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How Middle and High School Educators and Students Adapt to the Challenges of Advancing Technology

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A thorough review of the literature was used to examine whether our middle and high school educational system is adapting to the technological changes in a constructive or destructive way. The research not only identified critical issues indicated within the literature review but also issues that remain controversial and those that have not received much consideration. The cultural diversity of not only our schools but the whole society as well offers a great magnitude of challenges. This review emulates the diverse responses by those men and women whom have experienced and worked with the educational systems. The benefits and burdens technology brings to the table for all school districts reflects the responsibility students and educators have when deciding which technology to implement into the learning experiences. Technology is and should be integrated into educational programs so that it benefits the majority of all students.

Dedication

Clarence James Young Jr.

"CY" is my father who passed away six years ago.

He has been my inspiration throughout my studies at

Saint John Fisher College and this research thesis as well.

How Middle and High School Educators and Students Adapt to the Challenges of Advancing Technology

Information technologies offer the school systems unprecedented opportunities to expand education's capacity of interpretive inquiry and learning. It provides degrees and modes of intellectual growth that can go far beyond what the educational structure makes available. The inevitable technological challenges, which bring positive and negative impacts and has a ripple affect on the students within the educational organizations. (Clark, 2006). The media-saturated culture of our schools presents a unique set of challenges to the whole educational system. Within each culture the students, teachers, parents and administrators all have essential decision to make regarding the changes technology brings. This is an interesting and revealing issue throughout the school districts across the nation. Each culture will have to incorporate and tolerate diversity and transition with much care and responsibility. These lessons of forbearance are the hopes that can be learned from this informational examination. The consequences of technology both positive and negative will influence all of our lives challenging us now and into the future. The trust and anticipation education has on us all depends greatly on the use of our growing technological advances. Not only what and why but how technology is integrated into the educational systems is the foundation for this thesis research paper.

Literature Review

How technology is incorporated into the educational system is an important factor in determining what new technological advances enter and why. Mathematics, science and technology all will benefit from the developments of technological improvements, however the vast challenges technology brings with it is significant to the educational environment.

Surveys consistently find that experts and the population as a whole believe that technology should be integrated into educational programs (Clark, 2006). Questions as to how and when to use technology in the classroom, however, is still a matter of debate, particularly as it applies to mathematics and science (Guerrero, Walker and Dugdale, 2004; Liu, 2006). Integrating technology into the school program is not a new idea. (James, 2000) Integrating technology into other subject areas is also not a new idea (James). In fact, the importance of providing opportunities for students at all grade levels to makes connections between content areas has been emphasized for many years (James, 2000). Yet studies have indicated that students are not, in fact, making the kinds of connections that are important for their future (James, 2000). Technology has been suggested as the link, the tool that could support this goal. As this report shows, despite numerous barriers, technology is being used by a growing number of teachers of middle and high school to support instruction in many disciplines, including math and science, and research into its use shows promising results.

The practical implications of incorporating existing technology in K-12 education are complicated and present significant barriers to integrating technology. Barriers include both systemic and individual components including: 1) lack of teacher training, 2) cost factors, 3) conflicting views held by experts on the role that technology should play in education, and 4) the lack of consensus on how to integrate technology into the educational system. (Barnes, 1999).

Firstly, teachers often lack the necessary training to make the best use of today's available technology. Teachers who are less comfortable will not incorporate electronic technology into their class instruction (Guerrero, Walker & Dugdale, 2006). At the same time middle school teachers face the added pressure of high school expectations that middle school students will graduate from middle school with the knowledge and skill to use computers (Guerrero, Walker & Dugdale, 2004).

Secondly, it is very expensive to have even one computer per two or three students in each classroom and school systems often cannot meet the financial challenge. Studies show that very few classrooms have enough computers for their students (Lawrenz, Gravely & Ooms, 2006; Guerrero, Walker & Dugdale, 2004). Lawrenz, Gravely and Ooms conducted a large study on the use of computers in classrooms that included surveying principals, teachers and students at all grade levels (Lawrenz, Gravely & Ooms, 2006). Principals and teachers both reported a lack of sufficient numbers of computers for math and science classes as the primary barrier to "achieving excellent science and mathematics education" (Lawrenz, Gravely & Ooms, 2006, p. 133). This means that even teachers who would use the

technological tools in their classrooms cannot do so (Guerrero, Walker & Dugdale, 2004). Additionally, the rapid pace of technological advancement makes it difficult if not impossible for schools to continuously have state-of-the-art technology.

To further confound the situation, schools and teachers get contradictory messages about using technology. For example, in 1989 the National Council of Teachers of Mathematics (NCTM) wrote that students should have calculators available to them (Guerrero, Walker & Dugdale, 2004). In 2000 the Mathematics Framework for California Public Schools issued a statement that technology might do good but it also might do "immense perhaps incalculable harm" (Guerrero, Walker & Dugdale, 2004, p. 5). This fear was partially attributable to the Third International Mathematics and Science Study that found students in nations at the top in math achievement used calculators less than students in nations whose achievement was below average (Guerrero, Walker, & Dugdale, 2004). In 2000 the NCTM also issued a statement in which it cautioned schools in how they use technology while simultaneously calling "electronic technologies – calculators and computers – essential tools for teaching, learning and doing mathematics" (Guerrero, Walker & Dugdale, 2004) and indicating that "using technology is one of the six principles of high quality mathematics" (Lawrenz, Gravely & Ooms, 2006, p. 133). Some states have also issued statements advising a more limited use of technology than what the NCTM promotes. Each state, each county and each district adapts differently to the use of technology in the school.

Lastly, an individual's attitude about technology in education and how best to use it is impacted by the role the individual plays within the system. Clark

conducted a Delphi study to learn how different stakeholders thought technology should be used in high schools (Clark, 2006). Four Delphi panels were used including teacher leaders, administrators, researchers and policymakers from different states (Clark, 2006). Although all panel members overwhelmingly believed it was very important to have technology right in the classroom, there was little consensus on how to do it. In round one, 34 practices were identified. Of these 34 practices, seven had consensus including "having a reliable infrastructure" and "having access in the classroom" (Clark, 2006, p. 481). Four items gained consensus in round two including "project based learning" (Clark, 2006, p .481). In the last round, only one practice, "having technology plans that address short term and long term goals" gained consensus. (Clark, 2006, p. 481).

The study demonstrated that researchers and teachers tended to respond similarly. While administrators and policy-makers were more likely to respond differently when asked to rate the importance or effectiveness of items (Clark, 2006). Teachers and researchers tended to rate items lower than did administrators and policymakers (Clark, 2006). This is not surprising given the classroom micro-perspective that teachers would have as compared to the entire-school or school system macro-perspective that administrators or policymakers would have (Clark, 2006). What is significant however is that all parties agreed on the importance of problem-based learning and that schools need both short and long-term plans for using technology to support instruction.

Yet, despite these and numerous other barriers, innovative technology use within the K-12 educational system has been advancing steadily. (Lawrenz, Gravely and Ooms, 2006). In their 2006 large scale study of the use and helpfulness of computers in the classroom, Lawrenz, Gravely and Ooms found several statistically significant results regarding computer technology use. The investigators found that computer use was lower in middle schools as compared to high schools. (Lawrenz, Gravely & Ooms, 2006). Computers were generally thought to more helpful in mathematics classes compared to science classes. (Lawrenz, Gravely & Ooms, 2006). Captivatingly, girls reported computers were more helpful than boys (Lawrenz, Gravely & Ooms, 2006. p. 133). The study also showed out of the entire sample of teachers surveyed, only 20% used technology on a regular basis "to enhance understanding or to explore concepts in more depth and to gather and organize information" (Lawrenz, Gravely and Ooms, 2006, p. 133).

Although the above study indicated a general consensus that computers were more helpful in math than science, the appropriate use, if any, of technology in math classes is still a sharply debated topic (Guerrero, Walker & Dugdale, 2004). On the one side are those who are enthusiastic about the possibilities and on the other side is an argument that students will not be able to compute on their own (Guerrero, Walker & Dugdale, 2004).

Investigators found that middle school mathematics teachers are not as open and enthusiastic as are high school teachers when it comes to using sophisticated

calculators and computers (Guerrero, Walker & Dugdale, 2004). Some think that students will not learn what they need to learn and that the "technology will somehow negatively impact their students' understanding and learning of mathematics" (Guerrero, Walker & Dugdale, 2004, p. 5). Students, on the other hand, have very positive attitudes towards using technology (Guerrero, Walker and Dugdale, 2004). In fact, some studies have shown students' attitudes towards learning improve when computers are used (Guerrero, Walker & Dugdale, 2004). They also had more self-confidence when working out math problems (Guerrero, Walker & Dugdale, 2004).

How technology is used in math classrooms has changed significantly since the 1980's when computers were used primarily for routine drill-type exercises (Guerrero, Walker and Dugdale, 2004). In the 1990's the computer was used more as a tool for problem solving and research (Guerrero, Walker and Dugdale, 2004). Technological advances to date include such things as graphing calculators that are used in middle school math classes (Guerrero, Walker & Dugdale, 2004). Although there have been studies as late as 1999 that reported computers were still being used primarily for drill and practice, the trend is to use technology in the classroom to facilitate a student's ability to study concepts to enhance understanding or to explore concepts in more depth and to gather and organize information (Guerrero, Walker & Dugdale, 2004).

Jim Pukys, a middle school math teacher, uses interactive technology in his classes (Cavanagh, 2006). Pukys used to follow the standard practice of asking

students if they understood the algebra lesson he just delivered but there were always those students who did not understand but said nothing (Cavanagh, 2006). Now Pukys, writes out a function and asks students to find its value (Cavanagh, 2006). Students have to send their responses electronically from their calculators and the responses are flashed on a screen in the front of the room (Cavanagh, 2006). This is immediate feedback for both teacher and students on their level of understanding. The teacher, equipped with this crucial information, can then choose to repeat the lesson or provide more examples.

The entire school district in which Jim Pukys teaches is using this kind of technology in math classes (Cavanagh, 2006). They use TI-Navigator and graphing calculators from Texas Instruments (Cavanagh, 2006). In the two years since beginning to use these electronic tools, "the math scores in the 6^{th}, 7^{th}, and 8^{th} grades on the Ohio achievement test … have risen, nearly doubling at some schools" (Cavanagh, 2006, p. 10). Prior to that, the district was below the state average in math (Cavanagh, 2006). The school district is now initiating the same technology in their high schools and anticipating similar results (Cavanagh, 2006). This type of use of innovative technology provides the students immediate feedback; they can correct their errors before they become ingrained habits. It also provides necessary information for the teacher in assessing the student in the class.

Although Lawrenz, Gravely and Ooms, (2006), reported that technology was more helpful in mathematics as compared to science, technology has been successfully used in science classes. (Lawrenz, Gravely & Ooms, 2006). A study

by Slykhuis & Park (2006) reported successful use of online resources to teach a high school physics class. Physics is not an easy class for most students however the authors of this study identified four variables most associated with success in physics. In order of importance they are "math ability, attitude towards physics, word knowledge, and study habits" (Slykhuis & Park, 2006, p. 147). The investigators wanted to find which variables could predict success in high school physics and if the method of instruction delivery had any effect (Slykhuis and Park, 2006). The two groups in the study were composed of one group who received instruction in a computer-based laboratory where they worked in groups and where the instructors offered a great deal of assistance and the other group that received Online instruction with no direct assistance from an instructor (Slykhuis & Park, 2006). The unit was on kinematics and the course lasted for two to four weeks. (Slykhuis & Park, 2006).

The investigators and surveys found that 56% of the variance in post-test scores was related to "current matb classes" (Slykhuis and Park, 2006, p. 133). It is interesting to point out that the variance related to classes in progress as opposed to prior completed math classes (Slykhuis & Park, 2006). There was no significant difference between the achievement of students who received more personal help and those who had to rely totally on the online instruction and peer group interaction (Slykhuis & Park, 2006). This study demonstrates that students who receive physics instruction completely online do as well as students who receive their primary instruction online but have the benefit of adult instructor assistance.

One of the controversies surrounding the use of technology in K-12 education stems from the belief that students will not learn as much using technology as they will when receiving direct instruction from a teacher. This study seems to contradict this argument.

One issue facing both math and science teachers is students' preconceived notions about their ability to succeed in those classes and their often negative attitude towards math and science. Sometimes students develop negative attitudes towards a subject based on the experiences they have had in the past. Liu, Guerrero, Walker & Dugdale , discussing science in middle school, said "[e]arly experiences with science can be expected to have an effect on the likelihood that students would pursue science in later grades" (Liu, et, al. 2006, p. 225). These researchers investigated "the effect of a computer-enhanced problem-based learning (PBL) environment" (Liu, et, al. 2006, p.225). They were looking specifically at achievement, attitude and self-efficacy. Self-efficacy has to do with an individual's belief that they can or cannot do something (Liu et al. 2006). If an individual does not believe they can successfully complete an assignment, the self-fulfilling prophecy will most likely come into play. Thus, a student's attitude about self will have a direct impact on degree of success.

Problem-based learning is a model that has been used successfully in higher education institutions (Liu, et, al. 2006). Although it is a very complex approach to education and there has yet to be a great deal of literature on this model for K-12 education (Liu et al), those involved in all aspects of education, from teachers to

policy-makers, agree that problem-based learning is an important development in efforts to improve our educational delivery system (Clark, 2006). The process of problem-based learning involves a problem being presented to students and they must use different resources as well as complex thinking processes in order to solve the problem (Liu et al). The approach is based on the process student's use rather than on the results (Liu et al). The process of solving the problem is more important than the outcome. Liu and colleagues believed that computer-enhanced problem-based learning could be successful in middle schools (Liu et al). To test their theory, they had a group of 549 sixth-graders participating in this approach to learning (Liu et al). The study resulted in a "significant increase in science achievement from pre-test to post-test" (Liu et al, 2006, p. 225). There was also a significant increase in self –efficacy scores (Liu et al, 2006). There was no significant difference in students' attitudes towards science between the pre-test and post-test (Liu et al, 2006). The authors pointed out that the attitude towards science were already "above the mid-point of the scale (Liu et al, 2006, p. 225). The found a positive correlation between attitudes toward science and self-efficacy. (Liu et al, 2006). In terms of achievement, the high self-efficacy group had higher science achievement scores (Liu et al, 2006). This study demonstrated that the problem-based learning model can be effective and successful even at the sixth-grade level when the approach is supported by computerized programs. This is an important finding because problem-based learning is such a powerful approach for student learning and retention. The program the researchers used was Alien Rescue

(Liu et al, 2006). The fact that students had far greater science knowledge after using the program is testimony to its effectiveness.

Reeve (2006) discussed the challenge of introducing a new technology course in the middle school technology education program. One of the criteria for effective technology programs is that it "integrates math, science, and other subjects" (Reeve, 2006, p. 25). The author comments that technology courses need to work towards technology literacy as well as need to make conneetions between content areas including math and science (Reeve, 2006).

Clark commented that technology has not had a great impact on schools (Clark, 2006). Despite the NCTM"s encouragement for mathematics teachers to use technology, both sophisticated calculators, computers and the internet, at this point the problem isn't so much that technology is being used inappropriately, it is that technology is not being used at all in many settings. A review of the literature however also indicates that despite significant institutional and individual level barriers, technology programs continue to be created, studied, refined and implemented bearing promising results. Given the importance of technology's role in supporting other disciplines, its unique place in the world as a whole, and its potential role in helping students make connections between content areas, technology development and use in K-12 education have become an essential element in 21st century education.

Methodology

The procedures and methods that were used are standard procedures conforming to the policies within our district at Honeoye Central School. All observations and conversations took place in the general classroom setting. This study is interesting and necessary for the development of our school district to grow and be responsible as well as proactive.

Population of Participants:

During the course of the daily teaching activities the observations and collected data from middle and high school classrooms were routine. The population used to analyze the adaptations to the use of technologies in the classroom environment consisted of eighteen random middle and high school classroom environments. The technologies available are standard selections from educational settings in the normal school districts. It was assumed that these technologies were directed towards children of the middle and high school years because they appeared in most standard classrooms. The technologies that were developed for high school students were mostly within the information and communication areas. These technologies were directed towards the high school level because they were used mostly in research for projects in their curriculum. There was approximately one computer for every four students at the middle school level and three students for every available computer for the high school level. This was done by looking at the classes offered and without consideration of who is teaching the class and who the students were in the classroom. No bias was used in choosing classrooms to be observed. A list of specific technologies that were looked at can be found in Appendix A.

Materials:

The next step was to select aspects of the technologies to look at. A data sheet was used for each technology to look at various elements used in the classrooms. The hardware elements that were looked at were the use of computers directly used in the classroom environment. Two other things that were looked at were the use of projectors to communicate information to the students as well as the use of laptop computers or a mobile lab. These specific technologies were looked at because they help to create a type of communication with fewer distractions. This is done by combining the different technologies together to enhance the type of atmosphere in each separate classroom. A structural analysis was used so that the various technologies could be observed and compared.

Procedure:

Each classroom was carefully analyzed to see what types of technologies were used and why. The observations of these classrooms were needed to see if there were differences in the ways that teachers used the technologies to communicate the curriculums. These observations and comparisons can help to find solutions to the following questions: Is there a similarity in the use of computers in the classrooms that require essays and term papers? How the use of computers is similar/different compared to each group as a whole? These same questions can also be asked for the use of projectors, whiteboards, laptops and videos. Is there a similarity in the use of a particular technology to teach the curriculum? How do the students adapt to the technological tools in the classroom compared to those classrooms without the advancements? How do the

students generate ideas with and without technologies? The use of the collected data hopefully will help teachers understand and discuss the usefulness of various technologies used so that comparisons can be made with as much information as possible.

The methods used here have been explored thoroughly in each setting. The classrooms were selected randomly and the teachers were all asked before the observation took place. There were limitations on the time available for observations. The assumptions of teachers and students were addressed before the observations took place. The range of validity and strength of each teacher and teacher assistant using the technologies was clearly identified and discussed before the examination took place. The data was measured by observation within the classrooms. The improvements of each individual situation were left up to the personnel involved.

Results

The results of the survey of a combined middle and high school facility indicated that there were 48 computers available to 359 senior high students or one computer for every 7.5 students. There were 243 students in the middle school and a total of 14 computers, or one computer for every 17 students. Sixty-six percent of middle school classrooms did not have any computers in the classroom accessible to students. Sixty-six percent of the high school classrooms also did not have any computers accessible to students. All of the classrooms were equipped with a television or they had access to a television on a rolling cart. All televisions were capable of playing video tapes but not DVDs; 27% of the teachers had purchased additional equipment so that they could show DVDs.

There were a total of four projectors for teacher power point presentations to be shared between the middle and high school. These were to be reserved in advance and checked out through the office. Zero out of eighteen classrooms had access to white boards. One hundred percent of the teachers, however, did have laptops that were issued by the school district to each individual teacher.

Teacher interviews indicated that 54% of middle school teachers used technology on a weekly basis, while 46% used information technology only on a monthly basis. In the high school, four of the six teachers used technology one to two times a week while two teachers used technology on a daily basis.

All teachers reported that they perceived no drawbacks to the use of computers, though two teachers made a conscious effort to keep its use limited. Eighty-eight

percent of teachers reported they utilized technology only as part of the curriculum requirements rather than as a tool for creative instruction or measurement activities. Only 28% of the teachers reported they included information technology as a component of their lesson plans. Seventy-two percent of the teachers reported that the use of computer technology improved student knowledge acquisition while 28% believed it did not have a positive impact.

All six of the high school teachers believed the use of information technology improved their student's performance on high stakes tests, while only one of the twelve middle school teachers believed this was the case. When asked to describe the benefits of technology in the classroom, 39% of teachers reported that the use of computer technology enhanced student understanding of material, 33% reported it gave students greater access to information, an 11% believed technology was an important tool for students to have in today's work environment. The teachers reporting positive benefits were the same teachers that provided their students with access to information technology as a regular part of their lessons.

Fifty percent of the teachers wanted to have more complete and up-to-date computer labs in the school, and 28% reported that they would like to see more mobile labs that could come to the classroom. Zero percent of the teachers indicated that they wanted more computers in their classrooms. One-hundred percent of the teachers interviews stated that they had not had enough training on the many uses of the computer and how to integrate it into their lesson plans.

Fifty percent of the class sessions observed utilized a television or computers that were either in the classroom, part of a mobile lab, or in the library. None of the teachers used projectors to make a power point presentation or any other sort of information technology except for computers and televisions. All the students in the classes that were using computer technology appeared to be engaged and enthusiastic when using them. In each of the nine classrooms the teachers reported that their students requested access to a computer before it was offered. According to the teachers, the majority of student requests were for using the internet and the remainder of the requests related to course specific software.

Discussion

Technology has shaped the human experience dating back to mankind's earliest discovery that sticks and stones could be used as tools to accomplish things in the world that human bodies alone could not. As a crucial driving force in the evolution of man, technological advancements have moved us from an agriculture based society to an information based society. But when surveys consistently find that experts and the population as a whole believe that technology should be integrated into educational programs (Clark, 2006), we need to ask what is meant by the word technology. Technology is not necessarily synonymous with computers or information technology although it is quite often used that way; the word technology can be used to describe a system of production, an object such as a piece of equipment or tool, or a certain skill set or knowledge base.

What experts and the population as a whole mean when they state that technology should be integrated into educational programs, therefore, can be interpreted in at least two ways, each with its own set of challenges, implementation strategies, purposes and controversies. The New York State Department of Education's Mathematics, Science and Technology (MST) Standards distinguish two separate but interrelated meanings of technology. (nysatl.nysed.gov/standards) In the Technology Standard 2: Information Systems, "[s]students will access, generate, process, and transfer information using appropriate technologies". (nysatl.nysed.gov/standards) The term technology, as used in MST Standard Two, refers to the use of computer technology to obtain, sort, analyze, and communicate

information, this is the technology of information. In MST Standard 5: Technology, "[s]students will apply technological knowledge and skills to design, construct, use, and evaluate products and systems to satisfy human and environmental need". (nysatl.nysed.gov/standards) As used in MST Standard 5, technology refers to a knowledge base or set of skills, that when applied, may lead to the development of a process or object. Technology in the MST Standard 5 sense of the word has been a recognized and necessary part of education for centuries. For example, technological advancement in boat building capability made exploration of faraway continents possible and the discovery of steel and its the many applications had a world changing impact on the strategies of war and shifts in world power.

When experts and the population as a whole state that technology should be integrated into educational programs, it is therefore most likely that they are referring to computer technology and the world of information made available to us through the internet. Advancements in information technology have exponentially increased our capacity to collect and analyze information in new and different ways, expanded and changed the means by which humans communicate, and in the process created both challenges and opportunities that sometimes have cultural, ethical, and moral implications.

Similar to the impact that the first written word had on man's ability to communicate and preserve information, computer technology and the Internet in particular have exponentially increased mankind's capacity to communicate and preserve information. Information systems technology offers unprecedented

opportunities to expand education's capacity of interpretive inquiry, to increase students' ability to connect content areas so that education becomes more reflective of and applicable to real life, and to develop systems of increased accountability for student and teacher outcomes. The actual use of existing technology within one rural middle and high school however, suggests that we have much to accomplish if we are to realize these benefits.

As is the case with much technological advancement, there exist challenges, and the integration of information technology into education is proving to be no exception. Questions of unequal access are raised when students in affluent communities have access to information technology not available to students in schools located in lower socio-economic communities. The results of this research arguably suggest just such a conclusion. Just as Lawrenz, Gravely and Ooms found in their 2006 study, very few classrooms in the middle and high school I studied had adequate computer and other information technology readily available for the students. (Lawrenz, Gravely & Ooms, 2006). The consequences of unequal access may leave behind those very students that most need the advantages that information technology can offer.

Access issues are not the only challenges faced by educators trying to integrate information technology into the educational process though. Moral challenges are raised by the increased availability of materials or information generally regarded as unacceptable for minors such as pornography or gambling. Ethical challenges are raised in numerous contexts, one of which is the potential for teachers to use computer-based instruction as a substitute rather than a support for engaging students in

classroom discussions and learning opportunities. Misuse or overuse of computers was not a problem that was found in this research. In fact, most teachers simply did not incorporate information technology in their lesson plans except as mandated by the curriculum.

The use of information technology in education is not only impacted hy economic issues that may hamper equal access; cultural values influence its use and impact as well. With increased access to information comes student exposure to diverse cultures, beliefs, values or behaviors that may be in sharp contrast to their own. Student and parent reaction in turn is influenced hy societal and cultural values and these values may either engender greater understanding or create increased hostility.

Although the majority of the population referred to in Clark (2006) thought that technology should be integrated into the education system, there are some parents and even some teachers that believe the use of informational technology takes away from a student's time to learn and the teacher's time to teach those skills that a student must acquire if he or she is to grow up to be a productive adult. As evidenced by actual use patterns, some teachers are resistant, if only in a passive way, to the introduction and regular use of information technology in their classrooms. This is consistent with research conducted by Guerrero, Walker and Dugdale where they found that educators held different opinions as to the usefulness of computer technology in the classroom (Guerrero, Walker and Dugdale, 2006). Some argue that the internet is unsafe; some parents have decided that they will not permit the technology into their homes because it is destructive to family life and encourages

solitude rather than togetherness. Additionally, with increased access to information and information systems, privacy concerns and the increased risk of tracking students are controversial issues. Even given all the apparent potential controversies, none of the teachers reported any drawbacks to information technology being integrated into middle and high school education.

Conclusion

This paper reviewed existing research on the availability, application, and impact - both positive and negative - of technological advancements within the American middle and high school educational systems. There is a general consensus among educators that technology is positive when decisions regarding purchase, distribution and availability, and application are planned on both a short-term and long-term basis. Clearly the advancements in information technology have allowed educators and students to exponentially increase their capacity to collect, store and analyze information in new and different ways. (Clark, 2006).Advancements have also expanded and changed the ability of humans to communicate, permitting unprecedented opportunities to expand education's capacity of interpretive inquiry, to increase students' ability to connect content areas so that education becomes more reflective of and applicable to real life, and to develop systems of increased accountability for student and teacher outcomes. On the other hand, technological changes have also created challenges that sometimes have cultural, ethical, and moral implications. One such challenge is a student's increased opportunity to the exposure of negative influences such as pornography or gambling, or to an increased vulnerability of being identified, manipulated, and coerced by ill-intended individuals. There is also the potential for teachers to reduce their preparation for class knowing that technology can be easily accessed as a substitute. Another issue is that of unequal access, where

schools in lower socio-economic communities have less access to information technology than schools in more affluent communities.

This study consisted of observing 18 classrooms in a rural middle and high school setting, and interviewing the teachers of each class, for their use of technology. One of the most significant findings was that student access to computers was very limited, only one computer for every 10 students, and access in the middle school setting was particularly limited with one computer available for every 17 students. Another significant finding was that all of the 18 teachers reported they needed more training to apply and use technology even if it was available. A third finding was that a significant difference exists between middle and high school teacher's perception on the value of technology in helping their students increase knowledge and perform better on high stakes tests, with high school teachers consistently believing that the use of technology was very beneficial in this regard and middle school teachers only seeing limited value. Observations of students indicated a high interest rate and a solid comfort level with using technology.

It appears that providing training to teachers in the use of technology is a critical factor in its usage. It was hypothesized that if teachers felt confident in their abilities around technology they would perceive increased value in incorporating it into their 'bag of tricks', and thus would utilize it more despite their being limited access. Additional research is needed to determine why there is such a discrepancy between the application of technology in this district's middle and high school.

The results of the research clearly agree with this hypothesis. Concerning the integration of technology how to incorporate it in the educational systems and the feelings for the future research it would entail are many-sided. The area that would have been explored more in detail is the misconceptions and definitions technology puts on the table. After completing this process in its entirety the only difference that would take place is finding the exact question to inquiry about.

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