ABSTRACT OF APPLIED PROJECT

Karen N. Conn, M.A. in Guidance and Counseling

Graduate School
Morehead State University
1997

INFLUENCE OF TECHNOLOGY ON GIFTED AND TALENTED ELEMENTARY SCHOOL STUDENT ACADEMIC ACHIEVEMENT

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An applied project submitted in partial fulfillment of the requirements for the degree of Education Specialist at Morehead State University

By

Karen N. Conn

Committee Chairman: Dr. Thomas Diamantes

Assistant Professor of Education

Morehead, Kentucky

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Abstract

In the course of the average teaching experience, educators work with all types of learners. They teach the special education student, the average student, and the gifted student. In many respects, every classroom in Kentucky is a multi-age, multi-ability classroom. It is difficult for a regular classroom teacher to meet the individual needs of the wide range of students in our classrooms.

Technology has given us the avenue to many different programs for our gifted students. Millions of dollars have been spent as the result of the education reform act to make technology available to our students. We have been told about the advantages Kentucky's students will have, based on these new technologies, and that all students should be able to work/learn at a proficient level. Can we use these theories with those students we would expect to work at a proficient and distinguished level and allow them to explore technology as a viable learning service.

This report will include an overview of the current literature to see how effective this approach is and determine if it would be feasible to work in Kentucky's schools. A study of a gifted and talented program in a rural setting in Kentucky will be completed to see if the findings match the current research.

Accepted by: Thomas Diamond, Chair

Deborah Stuhlt

Marvin Williams

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Morehead, Kentucky

1997

Accepted by the graduate faculty of the College of Education and Behavioral Sciences, Morehead State University, in partial fulfillment of the requirements for the Education Specialist Degree in Instructional Leadership

Thomas Diamantes
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1-14-98
Date

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Review of Literature

This paper explored gifted and talented programs that are currently using technology to enhance student learning. It began with a broad search that included programs in other countries. The study was then narrowed to the United States and finally narrowed to a specific school in rural Eastern Kentucky. An action research project was conducted there based on the technology currently available due to Kentucky Education Reform Act.

The purpose of this study was to explore successful gifted and talented programs that were currently in place and then adapt the programs to fit with the current technology available in our school district. An attempt to follow a quasi-experimental design where as many variables as possible were controlled for to see if unlimited access to technology for gifted and talented students made a difference in their standardized test scores.

There are vast amounts of information concerning gifted and talented programs available. The literature provides a great deal of insight into the feasibility of incorporating programs that are currently being used in other areas into districts in Kentucky that are facing budget cut backs in their gifted and talented programs.

McLoughlin (1996) delivered a paper describing a recent program by the Education Department of Western Australia. Educators there are extending the use of audiographic teleconferencing to deliver services to gifted and talented students in rural and remote areas. The goals of the program are to extend and apply innovative approaches to teaching using technology and to teach higher order learning in the students by linking them with other students in metropolitan and rural areas. They are using an action research approach to develop a teacher-learning framework for application of telematics to learning environments seeking to promote higher order cognition. The three main dimensions of this program focus on the role of the teacher in the learning process, the role of the student, and teaching strategies.

In a paper by Janice R. Attkisson (1996), several options are presented to improve the education of gifted students in rural areas. The options discussed include: using interactive television systems to offer more challenging courses to gifted students, having rural schools collaborate and share their resources, developing summer programs at universities and other institutions, establishing charter schools, establishing academics that bring gifted students together with teachers and resources, and having gifted students engage in home schooling using the technology available.

Her paper offers principles of good programming for gifted and talented students. The use of computers is being encouraged to support program goals such as accommodating individual learning styles and preferences, encouraging students to take responsibility for their own learning, and allowing for new kinds of social interactions.

The Maryland Task Force on Gifted and Talented Education (1994) presented a paper on the future needs of gifted and talented education. Recommendation for the following issues were: appropriate recognition of giftedness and services for all gifted and talented students, world class curricular standards, system wide flexibility, well trained staff, a state mandate for gifted education, funding, a state definition of giftedness, a state office for gifted and talented, summer centers, local action plans, local gifted and talented supervisory positions, counseling services, teacher selection, early childhood education, provision of a range of services and educational options, appropriately challenging curricula and instruction, acceleration options, increased opportunities through the use of technology, special funding and technical assistance, a state wide data base, a state wide initiative, and a state report card.

While businesses have been building electronic superhighways, education is traveling a dirt road. There are many reasons for using technology in the classroom. Students learn and develop at different rates. Graduates must be globally aware, proficient at accessing, evaluating, and communicating information, and adept at solving complex problems. Technology nurtures artistic expression and creates opportunities for meaningful work according to Peek & Dorricott (1994).

Although U.S. public schools now posses 5.8 million computers, roughly one for every nine students, they are not widely used in classroom instruction. Industry leaders have neglected the teacher's central role in instruction and have grossly oversimplified the complexities of the schools. Computers will become more commonplace when they are used to make the teacher's work easier, not to redefine teaching. (Loveless, 1996)

Technology may be the answer to American educational change. Nicholas Paleologos (1994) argues for the creation of a telecommunications highway to connect the diverse and worldwide educational resources for use by all children, not just the gifted ones. He suggests that the marriage of the technological revolution and educational equity and excellence is possible.

The staff of the Hueneme School District, working in partnership with GTE California, developed a "Smart Classroom", a high technology classroom equipped with personal computers, interactive laser disc video programs, closed circuit television, V.H.S. programs, satellite down links, local area networking, and phone modems (Rescigno, 1988). The use of technology enabled those students to progress through lessons at their own pace. This use of technology lead to, meeting the primary goal of the program, maximized student involvement.

The students were given criterion-referenced computer tests at the end of each unit. Any objectives missed were retaught by the software program and tested again. By using this approach to master material at their own speed, there was an improvement in student attitudes toward learning. As they experienced success, they became more self-confident. The students realized they could progress as far and as fast as they wanted and became willing to accept new challenges. (Rescigno, 1998)

Jones' (1990) research also supports the belief that when choices are provided and experimentation allowed, individual learning styles and preferences can be accommodated and enhanced through the flexibility of the computer to interact with pictures, words, numbers, or any other medium the student is comfortable using. The flexibility of the technology is the key concept.

Planned experiences with computers can help students maximize strengths and overcome weaknesses. Word processors and databases can be used to improve writing and expression of students' ideas and data. Computers can match the student's pace. They enable a student to progress to more complex tasks as they master basic skills. The better students understand the learning process, the better they will use technology.

People learn from interacting with each other. Students have contact with others through software, bulletin boards, chat rooms, and group projects. Therefore they are on the receiving end of the knowledge and ideas accessed through a computer.

Molnor's (1997) research shows that educational technology, when used properly, can provide an effective means for learning. Technology offers new and better ways to expand human capacity, multiply human reasoning, and compensate for human limitations. The technology is now available to supplement the skills that are needed to convert data into information and information into knowledge. It is clear from the research, that we will see a major restructuring of our social, industrial, and educational institutions and an increased reliance on computers and telecommunications for work and education.

The economy, science, technology, and education are highly interrelated. Technology increases productivity but requires a more highly skilled work force with a broader education and a greater familiarity with tools. Competitiveness in the work force will depend on the discovery of new innovations and the speed at which knowledge is transmitted through our education systems to create highly skilled workers who can apply their knowledge.

Implication for Education

The implications for education are unlimited. This could be a viable mode for equality of education throughout the United States for our gifted students. Using technology to enhance instruction is a viable option. Through proper use of computer programs, students can reach high levels of computer literacy. They can use computers to support program goals such as encouraging students to take responsibility for their own learning, allowing new kinds of social interactions, and accommodating individual learning styles. This would be a way for students and teachers to use informational technology to individualize instruction to meet the various needs of the these students.

I foresee that, with the push toward a collaborative approach to problem solving and the availability of technology, an on-line service for students will become available soon. If a student encounters a problem, he/she could present it to a virtual community of other students or educators who, collectively, would know more than most teachers possibly could, especially with the information explosion we are facing today.

Research shows that computer based learning could increase scores from 10 to 20 percentile points and reduce the time necessary to achieve goals by one-third. The use of computers can improve class performance by about one-half a standard deviation, less than the one-sigma difference that could be accomplished by peer tutoring (Kulick & Kulick, 1991).

Technology is a means of managing the information explosion. So much scientific data is being collected yearly that it would take seven centuries to just read a year's worth of data. Students and workers in today's global economy must be able to access data to use in their daily tasks. The technological skills students need in order to be productive and employable in today's job market must begin to be taught as early as possible. It is up to educators and parents to make these opportunities possible.

General Conclusions

Do computer based technologies work? Yes, they most certainly do! The definition of knowledge once meant "having information stored in one's memory". It has been expanded to include the process of having access to information and the knowledge to use it.

Technology is a method to add equality in education. Students from rural areas can link with their counterparts in metropolitan areas and even other countries to collaborate in a problem solving process.

The use of personal computers, interactive laser disc video programs, closed circuit television, V.H.S. programs, satellite down links, local area networking, and phone modems allows students educational opportunities in rural areas that were never before possible.

The use of technology in classrooms can allow a student to progress at his/her own pace and complete criterion-referenced tests to see if content objectives were mastered. The skills or objectives missed may then be retaught and retested using the software.

Research (Jones', 1990) shows us that students' attitudes toward learning improve as they are able to master material at their own speed. As they gain success, they develop more self-confidence and begin to realize that they may progress as far and as fast as they wish.

According to Jones' research the following objectives are essential for good programming for gifted and talented students:

- Instruction is geared toward students' individual learning styles.
- Students are encouraged to grow in self-confidence and self-awareness of their strengths and weaknesses.
- Students are allowed to progress at their own rate.
- Structured activities are provided for individual and small group investigations of real problems.
- Students are encouraged to develop higher order thinking skills.
- Students learn with and from each other.
- A wide range and variety of materials and resources are available.
- Student interests are used as a basis for learning.
- Opportunities are provided for students to establish goals and determine

objectives.

Impressions of Articles Researched and Benefits in Understanding this Topic

The articles I read outlined what would be required to put together an effective curriculum for gifted and talented students using technology. I discovered that many of these concepts were currently being successfully used in other countries around the world.

With the push toward technology in Kentucky's Education Reform Act, the technology is being put into our classrooms. We have the means to design and implement programs with very minimal cost in districts where programs for gifted and talented students are being cut back drastically. It is up to us as educators and parents to provide the educational opportunities for our students that will enable them to compete in today's global economy.

PROBLEM STATEMENT

In the course of the average teaching experience, teachers work with all types of learners. The special education students, the average students, and the gifted students are taught. In many respects, every classroom in Kentucky is a multi-age, multi-ability classroom. It is extremely difficult for the regular classroom teacher to meet the individual needs of the wide range of students in our classrooms. In many districts funding for the gifted and talented programs has been severely reduced while the federal funding for special education has remained untouched. Thus, school systems are looking for new ways to reach the largest number students for the least money.

Technology has given us the avenue to many different programs for our gifted students. However, how effective is this? Are technology driven gifted and talented programs at the sixth grade level as effective as teacher driven curricula? It is possible that a study in this area might provide an important link between practice and theory based on what the teachers are learning about the process of using technology to enhance our curricula. Millions of tax dollars have been spent as a result of the Kentucky Education Reform Act to make technology accessible to our students. Teachers have been told about the advantages Kentucky's students will have based on these new technologies, and that all students should be able to learn/work at a proficient level. Can we apply these theories of the advantages of technology with those students expected to work at a proficient and distinguished level and allow them to explore technology as a viable learning service? If, in the course of this study, it is found that there are no differences in the outcomes of the instructional approaches, then technology may be a viable approach to teaching gifted and talented students and allowing them to go beyond the restraints of the average classroom.

Technology is already being used in other countries to enhance these students learning. In a speech given by Catherine McLonghlin (1996) in Australia this year, she outlined a recent initiative by the Education Department of Western Australia. They are using telematics (autiographic teleconferencing) for delivery of education services to gifted and talented students in rural and remote areas. The goal of this program is to extend and apply innovative approaches to teaching, using audio graphics, and to encourage higher order learning in the students by linking them with other students in metropolitan and rural areas.

A program that would aid in solving the problem of choosing which method of instruction is most effective would include three basic components. First, a gifted program using technology to individualize instruction without increasing teachers' workloads is needed. Second, educators would need evidence that technology directed instruction would be better than a teacher directed curriculum. A form of evaluation would be needed to compare the results of the instructional methods. The evaluation method must include a listing of the various types of technology to be used, the students' scholastic aptitude, students' achievement in subject areas, and student perceptions of the use of technology in gifted and talented programs.

Purpose of the Study

The purpose of this study was to determine the feasibility of using technology to provide gifted and talented students access to advanced curricula. Many local school districts have undergone tremendous budget cuts over the last few years. The areas of gifted and talented programs and technology have been cut especially hard. School systems are not providing the services these students need.

Parents of gifted children are very frustrated with the lack of support they are receiving and with the knowledge that their children's special needs are not being met. The effect of this is that students are not able to reach their full potential. Parents are very frustrated with school systems and the mismanagement that has led up to a lack of services for the students. The feeling among the parents and students is one of discouragement and hopelessness. They wonder what is the point of being identified as gifted if they are not going to have their needs met. These are our brightest students, our leaders of tomorrow and we are short changing them and defeating their natural inquisitiveness before they have an opportunity to excel themselves.

Operational Definitions

The following contextual and operational definitions or descriptions have been used consistently throughout this study. Terms used throughout this report are defined in this section. Terms are listed alphabetically so they may provide a convenience to the reader.

Gifted and Talented Students: Students who have been identified by the local school system using the "Stanford Achievement Test" Series scoring in the 9th stanine.

Limited Access to Technology: Technology used at school primarily to type portfolio pieces.

Self-Concept: The way an individual perceives himself/herself and his/her behavior and his/her opinion of how others view him/her.

Stanine: A stanine score is found by dividing the normal curve into nine equal segments; each having an interval representing one-half a standard deviation and assigning to each segment an ordered number from 1-9 (Sax, 1989).

Technology: The technological process, invention, method, or the like (Random House College Dictionary, 1993). This will include the use of computers, technological programs, and telematics/teleconferencing programs, calculators, and other electronic devices.

Unlimited Access to Technology: Students are allowed to use the technology available at school whenever needed and also have personal computers and Internet access.

General Research Questions

In the course of this study, the following research questions will be addressed:

RQ1: Are there differences in science scores of gifted students with limited technology and those with unlimited technology?

RQ2: Are there differences in math scores of gifted students with limited technology and those with unlimited technology?

RQ3: Are there differences in reading scores of gifted students with limited technology and those with unlimited technology?

Significance of the Study

Education is experiencing a scientific information explosion of unprecedented proportions. It is estimated that workers will have to prepare for two to three career changes in their lifetime. The new emerging educational technologies are to become an important catalyst for education. Kulik (1991) has researched scores at the elementary, secondary, higher, and adult educational levels. He found that computer-based education could increase scores from 10 to 20 percentile points and reduce time necessary to achieve goals by one-third. He also found that computers improved class performance by about one-half a standard deviation.

If teachers could build on the available technology provided through the Kentucky Education Reform Act, they could provide students in their local school districts with a gifted and talented program. It is possible that a study in this area might provide an important link between practice and theory based on what we are learning about the process of using technology to enhance our curricula. If, in the course of this study, we find that there are no differences in the outcomes of the instructional approaches, then technology may be a viable approach to teaching our gifted and talented students and allowing them to go beyond the restraints of the normal classroom. In computer based instruction, delivery is individually paced, different learning styles may be accommodated and self-confidence may be gained.

Assumptions for the Study

Students' attitudes and their instructional needs and wants are critical to their learning environment. It is believed that technology driven instruction could be an alternative method of teaching gifted and talented students. Therefore, it is assumed these students may possess a more desirable self-concept, a greater internal locus of control, and gain the ability to extend themselves beyond the restraints of a regular classroom. The following assumptions have been made with regard to this study:

1. There is a difference in the overall "Stanford Science Achievement" scores in students with unlimited technology and those with limited technology.
2. There is a difference in the overall "Stanford Math Achievement" scores in students with unlimited technology and those with limited technology.
3. There is a difference in the overall "Stanford Reading Achievement" scores in students with unlimited technology and those with limited technology.
4. Teachers perceive that technology driven instruction is a viable method of individualized instruction for gifted and talented students.
5. There are no differences in socioeconomic status academic backgrounds of the 6th grade students.
6. There are no differences in mental ability (scholastic aptitude) between the students with limited access and those of unlimited access.

7. All gifted students possess an equal or reasonable affinity toward technology or technological applications.

Limitations of the Study

As with any research project, the conditions were not perfect or uncontaminated. Because of the small percentage of students that are classified as gifted and the small class size of the school, the choice of subjects was limited. Any generalizations from this study must be done with the following limitations in mind:

1. Validity of collected data may have been affected by the students' awareness that they were part of a research project.
2. The elementary school was chosen because of the concerns caused parents by cuts in the school district's gifted and talented programs. Therefore, we have a limited sampling with bias toward the program.
3. Because of the singularity of the studied population, application of this research in another setting with different socioeconomic levels, increased availability of technology, and a larger student sampling may yield different results.
4. Because of the nature of the school environment, there is interaction of the subjects in academic areas.
5. The types of technology students had access to was limited.

METHODOLOGY

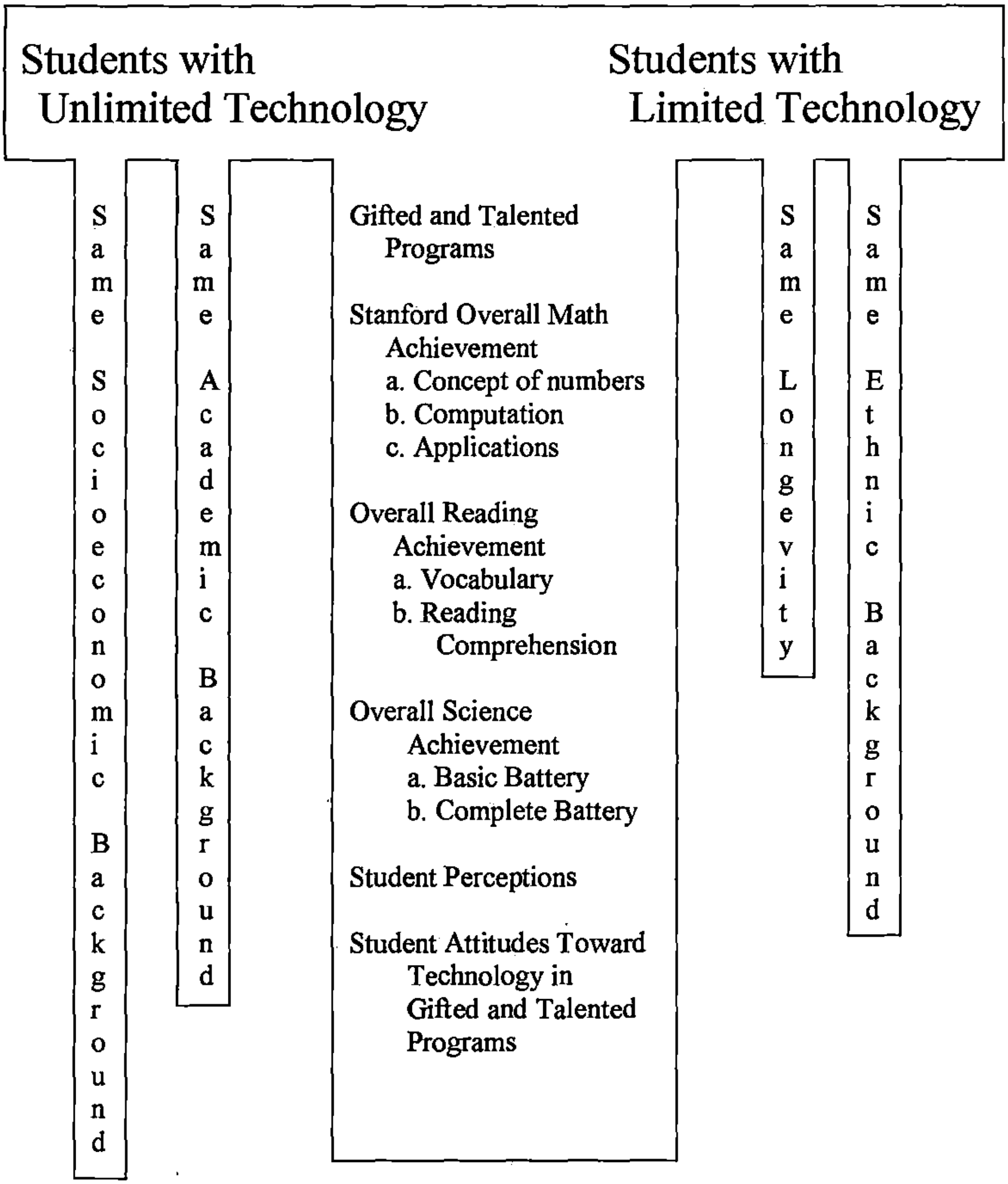
This study has been designed to investigate whether technology driven instruction is a viable teaching strategy for gifted and talented students with respect to achievement in science, math, and reading, attitudes toward technology, and the students' perception of the school's gifted and talented program. Covered in this section: the conceptual framework for the study, the research design for the study, a description of the subjects, instrumentation, and the statistical procedures and data analyses.

Conceptual Framework for the Study

A student's personality (tendencies and affinities) and scholastic aptitude affects a student's success at school. A graphic model has been developed to portray the conceptual relationships for the study. The framework (FIGURE A) represents the relationships among the variables studied. The top of the T represents two groups of students with varying access to technology. The study focus dimensions are the foundations of learning that are built upon, specifically the fundamental basics: math, science, reading, and student perceptions about technology. The group with unlimited technology was expected to show greater achievement in science, math and reading. They were also expected to show a greater interest in technology.

Gifted and talented education is geared to allow identified students the opportunity to exceed the boundaries of the regular classroom. This educational program should expose students to more challenging academic material. These students need to be exposed to and allowed to socialize and study with other identified students as well as their classmates in the regular classroom. Using technology in gifted and talented programs allows students to work at their own pace, accommodate

FIGURE A
Conceptual Framework for the Study



individual learning styles, allows a new kind of social interaction, and it allows students to take more responsibility for their own learning.

In the conceptual framework model, it can be seen that the students in this study come from the same socioeconomic backgrounds. They have had the same academic background in that they have all attended the same elementary school and the same teachers. The subjects could all be classified as white, middle class students from a rural area. Theoretically, a relationship should be seen between the students' perceptions of using technology in their curricula and their achievement test scores. We tend to do well at those things we enjoy and feel good about. We would expect those showing favorable reactions toward the use of technology would have an increase in their achievement test scores.

Description of Subjects

The subjects for this study were six 6th grade students from a local elementary school. The school has a student population of two hundred twenty students. They have a 50% free lunch status. The students attending this school are all from a rural area and are from upper-lower class and lower-middle class homes in terms of socioeconomic status.

The students in this study are all of the same mental ability in terms of being classified as gifted and talented students in the district. They possess the same academic background having had the same experienced, tenured teachers with master's degrees and the same elementary school curriculum.

The students are caucasian, have attended this same elementary school since kindergarten, come from traditional, two-parent families (with the exception of one who is in a stable, supportive, one-parent family), and have little trouble with completion of homework

Research Design for the Study

The design of this study (FIGURE B) was a configuration in which the limited technology group and the unlimited technology group served as levels of the independent variable and the measures of the students' perceptions of technology and achievement in the areas of science, math, and reading were the dependent variables.

Students were divided into two groups; those with unlimited access to technology, including home computers and Internet access and those whose only access was at school primarily to type portfolio pieces. The research design was developed to respond to the following specific research questions:

RQ1: Whether differences in science achievement existed between 6^{th} grade students with unlimited access to technology as opposed to a group of 6^{th} grade students with limited access to technology.

RQ2: Whether differences in math achievement existed between 6^{th} grade students with unlimited access to technology as opposed to a group of 6^{th} grade students with limited access to technology.

RQ3: Whether differences in reading achievement existed between 6th grade students with unlimited access to technology as opposed to a group of 6^{th} grade students with limited access to technology.

RQ4: Whether a difference in student perceptions of technology existed between 6^{th} grade students with unlimited access to technology as opposed to a group of 6^{th} grade students with limited access to technology.

Procedures for Data Collection

This study began at the end of the students fifth grade academic year when the "Stanford Achievement Test" was given. A copy of these scores was received during the beginning of the students' sixth grade year. The students were sorted into two categories, those with limited access to technology and those with unlimited access. The differences of these two groups did not exist prior to the beginning of the study.

The students were tested again at the end of the sixth grade year using the "Stanford Achievement Test". Their scores were obtained at the beginning of this academic year from the coordinator of the gifted and talented program and a self-designed survey was administered to the students to collect their perception of the infusion of technology in gifted and talented programs.

Students' perception surveys were distributed and then collected at the end of the day. The researcher reemphasized that their responses would remain confidential and that their honesty was appreciated. The instrument was given to six seventh grade students in the Gifted and Talented Program. Copies of their test results on the "Stanford Achievement Test" had previously been received from the coordinator of the program in our district. (Table 1)

TABLE 1

Stanford Test Scores and Student Perception Survey Results

National PR-S

Groups / Measures	Students with Limited Technology						Students with Unlimited Technology					
	A		B		C		D		E		F	
	1995	1996	1995	1996	1995	1996	1995	1996	1995	1996	1995	1996
Total Reading	97-9	99-9	84-7	90-8	88-7	74-6	97-9	99-9	88-7	97-9	91-8	96-9
Vocabulary	97-9	99-9	79-7	82-7	84-7	70-6	97-9	93-8	84-7	99-9	81-7	88-7
Reading Comp.	95-8	96-9	82-7	91-8	85-7	72-6	93-8	99-9	85-7	94-8	93-8	97-9
Total Math	78-7	66-6	86-7	88-7	96-9	84-7	97-9	97-9	80-7	84-7	95-8	92-8
Concepts of Nos.	79-7	55-5	86-7	83-7	90-8	95-8	99-9	99-9	97-9	89-8	94-8	90-8
Computations	61-6	45-5	76-7	84-7	96-9	68-6	92-8	87-7	39-4	65-6	92-8	89-8
Applications	93-8	94-8	93-8	87-7	95-8	80-7	97-9	98-9	97-9	91-8	89-8	93-8
Science	89-8	81-7	82-7	57-5	82-7	60-6	99-9	98-9	99-9	98-9	90-8	78-7
Student Perception Total Score	32		35		32		33		34		40	

Instrumentation

The "Stanford Achievement Test", according to "The Eighth Mental Measurements Yearbook" by Burros (1978) is a highly reliable and valid test. The technical data report presents split-half and K-R 20 reliability coefficients for each test at each level. Of the 668 coefficients reported, 428 (64 %) are 0.90 or above. It is clear that these tests have satisfactory reliability.

The technical data report places emphasizes on the content validity of the tests. Content validity is built into the test by the design of items capable of differentiating those who have achieved a particular objective of instruction from those who have not, and by sampling comprehensively and representatively from all objectives in an area of learning. Student achievement was measured by the professionally recognized "Stanford Achievement Test Series", eighth edition.

A study-specific "Student Perceptions toward Technology Survey" was locally developed (FIGURE C) and validated by a panel of Eastern Kentucky educational experts. This consists of 11 Likert-like items where 5= strongly agree, 4= agree, 3= undecided, 2= disagree, and 1= strongly disagree. The possible range score is from 11 (representing more negative reactions) to 55 (representing more positive reactions). Administration time is about ten minutes. This instrument was validated using a panel of ten educational experts.

The "Student Perception Survey" consists of 11 Likert-like items where 5= strongly agree, 4= agree, 3= undecided, 2= disagree, and 1= strongly disagree. The possible

FIGURE C

Student Perception of the Infusion of Technology in Gifted and Talented Programs

Students,

We would like your input on the Gifted and Talented Program at out school. The following statements relate to the quality of our program. Please indicate your agreement or disagreement with each statement by placing the appropriate number in the space provided. Please use the following scale: 5-strongly agree 4-agree 3-undecided 2-disagree 1-strongly disagree.

_____ 1. My teachers encouraged individualized instruction using the technology available.
5 4 3 2 1

_____ 2. I feel the use of technology benefited my understanding of subject material.
5 4 3 2 1

_____ 3. I feel that the use of technology allowed me to learn at my own pace.
5 4 3 2 1

_____ 4. The technology at our school is adequate to meet the needs of gifted and talented students.
5 4 3 2 1

_____ 5. My feelings of the effectiveness of using technology as a method of instruction have increased.
5 4 3 2 1

_____ 6. Using available technology added an increased interest level in the area of science.
5 4 3 2 1

_____ 7. Using available technology added an increased interest level in the area of math.
5 4 3 2 1

_____ 8. Using available technology added an increased interest level in the area of reading.
5 4 3 2 1

_____ 9. My teachers feel comfortable using the available technology.
5 4 3 2 1

_____10. I would recommend using available technology as a method of individualized instruction to other gifted and talented students.
5 4 3 2 1

_____11. I am motivated to learn more than is required about a subject through investigative techniques.
5 4 3 2 1

_____ Total

range score is from 11 (representing more negative attitudes) to 55 (representing more positive attitudes). Administration time is about ten minutes.

Using a validation instrument (FIGURE D) adapted from Harty and Enochs (1983) the "Student Perceptions Toward Technology Survey" was validated by a panel of education experts consisting of three middle school teachers, three high school teachers, two elementary teachers, and two administrators. Face validity was established and split-half reliability was calculated by correlating even-item subscores with odd-items subscores (N=10). The resulting coefficient was 0.955.

The validation instrument consisted of 4 items where 5= highly representative, 4= well representative, 3= representative, 2= somewhat representative, and 1= totally representative. The coefficients of face validation derived from the validation instrument (FIGURE D) are as follows: Representativeness (M= 0.96), research relevance (M=0.92), clarity (M=0.96), and gifted and talented relevance (M= 0.98)

Data Analysis and Interpretation

When comparing the overall achievement scores between the two groups we see that the students with unlimited access to technology out performed the group with limited access in all areas. They also had a greater overall favorable perception toward using technology as a viable option in gifted and talented programs. (TABLE 2). The total achievement mean scores in math show the group with unlimited technology outperformed the group with limited technology by 7.8 percentile points. In reading, they outperformed the limited technology group by 6

FIGURE D

VALIDATION INSTRUMENT*
Student Perception Survey

Please review the items in the survey in their entirety and rate them on the designated scales below by circling your response number. You may use the blank space to make comments. In addition, please feel free to make comments on the text or in the margins of the survey itself.

Name:________________________ Current Position:______________________

1. Degree of representativeness of the questions with respect to the use of technology.

    1. totally unrepresentative
    2. somewhat representative
    3. representative
    4. well representative
    5. highly representative

2. Degree of relevance to the research topic.

    1. totally irrelevant/unimportant
    2. irrelevant/important
    3. undecided
    4. important/relevant
    5. very important/relevant

3. Degree of clarity and understanding of questions.

    1. totally unclear
    2. somewhat clear
    3. clear
    4. above average clarity
    5. high degree of clarity

4. Degree of relevance of student perceptions to the gifted and talented program at our school.

    1. totally irrelevant/unimportant
    2. irrelevant/unimportant
    3. undecided
    4. important/relevant
    5. very important/relevant

*Adapted from Harty and Enochs, 1983

TABLE 2
'95-'96 TOTAL MEAN SCORES

GROUPS / OUTCOMES	Limited Access Group N=3	Unlimited Access Group N=3
Mathematics Achievement	83.0	90.8
Reading Score	88.6	94.6
Science Score	60.5	93.6
Technology Perception	33.0	35.6

percentile points, and in science they outperformed the limited technology group by 33.1 percentile points.

As the data are further examined, it is found that the total reading scores from the years 1995 to 1996 show a gain in a range from 2 percentile points to 9 percentile points. In those students with limited technology, a gain is seen from the years 1995 to 1996 of two of the students of a range of 2 percentile points to 6 percentile points and an actual loss of 14 percentile points in one of the students. With the limited numbers of students in the study, this will greatly skew the results. Students with unlimited technology outperformed those with limited technology by 6 percentile points (TABLE 2).

When the overall math scores are examined, no change is seen in the overall achievement of student D, a gain of 4 percentile points is seen in student E, and a loss of 2 percentile points is seen in student F. When this is compared to students with limited technology, a loss of 12 percentile points is seen in student A, a gain of 2 percentile points is seen in student B, and a loss of 12 percentile points is seen in student C. The students with unlimited technology outperformed those with limited technology by 7.8 percentile points (TABLE 2).

The overall achievement test scores in science for students unlimited technology show percentile points ranging from a loss of 1 percentile point in student D & E to a loss of 12 percentile points in student F. Those students with limited technology show an overall loss in percentile points ranging from a loss of 0 to 22 percentile points. The group with unlimited technology outperformed the limited technology group by 33.1 percentile points (TABLE 2).

When data from the student perception toward technology survey is analyzed, it is found that the overall mean score for students with limited technology is 33. The mean score for students with unlimited technology was 35.6 (TABLE 2). The students that had unlimited access to technology felt that this was a viable way to learn.

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Students feel that using technology, as a method of instruction, is a viable alternative. When choices are provided and students are allowed to experiment with technology, individual learning styles and preferences can be accommodated with the flexibility of the computer to interact with pictures, words, or numbers. As the students build their repertoire of skills, their confidence levels will increase. The study found that students with unlimited access performed better in the academic areas of math, reading, and science than students with limited technology on the "Stanford Achievement Test".

The mean of the percentiles of their total scores from the "Stanford Achievement Test" show they outperformed students with limited access in math 90.8 to 83.0, in reading 94.6 to 88.6, and in science 60.5 to 93.6. Students, both with limited and unlimited technology, scored at or above the mean on the "Student Perceptions Toward Technology Survey". Both groups indicated using technology aided them in the educational process and felt this was a viable way to adapt the current Gifted and Talented Program.

Both groups of students felt that the technology was not enough to adequately meet their needs in the area of science and that the technology available at school was not adequate at this time to meet their needs. However, they felt that technology was an effective way to allow students to learn at their own pace and that it was beneficial in allowing students to individualize instruction.

The level of performance on the standardized achievement test showed that students with unlimited technology scored significantly higher in Math (M=90.8) than those with limited technology (M= 83). In Reading, students with unlimited technology (M=94.6) outperformed those with limited technology (M= 88.6). In Science we see a significant difference between the two groups. The group with unlimited technology had a mean score of 35.6 compared to a mean score of 33 for the group with limited technology access. The mean score on the "Student Perception Toward Technology Survey" was also 33.0.

Conclusions

This investigation was concerned with the academic achievement and student perceptions of using technology as a viable means of enhancing gifted and talented programs in counties that have had budget cutbacks. Based on an analysis of the findings and the limitations of the study, the following conclusions are made:

Students that had unlimited access to technology scored higher on the "Stanford Achievement Test" than did those with limited access. However, this could be due to a drop in one student's score and the small number of students in the sample.

The group with the unlimited technology had a mean score of 93.6 while the mean score of the group with limited technology was 60.5.

The results of the "Student Perception Toward Technology Survey" showed both groups of students favored using technology in their academic programs. However, those students with unlimited access showed a greater affinity toward using technology. This could be due to the comfort level that comes from working with something and becoming familiar with it.

A gifted and talented program allowing students unlimited access to available technology could be a viable option for school systems. With current technology students could access classes being taught in school systems that are not available in their geographical area. Also, this would give gifted and talented students an opportunity to meet and work with gifted and talented students in other geographical areas so they could find common interests and expand their educational horizons.

Recommendations

In order to implement an effective technology program for gifted and talented students, the following actions are recommended:

1. Provide inservice training and technical support to use technology in the curricula for teachers and students. This can be done through professional development, peer tutoring, and computer classes.
2. Integrate computers into the curriculum and instruction by providing assignments using technology in investigative activities chosen cooperatively between the student and teacher.

3. Do a school-wide inventory to determine what hardware and software are available and what the teachers feel would best fit the needs of their curricula.
4. Create a bridge over time to allow educators to move to computer applications that makes changes in how teachers teach and students learn. This bridge can be created through increased awareness of the benefits of technology through research, reading professional journals, and professional development.
5. Promote an effective technological climate. Allow gifted students to use electronic main, electronic bulletin boards, and the Internet. Encourage use of resources, the exchange of information, and assist each other to develop skills.
6. More financial assistance is needed to provide the technology required for an effective gifted and talented program.
7. Provide links to other school districts to allow students access to courses not taught in their school. Ex.: foreign language classes.
8. Provide gifted students with educational programs geared to allow them to progress at their own pace, test their knowledge, and retrack areas if necessary. These programs should be in the basic areas of science, math, and reading. Other programs should be added as the students' interests demand it.

The technology program must be defined and its importance emphasized to teachers, students, and parents. They must model the program by becoming active participants in the established programs. The gifted and talented program must be managed by studying the various components of technology such as the cost and what the impact will be on teaching and learning. Administrators need to promote an effective instructional climate. They can do so by encouraging the use of resources and the exchange of information. Faculty meetings could be used to share insights and trials and errors as teachers integrate technology into their classrooms.

This action project warrants future study. This study needs to be expanded to include all sixth grade gifted and talented students in the county and compare those results to results in another county. Also, the types of technologies each student would be exposed need to be controlled so as to keep all the variables as consistent as possible.

Significance of Data

Research shows that computer based learning could increase achievement test scores and reduce the time necessary to achieve learning goals. Students in gifted and talented programs that have unlimited access to technology are able to adapt curriculum to students' individual learning styles. This can lead to a growth in self-confidence and self-awareness of their strength and weaknesses.

Similar results were found in this study. Students with unlimited access to technology had a difference ranging from 7 to 33 percentile points over the students with limited access to technology on the "Stanford Achievement Test". This could be a viable mode of instruction for gifted and talented students. In areas that are experiencing severe cutbacks, this could be a method of providing equality of education throughout Kentucky. Students with unlimited access to technology also had a better attitude toward using technology in their classrooms.

This project warrants more study. The sampling size was very small, therefore some of the results could be skewed. The study needs to be expanded to include gifted and talented sixth grade students throughout Kentucky for a more accurate reflection of the questions studied.

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