

The Relationship Between Computers and Learning:
Is There a Link Between Technology and
Transforming How Students Learn?

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Section One: Abstract

Many statements have been made in recent years that technology, when properly utilized, is capable of redirecting the lecture method of instruction into student-enabled, two-way learning environments, thus allowing the teacher to become a “guide on the side”. However, with the arrival of personal computers in the public and private school classroom, there are many obstacles to overcome. As Christians, we are called to redeem and make full use of our time (Eph. 5:16), in addition to being wise stewards of what has been entrusted to us (I Cor. 3:11-15), particularly in the financial realm (Luke 19:11-27). Because God has commanded us to subdue nature (Gen. 1:26, 28) and to use all in it for our good, we must also be careful in the way technology is used. Because computers are neutral (incapable of making right and wrong decisions), they are instruments that can be used for legitimate and illegitimate purposes. The researcher will seek to answer the question if computer usage is a legitimate means of classroom instruction. If it is, what are the barriers that need to be overcome to make existing technology more effective? In addition, the question that needs to be answered concerns computers ever taking the place of teachers in the classroom.

Section Two: Brief Review of the Literature

In the last thirty years, the advent of computer technology has revolutionized the world. The researcher can remember when computer science majors spent hours in the computer lab writing BASIC programs on white pages with blocks. He can also recall the frustration of some of his fellow classmates when a program didn't work, simply because a semicolon was in the wrong location. Oh, the agony of having to search for that missing link to making a program work. Fortunately, the researcher didn't have to worry about concerns like that!

Fast forward to today. The world has been connected via the Internet and civilization is capable of taking virtual field trips to places once only imagined, simply by the click of a mouse. Consider how far we have come to gaining access information from around the world. Once considered to be a staple of the business world, the fax machine is now almost obsolete. Look at what businesses do with a machine sitting on a desktop that is more powerful and occupies less space than the "computer" which once took an entire warehouse to do simple calculations. Even this project is being completed on a word processing software application, housed inside a machine that would be the envy of many people by today's standards. So it would be safe to assume that technology is intended to make our lives easier, save us time in the workplace, and make our lives more productive.

But how does this apply to our schools? How are computers, and the technology that is intended to accompany them, intended to prepare our students for the occupations that they will have in a few years? What about the teachers and the preparation they must have to educate our students in doing their jobs? There is no disputing the fact that computers are here to stay; there is no question that existing technology has become commonplace in a wide variety of occupations. If our students are not prepared today for the challenges of tomorrow, how can they

ever expect to survive? Is there a link between how students learn and being able to take advantage of what we have today in computers, technology, and the plethora of application software?

In the article Transforming Learning with Technology: Lessons from the Field (Rice & Wilson, 1999) the authors shared in their reflections concerning the use of technology that "...students want to use technology to learn, they don't want teachers to use it to teach them. The best thing that I have found when using technology is that students teach themselves and other students. Students seem more willing to listen to their peers." The authors were very direct in their statements that, when technology is used for proper purposes in the classroom, the creativity and openness on the part of the students was phenomenal, as they became involved in projects, very more involved in their interactions with their peers, a cooperative learning environments was created, and the students were much more comfortable in answering questions presented by their classmates. The authors also found, upon data analysis that when traditional modes of learning, such as the commonly used lecture and questioning by the teacher was used, students participation and activity dropped significantly. The authors found that the use of computers in a wide variety of settings for a social studies class greatly enhanced what they were learning, as the students began to think about their activities, what they needed to learn, and how history could be related to their everyday lives on the basis of the projects they completed.

At the end of the year, students felt much more confident that, in addition to learning history in a more meaningful format (such as through PowerPoint presentations, word processing abilities, speaking engagements and learning HTML [used in designing web pages]), they also acquired valuable skills that would be utilized in their future professions.

However, the authors were clear, as were some others, that there are significant barriers that must be overcome in order to more fully implement technology in the classroom. These barriers include the following items:

1. A lack of funding.
2. Administrative support. It is the common belief of many administrators and parents who have students in the traditional classroom that learning is taking place only when the teacher stands at the head of the class and talks the entire period. Technology, especially in the form of computer usage, is strongly frowned upon. If they do not understand the intent behind using computers, then it should not be permitted for anyone to use them. This is a strong barrier that is not easily overcome except through explanation and showing what the students are capable of accomplishing through their work.
3. Time. Because there is limited time given to each day, in addition to teachers not having the ability to implement such technology, most teachers would find it difficult to take the time to incorporate technology to a significant degree.
4. Teaching Practices. Most teachers teach in the way that they were taught, through lectures, quizzes, tests, and exams. However, the authors found that as they began to implement new teaching strategies in their classes, the students were required to start thinking for themselves, were stop being told what to think, what they needed to know, and were given the tools needed to think for themselves and to find the answers. It was required for students to interpret, analyze, and come to their own conclusions.

In the article Howard Gardner Talks About Technology (Weiss, 2000), the authors quote renowned educational theorist Howard Gardner, the guiding force behind the theory of Multiple intelligences, that technology is simply a tool that can be used in our children's education, nothing more. It is also important that simply because the computer is available for use in classrooms across America, educators are responsible to see if the trend toward their usage will help in realizing the goals that have already been determined. The authors shared that Gardner believes that emerging technologies make learning exciting (which students needs), but also that the computer medium is not intended to constitute the whole of learning, simply because people do not learn that way. Using technology that is people-friendly will adjust to what students need to challenge their thinking and cause them to become excited about learning, rather than creating another classroom generation of apathy.

In the article Facilitating a Constructivist Vision of Technology Integration among Education Faculty and Preservice Teachers (Vannatta & Beyerbach, 2001), the authors found that there are more colleges and departments of education that are seeking to develop courses on educational technology for the school room. They discovered that even though basic computer skills are developed, there is inadequate preparation in showing how teachers can use what is available in a variety of settings. As mentioned in an article above, there have been many obstacles to technology infusion in a workable curriculum, even though, through a workshop-type seminar, teachers were pleased to know that there was a wide variety of available software that would challenge student thinking rather than listening and answering simple questions. However, the teachers who participated as students at the seminar were perturbed by the fact that so much needed to be learned in an extremely short period of time. The authors felt that, in order to implement technology in the classroom more fully, the most reliable judge concerning

whether or not this would be implemented would be proficiency in instructional methods, not having a deep, detailed knowledge of every software application currently available.

Mr. Keith Dils, in his article on Using Technology In A Middle School Social Studies Classroom (Dils, 2000) enumerated concerning the usefulness of implementing existing technology in his social studies curriculum because of the possibilities of curriculum expansion and appealing to those students whom it is more difficult to reach due to learning styles. He believes that if teacher-directed lecturing methods incorporated a more broad-based appeal to the use of application software, such as exists in PowerPoint presentations, a wide base of students would find more interest in social studies and would appeal to the dynamics that appear in Howard Gardner's multiple intelligences approaches.

He found that this strong student appeal was brought to fruition with respect to student involvement in political involvement in a way that was unique to students by encouraging them to make an appeal through multimedia presentations in the real world. Because students are not involved in the representative process of elections, there is little interest and involvement for students to become active citizens later because of limited experiences now.

Through grants secured by the teacher, they were able to produce public service announcements which enabled them to see that their abilities as students could make a difference and secure positive results. As Mr. Dils stated, "the teacher further explained that students could use the computer to run comparisons between the past voter turnout and the current year's turnout. They could then develop hypotheses concerning the effect of their projects on voter attitudes. By considering the results of what they had developed, the students could recognize the impact of their efforts on the democratic process. Having students become involved in the democratic process through use of technology to increase local voter turnout is one way social

studies teachers can provide experiences that lead to the outcomes teachers are expected to achieve. Action research has provided tentative support that technology use may be effective in increasing democratic values of eighth grade students.”

But Mr. Dils did make one caveat concerning the implementation of implementing computer technology which has been echoed previously: if computer-aided learning is not used properly, then it will not help educators reach their educational objectives.

In a study written by Vicki L. Cohen concerning Learning Styles and Technology in a Ninth-Grade High School Population (Cohen, 2001), a study was completed with two high schools; one that had a great deal of technology for their students and have been listed by the researcher:

- Every classroom is equipped with overhead projection systems, a scanner, and notebook computers for student overflow.
- The school also has:
 - specialty classrooms equipped for multimedia production with video capture boards, high-capacity storage drives, and VCRs and videodiscs attached to workstations for capture of video images;
 - special PC CAD rooms and specially equipped advanced scientific equipment attached to computers;
 - a robotics area where juniors and seniors can work on special industrial projects; and
 - a distance-learning classroom equipped with two-way interactive television that can transmit to a consortium of 14 schools throughout the county.

- The layouts of the rooms are done in a conference style with workstations and informal tables designed either as a lab or located around the edges of the rooms.

The other school mentioned is a purely traditional layout, with the classes comprised of rows of seat, and the teacher lecturing from the front using an overhead projector. The rooms have very few computers, if any to be used by the students in the actual class. Technology is rarely used; when it is implemented in the curriculum, the classes are held in a traditional computer lab or media center, ensuring that there are enough computers for each student.

Based on the study completed by the authors, the AAST students were thrilled to have such a wide variety of technology available to use at their fingertips that created a high degree of relevance to their lives and future plans. However, when compared to students at RHS, the students here, although the school was known for its high academic achievement, were greatly disappointed for there being a lack of technological implementation in their everyday courses. They believed that although schooling was important, it was useful only for making plans for college or in anticipation of a future career. Even more interesting to note was this fact: on a scale of 1 to 5 with 5 being the highest, to what extent did you use technology in your classes? The AAST average was 4.5. The RHS average was 2; the RHS students frequently mentioned more use of technology as being a guiding factor of the relevance of the course work to their lives.

In another study completed by Rice and Wilson, How Technology Aids Constructivism in the Social Studies Classroom (Rice & Wilson, 1999), “technology can assist in the process by acting as a personal tool that empowers the learner to become independent. Moreover, in this process of change, technology will not be merely integrated into the curriculum or represent a merging of something new with something old, it will result in an entirely new medium with

unique characteristics, advantages, and problems. Social studies teachers must encourage their students to engage in collaborative learning, use higher-order thinking skills, construct their own knowledge about social studies concepts, and relate classroom lessons to their lives and experiences.”

The authors have found that constructivist policies, when included within the social studies curriculum via technology have been a great source of learning for the students in allowing them to obtain relevant information by reading and observing documents, photographs, transcripts, video, and audio clips. Because many students are bored with social studies as whole due to their learning being restricted to names, dates, and places, changes in technology have permitted more realistic graphics that attract young users and user information that can be retrieved, stored, and used in CD-ROM format has created a great deal of meaningful change.

Technology Use in Tomorrow's Schools, authored by Barbara Means and published in *Educational Leadership* (Means, 2000), found that professional teachers are taking great strides to use existing technology in their classrooms. However, the authors did find that the total percentage of classrooms that participate in collaborations through network leaning is still relatively small; even more shocking to realize is that there still exists a gap in providing reliable technological support structures for all those involved in the classroom (teachers and students). The barrier that must be overcome at the present is in preparing educators in knowing how best to use more effectively what does exist. Most common among educators in their students conducting research was the use of educational CD-ROMs; third in the list was research completed on the Internet. Of this population, nearly 30 percent of all the teachers, with more than 70 percent of the teachers with high-speed Internet connections in their classrooms, had their students conduct Internet research.

The author's conclusion stated that "schools that incorporate the technology of the future can offer the best combination of traditional face-to-face instruction -- role modeling, socialization, and morale building -- and projected benefits of learning with new technologies: increased participation in systems of distributed learning that engage broader communities, learning-enhancing representations of concepts and data, a restructuring of teaching and learning roles, and more meaningful assessment practices. My vision is technologically feasible--the question is whether our education system, and society in general, will support and promote the policies, resources, and practices needed to make it a reality."

Computer Technology in the Social Studies: An Examination of the Effectiveness Literature (1996-2001), authored by Whitworth and Berson, professors at the University of South Florida, presented conflicting information based on their own literature review (Whitworth & Berson, 2003). While they acknowledge that social studies technology has played an important role on various functions of human society, the technology that has been utilized has had a dramatic and immense impact on student learning. Perspectives have been broadened, and students have become more active in their global societies. Decision-making abilities and problem solving skills are being sharpened, and students have been able to view world events through the advent of the Internet, which was not possible just a few years ago.

However, the authors raised the concern found by one author that technology, as we have it in our society today, is just another expensive way to produce learning outcomes that have not changed for several years, and are best achieved through traditional means.

Yet in spite of this, the NCSS supports the use of technology in promoting vital critical thinking skills that will be needed by the students of tomorrow. Although this need is recognized, there needs to be a stronger emphasis on preparing teachers to more effectively use existing

technology, a feat which has yet to be accomplished in many classrooms. Although there has been a great deal of money spent placing computers in the classroom, many teacher do not use them. The authors believe that it begins with teacher education, such that introducing technology to a new workforce is comfortable with implementing it in the classes where they will teach, not only on a formal, instructional basis, but also informally in non-instructional use. Efforts are being made to revise national technology standards and teacher accreditation procedures.

In reviewing computer technology, one means of assessing student learning that has been considered in the past has been digital portfolios, as mentioned by David Niguidula in Picturing Performance with Digital Portfolios (Naguidula, 1997). Simply put, digital portfolio software is used to create a multimedia collection of student work and connect that work to performance standards. Schools have found what students are capable and the technology that is needed in schools that choose to implement this new assessment tool. Several aspects were raised that bear closer examination.

- Vision: What should a student know and be able to do?
- Assessment:
 - How can students demonstrate the school vision?
 - Why do we collect student work?
 - What audiences are most important to us?
 - How do we know what's good?
- Technology:
 - What hardware, software, and networking will we need?
 - Who are the primary users of the equipment?

- Who will support the system? (Technical support is often the overlooked component of a school's technology system.)
- Logistics:
 - When will information be digitized?
 - Who will do it?
 - Who will select the work?
 - Who will reflect on the work? (Because time needed for reflection is essential, time allocated on the part of both teacher and student will be required.)
- Culture:
 - Is the school used to discussing student work?
 - Is the school open to tuning standards? With whom? (What allows a digital portfolio to work is time for reflection and discussion, as well as openness of others within the community to examine the foresight and dreams of the school who stand to be affected the most by the students' education.)

Finally, we can see that technology has been instrumental in helping students learn and be prepared for the future. But does this spell the demise of the teacher? Vicki Collinson, author of Intellectual, Social, and Moral Development: Why Technology Cannot Replace Teachers (Collinson, 2001) believes that, “as student use of computers increases, teachers will be more indispensable than ever to guide the intellectual, social, and moral development of children.” It is her firm opinion that technology will not replace teachers, as they are the crucial link in assisting students how to judge informational quality, relevance, and reliable sources, in addition to setting standards for what is expected in the classroom, something that a computer is unable to achieve.

She stated, “As students gain access to and familiarity with computers, some become proficient with computers in ways their teachers might not envision. Many of these new technology-based issues involve values and judgments and are therefore moral/ethical problems.” There are such issues involved in cybercrime as plagiarism and hacking, in addition to a misuse of time on task by the students, cooperative learning skills, societal manners in working with other students in the class, and guidance from those influential individuals (such as parents, teachers, and other professionals in order to further develop from intellectual, social, and moral standpoints. In the future, there will be an increase on complex decision-making skills that necessitate morally responsible decisions. Mrs. Collinson believes that computers, however important they may be in the classroom, simply cannot be a substitute for a teacher. If learning is to remain at the center of the classroom, then students must be taught social skills necessary for developing good relationships and negotiating conflicts. Additionally, good human relationships and the resolution of difficult or complex social situations require moral judgments. And these attributes are only capable through human interaction, not taught through a computer.

Section Three: Critical Analysis

In reviewing the literature from ten different sources, the researcher will view this from the functional perspective. It is noteworthy to see that computers are becoming such an integral part of the school curriculum, as they are important aspects of almost every part of business, marketing, consumer goods, automotive manufacturing and servicing; it would be hard to determine what area is not affected by computers. For this reason, it is important that our students be given the tools needed to succeed in a global economy. The functionalist educator would view the training of computer usage in any school curriculum from the perspective that because there is a need to prepare students for their roles in society, then we need to level the playing field so that all have an equal opportunity to be successful. Students are given the opportunity, with specialized training in a wide variety of classes to be evaluated on what they are capable of doing.

For this reason, curricula should include the opportunity to be exposed to several varieties of software, many of which are easily obtainable. But because students learn from their teachers, what is being done to train our teachers through effective educational programs? How can we truly expect our students to get ahead in society if teachers do not have either the inclination, know-how, or motivation to become better prepared themselves? There seems to be several barriers that are not easily overcome in implementing effective technology on the college or graduate school levels that help prepare teachers to do their job of perpetuating effective learning activities that are meaningful to students. Traditional pedagogy and teaching techniques by our current educational faculties is seen by many students as only being effective into getting them into the colleges of their choice, so that there they may receive what they need to get ahead in life. But if the tools that are needed for successful college entrances are not being provided on

the secondary level, then it appears that the schools determine who is going to be placed in the most responsible positions of society.

When it comes to our students being able to get ahead with existing technology, our students must be treated with what they are capable of doing when we provide the computer technology in class. Simply because they do not have the necessary intelligence does not mean that they are to be held back in attaining a higher position in society. If all students are capable of doing the work, then by all means they have an opportunity to be able to make better choices and transitions for their futures.

For instance, when social studies, typically a worthless subject for many students in middle and high school, has technology and an appropriate type of project (such as designing real-life political involvement projects through PowerPoint presentations) and it is empowering to students rather than hearing lecture after lecture about simply getting involved in the political process without knowing how to go about doing this. It is not the intent of our schools to lose students in the shuffle.

In reviewing the literature, the researcher saw that many aspects of computer technology lent itself to cooperative learning and collaborative work environments. There are some cultures that work together easily. This is typically not the case in American culture where the spirit of competitiveness is the dominant factor in most classes. In what way can teachers encourage students who are not familiar with working together of students from another race (particularly where the dominant race is Caucasian)? Educators recognize that not all children start at the same level educationally, and that opportunities should be made available for everyone to learn the same material. However, inequalities are part of the system and can be difficult to overcome. This is where, in the researcher's opinion that the "hidden agenda" comes into play. Children of

all school ages are taught manners, how to act in school, habits that may help them to get ahead further in life than if they did not have them. Being able to work in a stimulating environment, such as a well-equipped computer lab, or having a wide variety of equipment in the class itself, in conjunction with classmates who want to do well may be a strong starting point. Even though our society has been headed toward the technological age for many years now, skills, attitudes, and habits that are learned will be in place long after the class is over.

But in looking at computer technology for the teacher from a functionalist perspective, in what ways are the teachers being left behind if they do not have requisite training, or have a lack of support from the administration, or the necessary funds are not available, or maybe some of these teachers are entrenched in their own particular style of teaching that they see no need of additional preparation, or there is an unwillingness to take time to learn different styles of teaching? These are not easy questions to answer. Is it possible that our students of tomorrow, in preparing for their own successful futures, will be left behind because of these unanswered questions?

The functionalist perspective believes that the investment is made in people with the intent to make them productive in society; schools are directly related to that need of society in educating and equipping students to take their place. But if there is no leveling of the playing field in that all our students have the same opportunities available to them, particularly as it relates to a computer oriented society, then they are clearly at a disadvantage from the very start.

In a review of the notes from this class, the researcher notes that equal educational opportunity is one of the areas discussed. There needs to be a tweaking of the system in order to provide a level playing field for all students. In classes that integrate computer technology, the students must start thinking for themselves, stop being told what to think and what they need to

know; instead they should be handed the tools that show them how to come to conclusions and find the answers in a collaborative environment. These students must be taught how to find the answers that will be needed in critical areas for the future through interpretation of facts, assumptions, and biases, and be shown how to analyze what they come across, and then form a reasonable conclusion based on what they have seen and learned. Computer technology enables students to have a hands-on approach that will prepare them well.

Some students may be questioning whether it is a good environment or a good intelligence quotient that gets them ahead in life. In one section of the literature review, the authors noted that, while social studies technology has played an important role on various functions of human society, “the technology that has been utilized has had a dramatic and immense impact on student learning. Perspectives have been broadened, and students have become more active in their global societies. Decision-making abilities and problem solving skills are being sharpened, and students have been able to view world events through the advent of the Internet, which was not possible just a few years ago.” This researcher asks the question “why does it need to be one or the other, but not both?”

Should not our students be given the tools to better opportunities, and let them decide where it is that they can go with their futures? There will almost assuredly be inequities in society, but is it necessary that schools be the sorting mechanism if a student wants to rise above his disadvantages and seek to have a better future for himself?

Therein lies the question for a Christian perspective of schools and what should be done in preparing our students to make a difference in the world where they live. All students have certain abilities that can be nurtured, and teachers can have a dramatic impact in working with students on an individual basis, although group work is sometimes necessary in a school setting.

We as educators know that students are varied in their individual capabilities, intelligences, and how they view themselves in society. If students want the opportunity to have technology implemented in their classes when they may not have the same in their homes, it is because these students want to learn. One section of the literature found that students, when they can use existing technology are capable of teaching themselves and their fellow peers. Students seem more willing to listen to their peers, because they have the opportunities to work together and learn together. When technology is unleashed and becomes an effective tool in the class, the creativity and openness on the part of the students was phenomenal, as they became involved in projects, very more involved in their interactions with their peers, a cooperative learning environments was created, and the students were much more comfortable in answering questions presented by their classmates. This was not found to be typically true in classes where traditional styles of learning and teaching (lecture and question formats from a teacher-directed learning environment). The authors of one study found that, as the students began to think about their activities, what they needed to learn, and how history could be related to their everyday lives on the basis of the projects they completed, that learning was enhanced and they were able to acquire skills needed for their future professions.

However, this does not discount the role of the teacher in providing guidance for the intellectual, social, and moral development of our students. Although computers and the accompanying tools are important, one of the functions of the school (or hopefully should be) is to prepare students to operate with a high degree of ethics and honesty in their dealings their with fellow man. Because teachers are the de facto agents of the state, one of the characteristics needed from our students is learning how to act and react in a just manner. They should learn how to follow the Golden Rule. In classes where there is a high degree of cooperative learning,

students learn how to work with those who are different from them. Although competition can be a good aspect of life, it is the responsibility of the teacher and the home to work together in seeing that these students learn to see each other as equals, and that even though each student has a different calling in life, every part is needed toward becoming a functioning member of society with his or her unique gifts and abilities and what they can bring.

Section Four: Christian Response

The researcher has performed a short literature review of ten documents that appear to support the general conclusion that technology is capable of making a significant impact on students' learning when utilized in any number of ways; however, there are problems that must be answered on a wide scale basis that present convincing arguments to administrators, parents (especially those in the public school sector who pay taxes for schools and the equipment in them), and students who must be prepared for the future by receiving good training now.

As Christians, we are called to redeem and make full use of our time (Eph. 5:16), in addition to being wise stewards of what has been entrusted to us (I Cor. 3:11-15), particularly in the financial realm (Luke 19:11-27). God has commanded us to subdue nature (Gen. 1:26, 28) and to use all in it for our good. However, mankind must be careful in what way technology is used. Computers are neutral; that is, they are incapable of making right and wrong decisions. But they are instruments that can be used for both legitimate and illegitimate purposes. How we use them in our classrooms for students instruction can have lasting impressions upon the lives of our students.

Therefore, in this section, the researcher proposes to defend the use of computers as a legitimate means of classroom instruction in the Christian school with the understanding that students are responsible, after proper instruction, to use them as a mean of enhancing their own thinking and place in this world in fulfilling the Great Commission of Christ.

In the book of Genesis from the passage listed above, mankind was given the command to subdue nature for his good. Perhaps this is a simplistic approach, but what is the primary item needed for a computer? Chips of all kinds; especially important to the running of the motherboard is the processor chip made out of silicon. Silicon is made from quartz, which is just

a fancy name for sand! In this respect, are we not permitted to utilize special types of sand (quartz) when they are made for a computer? Would this not be harnessing and subduing nature for the good of mankind? If God has already given us everything we need in the earth's natural elements, then we should be able to determine in what way those elements can be used for good in the Kingdom of God!

When we discuss educational technology, it is important to define the terms from several years ago in light of where our civilization stands today. Educational technologies really include any resources, in this researcher's opinion, that run the gamut of methodology, tools, or processes that are used for handling any activities involved in education. In this sense, then, the presence of a teacher, books, physical materials like alphabet blocks, display media like chalkboards and overheads, techniques of lectures or hands-on labs themselves, even the use of assessments, are all education technologies. But in practice this phrase has been used since World War II with a more restricted meaning of technologies like filmstrips, slide projectors, language labs, audiotapes, radio, and television. Since personal computing arrived in the early 1980s, the phrase "education technologies" has come to refer more to computer-based learning, later to the use of interactive videodiscs and, more recently, CD-ROMs, and within the past 2 years, to learning environments established with computer and communication technologies such as the Internet and the World Wide Web. In short, "education technologies" is a phrase commonly used to refer to whatever the most advanced technologies available are for teaching and learning in a particular era.

With respect to being wise stewards of our world and what God has given us to understand, technology is changing the "what" of learning by introducing new concepts, techniques, and tools for understanding and also making the world: for inquiry, design, and

creative expression. Many could be mentioned, some of which are CAD (computer-aided design), the origins of the universe and the vast variety of systems contained within, as well as new ways to visualize and integrate data and to carry out radically new forms of inquiry that weren't possible until recently. New computer tools for supporting learners and their naïve understandings of rate of change are providing foundations to learning calculus as early as late elementary and middle school. These were not even considered within the last twenty years.

In addition to shifting the time and place of learning through wide-area networking, new participants in on-line communities are also learning from one another across school and age boundaries, including scientists, scholars, parents, and senior citizens. Yet technology in and of itself is not a panacea for education and its applications can surely be misguided. Computers and communication technologies are clearly not solutions alone, nor do they automatically foster utopias. Think of pencils and paper and you can see the same thing would apply. It's crucial to recognize that all such tools are mediated in whatever effects they have by human goals and activities.

In preparation for the future, there is an almost unlimited litany of reasons why computer technology is essential in our classrooms. As Christian educators, we must face the fact that computers are a way of life for almost every fact of American life, in addition to nations around the world. We use computer technology in a wide array of workplaces, as a means of play and entertainment in our homes, and even in the way that we live pertaining to health and recreation. Anyone who does not believe that computers are a non-essential for our present way of life, not to mention our future, is simply burying their head in the sand. Our students must be prepared to use computer technology to the fullest or else they will face a future that is redundant and

menial, simply because they are not prepared for it, and they will be ill-prepared and out of step with the rest of society.

Furthermore, many aspects of these new technologies are exciting and empowering to learners, all learners, including increasing numbers of teachers, and there are truly good reasons to be hopeful that new designs for learning with such tools can improve education. So if we're going to get on with it, what should we do? Where should we seek out inspiration for recommended uses of technologies in education as they emerge and change? What are the models we're beginning to sense for what works, what compels learners and teachers, what might offer breakthrough opportunities for increasing access to deeper understanding and more adaptive skills for all learners?

Concerning who has access to learning and knowledge, it's a pretty fundamental question, and we're starting to see that model building and other approaches using technology in science and mathematics makes much more complex thinking and reasoning and understanding accessible to a far broader range of kids than ever before. And who creates knowledge? Not only adults, but pre-college students in the kinds of research that they can now develop and publish on the Web and other places. And where and when learning takes place, increasingly, any time, anywhere. One need only look closely at leading-edge transformations of uses of technology in society and the workplace, such as simulation modeling (Sim City readily comes to mind in understanding government and economic forces) and network-enhanced collaborative work. It's been argued that simulations and computer-based models have proven to be the most powerful resources for advancing and applying math and science since the origins of mathematical modeling in the Renaissance.

With respect to financially wise stewardship, some of the causes for inadequate preparation of a wide variety of teachers were a lack of funding for support and a lack of up-to-date computers in various programs. And in looking closely at some higher education programs for teachers, these programs lag behind K-12 schools in the acquisition of the latest computer technology and faculty training in technology is limited. Due to these limitations, education faculty are often unable to model instructional computer use in their classes, and may view computer technology as a separate content area isolated to one course rather than an approach which should be integrated throughout the teacher education program. However, one teacher was able to spend considerable time and overcome almost insurmountable barriers to implement meaningful relevant technology in his classes. Here is how this teacher describes what he did.

“The participating teacher pursued various grant opportunities and through the writing of several grants, he managed to purchase four computers for his classroom, a multimedia projector, a digital camera, two color printers, and a scanner. He applied for grants from five local and regional organizations and received three of the grants. Although he discovered more available sources, due to time restrictions these five grants were all he was able to apply for. His experience was that he was much more likely to receive funding for individual classrooms from local organizations than from regional or national organizations. A lack of funds can be a difficult barrier to overcome, but the participating teacher believed that technology could transform his classroom and he was willing to persist in efforts to fund technology for his classroom. He was so successful that he was assigned to teach the media class and managed to supplement funding for a television station. The initial startup funds for the station (\$43,000) were furnished by Cullman City. Additional money came from local businesses in the community, approximately \$20,000.” (Rice, Wilson, & Bagley, 2001)

This teacher also indicated that it took large amounts of time outside of the normal school day in being prepared. Again, let us take a look at what this teacher did, in his own words. “The participating teacher had to spend a large amount of time outside of his in-school preparation and class time in order to accomplish his goals for integrating technology, as he was not given time during the school day. He did most of the grant writing in the evenings and on weekends and when he began working on the television station, he worked early mornings and late evenings to prepare the equipment, train the students, and conduct the other activities necessary to run the station. Most teachers would find it difficult to take the time to incorporate technology to the degree which the participating teacher did, but he enjoyed working with the technology as well as seeing how it benefited his students.” (Rice et al., 2001)

In light of the tight finances that characterize many Christian schools, it would seem to this researcher that the services of a director of development could be utilized in bring the computer technology that is typically lacking up to speed so that students can learn on equipment that is comparable to what is found in business workplaces, rather than relying on donations of outdated equipment from places that no longer want or need it. Perhaps business could be shown what the students are capable of doing with the equipment that is available and be solicited to include making financial investments in the ministry of the school.

It is this researcher’s opinion that if teachers are open to implementing new ways for their students to learn, then those barriers that stand in their way will be overcome. It is interesting to note from the teacher referenced above that he sought help from local, rather than state or national organizations. It is this researcher’s opinion that if businesses and organizations have available funds to help and will stand the most to profit from future employment of graduating students within their own area, then these people may be useful in helping those teachers and

schools who are wanting to make a difference through voluntary contributions. There is nothing wrong with showing what students are capable of doing through the use of electronic portfolios if they are meaningful and relevant to what local businesses need and want.

Technologies have tremendous prospects for revitalizing the teaching profession itself. Teachers are the crucial link for the success of technology in the classroom. No amount of good software and materials is going to work without substantial teacher intervention. And so the teacher is the crucial link and we've also now come to recognize how widely neglected teachers truly are in being supported to effectively appropriate and integrate for their purposes technology in relation to new teaching standards. The computer, especially with Internet connectivity to classrooms, opens up windows onto not just new digital resources for teaching, but social resources-teachers being able to begin to convene with one another. The teacher mentioned just recently was able to secure a master's degree which was paid for through his home state. And one may ask what benefit earning an advanced degree had on him.

Like 55% of the TSPAT (Teacher Scholarship Program for Alabama Teachers) students surveyed, the participating teacher would not have taken the technology courses had they not been offered as part of a paid Masters degree. The training he received enabled him to view his classroom and technology in different ways. When asked, "If you had not been a TSPAT participant, would you have made these changes in your instruction?", he stated that "If it had not been for TSPAT I doubt that I would be using the amount of technology that I use today. TSPAT was the spark that created the interest that convinced me to use technology in my classes. I am sure that if it was not for TSPAT, I would not have used it as quickly as I have. It was the interest that I took back to my school that set

the stage for many things that have happened there. Such as our Internet lab, our school web page, etc.” (Rice et al., 2001)

When it comes to justifying the proper use of our time, computers render a tremendous service for mankind in many different respects. Although it may take some time to learn how to fully utilize the technology that exists in our culture, this can be taught by experienced teachers who have a certain degree of practical experience and/or textbook learning. Research is accomplished much easier with being able to use the Internet. Although training is needed for students to learn how to critique information and determine what is just, right, honest, and accurate, students can learn how to find information with just the few clicks of a mouse when they know where to look. Is this not a way to redeem the time that God has given us?

However, in light of all the positive attributes that may be ascribed to computers and advances in technology for our classrooms, there are problems that must be faced. This is intended to be a partial list, as there are doubtless many others that may be higher in priority than what this researcher believes.

A first and a common one is leaving teachers out. Initiatives for change that don't involve teachers as partners in rethinking educational practices and how technology might provide radically better tools are going to be a big problem. Teachers will continue to need sustained support, not only from parents and students, but especially from administration. Believing that software will replace teachers is a frequent and mistaken conception, too. The human agency in the activities of teachers helping their students make sense of the world given interpretations of their situated actions is always going to be part of good teaching. Teachers must be vitally involved in the process of helping students make good decisions with the information they read and how it will impact the world around them.

This aspect is especially important in Christian schools; teachers in Christian schools are responsible for helping parents in the educational process of their children. Parents should be intricately linked in the process of how computers are being used, and the influence that they can make in helping to bring their scholar to a biblical worldview in using the computer in its various capacities.

A second caution is replacing flesh with silicon. The point here about technology is to augment physical, hands-on learning, face-to-face encounters, not to replace it; and yet, certainly, there may be places that come to feel that interactive programs, simulations, teleconferencing, travels in cyberspace, are cheaper, more effective, and easier to conduct than the real thing. Schools, teachers, and administration must be on the lookout that they do not fall prey for such a flawed perspective.

A third problem is a focus on improving the outdated. A great deal of technology initiative only seeks to improve upon the worn-out methodologies found in the classroom from years ago. Instead, the goal is to focus and perform upon what is the best thing to do for our students. In Acts 18:24-26, Apollos was explaining Scriptural truth to believers in Ephesus. When two believers named Aquila and Priscilla heard him, they were able to explain the truth in a better way. Can this example we find in Scripture also be applied to our computer technology classrooms? In Acts 1:8, as Christians we are commanded to be witnesses. Can this not also be accomplished through the use of the Internet, which clearly implements the use of computer technology. The Christian history teacher can have a tremendous impact in helping the students under his/her tutelage to understand how cultures believe and understand, and what can be done through various forms to reach these groups for Christ.

Fourth, we should beware teaching the tools rather than using the tools for inquiry. No more computer literacy courses! Because our present youth understand how to use a computer even more effectively than the adults, they should be taught how this instruments can be used for strengthening their mental processes in a way that prepares them for critical thinking that is needed in today's real world. For those teachers who are unsure about how to use a computer, technology courses abound in computer stores across this nation that are reasonably priced and very effective. Student and teacher minds alike must be strengthened for the rigors needed for the fast-paced world in which we live. I Peter 1:13 instructs us to gird up the loins of our mind. This researcher believes that although this applies primarily to our Christian walk, it also has a further application to what we are capable of doing academically as well. In verse sixteen of this same passage, we are instructed to be holy, as God is holy. This is where teacher interaction is essential, even vital, with our understanding that a computer is a neutral object, incapable of making right and wrong decisions.

Fifth, we must highlight using the computer as a high-tech babysitter. There's way too much low-grade use of computers now, running videogames and now aimless Web surfing without educational guidance. Suffice it to say that the classroom must move beyond mindless activities under the guise of educational technology, as the world zips by us and we are found left sitting on the wayside, unable to catch up. There are many communities of learners that integrate the best of current Internet communication tools. Among these are email, listservs, Web pages and newsgroups. They are incorporated into a Web-based graphical, multi-user virtual environment that simulates and extends face-to-face, real-time collaborative learning and mentoring situations. Geographically-distributed teachers can meet and learn from one another via diverse levels of interactivity in a virtual office. Participants may have an office assigned or

"built" for them there, and bring in various informational resources for joint review or mentoring with colleagues and others (such as text and graphic "overheads," class notes or plans, articles, Web pages). Whiteboards in meeting spaces may be written on, erased, and saved as meeting archives along with textual discourse that participants contribute to a meeting.

In addition to these locations available online, there is a plethora of websites available for downloading lesson plans, curricula, teacher and administrative helps that help teachers to become even more effective in the classroom. There are opportunities for teachers to have online teacher encounters in which they may share their experiences with other teachers, teacher professional developers, and researchers.

In closing, technology in our classrooms is a valuable, though not the only, resource in helping our students to learn even more effectively than they are at the present day. From a social studies perspective, let us close with what could transpire if we as teachers, administrators, and schools could visualize as a learning community.

The use of presentation software (e.g., Microsoft PowerPoint or Apple Hyper-Studio) can enhance lectures covering the recent history of the Republican and Democratic parties. Video clips provide another means to reach visual learners. A vicarious experience, watching a clip of Jimmy Stewart's filibuster in *Mr. Smith Goes to Washington*, enabled eighth grade students, in an otherwise isolated classroom, to take a trip to the Senate floor. In another example, after a class debate on the removal of President Nixon from office, a video clip of Nixon resigning at the end of the Watergate scandal connected, in a powerful way, the classroom discussion with what actually happened. Finally, rather than merely talk about what it would be like to experience Martin Luther King's power as leader during the civil rights movement, the viewing of his "I Have a Dream" speech, at a

critical time in the lecture, helped bring to life that moment in history. By utilizing this technology, a three-minute clip of a video inserted in a crucial time in a lecture/discussion can help fulfill what Dewey has described as a "quest for something that is not at hand."

Virtual reality goes at least one level above multimedia in terms of perceptual richness and locus of control. The primary difference is in intent; multimedia is a representation, whereas virtual reality is a simulation, intended to fool the senses into believing that the participant is perceiving their "physical" body to be in another place. And yet, it is the reintegration of the body in the search for knowledge that provides such a compelling tour de force to the technology...This last point is particularly powerful in education. By bringing our bodies back into the search for meaning, we can at long last become fully, not just intellectually, integrated.

The value of using the computer in a middle school history or social studies classroom is that it helps to diversify the curriculum and, therefore, reach the various learning styles of middle school students. Augmenting traditional teacher-centered approaches with the use of PowerPoint presentations can effectively reach verbal, kinesthetic, and visual learning styles. However, as with any learning activity, if computer-aided learning is not used properly, then it will not help educators reach their educational objectives.

Whether teachers are to use computers in support of constructivist learning experiences or more traditional teacher-centered learning experiences, it should be done in a way that increases the attainment of educational objectives-not merely for the sake of using technology. Therefore, with either learning approach, the thoughtful application of

computers in a middle school classroom can be an excellent way to reform the educational process so that learning is more likely to take place. (Dils, 2000)

Section Five: Conclusion

Computers in the classroom help to diversify the middle school curriculum not only by providing constructivist learning experiences, but also by enhancing the more traditional teacher-centered instruction. Although the traditional teacher-centered approaches of lecture/discussion are effective for students who are verbal learners, the computer can augment presentations so that students with other learning styles are more effectively reached. Constructivism encourages active, rather than passive, learning and the use of group-based cooperative learning activities. Many types of activities can be used in the social studies classroom to incorporate the use of technology to promote constructivist learning. The activity promotes the use of higher-order thinking skills, collaboration with classmates and individuals from another culture, and construction of knowledge about another culture. The activity has relevance for the students because they examine and relate aspects of their own culture to other cultures. In order to achieve these goals, technology integration activities must be connected to course content, objectives, and assignments.

Practicing teachers are usually skeptical of reforms originating from outside the classroom and often find more valuable ideas coming from teachers who are actually attempting to implement reform. But for those teachers who are desirous of technology implementation should be capable of observing their instructors model technology integration, be required to develop technology-rich lesson/unit plans, and complete several assignments using technology. Further, it is recommended that all education majors be required to take educational technology courses that provides step-by-step instruction on a variety of computer applications and hardware.

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