2001

Using web pages to enhance communication and learning in the math classroom

Joy Cappello Gorman

USING WEB PAGES TO ENHANCE COMMUNICATION AND LEARNING IN THE MATH CLASSROOM

A Project

Presented to the

Faculty of

California State University,

San Bernardino

In Partial Fulfillment

of the Requirements for the Degree

Master of Arts

in

Education:

Instructional Technology

---

by

Joy Cappello Gorman

December 2001

USING WEB PAGES TO ENHANCE COMMUNICATION AND LEARNING IN THE MATH CLASSROOM

A Project

Presented to the

Faculty of

California State University,

San Bernardino

by

Joy Cappello Gorman

December 2001

Approved by:

[redacted]

Dr. Amy S.C. Leh, First Reader

11-21-01

Date

[redacted]

Dr. Sylvester Robertson, Second Reader

ABSTRACT

The purpose of this document is to review the incorporation of technology into a math classroom. With technology becoming more a part of our growing society it is important for teachers and students to stay up with the times. Learning what technology is available and how to properly integrate those resources are important components in increasing technology use within the classroom. This paper displays how a secondary math teacher incorporated a class web page into her classroom. The web page that this teacher used included many features: class information, assignments, a link to grades, links to important web sites, email, discussion boards, and virtual chat rooms. Through the use of the web page, the teacher was able to increase communication between herself, her students, and the students' parents. As a result of increased communication, the teacher experienced an increase in student performance.

ACKNOWLEDGMENTS

I would like to thank my professors for all their help throughout the duration of the masters program. I would like to thank my friends Michelle and Janet who suffered through editing this project over and over again. Finally, I would like to thank my husband for putting up with my stress and frustration and encouraging me throughout the Educational Technology program. I would not have survived had it not been for him always there to keep me going.

TABLE OF CONTENTS

LIST OF FIGURES

CHAPTER ONE

INTRODUCTION

Introduction

There has been much advancement in technology over the past 25 years, but none have had as powerful an impact as the creation of the Internet. Developed in 1969 by the Advanced Research Projects Agency Network (ARPANET) of the U.S. Department of Defense, the Internet was originally designed to connect computer users at different locations throughout the country and to "increase computer research productivity through resource sharing" (Hauben, n.d., Part I para. 5). As time continued, the World Wide Web was created which made the Internet user-friendly and increased its availability. This allowed information sharing to become more accessible to a wider range of computer users.

Because it has proven to be profitable, businesses have invested a great deal of money in technology. Educational systems can also profit from technology in the form of student achievement. Businesses have already seized this opportunity and realized the benefits of using technology. Technology enables employees of businesses to be more proficient at their jobs. It, too, can enable

teachers to be more proficient at their jobs, thus increasing student achievement. Schools, because of their limited budget, have had a more difficult time implementing technology to its fullest potential. Teachers need a greater sense of motivation because job security is not an issue like it is in the business world. A way to combat this issue is to improve teacher preparatory programs by requiring a greater variety of technology courses. Just as businesses require a specified amount of technology education, so should educational systems.

Computers are rapidly weaving their way into the infrastructure of society. At the same time, parents are working longer hours and students are involved in more extra-curricular activities. Therefore, communication between the school and home has become difficult or non-existent. Parents have less time to conference with teachers, therefore "phone-tag" becomes a routine event and letters sent home do not always reach their destination. With the advanced capabilities of technology, specifically the Internet and its accessibility of information, lines of communication between parents, students, and the school have a means of improving. Improved communication will therefore lead to an increase in student achievement.

In order to benefit from the advantages that technology has to offer as an instructional tool, teachers and students need to be proficient technology users. As graduates from high school enter college or the work place, they will be faced with the expectation of knowing how to effectively operate a computer and understand basic technology. As a result of this, schools today are changing their graduation requirements. For example, in the Corona-Norco Unified School District of Corona, California, proof of computer literacy has become a graduation requirement (Corona-Norco Unified School District, 2000-2001). To fulfill this requirement, students must either pass a computer literacy exam or complete a required five credit elective course in computer applications.

This growing demand for computer literacy among students leads to the need for an increase in technology integration within school curriculum. Teachers will need to become educated on effective integration of technology in their classrooms. A variety of methods have proven to be effective in the education of teachers and have received many positive responses from school districts.

One method that proved successful was displayed at a school district in Virginia. The Louise Archer School in

Fairfax County, Virginia, created an incentive program to entice teachers to participate in summer training on using the World Wide Web (Azzara, 2000). *A Model of Constructivist Learning in Practice: Computer Literacy Integrated into Elementary Mathematics and Science Teacher Education* (Halpin, 1999) discusses the importance of teaching pre-service teachers the implementation of technology into curriculum prior to working in the classroom.

Another successful teacher education program took place in an urban area school in Kansas. The teachers were surveyed about their "perceptions of the use of instructional technology in their schools and the need for instructional technology in-service training" (Chin & Hortin, 1993, p.318). It was determined that the more school administrators encouraged, supported, and demonstrated the use of technology, the more willing the teachers would be to learn effective use of technology within their classroom.

Many students already enjoy using technology available today; therefore, technology use in the classroom is welcomed. The graphic-intensive, aesthetically pleasing nature of technology, such as computer games or web pages, make learning and

communication easy and fun. Students enjoy a variety of computer games and software. They also e-mail their friends, chat with other students their age, and "surf the web" to find interesting sites. Incorporating technology and Internet tools such as discussion boards, e-mail, chat rooms, and web links into the curriculum, will only help to increase the student's interest level in the materials being discussed in class.

Many educators have witnessed the effect that technology has had, and therefore have begun integrating it into their classrooms. Specifically in a math classroom, technology can help math teachers make better connections between class and the real world. Tools such as a web page are not only used to help make strong real world connections, but also to increase the lines of communication between the math teacher and student. Through the use of a free web site and a password-protected environment, teachers can make information readily accessible to both math students and parents.

Access to the class syllabus, daily homework assignments, important notices, and grade information offers the student and parent the opportunity to be more informed. When students are absent the issue of missing

assignments becomes less of a dilemma because they have perpetual access to the class web pages. There is no longer a need for parents to wonder about the daily assignment. They can check for themselves either at work, home, or the public library. By logging onto the grade web page, parents or guardians can remain current with their child's grades as often as the teacher updates the site.

Statement of the Problem

Currently, parent-teacher communication is conducted through phone calls, conferences, or letters. Parents and students of today are more involved in work or extra curricular activities than in the past. Therefore these forms of communication do not always prove to be successful. Students will sometimes intercept school letters before their parent has an opportunity to read them. Phone messages can easily be deleted, never passed on, or lost in the trash. Conferences are also difficult to arrange around an already over-scheduled calendar.

Through the use of technology, and a class web page, schools can increase the lines of communication between teachers, parents, and students. Using a class web page that incorporates class information, assignments, grade and subject-related links, email, chat rooms, and

discussion boards, a teacher is able to offer parents the opportunity to remain current with class information and to communicate when it is convenient. With this web page, teachers and parents are able to communicate with each other throughout the day. Student information, which might otherwise take days to deliver, can be passed between the school and parent within minutes. In addition, the increased access to information will allow parents to better help their children by monitoring homework, offering alternative study strategies, or arranging a tutor or study partner.

In addition to communication problems, high school graduation requirements are on the rise. Technology is an area where students are expected to be proficient. Therefore, it is becoming imperative that teachers integrate technology into their classrooms and more specifically into their curriculum. This project is intended to show, through the use of technology within a math classroom, how communication and learning can be increased.

Having a variety of technologies available in a math class will provide the teacher with resources to assist more students at one time. Individuals who are either ahead of the class, or lagging behind can be set up on the

computer to work on remediation materials while the rest of the class continues. If someone is having trouble visualizing the graph of a function, an instructor can display the graph on the overhead using an overhead-graphing calculator. Students have individual ways of learning. Therefore, it is important that teachers incorporate as many learning styles into their classroom as possible to be able to reach as many students as possible.

In addition to increasing student learning, those who are exposed to a variety of technology experiences are provided with more opportunities to see how their studies are relevant in everyday life. Through the use of the Internet, students can chat with professionals who are using what the student is learning in class in their everyday life. It is important for students to see a relationship between what they are learning and the real world.

Purpose and Overview of the Project

The purpose of this project, a class web page, was to show how technology integration could be used to help increase communication and student achievement. The web page demonstrated the incorporation of technology into a

math classroom and its successes with increasing communication. It was the author's goal to first survey the wants and needs of various math students and their parents. After student and parent information was collected, the author researched a variety of web building options. Once a site was selected, the class web page was constructed. This web site contained information that students and parents requested along with information that the author felt was important to the success of the web page.

Once the web page was completed, it was necessary to show how the Internet and class web page were implemented into math classes. Students and parents were given information on how to access the site. Finally, the author demonstrated, using the class web site within her math class, how the lines of communication and student achievement increased.

Chapter two of this project discusses research related to the implementation of technology and the Internet into a mathematics classroom. Research on the increase of technology available, effects of technology use within classrooms, and the preparation of classroom teacher are among the items considered.

Following the research, chapter three focuses on the design and development of the class web page. Many variables are weighed prior to choosing the best Internet site to host the web page and what information would be included on the class web page.

Finally, chapter four examines the results of all research considered and the use of a web page within a math classroom. Recommendations are also presented on how to improve the implementation of a class web page in the future.

CHAPTER TWO

REVIEW OF THE LITERATURE

Introduction

Technology is rapidly becoming an integral part of the instructional classroom. More specifically, the need to properly integrate technology into mathematics classrooms is becoming common throughout our growing society. With increased research, teacher preparation, and availability of software and technological programs, mathematics educators can increase their knowledge of technologies, better prepare their classrooms to improve the quality of technology use, and increase the lines of communication between school and home. Included in this literature review are summaries of journal articles related to the issues stated above.

Software and Technological Programs

The increased availability of software and technological programs provide researchers with a variety of implementation methods. One research consideration took place in the Bristol Public School District of Bristol, Connecticut (Gerzanick, Lanoza, & Nolan, 1982). The Connecticut State Department of Education requires all

ninth graders to take the Connecticut Ninth Grade Proficiency Test. The Bristol Public School District developed computer remediation programs to aid the improvement of their ninth grade proficiency tests. The test was designed to evaluate each pupil's academic standing. If a student did not perform well on a particular section of the test, he/she was reviewed and considerations were given for possible remediation. Throughout the Bristol schools, self-paced instruction in the form of computer remediation was developed. These programs allowed students the flexibility of working at their own pace to achieve personal academic goals.

The microcomputer laboratories developed by the district were inexpensive, small in size, and suitable for remediation use. To aid the Bristol schools in purchasing the microcomputers for their remediation program, the school district applied for and was awarded a grant of $60,000. This grant allowed each high school in the district to establish a remediation laboratory. Students who did not perform well on their proficiency exam were scheduled to appear in the remediation lab anywhere from one to six periods per week. The number of times a student was scheduled depended on each student's academic deficiency. The more deficient a student was, the more

time he/she was scheduled for remediation. Because of a shortage of laboratory time and space, additional lab times were established for student use during their free time (i.e. study hall).

Each lab was equipped with six Commodore PET microcomputers, three cassette drives, one dual disk drive, one printer, and an Apple II. There was a lab coordinator and assistant in each laboratory to test individuals, develop personal assistant programs, keep records of progress, and give support to students.

At the end of the pilot year in the remediation lab, Dr. Roby, one of the program evaluators, reported that "computer assisted remediation students did achieve highly significant test score increases in math and language arts..." (Gerzanick et al., 1982, p. 51). He added "students in the computer assisted remediation lab have shown positive growth in the basic skills. They were motivated and interested in their progress. This was evident from the extra sessions students attended"(p. 52). Roby continued to say that students who did not receive remediation did not show any signs of academic improvement throughout the year.

Bristol School District was so successful that they were awarded another grant for the following year. In

addition, the district received many school visits from "...representatives of more than sixty school districts" (Gerzanick et al., 1982, p. 52). Each representative that visited reflected positively on the success of the district, the implementations of their remediation labs, and the choice of remediation software.

Although the information presented within the above article is out of date, it is evident that even at the time of early technology integration there is evidence to support technology integrating. Having students use technology for remediation does have a positive effect on students, and it also helps to improve the quality of education that students are receiving.

In considering the effects of software on student achievement, there are many factors to consider. Shape Maker (Battista & Van Auken Borrows, 1997), a computer-based learning program that students can use to develop their own conclusions about properties of geometric shapes, was used prior to actual study of geometric proofs as an effort to prepare students for critical thinking. Battista and Van Auken Borrow (1997) discuss students' use of Shape Maker and the ways in which students learn according to the constructivist method of discovery learning. In conjunction with constructivism,

students were learning according to the van Hiele levels of geometric thinking.

In the van Hiele method, students acquire knowledge through different levels of thinking. They start at a basic visual discovery stage where they recognize a variety of geometric shapes. As they progress, students develop the ability to describe and analyze shapes and their characteristics, think abstractly and relationally about properties of new shapes related to old shapes, "comprehend and create formal geometric proofs" (Battista & Van Auken Borrow, 1997, p. 572), and finally "compare axiomatic systems" (p. 572). As students worked with Shape Maker, they were able to progress through van Hiele's levels of geometric understanding with much ease.

Students were able to make conclusions about the properties of shapes, develop interrelationships between similar shapes, and gain the ability to apply "formal deduction, logic, and axiomatic thinking"(Battista & Van Auken Borrow, 1997, p. 577) to additional geometric exploration.

Individual student perception of computer software applications is another factor to consider in the effectiveness of using technology. Bowers examined a pair of third grade math students and their interpretation of a

mathematical concept through computer representation. She found their interpretations provided insight to the effects of computer integration. It was the goal of Bowers (1997) to determine whether or not all students gain the same knowledge and information from computer-based microworlds.

Are designers really getting out of the program all that they intended, or are the users, primarily students, viewing it as a separate activity, not related to what is being learned in class? Within a study by Bowers (1997), students were examined to determine their personal understanding "...of place value and personally meaningful ways to solve three-digit addition and subtraction problems" (p. 611). A special teacher was brought into the classroom during the experiment time to aid in the research and design. Two students were presented with a problem about a candy store and the number of boxes of candy within the store. They were asked to determine the number of individual candies left over in the store after someone ordered a specific amount.

Using the microworld, or computer, one student was able to represent the candy store and its boxes of candy using computer icons and simple manipulations. Her boxes of candy were arranged such that 10 candies were in each

roll and 10 rolls in each box. By performing a few simple manipulations, she was able to determine how many candies were left after a purchase was made.

The other student chose not to use the computer. Consequently he was not able to see the connection between the given problem and the use of the computer program. Instead he worked the problem out by long hand on paper. Bowers (1997) felt this presented an issue of improperly arranging place values, a typical mistake when one first learns to subtract. As a result, the student was not able to obtain the correct answer.

Another point to consider is whether the classroom teachers teach their students how to properly use instructional technology. By frequently re-evaluating students' understanding, a classroom teacher can quickly determine whether or not a student is gaining the intended knowledge, and when necessary, make appropriate adjustments.

Effects of Technology Use in Mathematics Classrooms

In considering the effects of technology use in mathematics classrooms, modern technology can greatly enhance the amount of learning that students receive in school. Yerushalmy and Gilead (1997) consider an algebra

class from a middle school in Israel, and their use of technology throughout the class. These students were first presented with an algebraic equation, and were asked to find the value of "x" that made the equation true. Students went about solving the problem using a variety of problem solving strategies, and resulted in a variety of different solutions. Upon completion, students conversed about their varied results, and decided that they needed a more accurate and efficient method for solving similar problems. It was decided that the use of technology would greatly enhance student learning without hindering what they already knew.

The software program, The Function Supposer: Symbols and Graphs, provided many learning opportunities related to graphing for the students. First students were required to learn how to use the software, then how to apply it to the given questions. Finally they had to decide how to properly interpret the results of the program, and consider questions of further investigation.

Issues arose during the use of the software related to the quality of knowledge students were receiving. It was feared through the use of technology, students would lose their "...intuitive numerical-analysis methods" (Yerushalmy & Gilead, 1997, p. 158). Further investigation

of student understanding proved this fear untrue. In actuality, it strengthened students' understanding and their ability to manipulate data to arrive at a solution. Students developed the ability to lead a "...discussion focused on the connection between the two representations of the equation and on the meaning of the solution" (p. 159).

It was determined if teachers are going to use instructional technologies in their classroom, they should not use them as a sole means of teaching. Rather, technology should be used to further a student's investigation into the meaning of a topic, to develop relationships between topics of study, or to relate it to the real world. Allowing students to investigate relationships strengthens their understanding of a topic, and provides students with information to build their schemata.

As curriculum and standards change for mathematics education, so does the way in which we teach it. With the emergence of new technologies, teachers are provided with an overwhelming amount of program and software teaching aids. It is stated in the Third International Mathematics and Science Survey that "...technology is a key factor in determining the economic health of a country" (Harvey &

Charnitski, 1998, p. 151), and "...the overriding presence of technology makes new demands on educational communities to prepare students with high levels of technical competence and flexible thinking" (p. 151). Throughout Harvey and Charnitski's article, the reader is presented with a variety of ways in which a mathematics teacher can implement these technologies. The classroom teacher needs to evaluate these technologies and make changes in his or her individual teaching curriculum to technically enhance the way students learn.

Also presented throughout the article are the theories of Vygotsky and Jonassen. Both theorists believed in constructivism, and each exemplifies ways in which constructivism can be used in a mathematics classroom.

Vygotsky's theory is based on sociocultural learning and "...may offer guidance in developing technology based mathematics curriculum materials consonant with the NCTM goals and objectives" (Harvey & Charnitski, 1998, p. 152). Jonassen, (as cited in Harvey & Charnitski, 1998) referred to devices known as "mindtools", computer-based tools, which enables students to participate in activities that enhance "...critical thinking and higher-order learning" (p. 154). Different forms of mindtools include databases, spreadsheets, and computer-mediated communication. Both

theorists discuss these forms of computer use. Included in their discussion are suggestions for implementation and possible effects on student knowledge.

Vygotsky and Jonassen both support the changing technological community. It is believed that greater computer use in classrooms "...promotes high level thinking skills and supports concept development" (Harvey & Charnitski, 1998, p. 157). Interactive computer use, computer mediated communications, provides students with access to information, resources, individuals, and experiences that they would otherwise not have access to.

Finally, "through technology, the perceived and functional distance between learning communities is becoming smaller" (Harvey & Charnitski, 1998, p. 157). As our school system progresses with the growing technology, our students will be better able to make connections between what is learned in school, and how it applies to the real world.

Integrating computers and software applications into mathematics classrooms has been a challenge to many school districts. The Stevens project was developed in 1988 by the Stevens Institute of Technology in Hoboken, New Jersey. It was developed to address the issues related to computer use in mathematics classrooms, and to formulate

ways to improve upon those issues. Many barriers faced this project: lack of hardware and software in schools and lack of teacher knowledge on how to incorporate the hardware and software, how to integrate the use of computers with the current curricular structure and objectives, and how to train and support other teachers who are interested in integrating computers into their classrooms.

The Stevens project (Friedman, Jurkat, & Pinkham, 1991) considered five school districts in New Jersey, which included thirty high school and thirty middle school teachers. The teachers, with the support of their administration and superintendent, went through extensive training on how to implement technology, how to create lessons, and how to decide on effective software.

Throughout the training, teachers learned the importance of computer integration, and were able to discover software that would be suitable for their classrooms. Teachers learned how and when to incorporate the software into their daily lessons and the advantages that would result from its use. They learned by using the software available they could reinforce concepts through teaching them at the same time, and also increase student

interest of a particular topic by varying the methods of instruction.

This project was videotaped and shown to various districts around the country. Its intent was to provide information to teachers of the possible uses of available technologies, provide feedback from teachers who have implemented various computer software programs, and provide support for those teachers who are interested in incorporating computers into their classrooms.

There are many mathematics teachers who do not realize the advantages of integrating computers and technology into their classrooms. By not doing so, these teachers are providing a disservice to their students. It is important for students to have as much exposure as possible in all of their classes.

Although there are many reasons to integrate technology and software into a classroom, there are also many issues related to the integration. Beattie (2000) discussed two issues involved with integrating technology into schools. The first "is not so much whether computer technology should be employed, but how the potential of computer technology can be fully realized" (Beattie, 2000, p. 56). The second issue focused on the ways schools will change after technology implementation has occurred.

To begin, a school needs support of its administration and buy-in of staff before it can make any changes. The school needs to see the integration of technology as a "manifestation of educational values and goals unique to each institution" (Beattie, 2000, p. 56). There must be a strong Information Technology Department within the school that is capable of effectively working with teachers to train them on how to use and implement the technology. The roles of the IT department need to be clearly defined and well known by all school site staff members. The IT department duties should include being able to "serve as educational mediators between the world of technology... and the world of the classroom teacher..." (Beattie, 2000, p. 57).

> They must be trained in educational theory and learning style variants, must understand the classroom environment, must have a facility with computer science, should be a good and patient communicator, should stay up-to-date on the latest technological developments, and must be able to see the creative elements integral to the educational process. (Beattie, 2000, p. 57)

Not only is it important for the IT department to be knowledgeable in all areas of technology integration, but they also must be able to meet the needs of teachers. In order to do so, it is important for teachers to discover their own weaknesses, wants, or needs with using

technology and make those feelings known to the IT department members. For beginning technology users, some wants and needs may include the need to know why the integration of technology is necessary, time to learn how to use the technology hardware, time to change curriculum, and proper training on computer hardware and software (Beattie, 2000).

Changes within a school are not easy. People that have been there for long periods of time are comfortable with the way things are and do not like the thought of change. However, once a school is convinced technology integration is essential to their students' success, their school will be much stronger after the implementation is complete and student achievement will rise.

Improved College Preparatory Courses for Future Teachers

The availability of technology for classroom use is overwhelming. A barrier to its incorporation has been lack of teacher knowledge. Without proper exposure to resources, one cannot expect a teacher to integrate software programs into his or her classroom.

With the improvement of college preparatory courses, our future teachers will be better prepared to incorporate modern technology into their classrooms. A college methods

course that was offered at the University of Missouri-Columbia focused on teacher education for mathematics majors and has two main purposes.

First, this course was designed to provide students with necessary materials to become a successful teacher. These materials included lesson plans, teaching strategies and methods, and technology applications.

Secondly, it was used to "identify content appropriate for a secondary geometry curriculum" (Nicaise & Barnes, 1996, p. 205). Students in the class were forced to examine a variety of constructivist methods including "problem solving, hands-on activities, supplemental materials, computer programs, and textbooks" (p. 205).

As a new teacher, it is difficult to enter a classroom with ideas that are guaranteed to be successful and accepted by one's students. The class at the University of Missouri-Columbia was designed to provide new teachers with the tools and knowledge necessary to make their first classroom experience as enjoyable and creative as possible.

The student environment in this class "...revolved around an authentic task; made extended use of collaborative learning; contained teachers who scaffolded student learning; and contained information-rich resources

inviting student discovery and exploration" (Nicaise & Barnes, 1996, p. 208). Students were forced to understand the ins and outs of "...constructivism and how or why it differs from other instructional models" (p. 208). They had to develop their own curriculum and incorporate technology into it as much as possible. When completed, each individual's curriculum was to be placed on the World Wide Web to share with other interested teachers.

The article focused on a particular college class that examined the possibilities and importance of instructional technology and constructivism integrated into the mathematics classroom. The authors stated, "When students are in student-centered, student-directed, collaborative classrooms supported with teacher scaffolding and authentic tasks, they learn more" (Nicaise & Barnes, 1996, p. 205). Learning how to teach those types of classes is what is most important. It is this authors' belief that all education majors should be required to participate in similar courses.

Because technology is so quickly becoming an integral part of our society, incorporation into the classroom is becoming a must. The amount of information that is now available to teachers and students is astonishing. By not taking advantage of it, teachers are cheating their

students and themselves out of an invaluable learning experience.

Halpin (1999) believes that in-service training should begin during a teacher's pre-service years and prior to actually working in a classroom. Halpin (1999) conducted a comparison study of technology usage of veteran teachers that had been trained to use technology and of pre-service teachers that had been taught how to utilize technology in all of their methods courses. "The results of this study indicated that integration of technology with integrated methods courses increased the probability that teachers transferred the computer skills into their classroom as compared to pre-service teachers who learned computer skills in an isolated manner" (Halpin, 1999, p. 134).

Halpin's (1999) study also addressed the importance of teaching future educators computer skills necessary "to compete in the 21st century workforce" (p. 136). She acknowledged the need for teachers to internalize technology usage in the real world and identified some criteria for training these individuals.

According to the International Society for Technology in Education (ISTE), pre-service education programs should include four computer literacy standards: "(1) basic

technology operations and concepts, (2) application of technology in instruction, (3) professional and personal use of technology and (4) societal, ethical, and human impact of technology" (Halpin, 1999).

Halpin (1999) also cautioned against using technology simply for the sake of having it. She discussed guidelines for the effective integration of computers into the curriculum. First, teachers should be taught to fit the computer to the curriculum rather than the curriculum to the computer. Secondly, Wang (2000) also asserted the computer should be seen as a personal and professional tool. Finally, students and teachers should learn subject matter with the computers rather than from the computers (Halpin, 1999).

Throughout her study, Halpin (1999) noted the pre-service teachers taking both computer theory and application classes, as opposed to just computer theory classes, were better prepared to integrate technology into their classrooms. These teachers were able to immediately implement computers into their classrooms with complete confidence because of their training. It was also discovered that teaching pre-service teachers computer theory and application at the same time is more effective than just in-servicing these teachers on theory alone. The

practical application helped them to internalize the need for technology within the school setting.

Sometimes teachers are knowledgeable about computers, but still do not know how to successfully implement them into their classroom plans. Such was the case at the State University of New York (SUNY) at Oswego School of Education. SUNY Oswego decided it was time to improve its use of technology among faculty. Through the National Council for Accreditation of Teacher Education (NCATE), Oswego set a goal to develop a long term technology plan that "would result in increased proficiencies and classroom integration among education faculty members and would ultimately lead to increased technology proficiency among education students" (Vannatta, 2000, p. 235).

Through faculty surveys, it was initially shown that most teachers were proficient in using computer applications for their own personal use, but teachers lacked the knowledge of how to implement computers into their instruction. These results outlined needs within the SUNY Oswego campus. First, faculty would need to be trained on how to better implement technology into their courses. Next, the education department would need to develop ways to better prepare their pre-service teachers in using technology effectively.

SUNY Oswego then went on to develop their plan for improvement. The improvement plan included more modern equipment, more faculty training, individual technology goals among faculty, and a plan to "increase technology proficiency among education graduates" (Vannatta, 2000, p. 238).

The technology training for the teachers at SUNY Oswego involved constructive use of computers. They were taught how to create and develop web pages. As a result small groups of teachers came up with ways that content standards could be addressed with such projects in the classroom (Vannatta, 2000).

An important lesson can be learned from this experience. Had the facilitators of the training at SUNY Oswego begun with the familiarization phase of training as suggested by Wang (2000), many of the teachers may have lost interest. Just as with children, teacher trainers should assess the abilities of their clientele and build on their strengths. In this particular case, the teachers were ready to work on implementation.

Increase Technology Integration and Improve Teacher Training

With increasing pressures from State Departments of Education to incorporate technology standards into the curriculum, schools are being faced with two difficult tasks: 1) finding technology and 2) training teachers to use it effectively in the classroom. The following details some of the problems faced by school districts in acquiring the necessary technology to institute state standards and successfully utilizing it within educational environments.

One of the first problems faced by schools in implementing technology standards is obtaining the essential equipment. Many school sites are old and not conducive to establishing a functional network. Such locations do not have the financial means necessary to ascertain the resources needed to handle technology such as the Internet.

At Louise Archer School in Fairfax County, Virginia, principal Azzara (2000) was faced with such issues. The school was slated to become the district's model technology site. The fact that Louise Archer did not have the necessary resources or any idea how to use the

technology was a pressing issue. No one at the site knew how to effectively implement technology (Azzara, 2000).

Although the problems described were enough to scare any staff, the educators at Louise Archer did not succumb to the challenge. With the support of a strong principal and assistant principal, the staff was able to pull together and develop ways of educating each other on the effective strategies of technology integration (Azzara, 2000).

In order to increase motivation among staff members, money was given to individuals who took time out of their summer vacation to receive training on using the World Wide Web. This event turned into a regular Wednesday occurrence where 100 percent of teachers from Louise Archer and other schools attended (Azzara, 2000).

Once the school year started, parents and other PTA partners volunteered their time to help in the training of all Louise Archer teachers. This lead the principal to make the decision to provide funding for continued teacher education and the maintenance and updating of hardware and software (Azzara, 2000).

The results of this school's effort proved to be positive. The school and community were impressed by both the staff's new enthusiasm towards teaching and the

outcomes of the technology implementation. The student and teacher results of the use of technology skyrocketed. "Students scored 99 percent on Virginia's new standards-based assessment, and our teachers' technological abilities were ranked in the upper three percent nationally by the School Technology and Readiness Report" (Azzara, 2000, p. 25).

Azzara (2000) attributed the success of this endeavor to the combined positive efforts of the staff and the community. All parties involved were extremely committed to the lasting success of the technology program.

The persistence of the school and community members in Fairfax, Virginia, demonstrates that when teachers are open to new information change can happen quickly. Because so much about technology remains a mystery to so many teachers, it can sometimes be difficult to institute a change process. Teachers are notoriously resistant to tackling the unknown. Often, they are held back by their successes in teaching through other means.

In other words, teachers do not like to fix what in their minds is not broken. Districts are therefore faced with the challenge of empowering teachers to use technology in their classrooms. One school in the Southern Regional High School District (SRHS) in southern Ocean

County, New Jersey, used staff development to bring about a positive change in regards to technology use in the school setting. SRHS made it their goal to make technology a regular and integral part of teaching and learning.

In efforts to make changes, the district applied for and received a grant from the Standards Implementation Project of the New Jersey State Systemic Initiative (NJSSI). This grant "enabled the teachers to develop three interdisciplinary curricular units addressing topics from Probability and Statistics, Discrete Math, and Biology" (Haas, 2000, p. 42). Technology usage was a necessary component of each of these units.

The results of this grant proved to be successful. Students and teachers worked hard to show how technology could be used effectively to make connections between different disciplines. All involved parties were enthusiastic and excited about the potential implications of this technology usage in their real-world functions.

Southern Regional teachers were so excited by the outcomes of this initial project they decided they needed another challenge. They "expressed an interest in participating in an online staff development project offered by The Concord Consortium in Concord, Massachusetts" (Haas, 2000, p. 44). This new project was

focused on "maintaining a collaborative environment of teachers working with teachers, trained moderators, and field experts" (p. 44). The project was also intended to measure the influence technological resources had on teacher learning.

At first, this project was met with some problems. Teachers mistakenly believed that on-line learning would be easy (Haas, 2000). Many teachers dropped out after they realized the unique challenges presented by a class in a cyber-world. It did not appear that this experiment would be as effective as the first. However, once dedicated teachers were found to participate in the Concord Consortium, the project substantiated the results of the first. Teachers learned how to develop and implement new skills and resources using technology. Throughout the learning process, the teachers were also engaged in constant "online interaction with other participants across the nation who were using the same materials and were facing similar challenges" (Haas, 2000, p. 46).

After this small group completed their training in the Concord Consortium, the district decided that it would be beneficial to have all middle and high school teachers throughout the district using technology at least for the purpose of maintaining their grades and other class

records (Haas, 2000). The teachers who had already been trained were given monetary supplements to continue the training of the rest of the staff.

As the next school year began, the staff of teacher trainers had grown from 13 to 45 members. These teacher trainers, along with a strong administration, were active in supporting technical issues, planning for new technology uses, and monitoring teacher leadership roles. The teachers within these schools now knew the staff development programs that were available would serve not only to make them more successful in integrating technology, but also help keep them "aligned with national technology standards" (Haas, 2000, p. 46). Had it not been for the support, determination, and motivation of the teachers and administration, these projects would have never been successful in the Southern Regional High School District (Haas, 2000).

As with the experiences at Louise Archer School, the success of the Southern Regional High School District (SRHS) re-emphasized the importance of commitment to a common goal. When everyone is determined to work toward a common goal, positive results will be seen.

In an article by Judy Parr (1999), she details the experiences of a private secondary school that, like

Louise Archer School and SRHS, was interested in increasing their teacher development and support for technology integration. This school was being pressured to increase their technology incorporation to meet the needs of students and the demands of modern technology.

In an effort to improve teacher training and support, the school developed a five-year plan of action to make the necessary changes to effectively meet their goal for technology usage (Parr, 1999). The improvement steps were as follows: (1) "Provide ready access to technology with a view to increasing the level of confidence and technical expertise of the staff" (Parr, 1999, p. 282); (2) Offer courses to teachers that could either be taken at their school site or at an outside agency. The district assumed the cost for these courses, and substitutes were provided for teachers who chose to attend them during the regular workday; (3) Coordinate technology implementation by devising a strategic plan that targeted increased hardware and technical support; and (4) Increase the strength of peer support availability (Parr, 1999).

Teachers who were willing to take part in the improvement plans were surveyed after six months and at the end of each school year. The survey was designed to reveal the amount and type of technology being used, the

primary location (school or home) of technology use, and the amount of professional development received throughout the school year (Parr, 1999).

As a final result, teacher use of technology within the classroom, in daily record keeping and personal use, increased significantly. By the end of the five-year period, the entire staff was part of the technology improvement process. The district felt through their step-by-step implementation process they were able to slowly gain the support of all teachers. They also believed the teachers' general knowledge of computers had been increased, so they were therefore more willing to utilize that knowledge to implement technology within their classrooms (Parr, 1999).

It has been established that if technology is to be successfully implemented in the classroom, then teachers must be trained. The question remains, however, as to the best way to train teachers.

In a study by Espinosa and Chen, a project called Constructing and Networking for Multiage (grouping two grade levels into one class) learning was developed to aid teachers in learning how to implement technology into their curriculum. During the project teachers were trained in a variety of areas by way of extensive staff

development. In addition "the project gave teachers access to the resources of the World Wide Web and supported their efforts to become more constructivist in their teaching" (Espinoza & Chen, 1996, p. 22).

The program description stated the focus of the study as "the acquisition of knowledge about multiage grouping and computer technologies by teachers" (Espinosa & Chen, 1996, p. 23). After information was gathered, teachers were organized into learning teams according to the grade level that they taught. The teams then attended monthly workshops on "(a) group networking time, (b) team time, and (c) technology training" (p. 23).

Observations, interviews, surveys, and journals were used throughout the study to observe the progress of the teachers. Observations were conducted to measure classroom quality. Teacher interviews were conducted to determine their attitudes about the training. Finally, teacher surveys and journals were used to determine teachers' perceptions and feelings toward multiage grouping and technology use.

The results showed "there was a significant improvement for the overall effects on the physical environment, daily routine, and adult-child interaction" (Espinosa & Chen, 1996, p. 26). Teacher interviews

indicated teachers were still concerned about the amount of technology used in the classroom and their personal knowledge of computers. But at the same time, surveys and journals proved teachers were using computers more frequently in their daily routine.

It was concluded, at the end of the study, teachers gained a more positive attitude toward multiage grouping. This change in attitude "was most likely due to having more knowledge about the topic and realizing that assistance was available" (Espinosa & Chen, 1996, p. 27). Also "teachers increased their use of computers for their own professional development and for curriculum enhancement as they received specialized training and gained successful experience" (p. 28).

The project proved teachers who made the effort to increase their knowledge began implementing technology more effectively. Since the study also focused on multiage grouping, it was shown those who learned to use technology effectively gained a more positive attitude towards multiage grouping. These teachers learned how to combine technology, curriculum, and multiage groups successfully.

As teachers become trained in using technology within their classrooms, there are three main phases they should

go through according to Wang (2000). The three phases include:

1. Familiarization: Getting Acquainted with the Computing Environment
2. Utilization: Using computers as Personal Production Tools
3. Integration: Integrating Computers into the Curriculum.

The familiarization phase is a way to banish the fear new users have with computers. Familiarizing users with computer terminology, skills, and components are important in this phase. Making analogies between the components of the computer and real life can help make computers more understandable and less fearful. It is not only important to build user knowledge of computers, but to make sure there is plenty of technical and moral support while users are learning and beginning their implementation.

The next phase, utilization, is designed to show teachers how "to use computers as personal production tools" (Wang, 2000, p. 69). The teachers are taught how to effectively use a variety of computer applications within their classroom to make daily tasks easier and more effective. Throughout the in-service training, teachers were encouraged to immediately implement what they were

learning into their own classrooms. It was believed that being able to immediately use their newly learned skills was a way to keep teachers interested in learning even more technology integration skills.

Integration is the final phase of the technology integration and teacher in-service training. This phase was designed to help teachers integrate technology into their classrooms. They learned how to integrate technology "as a teacher-centered tool as well as a student-centered tool" (Wang, 2000, p. 71).

By implementing these three phases into a school or school district, teachers can quickly be taught how to effectively integrate technology into their teaching environments. Wang (2000) concludes by saying that technology integration into a school does not have to take years to catch on among teachers. Following the three steps mentioned above and providing plenty of training, technical and moral support are all that it takes to create a successful integration.

Using Technology to Enhance Communication and Learning

Using technology to enhance communication and learning is becoming more and more necessary. Technology is becoming more available to a wider community of people,

and therefore teachers are better able to correspond with parents about their students' progress within a class. Having an email address or creating a web page filled with class procedures, assignments, and schedules are two ways to easily communicate with parents using technology.

Walton High School in Marietta, Georgia was able to successfully create a web page to be used in increasing the lines of communication between the school and parents (Web Site Keeps Teachers, Parents and Students on Track, 2000). They have found through using a web page the school is able to inform parents and other community members of events going on within the school and around the community also. Through the web page parents were better informed of not only what was going on within the school, but also within each of their child's classes. In fact there was an increase in student learning.

Although there are a variety of good web hosting sites available to educators, Walton High chose to use eHomeRoom.com to host their web site. They have posted on their web page homework assignments, test schedules, and projects per teacher. "Academic, extracurricular and sport activity schedules" (Web Sites Keep Teachers, 2000) are also posted, and it is easy and convenient for the school site to update this information on a daily basis.

Giving each member of the school community the opportunity to post information not only keeps parents informed of what is happening around the school, but also exposes the community to events that might otherwise go unnoticed. Smaller organizations suddenly become larger because they are able to inform people of their existence.

In addition to school calendars, Walton was able to post school closings, for example due to snow, announce sports cancellations, and advertise organizations' fundraising information. This ability to quickly get important school information out to all parents at the same time helped to cut down on phone calls related to such issues.

It was found that the parents of students who attend Walton really enjoyed using the school web site. They felt like they were up-to-date with what was going on not only within the school, but also in the classes of their children and the organizations around campus.

"Genuine, regular, real-time collaboration with parents can make a positive difference in a child's learning experience" (Johnson, 2000, p. 48). Teachers who build class web pages are able to communicate more effectively and more often with students and the parent/guardian. Parents who have had the opportunity to

communicate with teachers who have web pages have been very satisfied. They are able to obtain class information whenever they want and are also able to stay on top of their child's progress on a daily basis.

There are many ways to design a web page. According to Johnson (2000) a school class web page needs to be carefully designed to be most effective for the individuals using the page. It is important to design a web page with a purpose. Include all information that a parent or student may want to know about the class: a class description, timeline, assignments, and student progress. This allows the parent to keep up-to-date with their child's progress and the student to be well informed of assignments and due dates.

Along with creating an effective web page, it is important for the designer to not generate more work than is necessary in the creation of the site. According to Johnson, there are "strategies that can be used to reduce the work and anxiety associated with maintaining a Web site" (Johnson, 2000, p. 49). Those strategies can be implemented by the school and are as follows:

1. Using Forms to Create Web Pages
2. Phasing in the Project
3. Phasing in the Online Gradebook

4. Providing Support

With the help of a school and the four steps stated above, a teacher would be able to create a powerful resource tool without a great deal of extra work. Teachers would not be expected to create their own page from scratch; a template or form would be provided to make the process very user friendly. Phasing the project in over a period of time would also make the development less intimidating to a teacher. Having time to adjust and slowly implement something new to a classroom is much more enjoyable than being forced to integrate immediately. With access to an online gradebook, parents can check their students' progress at their own leisure. Lastly, having support provided by the school will aid in the comfort level of teachers. As teachers run into problems creating or maintaining their web page, they can easily correct their mistakes with the help of on-campus support.

"Schools can take an active role in making parent-consumers aware of the quality of their teachers and programs by having useful, informative, professional class Web pages" (Johnson, 2000, p. 51). When parents are involved in their child's education there is higher teacher morale, more appreciation of teachers by parents, more support from parents, greater student achievement,

and a better connection between the school and the community (Faucette, 2000). All of these factors can be further enhanced with the incorporation of technology within the school.

Although there are many reasons to incorporate technology into our school system, there are some families against the use of technology, particularly the Internet, in the classroom. These families are afraid of what their children may have access to using the Internet. Faucette (2000) felt that it was important to educate family members who are against the use of technology. Consequently, it is necessary to show those families the positive, educational uses of modern technology.

Just as Johnson felt it was necessary to have an organized way of incorporating technology into a school, Faucette also felt a plan was a must. She felt it necessary to involve the entire school staff, student body, and community members in devising the implementation plan and in bringing technology into the school.

Once all technology is in place within a school it is important to educate everyone on proper uses. Teachers need to be taught proper use within the classroom, students need to be taught appropriate use, especially on the Internet, and parents need to be taught the advantages

of use within the class and at home. Through education, Faucette hoped that parents would...

1. Be more confident at guiding children in both learning and appropriate use.
2. Be more engaged and activated in home, school, and community.
3. See teachers as partners in helping their children learn.
4. Make more informed choices on bond referendums and when giving feedback to school board trustees, county commissioners, and regents (Faucette, 2000, p. 58).

In addition to involving the community in the implementation plan, it is also important to call upon community members for technological resources and make the school technology resources available to community members. Offering equipment loans and technical support from local PTA members is a valuable way to improve the involvement of parents and the community within the school. That way they are more a part of decisions about hardware, software, and educational training available to their children and themselves.

Technology will help to increase communication between the school and home. In addition, it is necessary

to keep our students abreast of the technology resources that are and will be available. As students graduate and enter the working world they will be expected to know how to use a variety of technological devices. Without having been exposed to such tools while in school, especially math class, those students are at a disadvantage. It is therefore not only important to help keep everyone informed of what is going on around school, but it is equally important to keep students informed of what tools are accessible to our society.

There is a strong need for children to use technology within school. More importantly, students need to be using calculators within their math class. "A calculator is not only an essential tool in today's world but a bridge for young children into the world of scientific technology" (Morrow, 1999, p. 7). Some disadvantaged children may not have access to a calculator or other modern technologies within their homes. Therefore allowing them access to the equipment at school provides them with experience of using a variety of different technologies and the knowledge of technologies that are available to use in today's society.

In 1989, the National Council of Teachers of Mathematics (NCTM) developed new goals focusing toward "problem solving, reasoning, communications, and

connections" (Drier, 1999, p. 21). Along with these new goals the Council is also recognizing how powerful technology can be in the math classroom. "Technology helps teachers make these interdisciplinary connections by providing ready access to worthwhile data. In addition, technology facilitates further exploration of mathematical topics previously too complex for typical classrooms, especially when they involve real-world, 'messy' data" (Drier, 1999, p. 21).

Technology can give teachers and students immediate access to a wealth of information. Technology allows students to explore certain math concepts more in-depth than without the resource. Students are able to manipulate mathematic equations and concepts with easy use of devices such as a calculator. These experiences give students a better understanding of topics discussed in class and provide students with technology skills needed once they graduate and move on to the real world.

Technology can be applied to many different educational fields. It can also be used to form relationships among a variety of curricular arenas. It is sometimes difficult for students to understand the importance of learning concepts, especially math, because they do not see how it relates to their life. Through the

use of technology teachers can relate math to areas such as history, language arts, and fine arts. Technology "empowers teachers and students to explore mathematical concepts through realistic applications and connections to other disciplines" (Drier, 1999, p. 25).

Ms. Kruger, a middle school math teacher, used technology in her class to show her students a variety of ways math could be used to predict the ending of a particular movie, The Adventures of Jasper Woodbury: Journey to Cedar Creek (Barron, 1996). Her students watched a movie and were asked to determine the ending using their mathematical skills. Each group of students considered different ways of ending the movie and each group utilized a different technological device to calculate their results.

Along with Ms. Kruger's class, other math teachers are using technological devices within the mathematics classroom to enhance student learning. These devices include "videodisc based problems," "general-application software (word processing, spreadsheets, databases, and graphics programs)," and "desktop adventures" (Barron, 1996, p. 126).

General-application software was used within a math class to determine the important factors in pizza sales.

Students were required to "explore the area and circumference of circles, to show the cost of buying more than one pizza when the price varies, and to examine the profits and losses in pizza sales for a fictitious school cafeteria" (Barron, 1996, p. 127). The reports were to be written up in a word processing program and supported with spreadsheets and solutions.

Networking computers better enables a campus to utilize peripheral devices. These devices can include printers, CD-ROMs, software programs, and individually created files. Students are able to use these devices without actually having them in the same room. A math class can be in a science class collecting data. The data can be stored on a school network. Students then can return to their math classrooms to analyze and manipulate the data. Using the network also allows for many students to utilize the equipment at the same time in many different locations.

"Telecommunications offers wonderful opportunities for mathematics students and teachers to communicate with peers and experts beyond their classrooms" (Barron, 1996, p. 129). Students working on the same math problem in two different places are able to communicate about the problem and help each other in formulating a solution.

Collaboration between students around the world and between students and professionals is greatly enhanced. Students can obtain a greater understanding of how their math relates to the real world.

Through use of the Internet students are able to see how math relates to working individuals. The Internet allows students to see how the concept they are learning in class is used in the working world. Students can become involved in a variety of Internet simulations with companies such as NASA Spacelink and Weather Underground.

The use of commercial software can also enhance students' mathematical experience. Programs such as Geometric Supposer, Cabri, and Geometer's Sketchpad are a few software programs that students can use to further enhance their classroom experience.

> In the fast-approaching twenty-first century, our students will experience a school environment that is drastically different from that of their parents and teachers. The integration of technology into school curricula is no longer a luxury; it is a prerequisite to survival in a future that will be driven and supported by technology. (Barron, 1996, p. 136)

In conclusion, technology is our future, and increasing student awareness of the capabilities of technology is becoming a necessity of teachers. Because of the way that technology has woven itself into so many

aspects of life, our future students must learn how to successfully utilize all that is available. Many initiatives have been taken in the right direction: increased availability of resources, studies of technology use in the classroom, better preparation of our future teachers, increased technology integration and teacher training, and using technology to enhance communication and learning. Through continued movements in these directions, technology will soon become one of the main components of our educational system.

CHAPTER THREE

DESIGN AND DEVELOPMENT

Using technology within a math classroom can help to enhance student learning and increase the lines of communication between school and home. To do so teachers need to modify their curriculum to incorporate the technology. First, the teacher must decide what technology he or she will integrate. Next, it is necessary to learn how to properly integrate the technology. To determine whether or not this author needed technology integration, specifically the Internet, a survey was given to all of her students and some of their parents.

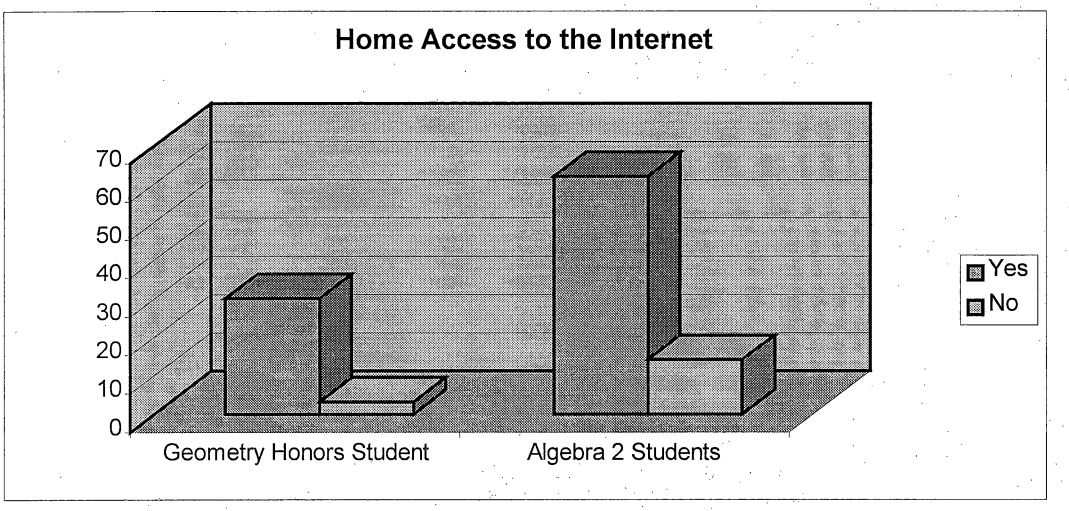
Analysis

A survey was used as an instrument to determine the need, or desire, of a teacher-created web page within a math classroom. Thirty-three ninth grade and seventy-six twelfth grade students enrolled in Geometry Honors and Algebra two courses, both college preparatory courses, at Santiago High School, in Corona, California, were surveyed in January 2001 (See Appendix A). The survey was given as an assignment during the first 15 minutes of class and the author received 100% of the responses. The students came from middle to upper class families; of the Geometry

Honors students surveyed, 91% (30/33) had access to the Internet at home, and of the Algebra two students, 82% (62/76) had Internet access at home (see Figure 1).

Figure 1.

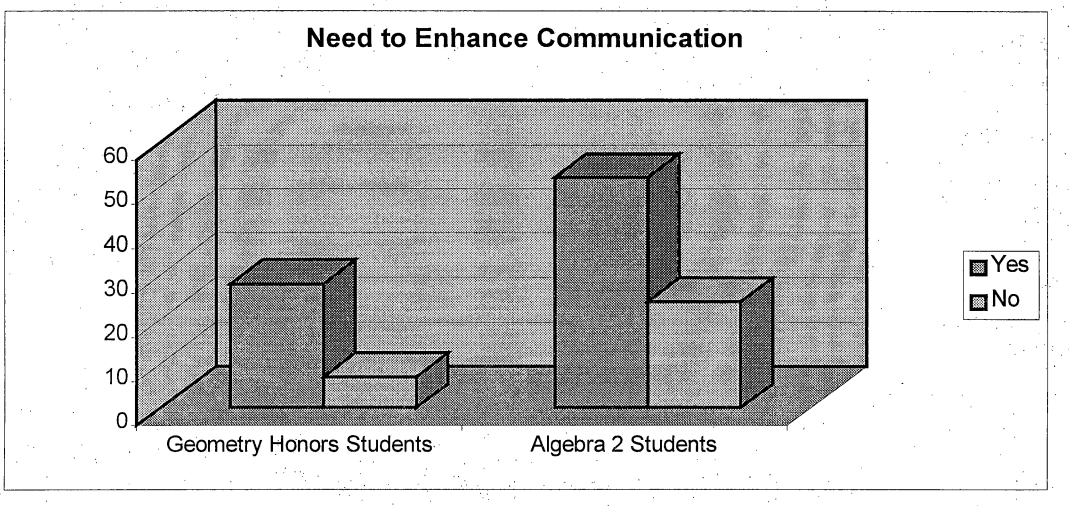
Home Access to the Internet



The student survey was geared toward the students' feelings on the use of technology within the classroom and the possibility of increasing the use of technology in the future. In addition, students were asked their opinions regarding the lines of communication between themselves and their teacher and whether or not they felt it needed to be enhanced. As shown in Figure 2, 80% (28/35) of the Geometry Honors students and 68% (52/76) of the Algebra two students felt it was necessary to enhance the lines of communication between themselves and their teacher.

Figure 2.

Need to Enhance Communication



A voluntary parent survey was given to the parents of these same students (See Appendix B). Students were asked to bring the survey home to their parent or guardian, have the parent or guardian fill it out, and return the survey to the teacher for extra credit points. The author received 71% (25/35) of the surveys from her Geometry Honors parents and 45% (34/76) of the surveys from her Algebra two parents. Among the Geometry Honors parents, 96% (24/25) had access to the Internet at home, and 64% (16/25) at work (see Figure 3). As shown in Figure 4, among the Algebra two parents, 88% (29/33) had access at home and 47% (16/34) at work (See Appendix C).

Figure 3.

Geometry Honors Parents

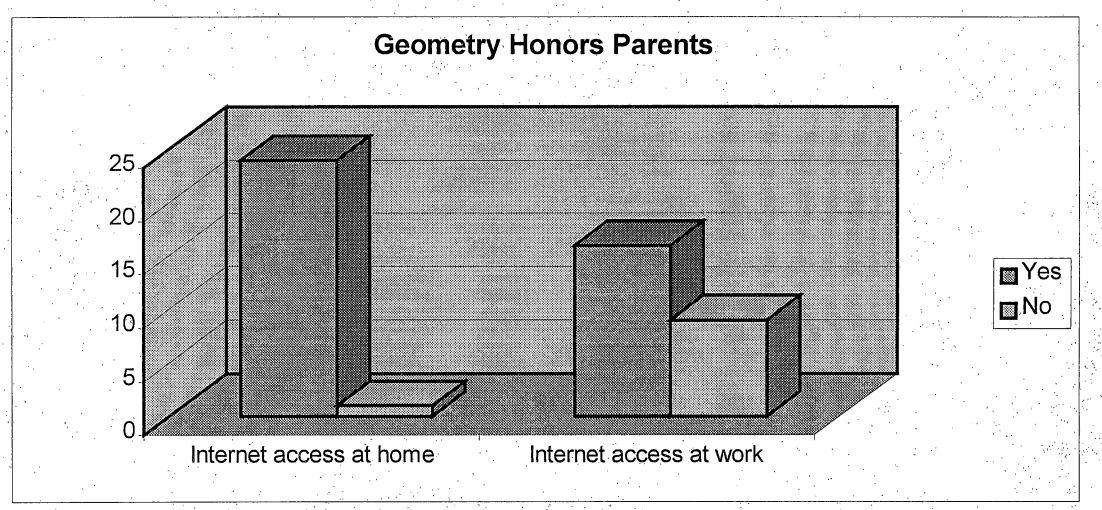
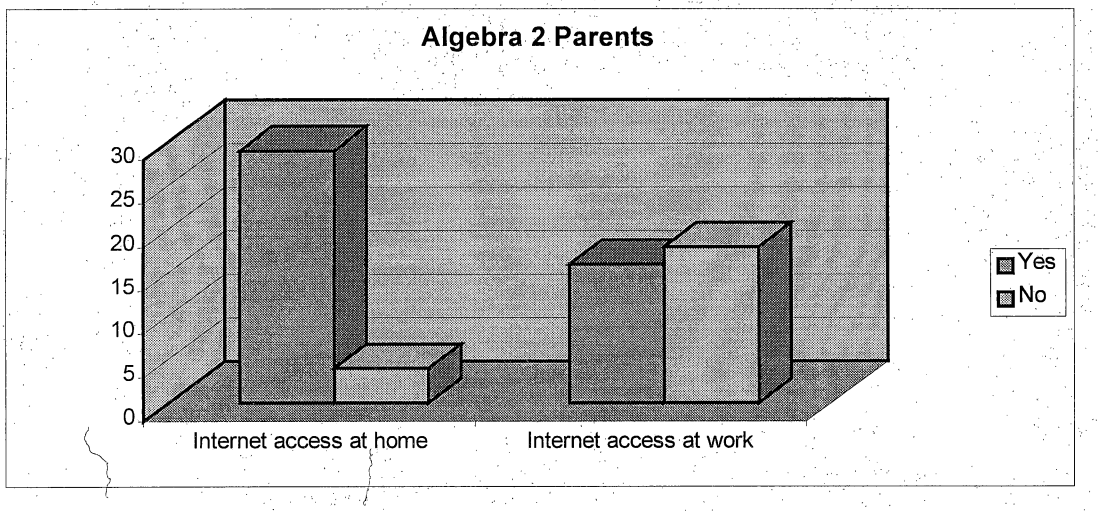


Figure 4.

Algebra 2 Parents



Parent surveys determined their feelings on the use of technology within schools, the lines of communication between schools and home, and their ability to access the

Internet either at home or work. Please note, of those surveyed not everyone answered all the questions asked (See Appendix C).

According to survey results, 96% (24/25) of the Geometry Honors parents and 84% (27/32) percent of the Algebra two parents were interested in improving the lines of communication (see Figure 5). In addition, as shown in Figure 6, 84% (21/25) of the Geometry Honors parents and 73% (25/34) of the Algebra two parents provided their email address to be used in communicating student progress (See Appendix C).

Figure 5.

Interested in Improving Communication Lines

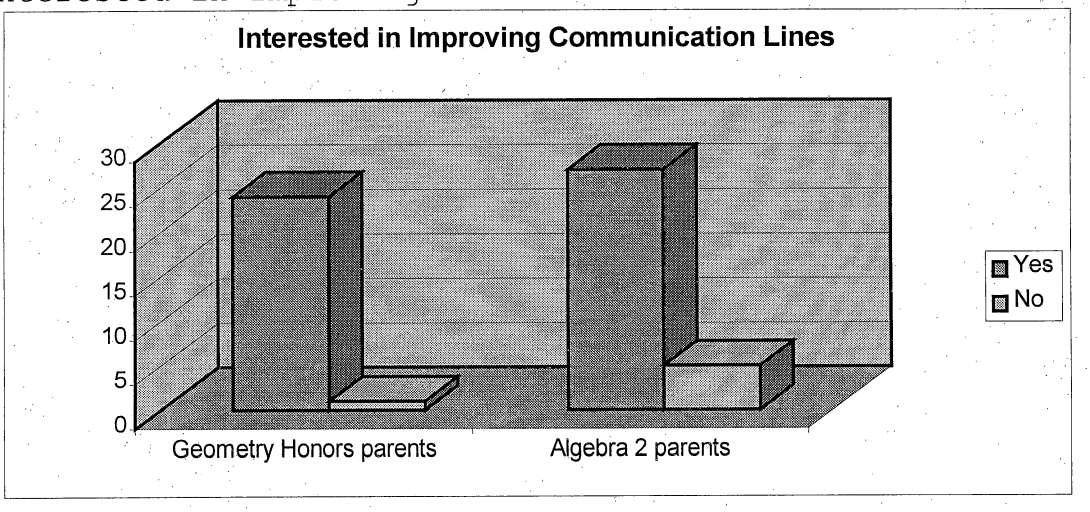
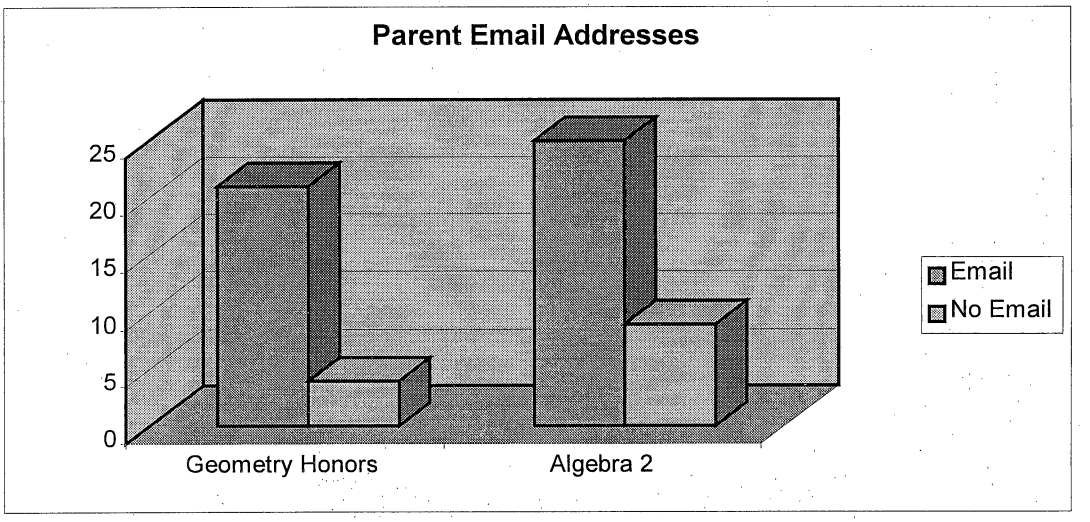


Figure 6.

Parent Email Addresses



Design and Development

Based on survey results, it was determined that a web page would benefit the author's students and parents. Much research was needed in order to build a web page that was suitable for use within a school and home setting, and would also meet the needs of students and parents. Items such as advertising banners, inappropriate graphics, and inappropriate language were characteristics that a teacher would not want displayed on his or her web page. Many web-hosting sites were considered to host the math class web page. These sites include www.Geocities.com, www.ePals.com, www.eClassroom.com, www.webct.com, www.homestead.com, www.domainvalet.com, and

www.blackboard.com. Of the sites reviewed, Blackboard.com was determined to be the most appropriate for an educational setting, offered the most features, and provided the site at no charge to the teacher or school.

The author chose to use Blackboard as the host of her web page. One reason was the easy-to-use features such as page editors, user management, assessment, communication center, assistance, site management, and service features available to the web page creator. Another reason was Blackboard could host the web page for free. Finally, unlike other web sites, students and parents would be able to view the web page without constant advertising.

Within the page builder options, the creator can personalize the color scheme, determine which features will be available to the users, attach documents, enroll users, create a variety of online assessments, and communicate with users through email or discussion boards. In addition the builder is able to set up class groups of students for collaboration in and out of the classroom.

This author created a class web page using the free resources of Blackboard.com. After obtaining a username and password from Blackboard, the author was able to upload important information for math classes such as the course syllabus, class due dates, homework assignments,

and project descriptions. Also added to the page were links to helpful math assistance sites, grade reports, and additional math related web pages (See Appendix D, E, F, G, H).

There were two goals of this web page. One was to create a site accessible to students and parents at any time that would contain important class information. As the web page was updated on a weekly basis, students and parents had the ability to remain up-to-date with class information, assignments, and grades. In addition, when students were absent from school they were able to keep current with class assignments.

Another goal of this web page was to create a tool to increase communication between the school and home. Because Blackboard provided the web page builder with email, discussion board, and chat room capabilities, many opportunities to increase communication were present.

The web page was created so all pertinent class information could be found in one central location. The Announcements page contained important dates, including test and quiz dates, project dates, and various other class announcements important to students (See Appendix D).

Course information, the course syllabus, grading policies, and extra help options were added to the Course Information section (See Appendix E). The Course Documents section included a list of helpful web sites that students needed to complete class projects (See Appendix F). One example of a class project required students to find tessellations in the real world. Students needed to show how tessellations were used in history, language arts, science, mathematics, and fine arts, and they needed to create their own tessellation.

The Assignments section listed the assignment number, page number, problem numbers, and due date for each assignment (See Appendix G). The External Links section contained a link to student grades online, two links to homework help sites, a link to a math problem of the week, and a link to a calculator information site (See Appendix H).

After all class information was added, students were instructed to enroll themselves into their class online. This method of enrollment was chosen to give students a chance to set up their own username and password and to force them to become familiar with the class web page. Included in enrolling themselves, students were required to provide an email address. The list of email addresses

was to be used by the instructor to communicate class information to students and by students to communicate with the instructor and with each other.

Once the course was completely up and running, the teacher often reminded students to use the site when they were absent, if they needed help with an assignment, to chat with other classmates, or to check their grades. To get parents involved in using the site, the teacher presented the online course to parents at Back to School Night, a school function at the beginning of the year where parents can go meet their child's teachers. In addition, the teacher made phone calls to the parents of students who were not performing well within the class. During those phone conversations, the course web address and instructor email address were offered to the parent.

The instructor first introduced the class web page in February 2001. From that time, weekly progress reports via email and the web site, were being sent home to the parents who provided email addresses to the instructor. Following the progress reports, parents would often provide positive feedback to the instructor regarding the updated information. Parents were excited about knowing how their children were doing and felt they could better monitor their success. As a result of survey responses,

the web page created would include class documents, links to grade information and related sites, and would be used to help students and parents stay abreast of what was happening with the math classroom.

Formative Evaluation

In order to evaluate the usefulness of a class web page, the instructor examined her class grades after using the page for two months. By April 2001, the instructor had developed an increase in the amount of communication that was transpiring between her and the parents. Of the 46 parents emailed weekly, an average of 50% of the parents replied back to the instructor each week. As a result of the constant emailing, those students whose parents received messages began to seek extra help more often and completed a higher percentage of homework assignments.

In addition to email messages, parents frequently referred to the class web page for updates on homework and classwork assignments. Having the assignments available daily provided parents with information necessary to remain abreast of their child's homework.

Students took advantage of the web site, email feature, and discussion boards as well. This author constantly received verbal feedback from students as to

the effectiveness of the class web page. Students told her when they were absent it was very easy for them to log on to the class page and find out what he or she missed that day. Students also expressed to the author when they forgot to copy down an assignment he or she would use the site to find out what it was.

Although many students and parents did take advantage of the web site, there were still some who did not. For those students the author found it much more difficult to contact parents regarding student progress. As a result, there was not as strong an increase in student success and motivation as there was for the students who did use the class web site.

Although this class web site appears to work very well in improving communication and student success, the author did not ask for suggestions for improvement. This created a limitation to the project. The author was not aware of adjustments that needed to be made to the web page, or how to improve communication between the school and families who did not have access to the Internet. All feedback received by the author was related to the effectiveness and usefulness of the class site. No survey was distributed regarding ways to improve the web page.

Overall, the author found the site to be a very powerful tool within her classroom. She was able to keep constant communication with parents, parents appreciated the updates, and student success improved.

CHAPTER FOUR

RESULTS AND DISCUSSION

Through extensive research, it was determined that "advances in technology have extended the boundaries of mathematics and underscored the importance of the integration of technology in the mathematics curriculum" (Harvey & Charnitski, 1998, p. 151). Students are able to make better connections between what is being learned in the math class and how it relates to the real world. Students are also able to strengthen their individual math skills. Finally, students and parents are better able to communicate with the teacher and school about what is going on within the classroom.

Using a class web page is one technology tool that can easily be applied to any classroom to help increase communication and learning. Throughout this project the author surveyed students and parents to find whether or not they wanted to increase technology use in the classroom and also increase communication using the Internet. The survey results proved that there was a strong desire for more technology use within the math classroom and also alternative ways of communicating with the math teacher.

A class web page was designed for a math class using Blackboard.com that offered parents and students a means of receiving important class information. Included on the site was a course syllabus, daily homework assignments, links to homework help sites, links to math research sites, a link to grade information, email addresses, chat rooms, and discussion boards. When students and parents began using the site, there was a definite increase in the amount of communication that was occurring between the school and home. As a result, parents became more aware of what was happening in the classroom and therefore were better able to help their students become more successful.

Recommendations

Before a teacher begins to implement a web page into his or her classroom, there are some recommended issues that should be considered:

1. Who will teach the teacher how to create a web page?
2. What program will the teacher use to create the web page?
3. How will the web page be hosted?
4. What information will the teacher include on the web page?

5. How will the teacher inform students' parents about the web page?
6. How will the teacher encourage students and parents to use the web page?

It is recommended that the teacher research the best way to create and host a class web site. The author of this project chose to use a free version of Blackboard.com to host her classroom web page. Although Blackboard has all the components necessary to host an effective classroom web page, it does not give the user the ability to possess a unique web page design. Page features such as item location, button location, button names, and background color are standard within the program. To have a more customized web page, a teacher might consider using other free web building sites (additional web building sites are listed in Appendix I) or purchasing web-publishing software.

It is recommended the teacher acquire proper training prior to implementation of any technological device. Without training, the device may not be used to its full capability or it may be used incorrectly. The teacher will need to be trained on the possible uses of the device and how to effectively implement the device into his or her curriculum area.

Finally, it is recommended a teacher create incentives for all students to take advantage of what the site has to offer. It was found that those students who did take advantage of the site were more successful than those who did not. A teacher should take time in class to show the student how to log in to the site and how to navigate around the site. Once the class has become familiar with it they will be more likely to log in again outside of class. In addition, the teacher should point out all places where one can go to log in to the site if access to the Internet is not available at home. Public libraries, school computer labs, and local print shops usually have Internet facilities for public use.

Conclusion

With the ever-changing technological world, it is so important for teachers to remain abreast of new advances, and to try and implement some of them into their own classrooms. Students are becoming more and more technologically advanced at an early age. As they progress through school, teachers need to be able to build on student knowledge to help them to grow even stronger. Not incorporating any technology into a classroom can prevent

a student from acquiring knowledge or techniques necessary for their future.

Today's technology gives teachers the ability to promote student achievement. This author feels that teachers need to capitalize on this opportunity and use it to promote learning. Finally, she feels that technology use in the classroom and class web pages are key links to increasing student success and communication between school and home.

APPENDIX A

STUDENT SURVEY OF COMMUNICATION

STUDENT SURVEY OF COMMUNICATION

Dear Student,

I am currently working on my Masters Degree in Instructional Media and Technology. For my master thesis I have decided to show how the use of web pages can enhance communication and learning in the classroom. In order to get a clear idea of the effectiveness of using web pages I am asking that you fill out this survey. The information that I gather may be used in my thesis and to help design my web page.
Along with filling out this survey I will be requiring you to use the web page for various assignments. For those of you who do not have access to the Internet at home I ask that you take advantage of the computers available on campus.

Sincerely,

Mrs. Gorman
mrsgorman@hotmail.com

Mrs. Gorman's Geometry Honors Web Page
http://www.blackboard.com/courses/Geo1A1B

1. Do you feel like you communicate enough with your teacher?

Yes No

2. Would you like to enhance the communication between your teacher and yourself?

Yes No

3. Do you feel that the Internet can help to increase communication between yourself, your teacher, and your classmates?

Yes No

4. Do you have access to the Internet at home?

Yes No

5. How often do you use the Internet?

1 hr./day 2 hrs./day 3 hrs./day

4 hrs./day 5 or more hrs./day

6. What do you use the Internet for? Circle all that apply.

Games Homework help

Research Leisure Surfing

Email Shopping

7. Are you interested in using the Internet more within your math class?

Yes No

APPENDIX B

PARENT SURVEY OF COMMUNICATION

PARENT SURVEY OF COMMUNICATION

Dear Parent or Guardian,

My name is Joy Gorman and I am your son or daughter's Geometry Honors teacher. I am currently working on my Masters Degree in Instructional Media and Technology. For my master thesis I have decided to show how the use of web pages can enhance communication and learning in the classroom. In order to get a clear idea of the effectiveness of using web pages I am asking that you fill out this survey. The information that I gather could be used as a whole group result. However, no individual results will ever be published.

The purpose of the web page is to help keep you and your child informed about what is going on in my classroom. Items such as homework assignments, class announcements, research links, homework help sites, and links to individual grades are some of the features that will be included on the web page. With access to this information I am hoping to increase the lines of communication between yourself, your child, and myself. This in turn will help improve his or her performance in my class.

I would also like to inform you that I will be requiring your children to access the class web page for various activities. If Internet access is a problem they will be given time in class to complete the online assignments. If you are opposed to this requirement please express your concerns at the bottom of this form.

Thank you for taking the time to fill out this survey. I hope that you will use the web page to keep informed on what is happening in your son or daughter's math class.

Sincerely,

Joy Gorman
mrsgorman@hotmail.com

Mrs. Gorman's Geometry Honors Web Page
http://www.blackboard.com/courses/Geo1A1B
Username and password must be obtained from your child

1. How often would you like to be informed about what is going on in your child's math class?

Daily Weekly Monthly When there is a problem

2. How difficult is it to get in touch with your child's math teacher?

Very difficult Difficult Easy Very Easy

3. Are you interested in improving the lines of communication between your child's teacher and yourself?

Yes No

4. Do you have access to the Internet at home?

Yes No

5. Do you have access to the Internet at work?

Yes No

6. Do you have an email address that I may use to communicate with you?

Yes No

If so what is the address _____

APPENDIX C

SURVEY RESULTS

SURVEY RESULTS

Algebra 2 Student Survey Results

Questions	Yes	No		
Do you communicate well with your math teacher?	46	30		
Enhance comm. between you and teacher?	52	24		
Can Internet help increase communication?	56	17		
Do you have access to the Internet at home?	62	14		
Interested in using the Internet in math?	42	29		

How often do you use the Internet?	<1h/day	1h/day	2h/day	3h/day	4h/day	5+h/day
	9	33	11	8	2	5
Uses of the Internet?	Games	Res.	Email	HW	Leisure	Shop
	21	66	56	27	44	15

Algebra 2 Parent Survey Results

Informed about child how often?	Daily	Weekly	Monthy	When problem	
	3	14	5	12	
Difficulty talking with child's teacher?		V.Diff.	Diff.	Easy	V.Easy
			2	4	1
		Yes	No		
Interested in improving comm. lines?		27	5		
Do you have Internet access at home?		29	4		
Do you have Internet access at work?		16	18		
Email address for me to use.		25	9		

Geometry Honors Student Survey Results

Questions	Yes	No		
Do you communicate well with your math teach?	9	26		
Enhance communication between you and teacher?	28	7		
Can Internet help increase communication?	27	8		
Do you have access to the Internet at home?	30	3		
Interested in using the Internet in math class?	26	7		

How often do you use the Internet?	<1hr/day	1hr/day	2hr/day	3hr/day	4hr/day	5+hr/day
	9	11	5	6	1	1
What do you use the Internet for?	Games	Res.	Email	HW	Leisure	Shop
	12	32	28	10	18	4

Geometry Honors Parent Survey Results

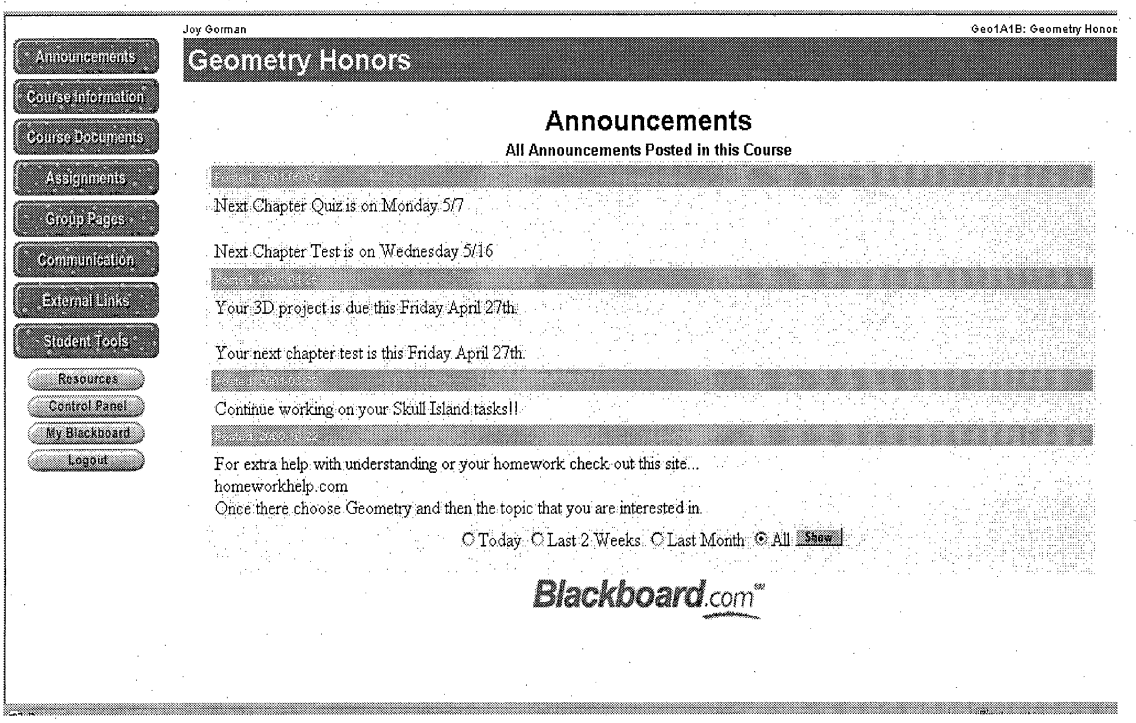
Informed about child how often?	Daily	Weekly	Monthy	When problem	
	1	17	2	5	
Difficulty talking with child's teacher?		V. Diff.	Difficult	Easy	V. Easy
		1	4	11	3
		Yes	No		
Interested in improving comm. lines?		24	1		
Do you have Internet access at home?		24	1		
Do you have Internet access at work?		16	9		
Email address for me to use.		21	4		

APPENDIX D

GEOMETRY HONORS ANNOUNCEMENT

PAGE

GEOMETRY HONORS ANNOUNCEMENT PAGE

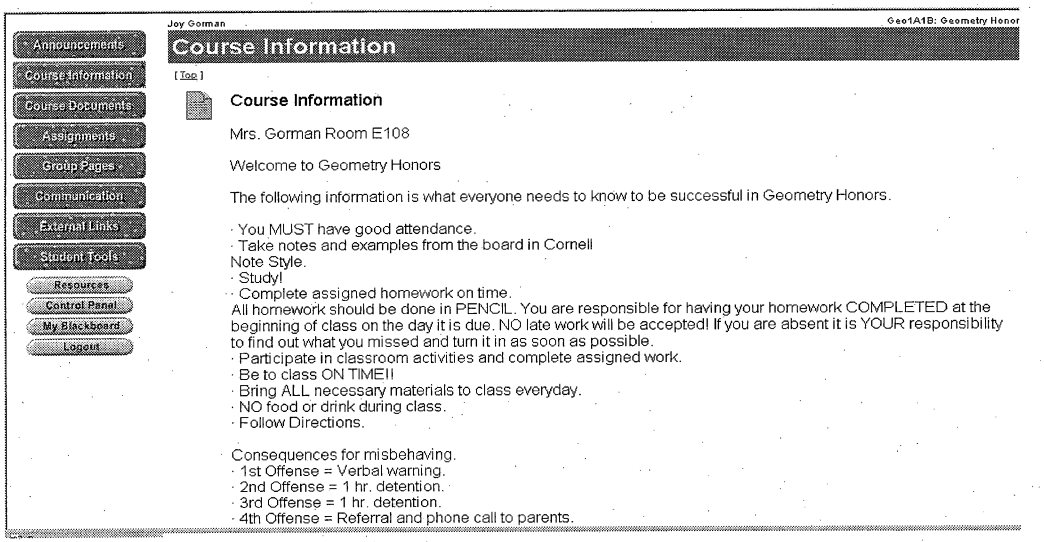


APPENDIX E

GEOMETRY HONORS COURSE

INFORMATION PAGE

GEOMETRY HONORS COURSE INFORMATION PAGE



Supplies you need everyday:
· Textbook
· Notebook and PLENTY of paper, lined and graph
· Plenty of pencils and erasers
· 3X5 index cards and ring
· Recommended supplies include a scientific or graphing calculator.
These will be available in class, but may not be taken home.

Grading Policies

Grading Policy is as follows:
· Focus lessons, homework, tests, quizzes, projects, and extra credit will be graded on a point system. Final grades will be determined by a proportion of total student points to total possible points.
Tests – 60%
Quizzes – 15%
Homework/Focus lessons – 15%
Notes/Participation – 10%
Projects/Classwork/Extra Credit – varies depending on assignments.

** Percentages vary slightly during the second semester due to Skull Island **

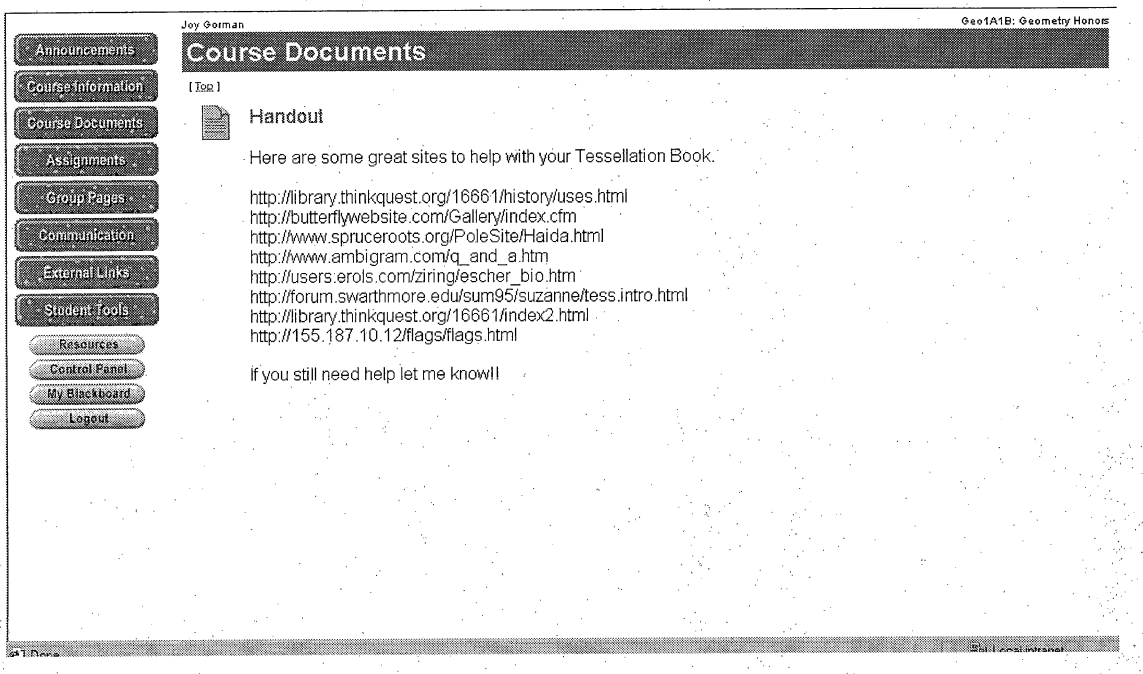
· Grading Scale: Citizenship Grade:
A = 89.5% - 100% Classroom behavior/attitude
B = 79.5% - 89.4% Being prepared daily
C = 69.5% - 79.4% Work ethic
D = 59.5% - 69.4%
F = 0% - 59.4%

APPENDIX F

GEOMETRY HONORS COURSE

DOCUMENTS PAGE

GEOMETRY HONORS COURSE DOCUMENTS PAGE

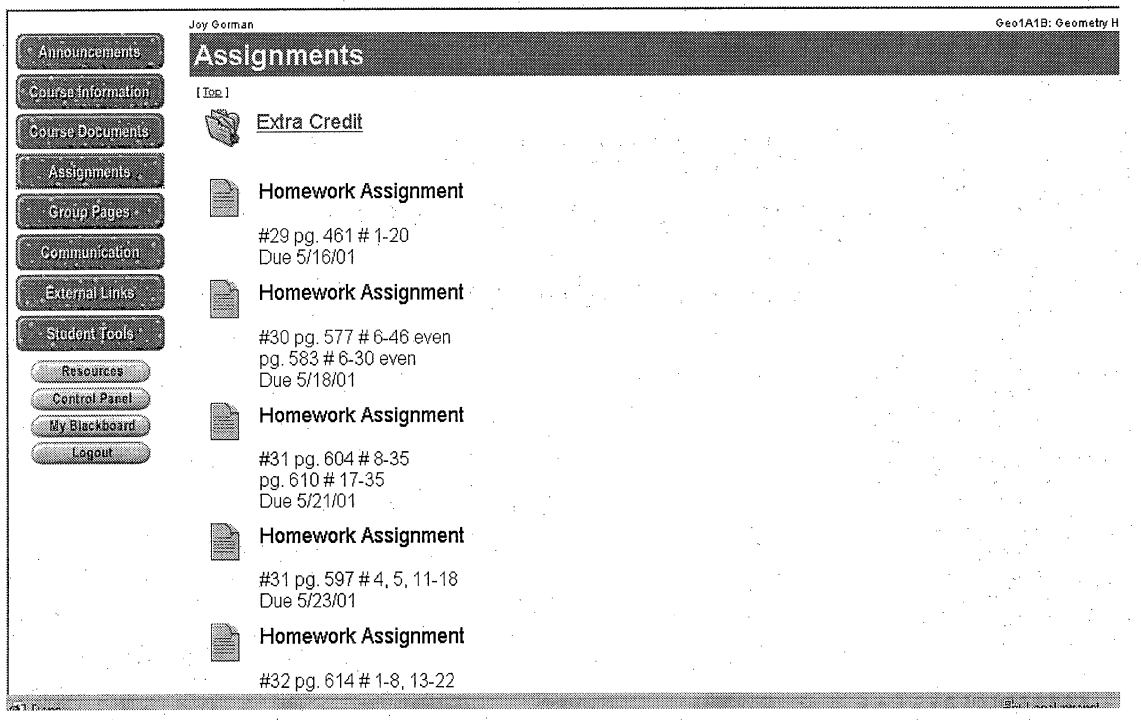


APPENDIX G

GEOMETRY HONORS ASSIGNMENT

PAGE

GEOMETRY HONORS ASSIGNMENT PAGE

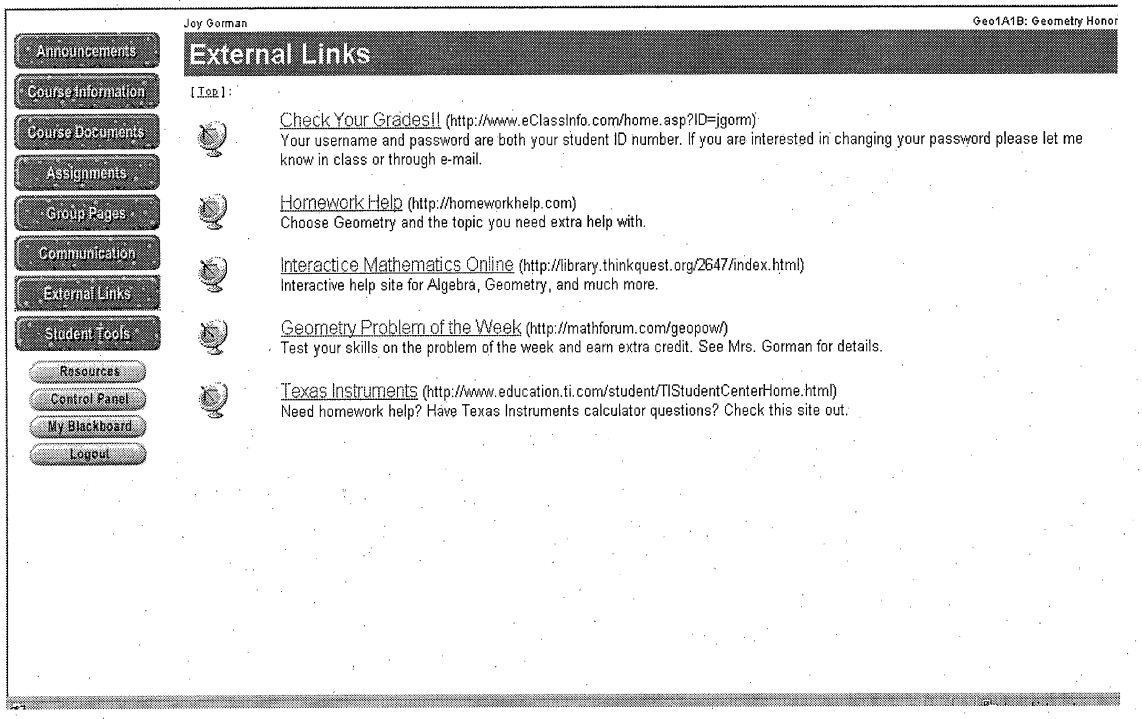


APPENDIX H

GEOMETRY HONORS EXTERNAL LINKS

PAGE

GEOMETRY HONORS EXTERNAL LINKS PAGE



APPENDIX I

WEB BUILDING SITES

WEB BUILDING SITES

www.Geocities.com

www.ePals.com

www.eClassroom.com

www.webct.com

www.homestead.com

www.domainvalet.com

www.blackboard.com

REFERENCES

Azzara, J. (2000). Training teachers for technology. Principal, 79(3), 22-25.

Barron, A., & Hynes, M. (1996). Using technology to enhance communication in mathematics. Yearbook (National Council of Teachers of Mathematics), 1996, 126-136.

Battista, M., & Van Auken Borrow, C. (1997, October). Shape makers: A computer microworld for promoting dynamic imagery in support of geometric reasoning. Proceedings of the Annual Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education, 19th, 571-578.

Beattie, R. (2000). Miles to go before we sleep: Supporting technology in education. Syllabus, 14(2), 54-58.

Bowers, J. (1997). Analyzing students' learning with computer-based microworlds: Do you see what I see? Proceedings of the Annual Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education, 19th, 611-617.

Chin, S., Hortin, J. (1993). A survey on the perceptions of elementary teachers' use of technology and the implications for inservice. International Journal of Instructional Media 20(4), 317-318.

Corona-Norco Unified School District. (2000-2001). High school course catalog. Norco, CA: Author

Drier, H., Dawson, K., & Garofalo, J. (1999). Not your typical math class. Educational Leadership, 56(5), 21-25.

Espinosa, L., & Chen, W. (1996). The effect of teacher inservice training on technology and multiage grouping: Year one evaluation of constructing and networking for multiage learning project. Journal of Computing in Childhood Education, 7(1-2), 13-38.

Faucette, E. (2000). Are you missing the most important ingredient? A recipe for increasing achievement. Multimedia Schools, 1(6), 56-62.

Friedman, E. A., Dr., Jurkat, M. P., Dr., & Pinkham, R. S., Dr. (1991). Enhancing mathematics education through computer integration. T. H. E. Journal, 19(2), 72-75.

Gerzanick, R., Lanoza, C., & Nolan, R. (1982). Microcomputer remedial instruction. The Computing Teacher, 10(2), 50-52.

Haas, K. (2000). From teachers to teacher mentors through staff development. Multimedia Schools, 7(1), 42-46.

Halpin, R. (1999). A model of constructivist learning in practice: Computer literacy integrated into elementary mathematics and science teacher education. Journal of Research on Computing in Education, 32(1), 128-138.

Harvey, F. A., & Charnitski, C. W. (1998, February). Improving mathematics instruction using technology: A Vygotskian perspective. Reports - Evaluative (142) - Speeches/Meeting Papers (150), 151-158.

Hauben, M. (n.d.). Behind the net; The untold history of the ARPANET. Retrieved January 2001 from http://www.dei.isep.ipp.pt/docs/arpa.html

Johnson, D. (2000). Teacher web pages that build parent partnerships. Multimedia Schools, 7(4), 48-52.

Morrow, C. (1999). Ensuring that all children are powerful technology users. Mathematics Education Dialogues, 2(3), 7.

Nicaise, M., & Barnes, D. (1996). The union of technology, constructivism, and teacher education. Journal of Teacher Education, 47(3), 205-212.

Parr, J. (1999). Extending educational computing: A case of extensive teacher development and support. Journal of Research on Computing in Education, 31(3), 280-291.

Vannatta, R. (2000). Evaluation to planning: Technology integration in a school of education. Journal of Technology and Teacher Education, 8(3), 231-246.

Wang, Y. (2000). Training teachers using computers: a process of familiarization, utilization, and integration. T.H.E. Journal, 27(10), 66-74.

Web site keeps teachers, parents and students on track. (2000, October). T.H.E. Journal, 28(3).

Yerushalmy, M., & Gilead, S. (1997). Solving equations in a technological environment. Mathematics Teacher, 90(2), 156-162.