20	GIRL	20	10	4	40	19	12
5.21	GIRL	17	12	8	33	21	10
5.23	GIRL	19	12	9	38	21	11
5.24	GIRL	27	16	7	39	23	18
5.25	GIRL	23	15	8	37	19	14
5.26	GIRL	20	17	9	36	19	19
5.27	BOY	12	9	6	28	16	12
5.28	GIRL	20	11	5	31	17	10
5.29	GIRL	17	13	6	29	18	12
5.30	GIRL	20	13	5	37	15	14
5.31	GIRL	22	14	6	36	21	10
5.33	BOY	17	13	8	28	16	17
5.34	BOY	23	14	7	45	14	18
5.35	GIRL	14	12	6	39	21	11
5.36	GIRL	23	12	9	43	23	15
5.37	BOY	23	13	8	41	20	13
5.38	GIRL	23	11	5	37	20	15

Appendix Q:

Raw Scores

Children's Academic Intrinsic Motivation Inventory (CAIMI) POST-TEST

These are the CAIMI raw scores of the students at PIONEER. The ID numbers were assigned to the same students who participated in the Pre-Test assuring confidentiality. The same ID numbers were assigned to students in the pre-test and post-test in order to analyze specific scores. The first ID digit indicates grade.

ID#	SEX	READING	MATH	SOCIAL SCIENCE	SCIENCE	GENERAL MOTIVATION
4.1	GIRL	98	97	98	98	75
4.2	BOY	65	90	113	113	74
4.3	BOY	86	109	73	86	67
4.4	GIRL	89	58	56	101	64
4.5	BOY	103	101	120	78	85
4.6	BOY	82	89	86	98	65
4.7	GIRL	80	100	90	100	70
4.8	GIRL	94	104	99	105	79
4.9	BOY	93	51	51	90	41
4.10	BOY	70	68	71	117	67
4.11	BOY	109	116	112	114	82
4.12	BOY	114	120	117	120	80
4.13	BOY	69	68	72	72	53
4.14	GIRL	87	83	86	88	64
4.15	BOY	85	73	90	94	63
4.16	GIRL	115	111	107	115	80
4.17	BOY	85	120	97	120	81
4.18	GIRL	86	115	88	119	71
4.20	GIRL	96	86	108	108	69
4.21	BOY	89	104	80	106	72
4.22	BOY	90	87	88	88	61
4.23	GIRL	97	109	97	97	71
4.24	BOY	113	114	117	117	84
4.26	BOY	82	80	99	93	62
4.27	GIRL	120	119	120	120	70
4.28	BOY	98	84	93	95	60
4.29	BOY	89	90	93	93	69
4.30	GIRL	60	54	73	73	36
4.31	GIRL	117	116	118	118	70
4.33	BOY	88	94	95	92	66
4.34	GIRL	101	110	112	115	76
4.35	GIRL	74	78	80	89	61
4.36	GIRL	94	87	99	106	74
4.37	GIRL	110	106	108	109	71
4.38	BOY	116	91	123	124	70

4.39	BOY	86	95	98	97	70
5.1	BOY	96	99	108	81	72
5.2	BOY	75	72	81	93	62
5.3	BOY	110	110	110	110	77
5.4	BOY	97	76	101	103	67
5.5	BOY	91	84	103	101	64
5.6	BOY	105	111	113	113	74
5.7	BOY	96	94	96	93	65
5.8	GIRL	64	88	75	103	65
5.9	GIRL	49	109	59	108	72
5.10	GIRL	87	102	112	116	68
5.11	GIRL	72	66	81	85	59
5.12	GIRL	90	92	90	93	68
5.13	GIRL	88	61	82	88	72
5.14	GIRL	102	104	105	107	76
5.15	GIRL	110	106	82	115	70
5.16	GIRL	45	54	45	112	51
5.17	GIRL	76	93	93	91	68
5.18	GIRL	83	89	88	91	64
5.19	BOY	107	104	109	110	68
5.20	GIRL	107	110	105	109	69
5.21	GIRL	92	109	102	109	65
5.23	GIRL	89	98	90	107	73
5.24	GIRL	68	72	82	79	50
5.25	GIRL	113	110	113	117	72
5.26	GIRL	94	112	94	109	62
5.27	BOY	99	105	108	102	66
5.28	GIRL	96	96	96	96	70
5.29	GIRL	78	94	95	97	61
5.30	GIRL	89	89	77	95	68
5.31	GIRL	78	79	99	97	63
5.33	BOY	70	115	101	116	73
5.34	BOY	80	105	101	110	72
5.35	GIRL	105	105	104	105	66
5.36	GIRL	103	87	101	110	72
5.37	BOY	103	113	113	107	78
5.38	GIRL	87	88	88	97	63

APPENDIX R.

Raw Scores

MOE Computer Educational Survey (MCES) POST-TEST

ID#	SEX	LEARNING	INTER-PERSONAL	MODE	PERSONAL	SOCIAL STR	IGNORED
4.1	GIRL	22	13	7	31	18	10
4.2	BOY	24	12	6	40	20	14
4.3	BOY	21	13	6	34	17	15
4.4	GIRL	19	13	7	38	19	14
4.5	BOY	19	11	8	41	17	14.6
4.6	BOY	18	14	8	35	19	14
4.7	GIRL	25	15	8	38	23	11
4.8	GIRL	21	15	8	33	22	9
4.9	BOY	23	13	8	43	23	14
4.10	BOY	29	10	6	48	21	13
4.11	BOY	28	13	8	47	24	18
4.12	BOY	24	14	8	40	19	15
4.13	BOY	20	13	7	36	16	18
4.14	GIRL	22	13	7	32	18	11
4.15	BOY	20	15	6	35	16	13
4.16	GIRL	24	15	6	31	22	15
4.17	BOY	26	18	10	43	22	16
4.18	GIRL	24	18	9	46	24	10
4.20	GIRL	24	16	7	35	23	12
4.21	BOY	26	14	5	38	20	13
4.22	BOY	14	15	6	34	16	12
4.23	GIRL	19	15	7	26	17	13
4.24	BOY	30	16	8	43	16	13
4.25	GIRL	19	15	7	35	19	8
4.26	BOY	18	11	7	22	15	11
4.27	GIRL	27	15	10	43	25	15
4.28	BOY	21	16	6	37	22	13
4.29	BOY	17	15	9	37	19	9
4.30	GIRL	17	11	6	36	18	14
4.31	GIRL	25	19	10	42	23	14
4.32	BOY	24	15	8	43	20	11
4.33	BOY	12	13	6	22	16	9
4.34	GIRL	24	17	10	39	22	13
4.35	GIRL	20	13	7	35	21	13
4.36	GIRL	28	18	10	44	25	11
4.37	GIRL	21	15	7	36	20	9
4.38	BOY	25	16	8	45	21	13
4.39	BOY	25	16	8	45	21	13

5.1	BOY	24	11	6	45	24	9
5.2	BOY	24	13	5	39	20	18
5.3	BOY	23	12	6	37	18	14
5.4	BOY	24	14	8	40	19	19
5.5	BOY	23	12	5	44	21	15
5.6	BOY	21	9	6	34	17	17
5.7	BOY	27	12	5	44	21	15
5.8	GIRL	21	12	7	32	17	14
5.9	GIRL	22	11	6	35	20	14
5.10	GIRL	22	13	7	30	19	13
5.11	GIRL	11	12	5	21	15	13
5.12	GIRL	10	8	4	20	17	11
5.13	GIRL	11	11	3	32	15	10
5.14	GIRL	19	11	5	32	16	14
5.15	GIRL	22	4	3	41	15	17
5.17	GIRL	14	10	6	36	16	13
5.18	GIRL	14	12	5	25	17	13
5.19	BOY	22	13	8	39	18	15
5.20	GIRL	22	16	8	41	19	11
5.21	GIRL	21	13	8	32	20	11
5.23	GIRL	21	14	8	34	20	10
5.24	GIRL	18	12	4	32	17	12
5.25	GIRL	20	16	10	42	22	12
5.26	GIRL	22	17	9	42	20	13
5.27	BOY	14	10	7	20	13	14
5.28	GIRL	24	13	6	39	21	11
5.29	GIRL	16	12	7	28	17	15
5.30	GIRL	21	11	7	32	18	15
5.31	GIRL	21	17	7	38	21	12
5.33	BOY	19	13	8	26	19	14
5.34	BOY	26	17	9	48	22	18
5.35	GIRL	22	15	9	40	22	12
5.36	GIRL	24	12	8	30	23	12
5.37	BOY	23	15	8	41	20	14
5.38	GIRL	16	13	7	37	20	11

Appendix S:

Raw Gain Scores

Children's Academic Intrinsic Motivation Inventory (CAIMI)

These are the CAIMI raw Gain scores of the students at PIONEER. The Gain scores represent the difference obtained by subtracting the Pre-Test scores from the Post-Test scores.

ID#	SEX	READING	MATH	SOCIAL SCIENCE	SCIENCE	GENERAL MOTIVATION
4.1	GIRL	4	3	1	0	4
4.2	BOY	-6	-8	15	11	4
4.3	BOY	9	2	-14	-10	-2
4.4	GIRL	-1	-16	1	-13	-6
4.5	BOY	1	-10	7	-35	3
4.6	BOY	-11	-12	-11	-12	-8
4.7	GIRL	-8	0	17	-12	-7
4.8	GIRL	-8	0	1	2	4
4.9	BOY	-19	-20	-19	-10	-28
4.10	BOY	-41	-43	-26	3	-8
4.11	BOY	0	-8	-2	-2	6
4.12	BOY	-4	2	-1	5	-1
4.13	BOY	-16	-8	-13	-12	-4
4.14	GIRL	-6	-10	-19	-17	-6
4.15	BOY	4	2	15	7	7
4.16	GIRL	11	7	2	11	8
4.17	BOY	-9	8	-5	17	2
4.18	GIRL	12	-1	9	5	-5
4.20	GIRL	-4	34	9	8	7
4.21	BOY	-6	-5	-6	-4	-5
4.22	BOY	5	4	4	1	-4
4.23	GIRL	2	14	2	2	8
4.24	BOY	5	5	8	8	6
4.26	BOY	-8	-12	9	1	-10
4.27	GIRL	0	6	6	6	1
4.28	BOY	6	-10	16	11	-2
4.29	BOY	-3	-2	-3	-3	-2
4.30	GIRL	-8	9	11	10	2
4.31	GIRL	1	1	2	2	-4
4.33	BOY	-10	-5	-4	-9	-3
4.34	GIRL	-10	-7	-4	0	3
4.35	GIRL	-20	-25	-16	-20	-10
4.36	GIRL	25	-9	3	13	-8
4.37	GIRL	-1	1	21	19	2
4.38	BOY	15	12	19	6	-1

4.39	BOY	9	-1	2	2	-8
5.1	BOY	-12	-2	-1	-21	-3
5.2	BOY	-7	1	-4	11	9
5.3	BOY	11	4	8	3	1
5.4	BOY	15	-18	-2	-7	-1
5.5	BOY	-5	-4	14	21	5
5.6	BOY	1	2	1	11	5
5.7	BOY	-14	-17	-17	-11	-10
5.8	GIRL	-2	21	-11	4	2
5.9	GIRL	-55	-11	-53	-11	-7
5.10	GIRL	2	-7	15	7	2
5.11	GIRL	-6	-14	-4	-2	3
5.12	GIRL	-8	-18	-9	-11	-8
5.13	GIRL	6	11	3	14	2
5.14	GIRL	-3	-1	0	-1	-6
5.15	GIRL	1	20	-22	9	4
5.16	GIRL	-17	16	13	14	2
5.17	GIRL	-17	-14	-23	-25	-2
5.18	GIRL	-6	3	-5	-1	-4
5.19	BOY	16	17	15	13	4
5.20	GIRL	0	0	8	8	3
5.21	GIRL	-5	-2	1	9	-3
5.23	GIRL	-9	-9	-6	-8	-4
5.24	GIRL	-6	-8	18	-12	6
5.25	GIRL	-3	-2	-3	1	-3
5.26	GIRL	10	18	8	20	5
5.27	BOY	-2	-8	-7	-3	6
5.28	GIRL	-3	-11	-1	-10	-10
5.29	GIRL	17	-4	6	-6	0
5.30	GIRL	7	4	-15	-3	7
5.31	GIRL	-5	-12	6	5	-1
5.33	BOY	4	9	27	14	3
5.34	BOY	3	-11	5	-5	-2
5.35	GIRL	24	-11	21	12	1
5.36	GIRL	1.5	22.5	-9.5	-2.5	-4
5.37	BOY	1	12	13	25	7
5.38	GIRL	-19	-13	13	-20	-10

APPENDIX T:

Raw Gain Scores

MOE Computer Educational Survey (MCES)

ID#	SEX	LEARNING	INTER-PERSONAL	MODE	PERSONAL	SOCIAL STR	IGNORED
4.1	GIRL	0	3	0	-2	-2	-3
4.2	BOY	-2	-1	-1	5	-1	-2
4.3	BOY	5	0	2	7	2	-1
4.4	GIRL	2	-1	-1	-2	2	-5
4.5	BOY	-4	-4	1	-4	-6	1
4.6	BOY	-3	-1	2	-8	-2	-4
4.7	GIRL	1	1	0	2	-1	0
4.8	GIRL	-3	3	0	0	-1	-2
4.9	BOY	2	3	1	2	7	-6
4.10	BOY	4	-7	0	-2	-3	-9
4.11	BOY	0	-1	-2	0	0	5
4.12	BOY	-4	-2	-1	-5	-6	-3
4.13	BOY	-2	0	-1	3	-4	-1
4.14	GIRL	-1	0	-1	-3	-3	0
4.15	BOY	-6	0	-2	-5	-5	-2
4.16	GIRL	5	2	-3	-4	5	3
4.17	BOY	1	1	1	3	2	-3
4.18	GIRL	2	2	1	5	2	-4
4.20	GIRL	1	-1	0	-2	2	1
4.21	BOY	4	1	-1	1	5	-2
4.22	BOY	0	2	0	1	1	-4
4.23	GIRL	-3	0	-1	-4	1	3
4.24	BOY	2	-1	4	-6	-1	-1
4.25	GIRL	-1	1	1	7	1	-7
4.26	BOY	1	-2	0	-9	3	-3
4.27	GIRL	-3	10	0	8	3	-4
4.28	BOY	6	1	0	5	4	-7
4.29	BOY	3	3	2	7	1	-2
4.30	GIRL	-7	-4	0	1	2	-2
4.31	GIRL	-3	0	2	0	-1	0
4.32	BOY	-2	0	0	7	0	-2
4.33	BOY	0	1	1	-3	-1	-2
4.34	GIRL	-2	4	1	0	-1	4
4.35	GIRL	8	1	2	19	8	0
4.36	GIRL	-1	5	1	0	0	-5
4.37	GIRL	-1	1	-1	0	3	-7
4.38	BOY	-4	3	1	-1	-4	-1
4.39	BOY	1	1	2	3	3	-1

5.1	BOY	-1	0	0	-1	2	-2
5.2	BOY	3	1	-1	4	-1	4
5.3	BOY	-3	-2	0	0	-1	3
5.4	BOY	2	0	1	4	-1	5
5.5	BOY	1	0	-1	1	1	-2
5.6	BOY	-1	-3	-2	2	-5	4
5.7	BOY	0	1	0	-3	3	-8
5.8	GIRL	0	2	-1	-1	0	3
5.9	GIRL	-2	1	-1	2	6	5
5.10	GIRL	3	2	2	4	2	1
5.11	GIRL	-8	0	0	-6	-3	-1
5.12	GIRL	-10	-2	-3	-10	-5	2
5.13	GIRL	-8	-2	-2	-9	-4	-5
5.14	GIRL	-9	-9	-1	-11	-6	0
5.15	GIRL	-6	-3	-4	1	-8	4
5.16	GIRL	-13	-7	-3	-6	-5	-
5.17	GIRL	-8	-2	-1	-7	4	-2
5.18	BOY	1	3	1	9	-2	-2
5.19	GIRL	2	6	4	1	0	-1
5.20	GIRL	4	1	0	-1	-1	1
5.23	GIRL	2	2	-1	-4	-1	-1
5.24	GIRL	-9	-4	-3	-7	-6	-6
5.25	GIRL	-3	1	2	5	3	-2
5.26	GIRL	2	0	0	6	1	-6
5.27	BOY	2	1	1	-8	-3	2
5.28	GIRL	4	2	1	8	4	1
5.29	GIRL	-1	-1	1	-1	-1	3
5.30	GIRL	1	-2	2	-5	3	1
5.31	GIRL	-1	3	1	2	0	2
5.33	BOY	2	0	0	-2	3	-3
5.34	BOY	3	3	2	3	8	0
5.35	GIRL	8	3	3	1	1	1
5.36	GIRL	1	0	-1	-13	0	-3
5.37	BOY	0	2	0	0	0	1
5.38	GIRL	-7	2	2	0	0	-4

End of Raw Scores

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Corno,L. & Rohrkemper,M.M. (1985). "The Intrinsic Motivation to Learn in Classrooms." Article in Book, "Research on Motivation in Education - The Classroom Milieu." 1985, pages 56 - 90. Academic Press Inc., Orlando, Florida 32887.
Discusses the relationship between learning and intrinsic motivation in the classrooms and the social-instructional and task conditions of classrooms that might support and enhance this form of cognitive skill development.

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Deci,E.L., Vallerand,R.J., Pelletier, L.G. & Ryan,R.M. (1991). "Motivation and Education: the self-determination perspective.," Educational Psychologist, 26, pages 325-346.
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Donahue,M. E. (1995). "Boston Public Schools: Framework for a System of Multidimensional Assessment and Reporting Technologies To Promote Academic Excellence." Prepared for the Office of Planning, Research, and Development, under her direction.
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Textbook offering teachers and educators a view of educational psychology and the role it plays in the classroom. It deals with development; individual differences; learning and cognition; student motivation;
classroom management; tests and measurement.

Gos,M.W. (1996). "Computer Anxiety and Computer Experience: A New Look at an Old Relationship." The Clearing House, 69(5), May-June 1996, pages 271-276.
Proposes that technophobia is still an affliction with one-third of college students and the numbers have never been bigger, suggesting that middle and high school teachers may be the ones with the power to change that trend. Reports on a study of computer anxiety where the author found a negative correlation between prior experience to computers and anxiety, although the quality of that experience showed the opposite.

Gottfried,A.E. (1985). "Academic Intrinsic Motivation in Elementary and Junior High School Students." Unpublished test (later published). Journal of Educational Psychology. October 1985, 77(5), pages 631-645.
Children's Academic Intrinsic Inventory (CAIMI) test based on the above study. This test is being used in the research reported by this dissertation.

Describes the results of three studies that demonstrate the significance of academic intrinsic motivation for children's education. A test developed as a result of this study has become a standard published test of intrinsic motivation.

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Describes a computer-based portfolio assessment product and how it works. Similar in nature to the Scholastic Inc. product evaluated in this dissertation.

Grossnickle,D.R. & Thiel,W. (1988). "Motivation. Promoting Effective Student Motivation in School and Classroom: A Practitioner's Perspective." Book published by the National Association of Secondary School Principals, 1904 Association Drive, Reston, VA 22091.

Provides ways in which student motivation to learn can be increased and sustained. Points as student motivation as an educational problem and the teacher in his or her role as motivator. Develops a model to increase motivation.

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Determines if the perceptions of teachers using a computer-assisted assessment program of early childhood differed from teachers not using any computer-assisted program in early childhood.

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Discusses issues of access and equality of women in Information Technology, the impact of education and images of masculinity in Information Technology and computers as a career.

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Herman,J.L. & Winters,L. (1994). "Portfolio Research: A Slim Collection." Educational Leadership, 52(2), October 1994, pages 48-55.
Reflects on the challenges to Portfolio Assessments in the technical quality, equity and feasibility for large- scale assessment purposes.

Hill,B.C., Kamber,P. & Norwick,L. (1994). "Ways to Make Student Portfolios More Meaningful & Manageable." Instructor, July/August 1994, pages 118-120.
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Hughes,K.R., Redfield,D.L. & Martray,C.R. (1989). "The

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Provides evidence of the psychometric integrity of the Children's Academic Motivation Inventory (CAMI), a test that was developed to provide academic achievement motivation.

Humphreys,V.B. (1994). "Splash Portfolios Kids Can Make Themselves.” Instructor, July/August 1994, pages 123-124.
Describes simple ways to create portfolios for assessment.

HyperStudio version 3.0. Multimedia software published by Roger Wagner Publishing, Inc., El Cajon, California 92020. Copyright 1988-1994.
Macintosh based software consisting of stacks of electronic cards that represent the equivalence of 3 by 5 cards where various computer media devices may be used to store writings, pictures and other multimedia documents that may be part of portfolio stacks created by the students. Although the program is not a “portfolio” software it may be used for that purpose.

Interactive Educational Systems Design, New York, N. Y. (1996) Commissioned and published by: Software Publishers Association, Washington, D.C.
Reports on the effect of technology on student self-concept and the various related issues of curriculum and student attitudes, software design characteristics and recent technologies that affect student populations and instructional decisions in the classroom of the nineties.

Jacobs, J. "Gender and Academic Specialties: Trends among Recipients of College Degrees in the 1980s.” Sociology of Education, 68, April 1995, pages 81-98.
Examines trends in the segregation of field of study by sex for associate, bachelor's, master's and professional, and doctoral degrees from 1980 to 1990. The data indicate a remarkable slowdown in the trend toward gender integration after 1985.

Jacobs, J. "Gender Inequality and Higher Education.,” Annual Review of Sociology, 1996, 22, pages 153-185.

This is a review of literature on gender and higher education indicating that gender inequality is more pronounced in some aspects of the educational system than in others. Women are shown as disadvantaged with respect to the outcomes of schooling.

Khattri,N., Kane,M.B. & Reeve,A.L. "How Performance Assessments Affect Teaching and Learning." Educational Leadership, November 1995, pages 80-83.
Describes evidential research that supports the theory that performance assessments can be an effective instructional tool if teachers are properly trained.

Lighthall,F.F. "Anxiety: A deterrent to Effective Learning." (1974). The Student and the Learning Environment, a publication of the National Education Association, Washington, D.C.
Analyzes the anxiety experience and its close relationship to the goals of education on the one hand and, on the other, to children's perceptions of danger and their experiences of anxiety.

Madaus,G.F. & Kellaghan,T. "The British Experience with 'Authentic' Testing." Phi Delta Kappan, 74(6), February 1993, pages 458-469.
Evaluates the implications that the British experience with Authentic Assessment will have in the American scene. It is a rather gloomy assessment of the cost and disruption caused in England with warnings about the risks and dangers of Authentic Testing.

Marzano,R.J., Pickering,D. & McTighe,J. (1993). "Assessing Student Outcomes- Performance Assessment Using the Dimensions of Learning Model." Association for Supervision and Curriculum Development, Alexandria, VA.
Introduces the concept of the five dimensions of learning as they respond to the demands for assessment reform. Makes the case for alternative assessment and compares it with the traditional assessment methodologies.

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This is Abraham Maslow's classical work about the hierarchy of needs and self-actualization. Maslow develops, amongst other concepts, a clear distinction between intrinsic and extrinsic motivation and its value in education as well as the benefit of self-management.

Maxwell,S.E. & Delaney,H.D. (1990). "Designing Experiments and Analyzing Data - A Model Comparison Perspective." Wadsworth Publishing Company, Belmont, CA 94002.
Explains the Philosophical Foundation and Conceptual Bases of Experimental Design and Analysis; Positive versus Negative hypothesis confirmations syllogisms; Model Comparisons for Between-subjects Design; Model Comparisons for Designs Involving Within-subjects Factors; Alternative Analysis Strategies (Robust ANOVA and ANCOVA).

McCombs,B.L. & Marzano,R.J. (1990). "Putting the Self in Self-regulated learning: the Self as agent in integrating skill and will.," Educational Psychologist, 25, pages 51-69.
Evidence summarized within an integrative framework that highlights the importance of the self as agent to the initiation, development and continuation of self-regulated learning processes and behaviors.

Meyer,C.A. (1992). "What's the Difference Between Authentic and Performance Assessment?," Educational Leadership, May 1992, pages 39-40.
Shows the difference between performance as directed and authentic as self-directed assessment and implications of the differences.

Miller,M.D. & McInerney,W.D. (1995) "Effects on Achievement of a Home/School Computer Project." Journal of Research on Computing in Education, 27(2), Winter 1994-95, pages 198-210.
Reports on the empirical evidence obtained in a study of a Home/School Project in which it was found that school provided computers in the home did not improve school performance and in some cases actually decreased it.

Moe, D. J. (1984). "The Effects of Sex, Residence Status, Grade Level, and Usage Level on Computer Equity." Moe Computer Educational Survey "(MCES)" Test developed for a Master of Education, South Dakota State University.
This study reports the results of a 36 Likert scale test that tries to determine female students attitudes towards the use of computers under various conditions and situations.

Murray,F. (1993). “A separate reality: Science, Technology and Masculinity.” Gendered by Design? Information Technology and Office Systems, 1993, pages 68-69.
Reviews the frequent association of computers and computing with masculine qualities and the impact it has on women’s career and educational choices in Information Technology. Compares men’s and women’s attitudes and responses as well as causes of those attitudes.

Nicholls,J.G. (1983). "Conceptions of Ability and Achievement Motivation: A theory and its Implications for Education.,” Learning and Motivation in the Classroom, Book, Lawrence Erlbaum Associates, Publishers, Hillsdale, New Jersey. Chapter 9, pages 211-237.
Discusses evidence to support the view that, if teachers
create and sustain the right motivation, many other educational problems will solve themselves.

Pardes,J.R. (1994). "Motivate Every Learner: How to replace motivation myths with strategies that work.” Instructor, 104(1), July/August 1994, pages 99-100.
Compares passive versus active learning in promoting true motivation and making students responsible for their own learning.

Paris,S.G. & Ayres, L.R. (1994). "Becoming Reflective Students and Teachers With Portfolios and Authentic Assessment.” Psychology in the Classroom Series, American Psychological Association, Washignton, D.C.
Defines portfolios and authentic assessment in the classroom and how their implementation affects students and teachers. Provides ideas about the best way to establish those programs.

Patton,M.Q. (1980). "Qualitative Evaluation Methods.” Sage Publications, Inc., 275 South Beverly Drive, Beverly Hills, CA 90212.
Provides support for the idea of research using qualitative methodology as opposed to quantitative research.
Advises in the use of both in real life methodology.

Patton,M.Q., Stiggins,R.J. & Rubel,E. & Quellmalz,E. (1988). "Measuring Thinking Skills in The Classroom: Revised Edition.” National Education Association Publication, 1988.
Provides ways in which Authentic Assessments can be

made
more affordable to the communities interested in them.

Pearlman,R. (1993). "Designing the New American Schools." Communications of the ACM, 36(5), May 1993, pages 46-49
Discusses school organization, curriculum, assessments and accountability, technology and learning environments as they relate to the redesign of the American schools.

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NJ.
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Vernon,W.M. (1972). "Motivating Children. Behavior Modification in the Classroom." Book. Holt, Rinehart and Winston, Inc. Chicago, Illinois.
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the Future of Alternative Assessment.” Phi Delta Kappan, 74(6), February 1993, pages 444-454.
Observes the practitioners' insecurity whether to venture into assessment strategies in view of the high cost and complexity that they entail.

ADDENDUM

Paul V. Montesino

Biographical Data

Born in Havana, Cuba; came to the United States in 1962.

Parents’ Names: Pedro Pablo Montesino and Bertha pages.(both deceased)

Other Personal: Married to Noemi Montesino, father of Paul A.and Mercy M. Caldarelli wife of Albert Caldarelli both parents of Albert

Paul.

Education: Attended elementary and secondary school education (High School) at Colegio de Belen, Havana, Cuba, a Jesuit educational institution and specialized in Sciences.

Attended Northeastern University, Boston, Mass where received an Associate Degree in Electronic Data Processing, a Bachelor of Science Degree in Management Information Systems (Cum Laude)and a Bachelor of Science Degree (Cum Laude) in Accounting.

Attended Babson College, Wellesley, Mass, where received a Master of Business Administration Degree in Accounting.

Attended Nova Southeastern University since the Winter of 1992 in preparation for a Doctor of Philosophy Degree (Ph.D).in Computer Education

specializing in Training and Learning.

Career experience: Currently a member of the Faculty at Bentley College, Waltham, Mass. with the rank of Instructor, in the Computer Information Systems Department. Previous to holding this position taught Information Systems courses as an Adjunct Faculty member in the Accountancy Department as well.

At that time and for several years was Assistant Secretary, Assistant Vice President and Vice President of Computer Services at USTrust Co., Boston, Mass.

Recently when the transition from full-time Banker to full-time College Professor took place, the position held at USTrust was as Senior Vice President, where amongst other responsibilities stood the coordination and direction of computer-based Budget and Performance Systems.

In addition to all of the above, the

candidate is currently President and owner of The PVM Group, a computer and financial consulting organization specializing in computer conversions and training

Future Plans: After completion of the doctoral program, the plans include College teaching, consulting and working with schools in the selection, training and installation of electronic portfolio assessment, applications, including further research and possibly designing new portfolio software.