

2010

# Technology in the Classroom an Educator's Guide to Technology & Learning

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TECHNOLOGY IN THE CLASSROOM  
AN EDUCATOR'S GUIDE TO TECHNOLOGY & LEARNING

A Project Report  
Presented to  
The Graduate Faculty  
Central Washington University

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In Partial Fulfillment  
of the Requirements for the Degree  
Master of Education  
Master Teacher

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by  
Joseph Lawrence Bishop  
July 2010

## ABSTRACT

### TECHNOLOGY IN THE CLASSROOM: AN EDUCATOR'S GUIDE TO TECHNOLOGY & LEARNING

by

Joseph Lawrence Bishop

June 2010

The need for an educational technology manual was researched. Based on research a resource handbook for understanding and using technology in the classroom was in demand. In order to meet the demand for a technology training guide for teachers, a detailed handbook was created. The handbook includes information on the following aspects of educational technology; desktop computers, laptop computers, miniature computing, visual technologies, educational software, accessibility software, the Internet, video technology, and WebQuests. The handbook is intended to be used as a technology resource for teachers K-12 in any State/Country.

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# CHAPTER I

## THE PROBLEM

### **Introduction**

It started four years ago when the author began his first year of teaching at East Valley High School, located in Yakima, Washington. He walked into a lab that was run-down, containing aging and broken equipment, compromised computers filled with viruses and spyware, and a server that was ten years past its prime. The district employs one lone technician to cover five schools and the administration building, so it was up to the author to remedy these problems. As time went by, new computers were purchased, labs were installed, a new server was purchased and security policies were put into place.

Software was installed that allowed administrators to simply reboot the computers in order to wipe off any viruses or programs students had added to the computers. Security policies were put into place to restrict students from playing games, running external software, or even change the background screens on the computers. Word began to spread about the changes being made, and suddenly, this author was in high demand. From work to personal technology questions, he was the unpaid, unofficial tech for the school. It was then that the author came to the realization that the majority of teachers in the school not only were lacking the skills to integrate technology into the curricula, but many were struggling with the basics of technology such as how to setup their own email, how to connect video cameras to their computers, and even how to open specific types of files.

It was at this moment that the author determined that his Master's project would be a technology handbook for teachers. Not one that included every detail about every

piece of technology available, but a nice well-rounded handbook where teachers could start familiarizing themselves with the technologies available for today's classrooms. While there are many informative books and websites available, this author believed that he could save other educators time and money by creating this handbook, and in turn, hopes to encourage educators to utilize technology in their classroom in hopes of creating a constructivist environment that challenges students, encourages them to use higher-level thinking skills, and eradicate digital divide in the classroom.

### **Rationale**

There are several reasons why the author has chosen to create a technology handbook for educators. The main reason is because he has witnessed, first hand, the lack of technical know-how in his own district. Upon speaking with other teachers across the valley he has heard similar stories; classrooms where teachers have problems simply trying to hook up a projector to their computer let alone integrate technology into their curricula.

While there are resources with excellent information spread across the web, or in books available for purchase, many teachers do not have the time or the understanding to locate and use this information. The overall goal is to create an easy to understand handbook that will help guide teachers to recognize technologies that may be used in the classroom to help create a technologically relevant, constructivist atmosphere where students may construct their own meaningful learning.

### **Scope**

The overall scope of the project is to create an educational technology based handbook that teachers may find useful in order to identify various different technologies



for the classroom, along with ideas on how these technologies can be used to achieve higher-level thinking skills in the their classroom. This project is intended as a resource for pre-service and experienced secondary teachers as they search for ways to incorporate technology and the Internet into their curriculum.

This guide was not created with specific instructions on how to use the different types of technology as there are too many variables in the classroom (teaching styles, budget, space limitations, etc.). It is written under the assumption that teachers already have access to a computer and the Internet in their classrooms and that they are familiar with the basics of computer function (such as file management, basic computer skills, etc.). The overarching goal was to introduce awareness of the digital divide and available educational technologies that may be utilized by educators to help a) bridge the digital divide, b) help create a constructivist environment where students design their own learning experiences, and c) to help educators realize that the future of education is directly intertwined with technology.

### **Limitations**

While creating the handbook, there were a few limitations that the author was faced with. One of the limitations was finding valid, peer-reviewed information for this type of handbook. Most of the information for the handbook came from industry and manufacturer websites. Another limitation for the project was the relevancy of the information presented in the handbook. Technology changes so rapidly that by the time the handbook was completed, many of the prices had already changed, and some of the technology discussed has already been replaced by new technology. However, the author believes that even if the material in the handbook is outdated, it will still give educators a

very good start in their search for classroom technologies and a very good grasp on which direction Educational Technology is headed in the future.

### **Definitions and Acronyms**

CACHE: Cache (pronounced cash) memory is extremely fast memory that is built into a computer's central processing unit (CPU), or located next to it on a separate chip (Kayne, 2010).

CAT-5: an Ethernet network cable. Used to connect computers together for communication and file sharing purposes (Mitchell, 2010).

Cathode Ray Tube (CRT): also known as a picture tube. Used in televisions and monitors until replaced by LCD technology (Bellis, 2009).

Capacitor: a tool consisting of two conductive plates, each of which hosts an opposite charge. These plates are separated by a dielectric or other form of insulator, which helps them maintain an electric charge (Kietzman, 2010).

CMYK: Short for cyan, magenta, yellow, and black. It is a color model describing how the four colors work together to form other colors. Typically a model used in print. "Unlike RGB (red, green, blue), which is used for creating images on your computer screen, CMYK colors are "subtractive." This means the colors get darker as you blend them together" ("CMYK", 2010, para. 1).

Constructivism: a philosophy of learning founded on the premise that, by reflecting on our experiences, we construct our own understanding of the world we live in. Each of us generates our own knowledge with which we use to make sense of our experiences. Learning, therefore, is simply the process of adjusting our understanding to accommodate new experiences (Cohen, 2001).

CPU: Central Processing Unit also known as the Microprocessor or processor. Also referred to as the “brain” of the computer.

Critical Thinking: ability to apply reasoning and logic to unfamiliar ideas, opinions, and situations (Upton 2010).

Digital Divide: refers to the gap between those who benefit from digital technologies and those who do not benefit from digital technologies (Smith, 2010).

Doc Cam: or document camera. Similar to older overhead projectors but instead of writing on a clear plastic sheet, document cameras transfer images of what ever is underneath the camera through a projector onto a screen.

Filters: An automated effect in a graphic design program which may dramatically alter the images original appearance.

Gigabyte: a measure of computer data storage capacity equivalent to one billion bytes.

GHZ: Gigahertz or the measure of computer processing speed.

GPU: The processing unit on a graphic card. Also known as a graphics processing unit.

Hard Drive: a mass storage device used in computers. Computer hardware that holds and spins a magnetic or optical disk and reads and writes information on it (Swan, 2010).

HTTP: Hypertext transfer protocol. The language that websites use to display in browsers.

HTTPS: The same as HTTP but the S stands for secure. Uses 128 bit encryption for maximum online security.

Integrated Circuit: electronic circuits where all the components (transistors, diodes, resistors and capacitors) have been manufactured in the surface of a thin substrate of semiconductor material (“The Integrated Circuit”, 2009).

Internet: A worldwide network of multiple smaller computer networks. These networks communicate through a similar protocol which allows users computers to locate and send data back and forth.

Liquid Crystal Display (LCD): a type of flat panel display commonly used in digital devices.

ListServ: allows people to create, manage, and control electronic mailing lists. Each list has a topic of interest ranging from fly fishing to educational technology.

Local Area Network (LAN): a grouping of computers connected together via CAT-5 cable or wireless connections, typically within a common location.

Megabyte: a measure of computer data storage capacity equivalent to one million bytes.

Microprocessor: an integrated circuit containing the arithmetic, logic, and control circuitry required to interpret and execute instructions from a computer program ("Microprocessor", 2008).

Motherboard: the underlying circuit board of a computer. The central processing unit (CPU), Random Access Memory (RAM), hard drive(s), disk drives and optical drives are all plugged into interfaces on the motherboard. A video interface and sound card can be optionally built-in or added (Kayne, 2010).

Netbook: A small, low powered type of laptop computer defined by price, size, and power. Used primarily for web surfing and basic applications (Horowitz, 2008).

No Child Left Behind Act of 2001 (NCLB): (Public Law 107-110), is a United States federal law that aims to improve the performance of the United States' primary and secondary schools by increasing the standards of accountability for student learning by States, school districts and schools ("No Child", 2001).

Open Source: Software that is “published under licenses that ensure that the source code is available to everyone to inspect, change, download, and explore as they wish”

(Woods, 2005).

Podcasts: Audio or video programs posted online and downloaded to viewer desktops via RSS feeds (Weinberger, 2010).

Primary Sources: Original sources of information such as interviews, manuscripts, and official documents.

Proxy: A server that allows users to connect through it. The most common is to speed network traffic by caching pages or files that are requested often (Kayne, 2010) Can be used to connect to websites via an external server therefore skirting web filtering.

PT3: the Department of Education's Preparing Tomorrow's Teachers to Use Technology grant program which disperses funding for teacher technology training (“Preparing”, 2010).

RAID: technology that stores data on more than one hard drive as a protective measure.

If one hard drive fails, the RAID array can rebuild the lost data based off the remaining data on the other hard drives.

Random Access Memory (RAM): most commonly refers to computer chips that temporarily store dynamic data to enhance computer performance” (Kayne, 2010).

Resistor: a component of an electrical circuit that resists the flow of electrical current. A resistor is primarily used to create and maintain a known safe current within an electrical component. (Dellaporta, 2010).

RGB: Short for red, green blue. It is a color model describing how the three colors work together to form other colors. Used to display on computer monitors. “Since RGB

colors are used for light, not pigments, the colors grow brighter as you blend them or increase their intensity” (“CMYK”, 2010).

**ROUTER:** A piece of hardware that routes network traffic. Allows users to share internet connectivity or connect two or more computers together.

**RSS Feed:** “RSS stands for "Really Simple Syndication". It is a way to easily distribute a list of headlines, update notices, and sometimes content to a wide number of people (“What is RSS”, 2010, para.1)

**SMART Board:** also known as an interactive whiteboard, the SMART board is “...a device that, when used with a computer and some type of large video display, makes the surface of the display become touch sensitive in some manner and allows it to be used to control the computer” (Criswell, 2010, para. 3).

**Transistor:** a three terminal, solid state electronic device. An electronic component used in a circuit to control a large amount of current or voltage with a small amount of voltage or current (Jones, 2010).

**Webinar:** An online interview or seminar typically presented with video and audio.

**WebQuest:** an inquiry-oriented activity in which most or all of the information is found on the Internet (Dodge, 2001).

## CHAPTER II

### REVIEW OF THE RELATED LITERATURE

#### **Technology Defined**

Technology is a broad term that refers both to artifacts created by humans, such as machines, and the methods used to create those artifacts. However, the word “technology” is most often used to refer to high technology, such as computers and cell phones, rather than technology in general (Anissimov, 2009). San Diego State University’s Department of Educational Technology defines technology as, “wise use of systems, environments, tools, products, and strategies that can enhance human learning and competence” (“Educational Technology”, 2000, para. 1). “With the prevalence of cell phones, e-mail, the Internet, and technological systems purported to make our work more efficient, accurate, and dynamic, there is no doubt that technology is changing our personal and professional lives” (Caillier & Riordan, 2009, p.490).

Integrating technology into the classroom and providing all students with access to up-to-date equipment, and high-quality content is a necessity in American schools. Teachers and students need to have access to current and useful educational technology for the following reasons:

- Technology can increase student achievement by reaching various different learning styles and promoting high-level thinking skills (Honey, Culp, & Spielvogel, 2005, p. 8)
- Technology (used properly) may help educators foster a constructivist environment (Nanjappa & Grant, 2003, para. 1&2).
- Technology can provide students with necessary job skills demanded in today’s marketplace (Hansen & Hansen, n.d., para. 7).

- Access to technology should be equal for all students; there should be no digital divide in the school system (Clinton & Gore, 1996, p.3).
- Technology can help teachers to create interesting and relevant lessons and units, and may be useful in furthering their own learning (“How Technology Helps Teachers”, 2009)

### **Multiple Learning Styles**

In 1983, Harvard professor Dr. Howard Gardner created a theory of multiple intelligences that many educators have adopted as a mold for educational design. This theory is labeled Howard Gardner’s Multiple Intelligences Theories. Dr. Gardner believes that every person has at least one of nine learning styles or intelligences:

- 1) Linguistic intelligence: sensitivity to the meaning and order of words, or verbal learning style.
- 2) Logical-mathematical intelligence: ability in mathematics and other complex logical systems.
- 3) Musical intelligence: the ability to understand and create music.
- 4) Spatial intelligence: the ability to "think in pictures," to perceive the visual world accurately, and recreate (or alter) it in the mind or on paper.
- 5) Bodily-kinesthetic intelligence: the ability to use one's body in a skilled way, for self-expression or toward a goal.
- 6) Interpersonal intelligence: an ability to perceive and understand other individuals -- their moods, desires, and motivations.
- 7) Intrapersonal intelligence: an understanding of one's own emotions.
- 8) Naturalistic: an understanding of nature and classifications.
- 9) Existential: Spiritual, the ability to ponder life, death, and alternate realities (Guignon, 2010).

Gardner believes that multiple intelligences rarely operate independently. “Rather, the intelligences are used concurrently and typically complement each other as individuals develop skills or solve problems” (Brualdi, 1996, p.2). Otherwise stated, “All normal



individuals possess each of these skills to some extent; individuals differ in the degree of skill and in the nature of their combination” (Kumbar, 2006, p.4).

McKenzie believes that educational technology and Gardner’s Theory of Multiple Intelligences are cyclical. He states, “...technology supports the accommodation of multiple intelligences in the classroom, while at the same time, the Multiple Intelligences Theory offers a strong theoretical foundation for integration of technology into education” (2005, p.31). Yet, educators must be aware that the goal of educational technology is not using technology as a cure all for student achievement (or for the sake of using technology), but rather as a tool to help students succeed by reaching multiple learning styles and promoting high-level critical thinking skills.

Gardner explains, “When one is simply typing on one’s keyboard, one can “think” in spatial, musical, linguistic, or bodily intelligences” however “technology does not necessarily improve education” (1996, p.33). Gardner believes that technology may enable students to “engage rich, textured material in ways that give a more rounded understanding” and that students will “be encouraged to think more creatively and critically by encountering material and master that goes beyond summary text” yet warns against using technology as a solution to America’s educational problems (1996, p.33). It is up to individual teachers to set their own educational goals and determine how they can implement technology to help them reach those goals.

Therefore, it is important that educators understand that simply adding technology to their lesson plans will not necessarily mean that deep understanding is occurring. As stated by Riley, the 1993 United States Department of Education Secretary, it is not about the technology teaching the students, but rather the “...effects

that technology has on what is learned and the teaching and learning roles within the classroom” (1993). The goal of educational technology is not to provide yet another means to drill and kill content, rather to enhance and provide higher learning opportunities. These opportunities may be highly interactive and content-rich filled with video, audio, simulations, and lessons which will not only capture students’ attention, but will keep their attention.

McKenzie offers several examples of different digital technologies that may be used to reach Gardner’s various multiple intelligences. Verbal: keyboards, email, voice recognition devices, and text bridges. Logical: graphic calculators, FTP clients, gophers and search engines. Visual: monitors, digital cameras, camcorders and scanners. Kinesthetic: keyboards, mice, joysticks, assistive devices. Musical: speakers, CD-ROM discs, CD-ROM devices. Intrapersonal: online forums, real-time projects. Interpersonal: chat rooms, instant messengers, Internet forums. Naturalist: floppy drives, thumb drives, file managers, semantic mapping tools. Existential: virtual reality, virtual communities, blogs, wikis, and simulations (2005). How educators use these tools to meet different Intelligences is up to the educator. There is no correct formula to suit each and every situation in every classroom as there are too many variables involved.

Dickinson, founder of New Horizons for learning, and one of Gardner’s advocates presents several different ways that technology may enhance Gardner’s learning styles. Verbal: the use of computers and the Internet to access scores of relevant information including user-friendly computer programs and assistive technologies which may provide learning opportunities for students with handicaps such as deafness, physical handicaps, and blindness. Logical-Mathematical: software programs that provide “challenging

opportunities to exercise and develop higher order thinking skills that are essential in problem-solving” (1998). Kinesthetic: keyboarding and use of mice and touch screen computers. Interactive games and simulations also provide kinesthetic learning opportunities.

Visual-Spatial: slides, overhead transparencies, doc cameras, videos, camcorders, televisions and interactive systems help students move from passive observers to active participants in the lesson. Musical: artificial music creation programs, digital instruments, CD's, videos, and even video games can be used to reach those whose primary learning style may be musical. Interpersonal: working in small groups on projects including connecting with other students via the Internet and networks, messenger programs, webinars, and email pals. Intrapersonal: using and creating databases, creating individualized learning and personal growth plans, portfolios and student reflections, intelligent tutoring systems, online classes, and search engines. Naturalist: being able to visit locations and see different things without having to actually travel. Sites such as national geographic online and DVD's such as Planet earth allow students to explore the natural world (Dickinson, 1998).

Using technology can not only help educators meet students individual needs while reaching different intelligences, but it can increase deeper knowledge of the content area as well. It may also be used to create a constructivist environment where students construct their own knowledge of subject matters, which in turn will provide meaningful understanding and deeper connection to the material.

### **Bloom's Taxonomy**

In 1956 Benjamin Bloom, an Educational Psychologist from the University of Chicago developed a classification of levels of intellectual behavior important in learning named Bloom's Taxonomy (Churches, 2010). The purpose of Bloom's Taxonomy was to categorize and classify levels of intellectual learning that commonly occur in the classroom setting (Waxler, 2005). The idea behind Bloom's Taxonomy is that there are six levels of thinking skills, starting with lower level thinking skills and leading to subject mastery or higher level thinking skills. Each level must build upon the former level in order to gain deep understanding. This process is similar to the scaffolding technique in which the scaffolds facilitate a student's ability to build on prior knowledge and internalize new information (Van Der Stuyf, 2002).

Bloom organized his taxonomy from the lowest level of thinking skills, knowledge, followed by understanding, application, analysis, synthesis, and finally with evaluation ranking as the highest level of thinking skill. In the 1990's two former students of Bloom's, Lorin Anderson and David Krathwohl revised Bloom's Taxonomy and restructured it, along with verbs for each section, to provide educators with ideas on how to reach various levels of Bloom's Taxonomy within their lesson plans. This new taxonomy lists from lowest ranking to highest ranking as 1) remembering, 2) understanding, 3) applying, 4) analyzing, 5) evaluating, and 6) creating (Churches, 2010).

The general idea behind Bloom's Taxonomy is that human beings must be able to remember before they can understand. They must then understand before they can apply the information, apply before they can analyze, analyze before they evaluate and evaluate before they can create. The following are verbs aligned to Bloom's Taxonomy by section:

1. Knowledge (Remembering)

Recognize, define, describe, identify, label, list, retrieve, name, locate, find.

2. Understanding

Summarize, interpret, predict, execute, infer, paraphrase, classify, compare, explain.

3. Application (Applying)

Experiment, calculate, construct, implement, execute.

4. Analysis (Analyzing)

Order, explain, differentiate, achieve, compare, organize, deconstruct, attribute, outline, discover, structure.

5. Synthesis (Evaluating)

Rank, assess, conclude, action, check, hypothesize, experiment, judge, test, detect, monitor.

6. Evaluation (Creating)

Combine, plan, compose, actualize, design, construct, produce, invent, devise, make, create (Forehand, 2005).

The goal of educators should be to teach students critical thinking and high-level thinking skills by attempting to incorporate analysis, synthesis, and evaluation into lessons and unit plans. This is important as “the advent of the Information Age has made the development of problem solving, critical thinking, and higher-order thinking skills crucial to future success” (Hopson, Simms & Knezek, 2002, p.109). According to Hopson, Simms and Knezek, recent studies have suggested that designing an environment that fosters a disposition for critical thinking is more important than simply using technology in the classroom. They further state that a restructuring of the classroom needs to take place (2002). Restructuring should include the use of computers

and other educational technologies to provide active learning, authentic tasks, challenging work, complex problem solving skills, and higher order thinking skills.

This restructured classroom would focus on learners constructing knowledge, rather than simply ingesting and recapitulate information. Sophisticated equipment and tools would be used to stimulate the students to rise to higher levels of Bloom's Taxonomy. There would be collaborative interaction with peers, and evaluation systems would measure complex, higher-level thinking skills rather than simple recall. (Hopson, Simms & Knezek, 2002). What the authors have described is very similar to a constructivist learning environment in which technology is utilized to help students achieve higher success and critical thinking skills.

### **Constructivist Learning Environments**

Constructivism, or often referred to as constructivist theory, is an educational theory that believes that people construct their own understanding and knowledge of the world through experiencing things and reflecting upon those experiences. In a constructivist environment, the focus is on the learner rather than the teacher (Thanasoulas, 2002). While the constructivist model may sound like a relatively new educational theory, its roots are actually hundreds of years old. "As a philosophy of learning, constructivism can be traced at least to the eighteenth century and the work of the Neapolitan philosopher Giambattista Vico, who held that humans can only clearly understand what they have themselves constructed" (Powell, 1994, para. 2). Other researchers such as Vygotsky, Piaget, Papert, Bruner and Dewey have similarly made significant contributions to the constructivist theory (Nanjappa & Grant, 2003).

While Vygotsky, Piaget, Papert, Bruner and Dewey all contributed to the constructivist theory, not all of their theories were aligned. Papert's research focused primarily on "how knowledge is formed and transformed within specific contexts, shaped and expressed through different media, and processed in different people's minds" as where Piaget's constructivism focused on what children are able to achieve, at different stages of their development (Ackermann, 2001). In simpler terms, Piaget believed that children develop in fixed, sequential stages as where Papert thought that environment could affect learning, and that the stages are not always fixed. Vygotsky theorized that human development is far too complex to be able to define it in stages as suggested by Piaget; that social and environmental influences could alter cognitive development. So, while Piaget saw cognitive development as solely from within, Vygotsky focused more on external influences and their effect on learning and development ("Piaget's Model, n.d.).

Dewey believed that "knowledge emerges only from situations in which learners have to draw them out of meaningful experiences" and that these situations are best when working with a community of learners, constructing their knowledge together (Thanasoulas, 2002, para. 5). Similarly, Bruner philosophized that "learning is a social process, whereby students construct new concepts based on current knowledge" (Thanasoulas, 2002, para. 6). One who is familiar with the constructivist theory can understand how all of these researchers have contributed to the model as the constructivist theory focuses on the learner constructing their own knowledge through experiences and reflection upon those experiences. This often takes place working with

other learners in a social context with each member positively contributing to the learning process.

In the article titled, “Learning, Technology, and Education Reform in the Knowledge Age”, Trilling and Hood present what skills will be necessary in the “knowledge age” or the “information age” that they refer to as the “Seven C’s.” These include critical thinking, creativity, collaboration, cross-cultural understanding, communication, computing, and career learning and self understanding.

Table 1 Seven C’s of the Information Age

<b>Seven C’s</b>	<b>Component Skills</b>
Critical Thinking & Doing	Problem-solving, Research, Analysis, Project Management, etc.
Creativity	New Knowledge Creation, “Best Fit” Design solutions, Artful Storytelling
Collaboration	Cooperation, Compromise, Consensus, Community-Building
Cross-Cultural Understanding	Across Diverse Ethnic, Knowledge and Organizational Cultures
Communication	Crafting Messages and Using Media Effectively
Computing	Effective Use of Electronic Information and Knowledge Tools
Career & Learning Self Reliance	Managing Change, Lifelong Learning, and Career Redefinition

(Trilling & Hood,1999)

Many of these skills that are considered by the authors to be “information age survival skills” are skills that are the focus of both constructivism and educational technology.



Critical thinking and problem solving are essentially the core of the constructivist theory as well as a primary goal of Bloom's Taxonomy. Students use critical thinking skills to construct their own learning, which in turn will build their problem-solving, research and analysis skills. These skills are necessary in today's workforce. Creativity is a key part of a good constructivist environment as students are constantly creating and modifying new knowledge to form solutions to complex problems. In a constructivist classroom, students collaborate with others to generate solutions to posed problems. Students learn about cooperation, agreement, build socio-relationships and learn communication soft-skills necessary for today's workforce.

While perhaps not the exact type of communication that Trilling and Hood refer to, students are still building communication skills while working in groups and interacting with the teacher. This can be taken to the next level by posing questions that require students to contact professionals in the field via email, telephone and Internet webinars. Computing, if incorporated properly, will help reinforce the skills that employers are seeking in today's society as well as giving students who may not have had access to those types of technology the chance to learn skills employers require.

Proper inclusion of constructivism and technology can promote desire in students to become life-long learners. Instead of followers, constructivist classrooms transform students into leaders who seek answers to problems and build a curiosity that may not be present in a direct instruction classroom. According to Nanjappa and Grant, "...by focusing on the learner, the role of technology can support new understandings and capabilities, thus, offering a cognitive tool to support cognitive and metacognitive processes" (2003, p.2).

Constructivism is all about inquiry, exploration, autonomy, and personal expressions of knowledge and creativity. As a result, constructivist approaches to learning and teaching are becoming more widely accepted in school settings because they shift instruction from passive to active learning and to authentic tasks. Computers are good tools for such expressions since they allow for exploration and highly creative and individualized self-expression. If technology is used effectively as a tool for creative work, students can be more autonomous, collaborative, and reflective than in classrooms where the technology is not present. (Burns, Heath & Dimock, 1998, p.2)

However, the authors warn “While technology has the potential to transform classrooms, this change doesn’t occur automatically. In some classrooms, computers sit idle, becoming expensive dust collectors” (Burns, Heath & Dimock, 1998, para. 2). If implemented properly, technology can help students not only reach the top of Bloom’s Taxonomy, but can also help students construct their own learning.

Specific technologies, such as the Internet, can be a useful tool in the constructivist classroom. The Internet allows learning to be student-driven, interactive, experiential, and collaborative all of which have been long time goals of constructivist educators (Berenfeld, 1996). With a computer network and Internet access, students can collaborate with others and have opportunities to interact with the materials. Kingham believes that for use of technology to reach its full potential, it must be integrated into meaningful projects which are part of the regular curriculum” (2000). In order to truly create a constructivist environment which utilizes different types of technology including the Internet, teachers should use technology to enhance instruction, not use technology just for the sake of using technology.

Thus, technology and a constructivist approach do not need to conflict, actually quite opposite. If computer use is diverted from merely a means to deliver instruction to one of a tool to solve problems, then constructivism can influence the use of technology, and technology can influence constructivism (Morrison, Lowther, and DeMeulle, 1999).

### **Job Skills**

It is important for educators to prepare their students to be not only productive members of society, but prepare them to become productive members of the workforce as well. According to National Center for Education Statistics, in 2008, the percentage of high school graduates enrolling in college immediately following high school graduation was 68.6 percent (2008) leaving roughly 31 percent of high school graduates who directly entered the workforce. These numbers do not take into account students who did not complete high school (eight percent) or opted to receive a General Education Degree or GED. Combining these known percentages, roughly 40 percent of high school students will choose not to enroll in post secondary education, but rather enter directly into the workforce (not to mention college students who choose to take on part-time employment). However, today's workforce is not the same workforce as it was fifty years ago. New skills, especially technological skills are a necessity to survive in today's job market. However Daggett believes that many schools are overlooking necessary training. He claims that academic skills demanded by many entry-level jobs today are at a higher level than the academic skills required for postsecondary education and that schools are turning out young adults without the skills to succeed in the workplace (2010).

Senese states, “America is changing from an Industrial age to an Information age wherein a premium is placed on the rapid acquisition, assimilation, and use of knowledge” (1984, p.5) Authors Bernie Trilling and Paul Hood state that this change truly began in 1991, when United States spending for Industrial goods, such as engines, electrical distribution, metals, mining, agriculture, oil, etc. were exceeded in sales by computers, and telecommunications goods for the first time ever, and by more than five billion dollars in sales. This year was the year that the American economy changed from one that was industrial based to one that is knowledge based, or as the authors put it, from the “Industrial Age to the Knowledge Age” (1999). From this point, technology began growing at a very rapid rate. In the first half of the 1990s, technology grew at an annual rate of 1.2 percent, but increased to 3.1 percent for the 1995-1999 period (Gorman, 2001).

In 1991, the United States Department of Labor released a SCANS report titled, “What Work Requires of Schools.” In this report, technology was identified as one of the five major competencies students needed to learn in order to become productive members of the workforce. The DOL believes that all students must be able to:

- 1) Selects Technology: chooses procedures, tools or equipment including computers and related technologies.
- 2) Applies Technology to Task – Understands overall intent and proper procedures for setup and operation of equipment.
- 3) Maintains and Troubleshoots Equipment – Prevents, identifies, or solves problems with equipment including computers and other technologies. (US Dept. of Labor, 1991)

In 2003, over 60 percent of all jobs required some sort of skills using technology (Solomon & Allen, 2003), and Hansen & Hansen agree by stating that nearly all jobs now

require a solid basic understanding of computers, both hardware and software (2010). This change from an industrial age to a knowledge age has had serious implications in both education and the workplace. “To be effective in the 21st century, citizens and workers must be able to exhibit a range of functional and critical thinking skills related to information, media and technology” (P21, 2009, p.5).

According to Trilling and Hood, “To contribute well to our Knowledge Age society, we need a new set of skills, knowledge work skills” Yet, as the authors claim, without strong societal initiatives to make the tools available for everyone, the “existing disparities between knowledge rich and knowledge poor will only increase (1999, p.3). This discrepancy is hereby referred to as the “Digital Divide.”

### **The Digital Divide & Cultural Implications**

Williams believes that the word “culture” is one of the most complicated words in the English language (1983). According to Shahnavaaz the word culture has been debated at length by both sociologists and anthropologists, for many years (2009). It is this author’s belief that due to the vast complexity of the word culture, and all of its underlying meanings, interpretations, and contexts, that one could write an entire master’s thesis simply on the word “culture.” According to the American Heritage Dictionary, one definition of culture is “the behaviors and beliefs characteristic of a particular social, ethnic, or age group” (“Culture”, 2009). Even this definition is too broad for one to simply generalize. If one was to say, all 16 year olds are part of the teenage culture, while this may be a true statement, does not qualify all 16 year olds to be exactly alike, or have similar interests, backgrounds, or belief structures. There are sub-cultures within cultures, and this is what makes the word “culture” so difficult to define.

Human beings are very complex and cannot be categorized simply by a statement or a word.

According to the 2005 US Census, 59% of White Americans had access to computer use, whether at home, work, or school. Yet, only 46% of African Americans and 38% of Hispanics had access to computers. Similarly, when questioned about Internet use in the home, 52% of Whites responded as having Internet at their homes as where only 34% of African Americans and 30% of Hispanics were able to use Internet in their homes. The 2007 US Census concluded that 72% of White Americans had at least one person living in their home who had some sort of Internet access as where 59% of African Americans and 54% of Hispanics had the same access ("US Census Bureau", 2009). While these numbers improved significantly, it is difficult to ignore that white Americans have historically had more and/or better access to computers and the Internet than African Americans and Hispanics.

This division of equality in access to technology and Internet has been labeled the "Digital Divide." The Digital Divide is most commonly defined as the gap between those individuals and communities that have, and those that do not have, access to the information technologies that are transforming our lives (Dickard & Schneider, 2009). Some may argue that this division of equity in technology is not important, as the Internet and computers are considered luxury items, however, technology is a means for knowledge and communication in the 21<sup>st</sup> century, not a luxury item, especially when experience with these technologies are required to survive in today's workforce. As stated by Mark Lloyd, Executive Director of the Civil Rights Forum on Communications Policy, "Being disconnected in the Information Age is not like being deprived of a

Mercedes or some other luxury. Being disconnected means being disconnected from the economy and democratic debate" (Dickard & Schneider, 2009, para. 5).

As Pittman believes, digital equality in education means making sure that every student, regardless of socioeconomic status, race, handicap, culture, or gender, has equitable access to educational technologies, information, and communication resources, and the learning experiences that these technologies provide (2003). The most important aspect of the digital divide is that many people of color, who are unable to afford these equipments (or may feel intimidated by them), may fall behind in many different facets or aspects of society in regards to technology... from knowledge and information to having a "digital voice" and even more important, real world job skills that include technology, which is a necessity in today's job market.

According to the National Center for Education Statistics, in 2005, over 94% of all schools in the United States had Internet access available for students to use in the classroom. Out of these schools, 97% of them accessed the Internet via broadband Internet connections. The center was also able to calculate the student to computer ratio (on average) of schools across the nation and determined that in 2005, this ratio was 3.8 students per 1 computer (DeBell & Chapman, 2006).

Even with these encouraging numbers, outlook was not always positive. Researchers such as Delia Neuman, of the ERIC research team believes that, technology and equity do not always go hand in hand and that "literature on computer equity reveals that many students--not only minority, disadvantaged, and inner-city but also female, handicapped, and rural--have been hampered by inequitable access to computers and by widespread patterns of inequitable distribution and use of computers within and across

schools” (1991, para. 3). Delpit emphasizes how this inequity could seriously effect education in the 2000’s, America’s classrooms will contain upwards of 40 percent non-white children (Delpit, 1995).

Much of the literature from the mid to late 1990s made similar claims, and while valid at the time, are now showing improvement as seen by the chart on the next page. This could be due to the fact that in the mid 1990’s, there was a very large push by government to improve and increase technology in America’s classrooms. A quote from a speech that former Vice-President Al Gore gave in 1996 read as:

Two years ago, President Clinton and I challenged America to connect every classroom -- inner-city, rural, suburban -- to the Information Superhighway by the year 2000. We challenged the nation to ensure that all of our teachers and students have access to modern computers and engaging educational software. We challenged the nation to provide all teachers with the training and support they need in order to help students make the most of these wonderful new technologies. We challenged the nation to make sure that our children will never be separated by a digital divide.

(1996, p.2)

While America did not respond by the year 2000 with only 77% of all schools having Internet access in the classrooms, it was a far cry from the 3% that was present when this challenge was made in 1994. This was especially evident in high-poverty schools and classrooms, which according to Pulliam and Van Patten improved the student to computer ratio from 6.8 students per computer in 2001 to 5.5 students per computer in 2002 (2007). Hispanic and African American students may not be given the equal opportunity to use the same technologies that white students are given. According to the



Neuman, “the most exciting computer opportunities are disproportionately available to students with the highest abilities” while low achieving and/or high risk students are less likely to be in those types of classes due to unnecessarily difficult prerequisites (2000). Most students use programs which provide opportunities for higher-order cognitive and critical thinking skills while minority and low-achieving students tend to use computers for drill and kill and practice (Resta & McLaughlin, 2003).

This is a serious issue as a “school’s failure to provide equitable learning environments for students of color would have damning implications for their academic, social and psychological development” (McShay, 2005, p 2). Yet, simply providing students with a computer and the Internet is not providing equality. The first step in ensuring digital equity for all students is a critical understanding of both multicultural education and utilizing technology in education. McShay believes this may be difficult as “Instructional technology and critical multicultural teacher education agendas are rarely pursued collectively to achieve educational goals” (2005, p.3).

Watt claims that economically disadvantaged students often use the computer for remedial work and basic skills, learning to do what the computer tells them to do, while more affluent students get to program the computers, or tell the computers what to do (1982). Often, students who come from lower-income backgrounds and do not have experience with technology, and while afforded opportunities to take the courses, may struggle due to their lack of knowledge with technology basics, subject matter, or are placed in remedial situations where they are simply reading text on a screen and answering questions the computers are asking them. This detracts from their ability to

enroll for higher level computer and technology courses which could provide them with real world job skills.

Another theory is that Hispanic and African American students choose not to sign up for courses that often utilize computer technology, on their own accord. It could be that these particular students feel intimidated by the technology, or perhaps, as McLoughlin states, it does not align with their own cultural values, "Technology is not neutral, it is imbued with Euro-American cultural values" (1999, p.233). Damarin believes that, "People of color and women have not have not been as influential in the design of technology, and that given the opportunity they would design and apply advanced technologies differently (1998).

Regardless of who has created the technology, it is pertinent that all students have equal access to training and skills in order to solidify themselves as capable 21<sup>st</sup> century workers. If it is necessary to create mandatory coursework for all students, or simply modify recruitment strategies, all students need the same opportunities to succeed. Other options are available, such as community based education and digital access through public libraries and Community Technology Centers (Johnson & Maddux, 2003). While these options are not directly related to public education, they may still be suggested by instructors and administrators as options for students who may need extra seat time that the school is unable to provide due to cost, time restraints, or lack of equipment.

Numbers and research aside, there is no surprise that educators should be concerned with the fact that they will have students who do not have technological skills and may or may not have ever used a computer, let alone other technologies. These students will require basic technology training and cannot be expected to simply log on to

a computer and start using it to its full potential. Educators will have students with handicaps and disabilities which may prevent them from fully using technology to its fullest extent in the classroom. They may have physical deformities, missing digits/limbs, vision and hearing problems, and learning disabilities. There is never a shortage of hurdles in education, and this is especially true when trying to incorporate technology into the classroom. Educators must be prepared to adapt to their environment in order to best serve the student population. However, it is not just students who may be falling behind in regards to technology training.

### **Educator's Use of Technology**

According to a 2005 United States Department of Education survey, 94 percent of public school classrooms had Internet access, compared with three percent in 1994. In respect, the ratio between computer and student dropped from 12.1 students per computer in 1998 to 3.8 students per computer in 2005 (Wells, Lewis & Greene, 2006). One need only look at these numbers to realize the trend of using technology in the classroom is dramatically increasing, especially concerning use of the Internet. Yet, even with access to the Internet and other computer technologies rapidly advancing, many teachers are not utilizing technology to its fullest extent with some not using it at all. As stated by Zhao and Bryant, considering the importance of technology in our information and technical society, lack of technology integration in American classrooms is a major concern (2006). Burke adds, "in many states, students are expected to be able to use technology before graduation from high school, yet teachers who may have had little preparation in using technology themselves are expected to teach them" (Burke, 2000, para. 2).

The United States Department of Education has stated “Federal, State and local agencies are investing billions of dollars to equip schools with computers and networks, but only 20 percent of the 2.5 million teachers in America feel comfortable utilizing these technologies in their classrooms (“Preparing”, 2009). When polled about using computers or the Internet in the classroom, 39 percent of teachers reported using computers to design instructional materials, 34 percent reported using computers for record-keeping and administrative duties, and less than ten percent reported using the technology to access model lesson plans or to perform research and other duties (Rowand, 2006).

This is a serious issue as educators are now facing new pedagogical challenges. They must design learning environments which respond to the changing needs of technology-savvy students (Schneckenberg, 2009). Even with this pressing necessity to effectively implement technology into classrooms many teachers are not using the Internet and computer technology to enhance lesson planning and instruction as often as they could or should. Strickland believes this is because teachers do not have time to effectively integrate technology into their lesson planning (2005). In addition, a survey given by the United States Department of Education showed that only 35 percent of teachers felt confident in their abilities to use technology effectively when designing curricula (Wells et al., 2006).

Even further, a study conducted in 1998 by Drenoyianni and Selwood found that 74% of teachers needed courses targeted upon software familiarization and 37% needed courses targeted on integration of software use into the delivery of curriculum subjects. Based on these numbers, one may assume that teachers do not have as much trouble

integrating technology into the curriculum as they do with trying to figure out the software in the first place. In addition, they found that the most frequent problems teachers faced when using computers in their classroom were of a technical nature (84%) and a lack of personal competence (54%). Based on these numbers...when computers break or have problems (which will ultimately happen), the majority of teachers do not seem to have the skills to fix the problems, and many admit to having a lack of training or ability to figure out computer software and hardware on their own.

Upon reviewing these statistics, there is an obvious need for significant district level support for technology integration and training. Wilburg and Butler believe that schools need administrators with vision for where technology and education are headed, along with a willingness to support necessary change in their schools in order to help create the 21<sup>st</sup> century classroom (2003). In 2005, the United States Department of Education Office of Educational Technology polled school districts regarding providing professional development and technology training. They found that nationwide, 85 percent of public schools with Internet access indicated that their school or school district had offered professional development to teachers on how to integrate use of the Internet into their curriculum (National Center for Educational Statistics, 2007). This positive start is important because as Thornburg states, “Unless effective staff development is in place, the only thing that will change when schools incorporate technology is their electric bill” (1999, p.10).

While teacher preparation programs are an important factor to promoting technology use in the classroom, it may not be sufficient in itself. For example, some States, such as Georgia and Oklahoma have required mandatory technology training for

all teachers. Yet a recent technology integration study by Zhao and Bryant concluded that while teachers believed that technology integration training was critical in helping them think about technology integration and in making attempts to use technology with students, they still needed technical and human resource support for continuous technology integration after the training (2006). They further state,

... Teachers received follow-up support from the technology integration specialist and they found the mentoring of the specialist to be the most beneficial technology integration support received after training because it catered to their individual learning needs. They felt the mentoring allowed them to expand their technology integration skills based on their current skill level, provided ideas for integrating with state curriculum standards they were currently teaching, and in their own classroom with their students. These teachers were able to integrate technology more efficiently and meet required curriculum standards without compromising limited academic time. (Zhao & Bryant, 2006, p.58)

These studies show that many teachers are having difficulties with the technology they are trying to use to improve education, and in some cases, cannot decipher how to use the technology itself let alone incorporate it into their lesson planning and curriculum development properly. As Thornburg states, "...they (teachers) will need a tremendous amount of staff development to transform their models of teaching to fit the needs of education in the coming years" (1999, p.11). To escalate the problem students are now growing up with technology that many teachers either do not possess, or may possess and find many difficulties in using.

Today's students are far ahead of their teachers in regards to using technology (National Educational Technology Plan, 1995). As Strommen and Lincoln state, "Our children have been raised in a world of instant access to knowledge, a world where vivid images embody and supplement information formerly presented solely through text" (1992, p.466). Bork agrees by adding that the needs of modern students differ from their teacher's needs (1996). Today's children have grown up with remote controls, spend more time watching television than reading, their toys are filled with blinking lights and interact with them. Malls contain digital information kiosks, video game systems bring highly interactive entertainment right to the living room, and most importantly, the children control the flow of information. (Strommen & Lincoln, 1992).

Because of the type of interactivity that children have grown up with, combined with the fact that the majority of classrooms have not changed substantially in the past 100 years, Strommen and Lincoln claim that "school strikes them as rigid, uninteresting, and ultimately alienating" (1992). Soloway believes that the most important task for educators is to embrace the future of education and help students to learn with the tools they have already been given (1991).

On a positive note, Rowand claims that newer teachers are more likely to use computers or the Internet to achieve their objectives adding that "teachers with nine or fewer years of teaching experience were more likely than teachers with 20 or more years of experience to report using computers and the Internet to communicate with colleagues, gather information for lesson planning, and to create instructional materials" (2006, p.3). One could rationally conclude this is due to younger teachers with increased knowledge

of technology. It could also be credit to increased teacher preparation at both the collegiate level as well as district professional development.

One Federal Government grant, the Preparing Tomorrow's Teachers to Use Technology Program (PT3) delivers millions of dollars annually to teacher preparation programs in order to restructure and ensure that teachers are prepared to face this changing environment. The grants support radical change at the University level and claim that "teacher preparation will involve comprehensive changes in: pedagogy, curriculum and faculty development, incentives and rewards, professional assessment and credentialing, budgeting, and support for new information technology infrastructure" (Preparing, 2009. p.2). While this does not solve current issues, change can take time. It is better to look towards the future and to remold the system rather than to band aid what needs a cast and hope the "wound" heals properly.

In summary, it is crucial that all students have access to up-to-date equipment, software and high speed Internet connections. Students need access to meaningful, high quality, culturally responsive content. Teachers need to know how to use technology, and be able to train students how to use it. While not all school districts can afford equipment and generous amounts of training, this author's goal is to produce a high quality teacher handbook that will allow teachers to familiarize themselves with the different types of technology available to use in the classroom which in turn may generate an enthusiastic response as, teachers who integrate technology into their classrooms not only help their students gain important skills, but will also help motivate them to learn (Rakes, 2006).



However, educators must remember that while computers, the Internet, and other educational technologies are popular tools, just having them in a classroom does not result in a constructivist environment conducive to critical thinking (Arnold and Keller, 2001). As former President George H.W. Bush stated, schools should use technology as a tool to improve academic achievement, but using the latest technology in the classroom should not be an end unto itself (“No Child”, 2001).

## CHAPTER III

### METHODOLOGY

#### **Introduction to Methodology**

With a strong background in Information Technology, the author entered the educational field to find that many teachers do not utilize technology in their classroom instruction and if they do, it may not be effective. Even though many teachers have multiple computers and Internet access in their rooms, they tend to use standard teaching methods such as lecture, drill and kill, and activities that only scratch the surface of Bloom's Taxonomy. With school districts committing numerous dollars to increase technology in the classroom, the author of this handbook believes that teachers should use technology to their students' advantage and to help foster an environment that promotes critical thinking skills within a constructivist atmosphere. The end product of this project was a manual that information systems (IS) trainers, Information Technology instructors, or educational technologists may use during district in-service trainings. It may also serve as a guide for high school teachers to use when creating curriculum for their classroom.

#### **Description of Methodology**

The author started by questioning his colleagues about their technology use and what they may or may not find useful in a technology handbook. One of the most common responses was information about purchasing a computer or a laptop computer. The next most common response was a need for a basic guide introducing the different educational technologies available. Many educators inquired about different types of

software available, and several had questions in regards to using podcasts and RSS technologies in the classroom.

Upon completion of this informal assessment, the author completed a review of related literature to determine if there was a need for this type of handbook. The author found that there is indeed a need for a basic introductory handbook that educators could incorporate into their arsenal of literature in attempt to familiarize themselves with educational technologies they may use in their classroom. The author also concluded that it would be useful to add information about constructivism, Gardner's Multiple Theories of Intelligence, and Bloom's Taxonomy as technology and how these theories work in tandem to create higher-level thinking opportunities in a constructivist environment.

After completing the literature review, the author began working on the handbook. This was begun by first contemplating what types of technologies teachers could use in their classrooms to help assist educators in designing a constructivist environment. The most obvious technology was the computer. The author believes that in order to understand modern technologies, individuals must first understand why it was created, as such. Included was a brief history of the computer, and how computers have evolved over the decades.

Next, the author felt it was essential for computer shoppers to understand all the different parts of the computer. By doing this, consumers could attempt to make wise purchasing decisions based on their personal and classroom needs. Therefore, the computer was broken down with information given about all the different components inside the computer. From this point, the project began to take shape, and the next two

sections involved miniaturized computers, such as laptops, netbooks, PDA's, smart phones, etc.

Once the computer was covered, in detail, the author began to brainstorm other useful technologies that can be used in the classroom. The second technology the author believed was important to discuss was visual technologies such as projectors, document cameras, smart boards, LCD televisions, DVD and Blu-Ray discs, scanners, and digital cameras. These too were placed into sections, although not in as great of detail as the computer. The author felt that these technologies were important to discuss as they not only are required to some degree to use a computer, but they also allow educators to reach students multiple intelligences.

Next, the author decided to discuss computer software available for the classroom. From office software to classroom management, graphic design, and speech recognition software, the author felt that a segment be included that was dedicated to various computer software available for education. The author then created a section about the Internet, with a short biography on how it began and information (with links included) about primary sources, finding educational videos on the Internet, using Webinars, Podcasts and RSS feeds. The author also included a segment dedicated to the WebQuest which is used in the author's current educational environment and the author has found to be an excellent alternative to standard projects.

Last, the author finished the handbook with an unplanned section on how to fund educational technology for the classroom. Although the author has never specifically written or applied for a grant, the author believed that it is important for educators to understand that there are monies available for purchase of educational technology. The

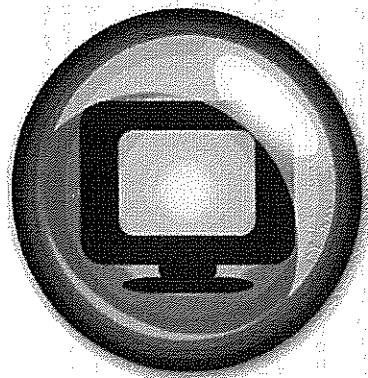
author listed several resources to where educators can find grants, along with additional information about grant writing, including grant writing tips.

CHAPTER IV

THE PROJECT

TECHNOLOGY IN THE CLASSROOM:  
AN EDUCATOR'S GUIDE TO TECHNOLOGY & LEARNING

# TECHNOLOGY IN THE CLASSROOM



by

Joseph Lawrence Bishop

June 2010

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### **Purpose**

This workbook was designed as a resource guide for teachers who may or may not be familiar with the various technologies that can be used in their classroom to promote a constructivist learning environment. It may be used by teachers of all grade levels, in-service trainers, and technology coordinators alike.

Due to the vast amount of technology available to educators, the goal of this project is to introduce these technologies, provide detail about the technologies, define specific terms, and even include the history of various technologies and components. In addition, some examples of how educator can utilize this technology are also included. While this project is not intended to inform readers how to specifically use technology in the classroom (as each classroom and situation differs), the author is hoping to provide readers with a starting point in which they may make wise purchasing decisions and begin adapting technology into their own curriculum.

### **Introduction**

While there may be several resources available that discuss and explain different classroom technologies available on the market today, this author believes that many teachers either lack the knowledge of how to find these resources, or that the resources are not brought together in one easy manual that teachers can quickly browse and pick and choose pertinent information from. The workbook is designed as a quick reference guide for educators who may be interested in several different classroom technologies, but may not have the knowledge or the time to locate resources and information about them.

Within the handbook, one will find information that covers computers in great detail, such as the history of the computer, what parts are inside a computer and what

they do, how to shop for a computer, and a comparison of different brands of computers. Also, information is given for laptops, netbooks, handheld computing devices, and other technologies such as projectors, document cameras, scanners, SMART boards, LCD televisions, Blu-Ray and DVD's, digital cameras, and video cameras. Information is given about educational software packages such as Microsoft Office, graphic design programs and classroom management software packages. The next section discusses the Internet and provides educators with information such as using primary sources, where to download educational videos, how to host webinars, the power of Podcasting, and using WebQuests to create constructivist learning environments. The last section of the handbook deals with funding technology via grants and provides a list of grant opportunities which educators may resource, complete with grant writing tips.

## **The Computer**

When determining what technology is best used in the classroom, the computer should be the first thought that comes to an educator's mind. The computer is the most flexible, and essential tool one could have in their classroom as it is the digital version of the Swiss Army pocket knife due to its expanding capabilities and consummate abilities in various areas. Computers can be used for many different tasks for both students and educators. As an educator, one might use the computer to:

1. Take attendance
2. Track scores and grading
3. Research topics
4. Lesson planning
5. Writing reports
6. Emailing parents
7. Communicate with colleagues
8. Communicate with other educators around the world
9. Find multi-media educational materials such as educational video clips and images
10. Calculate, plan and store data
11. Creating multimedia presentations
12. Webinars with experts in the field

Students can use computers for:

1. Researching topics and finding information pertinent to specific classroom projects
2. Typing reports/research papers

3. Creating brilliant multimedia presentations
4. Building websites
5. Creating portfolios
6. Webquests
7. Using educational software
8. Communication with other students around the world
9. Editing sound and video
10. Managing photos & video projects

The list could go on and on and this author cannot emphasize how important the computer is as an educational tool.

However, should not simply walk into a store, or shop online and buy the very first computer available. There are many factors to be taken into consideration before purchasing a computer such as: processing power, memory, hard drive storage space, video requirements, sound, connectivity to the Internet, operating system, software packages and bundles, cost, and quality of the computer. This purpose of this section of the guide is to explain in further detail all aspects that an educator or consumer needs to know before purchasing a computer so that they may select the computer that fits their personal or classroom needs. But first, a brief history of the computer.

### **A Brief History of Computer Technology**

While computers and computer technology have become wildly popular in the past 25 years, the concept of the computer is much older. While one could argue that the very first computer was the abacus, used by ancient cultures to assist in mathematical equations, this section will instead focus on actual computer devices, from mechanical

computers to present. The first computer was created in 1837 when a scientist, Charles Babbage, created the world's first mechanical computer called the Analytical Engine for the purpose of performing mathematical calculations and equations. Walker describes the analytical engine as a mechanical computer which pre-dated today's computers by at least a century and a half (1998). While proving to be too costly and materials too difficult to acquire, the analytical engine was never completed, but as Walker stated, the Analytical Engine was 100 years before its time and, in many ways, very similar to modern day computers. Although the Analytical Engine was never completed, a small portion of the machine was built and

It wasn't until the early 1940's that a complex machine such as the Analytical Engine would be once again attempted, in the form of ENIAC (Electrical Numerical Integrator and Calculator). The ENIAC was submitted for patent in 1947 which stated "with the advent of everyday use of elaborate calculations, speed has become paramount to such a high degree that there is no machine on the market today capable of satisfying the full demand of modern computational methods" (Norman, 2005, p.441). The problem with ENIAC is that it used over 20,000 vacuum tubes to process information, and when one went out, it needed to be replaced, which could shut the entire machine down for hours at a time. Because the tubes consumed power, they created heat and burned out quickly (Bellis, 2009). In fact, the tubes burned out so frequently that scientists were lucky if the machine would run for twenty minutes; however, the ENIAC was so powerful that a lot of work could be completed in this short amount of time.

In 1947 a very exciting technology was invented that would forever change the face of electronics manufacturing, known as the transistor. Computers that were once the

size of an entire room would have the potential to be downsized significantly. Computers could now perform the same functions, but used less power and were much smaller in physical size (Bellis, 2009).

The invention of the transistor ultimately led to the invention of the integrated circuit in 1958 by Jack Kilby of Texas Instruments, later perfected in 1960 by Robert Noyce, founder of Intel. Kilby won a Nobel Peace Prize for the integrated circuit, but Noyce was awarded the patent (Warner, 2004). The integrated circuit is “made up of transistors, resistors, capacitors and diodes that are connected to each other in different ways” (“The Integrated Circuit”, 2003). What this meant for technological advancements was that now these circuits could be automated, and mass produced to be placed in radios, clocks, televisions, and all other electronic technologies known today.

It were these advances in electronic circuitry that allowed all electronics (including the computer) to consume less power, significantly shrink in size, yet become more and more powerful in their processing power. Along the way, many different companies and scientists contributed to creating parts, pieces, or machines that ultimately led us to the technology that we have today, but many will argue that the transistor and ultimately, integrated circuits and microprocessors were the key to modern advances in electronics and computing. While these technological advances were beneficial to the scientific world, it wasn't until 1964 that a man named Douglass Engelbart took this technology and adapted it so that the common person could use it.

According to the Douglass Englebart Institute, “Mr. Englebart garnered fame especially through his invention of the computer mouse, and is credited with many pioneering firsts including interactive computing, hypermedia, groupware, and online

community support, much of which was first showcased in his now-famous 1968 Demo” (Englebart, 2009. para.2). In Mr. Englebart’s 1968 Demo, he was able to connect, over a very primitive version of the Internet, with his colleagues over 25 miles away, and did it all through a series of hyperlinks and a Graphical User Interface, complete with functioning mouse. It wasn’t until the year 1984 that a company, the Apple Corporation, would include a functioning mouse and Graphical User Interface on a mass produced level. Therefore Englebart was at almost 20 years ahead of his time. The Macintosh was one of the first computers marketed towards home users in 1985 due to its use of a Graphical User Interface and a mouse. Microsoft introduced its first Graphical User Interface, Windows 3.0, in the early 1990’s, which began the war between Apple and Macintosh that still thrives today.

However, the computer was not the only technology that helped shape today’s America, nor would some call it the most important. According to Strommen and Lincoln, it was the television that initiated the huge technology push that ultimately has brought America to where it is today. They claim that television liberated the world from the confines of text, instead rediscovering and recasting the world as a direct experience (1992) which sounds very similar to a description of the Internet or any form of modern multimedia technology. Yet even larger or more important than the actual television, or the computer, are the impacts on society that these technologies have conveyed in just shy of one century.

### **Macintosh Vs. The PC**

When shopping for a computer, one must first determine which platform will best meet their needs, the Macintosh OS or Microsoft Windows. If one were to ask their

colleagues what type of computer they should buy, they will receive different answers as some will prefer the Macintosh and others will prefer the PC. One could equate it to the Chevrolet versus Ford debate. They are both trucks, and they offer similar packages and prices, yet some people will only buy a Chevrolet while others will only buy a Ford. It is a matter of preference, and in some cases, a family tradition. This specific loyalty to a particular product is called, "Brand Loyalty." Brand loyalty is essentially a consumer's preference or choice of a specific brand. According to Giddens and Hoffman, brand loyalty occurs because consumers believe that the brand offers the right features, image or level of quality for the right price. This perception then turns into new buying habits (2002).

If one does a web search for "Mac vs. PC" they will find multiple thousands of pages with opinions about which operating system is superior. According to PC consumers, Mac's are too expensive, they do not have enough software, and do not have a right click capability on their mouse, making it difficult to use (although right click mice are now available for the Macintosh). Upgrading a Macintosh is very difficult due to their designs, and finding a repair shop that can repair a Macintosh is extremely difficult unless one lives in a large city with an Apple store available. According to Macintosh users, PC's crash too often, they are prone to viruses and spy ware that Macintoshes do not get. They are clumsy, unstylish, and cannot perform the way a Macintosh does.

From this author's experience, working in the computer industry for over 10 years, some pros and cons of both platforms are as follows:



#### PC Pros:

1. Widely available and affordable. Macintosh held 2.7% of the market share in 2004 (Dvorak, 2005) and 2% of the market in 2006 (Hanna, 2007).
2. Ability to purchase parts and build one's own computer.
3. Ability to purchase parts and easily and affordably upgrade one's own computer.
4. Multiple large manufacturers of new computers: Dell, Sony, Gateway, Hewlett Packard, etc. Competition leads to lower prices and incentives.
5. Can run multiple operating systems such as Linux, Unix, Windows 3.11, Windows 95, Windows 98, Windows ME, Windows 2000, Windows XP, Windows Vista, Windows Server, etc.
6. Grand multitude of software available, especially in the gaming platform.
7. Easy to find repair shops or information on how to repair issues.

#### Cons:

1. Many cheaper models come without useful software and antivirus packages which force the buyer to spend hundreds more to compete with the Macintosh, therefore negating the lower price.
2. Susceptible to a multitude of viruses and spy ware.
3. Windows has a history of not being as stable as the Macintosh OS platform
4. Can be noisy compared to a Macintosh computer.
5. From an aesthetics viewpoint, not as attractive as a Macintosh computer.

#### MAC Pros:

1. Comes with very nice software packages which make it easy for a beginning user to burn a disc, edit a video, and sounds.
2. Has less susceptibility to viruses and spy ware problems.
3. Powerfully steady platform rarely crashes or has issues.
4. Runs extremely quiet

5. Have very beautiful designs and layouts, both machine and operating systems alike.
6. Can now run both Macintosh OS and Windows
7. New Mac OS is based off Linux platform increasing stability even further
8. Newer Macs using Intel Pentium Processors
9. Can now run multiple operating systems including Microsoft Windows

Cons:

1. Initial cost is higher than a PC
2. Only one manufacturer, so cost is not affected by competition.
3. Has turned to Intel CPU chips which while allows running Windows platform, significantly raised price.
4. Are very difficult to repair or upgrade due to proprietary parts and difficult designs.
5. Lack of software for the Macintosh platform. Due to lower market share (2%) many developers only develop for PC platforms, especially gaming platforms.
6. Lack of right click which many PC users rely on, making a difficult transition from PC to Mac. However, a multi-button mouse may be purchased separately or users can hold control and click which acts as a right click (I. Loverro, personal communication, July 23, 2010).

As one can see, both the Macintosh computer and the personal computer have their pros and their cons. It is up to the purchaser to determine which platform will work best for them by carefully weighing the benefits for both types and then making a rational. Once a platform is determined, the next step is to decide what hardware, or physical parts of the computer, will fill the users needs. One should not simply go to Dell.com and buy a computer, there are several different makes and models, just like one would see from an automobile manufacturer. Similarly, after one determines what model one would like to purchase, there are upgrades available as well. The next section will

discuss the basics of computer hardware and help the user decide what hardware will best suit their needs.

### **Computer Buyer's Guide**

There are several questions that every savvy computer shopper should ask themselves. "What will be the primary use of the computer? Is mobility important? How much processing power will be needed? Will the computer be used primarily for presentations and writing word documents, or will there be video and/or graphic editing and playing of graphics intense video games? Perhaps it is a mix of all of these. Both a Macintosh or PC can suit a users needs, and both platforms offer multiple options. The essential question is, "What type of computer is needed?" If the buyer needs mobility for travel or plan on using their computer at home and work, then a laptop will fit their needs nicely. If processing power is more important than mobility, a desktop computer would be a wiser decision.

Other questions to ask would be; is there a need to host websites or applications, or a computer that can manage networks? If so, then a server will be necessary. In this section, each part of the computer is broken down and discussed. This author is hoping that by understanding the different parts and pieces of the computer, that the consumer can make a wiser decision when purchasing a new computer, or parts to build a custom computer.

### **Computer Cases**

When purchasing a computer, the average consumer does not pay much attention to the computer's case, instead, worrying more about the model and the brand. Yet, case selection is surprisingly important. For example, a server can be built in a standard

computer “tower” or stand up case, but before a server, which can cost thousands of dollars, is purchased, would a rack mounted server case be more space efficient? Should the desktop computer be a stand up tower, or one that lays down flat with the monitor resting on top of it? Or maybe one would rather not have a tower at all, but would rather have the computer built into the monitor, such as one would find on Macintosh or some of the newer touch screen PC’s. If desktop space is an issue, a built-in style computer is a perfect compromise. However, users should note that these styles of computers are much more difficult and costly to repair and update in the future.

Another important aspect of the case is its cooling capability. If one is planning on buying a new quad-core processor running dual video cards in tandem, they will need much more cooling and airflow than if one were to buy a simple single core processor with built in video on the motherboard. Today, consumers can get cases in all shapes and sizes. For example, there is the desktop case which traditionally lays on its side with the monitor sitting on top of the case. There is the tower case, which comes in three sizes, micro, mid and full tower sizes. These cases range anywhere from 17" x 9.9" x 23.5" to 30" x 28.4" x 17.4" and are made from different materials such as aluminum, steel, plastic, and plastic/steel, plastic/aluminum mixes (“Computer Cases”, 2009). A point to note is that the taller or larger the case, the more equipment may fit into it. For example, one could not fit a quad socket server motherboard into a micro case; it would require a very large case such as a full tower. Also, if one buys a slim case, such as the ones that Dell uses on many of their computers, it is very difficult and more expensive to upgrade specific items, such as the power supply, as it takes a custom power supply to fit the slim

case. All of the other case designs take a similar power supply and are therefore much more inexpensive to replace.

Consumers can buy cases with water cooling systems, multiple fans, neon lights, clear plastic sides, and different designs from plain rectangular shapes to cases that look like futuristic robots. One important thing to note, especially if one is building their own computer, is that the high end cases do not typically come with a power supply, which powers the entire system. The power supply may have to be purchased separately. Power supplies are important as users need to make sure that their computer has enough power to run properly and efficiently. Sometimes, even manufacturers do not use proper power supplies in their computers. A prime example is the E-Machine. E-Machine power supplies are notorious for destroying the computer's motherboard, memory and sometimes even the hard drive when they expire, and if one purchases an E-Machine, they can almost count on the power supply going bad. This author suggests to stick to quality brands such as Asus, CoolerMaster, and ANTEC when purchasing a case and/or power supply. Cheap cases are known to be made from low grade light aluminum, tin and other pot metals, and (from experience) can cut as deep as a sharp knife on the backside of the case. Spending a few more dollars on the case is money well spent.

### **The Motherboard**

Typically, unless users are building their own computers or having custom computers built, they will not need to worry about the motherboard. All manufacturers either make their own motherboards, or buy them in bulk to mass-produce specific models that they sell. Yet, the motherboard is one of the most important parts of the computer. Many people who build their own computers do so because of the control they

have over the parts, especially the motherboard. Once again, there is a wide variety of motherboards available. Some will accept single core processors (which will be discussed in the next section) some will accept dual core, quad cores, and of course the newer six core processors.

A good motherboard will range from around one hundred fifty dollars to five hundred dollars, although this author has personally sold a motherboard that held four quad core processors, cost over five thousand dollars, and requiring a custom case be created by a welding shop just to house it. Many motherboards come complete with built in modems, networking ports, sound cards, networking cards (LAN cards) and video cards. These motherboards are great for users who need a good solid basic system without any bells and whistles. Due to everything being built into the motherboard, it brings the cost down significantly as there is no need to buy those five parts individually. When building a computer users should once again stick to the quality brands such as ASUS, MSI, and Gigabyte.

Other things to pay attention to: What type of processor will be required? Even the best technicians cannot put an Intel processor in a motherboard designed for an AMD chipset. What actual processor will be needed (not just the type, but what model?) Consumers need to be aware that even if they buy a motherboard that supports Intel chipsets that not every Intel chip will fit in that motherboard, or in other words, it might have the wrong socket, or socket set. Also, the proper memory or RAM must be purchased for that specific motherboard.

This author suggests that consumers do research before they decide on what motherboard and socket type they would like to purchase by going to manufacturer's

websites and viewing the specifications of the motherboard they are interested in. Retail sites such as Mwave.com or Newegg.com list technical specifications on the motherboards they sell, and most sites will package motherboard and CPU bundles, which are nice, especially for shoppers who may be confused about what processor to mate with what motherboard. Many retailers even offer a deal where if one pays a small fee, some as low as five dollars, they will insert the chip and memory into the motherboard, test it, and ship it with the chip and memory already installed and working.

For serious gamers, or users working on video and graphic editing, ensure that the motherboard supports SLI, which allows users to run two video cards in one motherboard. The motherboard bridges the two video cards together and they work as if the system contains one powerful video card. This may be expensive as two good video cards will run at least five hundred dollars, but the quality and power one will receive by doing this makes it once again, money worth spent.

### **The Microprocessor or CPU**

The Microprocessor or CPU is the brain of the computer. Reflecting upon the history of the computer, it is the integrated circuit, or microprocessor, that really gives the computer its power. Without going into extreme detail about how the CPU operates, a basic explanation is still helpful. According to Whatley,

The CPU sits in the motherboard as the central unit. All of the other hardware components and programs installed on the system must go through the CPU before their function can be carried out. When a function, program or piece of data is called, the CPU pulls it from Random Access Memory (RAM) and any other hardware in

order to process it. The CPU then reads the instructions associated to the task before sending it back to RAM. (2009, para. 3)

In other words, if one were to use the calculator on their computer, the information would be pulled from the memory into the CPU or processor where it is processed and placed back in the memory. One important thing to note is, the CPU does not execute program instructions; rather, it directs other parts of the system to do so (Wolfe, 2005).

Determining what processor is needed for a custom built computer should be a relatively easy task, but often this author has found that consumers will buy a slower processor or a computer with a slower processor in it than is necessary, in order to save a few dollars. This is not an area where one wants to save money as the longevity of the entire system depends on the processor speed that is purchased. To add to the confusion, there is not just one brand or type of CPU that shoppers can purchase. In fact, there are two manufacturers of CPUs for personal computers and servers, Intel and AMD. Just as in the Macintosh versus PC debate, PC users tend to pick sides and are extremely loyal to their processor. In 2007, AMD held a market share of about 23% with Intel at 77% (Shilov, 2008). Of course these numbers are constantly changing, fluxuating from 18% to 25% for AMD and upwards of 80% for Intel (Krazit, 2007).

Both AMD and Intel make very nice processors with quad core, dual core and single core versions as well as lower end processors, where AMD shines in both price and performance. AMD processors tend to be similar in processing speed as the Intel processors and typically cost less. Still, Intel does have a higher market share and many times throughout the past decade AMD has been at risk of bankruptcy. As both processors work well, Intel's success may be attributed to their aggressive marketing



strategy and large scale deals with computer manufacturers, or the fact that they were the first company to begin manufacturing Microprocessors. This author feels that one cannot go wrong with either brand as long as they stay away from the lower end models such as Intel's Celeron line or AMD's Sempron processors. While the price is attractive on these processors, they do not provide reasonable performance.

When determining how much processing power is needed, always remember one word, "overkill." How much overkill is up to personal determination, but if one believes that a 2.0 GHz dual-core processor is fast enough, yet a 2.8 GHz quad core processor fits within the budget, then the upgrade is worth the extra dollars. Yet, the law of diminishing returns does apply, especially on processors. To buy the latest and greatest, one may have to spend hundreds of dollars more for a very small upgrade. For example, currently a 2.66 GHz quad core processor from Intel costs \$169.00 on Newegg.com.

A 2.83 GHz quad core Intel processor costs \$220.00. Is the extra fifty dollars worth gaining only 0.17 GHz worth of speed? In this case, yes because the 2.83 GHz has a 12 megabyte cache as where the 2.66 GHz processor only has a 4 megabyte cache. The cache works as storage or memory for a processor and as expected, higher levels of cache equal higher processor performance. As defined by Kayne, "Cache (pronounced *cash*) memory is extremely fast memory that is built into a computer's central processing unit (CPU), or located next to it on a separate chip. The CPU uses cache memory to store instructions that are repeatedly required to run programs, improving overall system speed" (2010, para. 2). Newegg.com sells a 3.0 GHz CPU with the 12 megabyte cache on it for \$320.00. In this case, the processor speed upgrade is so minute that it would not make sense to pay the extra \$100.00 for the upgrade.

Another thing to take into account when purchasing a processor is the amount of cache memory the processor contains. AMD processors do not typically have near the amount of cache memory that Intel chips do as they work a slightly different way. Instead of placing large amounts of cache on their chips, they instead use faster and larger bus speeds to transfer data between the motherboard, the CPU, the hard drive, and the RAM or random access memory (the bus is the pathway that information travels between the physical components of the computer). So, if one were to compare an AMD chip to an Intel chip, they will notice radical differences in cache levels. By using bigger buses, they actually equal out to the lower cache amounts on their chips as the information travels quicker to the components instead of saving in cache memory.

If making a decision is difficult, or if one is unsure about what purchase to make, they should tap into tech-literate friends, their school's technology coordinator, or simply visit a local computer store and speak with the experts there to determine their impression of which CPU would best suit their needs. It is worth investing time to ensure the most "bang for the buck." Consumers should not buy a processor that does not suit their needs, as they may not be able to upgrade later without replacing the motherboard, processor and RAM, which can be quite expensive. If one plans carefully, and purchases wisely (even waiting for a few months until upcoming technology might be released) they can purchase a CPU that can last many years 50% plan their day when they are told to put assignments in the handheld without the need for an upgrade.

### **Random Access Memory (RAM)**

Random Access Memory, or RAM as it is typically referred to, is the working memory on a computer. The more memory in the machine, the smoother the system

should operate and the more things users can do at once, to a certain extent. As Tyson states, “If your computer's CPU had to constantly access the hard drive to retrieve every piece of data it needs, it would operate very slowly” (2009, para. 1). Similar to a microprocessor, RAM is also an integrated circuit made up of many transistors and capacitors. It acts as the computer’s temporary storage system, similar to a human’s short term memory. In contrast, the disk drive, or “hard drive” of a computer would be the equivalent of a human beings long term memory.

Before, it was mentioned that the more memory a user’s computer contains, the smoother their system will run, to a certain extent. This disclaimer was put into place because certain operating systems will only use a designated amount of RAM and any more ceases to be beneficial. Once again the law of diminishing returns applies. The following information is directly from microsoft.com and will show the maximum amount of RAM each version of Windows can utilize (note that 64 bit operating systems can utilize much more memory than the average 32 bit operating system):

Table 2 Microsoft Windows RAM Limits

Version	Limit in 32-bit Windows	Limit in 64-bit Windows
Windows Vista Ultimate	4 GB	128 GB
Windows Vista Enterprise	4 GB	128 GB
Windows Vista Business	4 GB	128 GB
Windows Vista Home Premium	4 GB	16 GB
Windows Vista Home Basic	4 GB	8 GB
Version	Limit in 32-bit Windows	Limit in 64-bit Windows
Windows XP	4 GB	128 GB

<b>Version</b>	<b>Limit in 32-bit Windows</b>	<b>Limit in 64-bit Windows</b>
Windows Server 2003 with Service Pack 2 (SP2), Datacenter Edition	128 GB 64 GB with 4GT	2 TB
Windows Server 2003 with Service Pack 2 (SP2), Enterprise Edition	64 GB	2 TB
Windows Storage Server 2003, Enterprise Edition	8 GB	Not applicable
Windows Storage Server 2003	4 GB	Not applicable
Windows Server 2003 R2 Datacenter Edition Windows Server 2003 with Service Pack 1 (SP1), Datacenter Edition	128 GB 16 GB with 4GT	1 TB
Windows Server 2003 R2 Enterprise Edition Windows Server 2003 with Service Pack 1 (SP1), Enterprise Edition	64 GB 16 GB with 4GT	1 TB
Windows Server 2003 R2 Standard Edition Windows Server 2003, Standard Edition SP1 Windows Server 2003, Standard Edition SP2	4 GB	32 GB
Windows Server 2003, Datacenter Edition	128 GB 16 GB with 4GT	512 GB
Windows Server 2003, Enterprise Edition	32 GB 16 GB with 4GT	64 GB
Windows Server 2003, Standard Edition	4 GB	16 GB
Windows Server 2003, Web Edition	2 GB	Not applicable
Windows Small Business Server	4 GB	Not applicable

2003		
Windows Compute Cluster Server 2003	Not applicable	32 GB
Version		Limit in 32-bit Windows
Windows 2000 Professional		4 GB
Windows 2000 Server		4 GB
Windows 2000 Advanced Server		8 GB
Windows 2000 Datacenter Server		32 GB

(“Memory Limits”, 2009)

It is evident from the above data, that Server software and 64 bit versions of XP and Vista can utilize much more RAM than the 32 bit versions of windows. On average, Windows Vista, XP, and 2000 can all utilize only four gigabytes of RAM. (“Memory Limits”, 2009)

Currently, the largest piece of RAM for sale for a desktop unit is 4 gigabytes. The average motherboard for larger cases can contain four slots of RAM and for micro cases, only two slots. This means that the maximum RAM a person could possibly put in a desktop system at this point in time, is sixteen gigabytes of RAM, which, unless a 64 bit version of Windows is being used, would be a waste of money. Server memory is a bit different as the largest stick for sale at this time is eight gigabytes, and server motherboards contain more than four slots for memory. Although, an eight gigabyte stick of memory currently costs \$420.00 per stick, which is very expensive.

Note that there are many different types of RAM, and what may fit one motherboard may not fit a different motherboard. For example, on Newegg.com there are the following types of RAM for sale:

Table 3 RAM Type and Speed

Type	Speed
100-Pin DIMM	DDR 266 (PC 2100)
168-Pin SDRAM	DDR 333 (PC 2700)
184-Pin DDR SDRAM	DDR 400 (PC 3200)
240-Pin DDR2 SDRAM	DDR 500 (PC 4000)
240-Pin DDR3 SDRAM	DDR2 400 (PC2 3200)
	DDR2 533 (PC2 4200)
	DDR2 667 (PC2 5300)
	DDR2 667 (PC2 5400)
	DDR2 800 (PC2 6400)
	DDR2 900(PC2 7200)
	DDR2 1000 (PC2 8000)
	DDR2 1066 (PC2 8500)
	DDR2 1100 (PC2 8800)
	DDR2 1150 (PC2 9200)
	DDR2 1200 (PC2 9600)
	DDR3 1066 (PC3 8500)
	DDR3 1333 (PC3 10600)
	DDR3 1333 (PC3 10660)
	DDR3 1333 (PC3 10666)
	DDR3 1375 (PC3 11000)
	DDR3 1600 (PC3 12800)
	DDR3 1625 (PC3 13000)
	DDR3 1800 (PC3 14400)
	DDR3 1866 (PC3 14900)
	DDR3 1866 (PC3 15000)
	DDR3 2000 (PC3 16000)
	DDR3 2133 (PC3 17066)
	PC 100
	PC 133
	("Understanding, 2009)

As shown by the data given in the chart above, not only are there various types of memory to worry about, but the BUS speed as well. When upgrading memory, or ordering memory for a computer, one needs to pay attention to both types features. Motherboard manufacturers post information on their website with information on what

RAM their motherboard accepts, as well as what speed it needs to operate effectively.

Note that sometimes RAM can be quirky.

For the GEAR UP video production class at East Valley High School, located in Yakima Washington, 10 sticks of DDR2 667 PC5300 memory were ordered for the Dell computers that were to be used for video editing and graphic design. These Dell computers called specifically for that style, size, and speed of RAM. The RAM fit with absolutely no problem and was of a very high quality. However, when inserted, the computers simply blue screened and the RAM was rendered useless. This is a very rare event if the proper RAM is placed in the motherboard, but users do need to be aware that issues can and sometimes will arise.

When purchasing RAM, it is this author's opinion that the minimum amount of RAM that should be placed in current computers is two gigabytes. If the budget allows it, try to purchase at least three to four gigabytes of memory to ensure that memory will not have to be upgraded in a year or two.

### **Hard Disc Drives**

A decade ago, if someone were to say that personal computers would contain over a terabyte of hard drive space, it would seem like science fiction, but with improvement in hard drive technology and the natural progression of computer technology, that fiction is now a fact. There are three styles of hard drives, IDE, SATA, and SCSI. On a new computer one will not see IDE drives as all motherboards currently use the newer and faster SATA style hard drives. SCSI are still very fast drives, but outside of servers, they are relatively uncommon. Therefore, when purchasing a hard drive replacement, as long as the computer is no older than four or five years, it should be able to be replaced with a

SATA drive. When ordering a new computer, it can be assured that it will contain a SATA hard drive.

There are a few important things to know about hard drives. First, how much space is necessary. This should be a non-issue as users can buy a 750 gigabyte hard drive for \$70.00 and unless they are placing a lot of video or music on the drive, they will most likely never fill up a 750 gigabyte hard drive (at least in the life cycle of that particular machine). Second is the drive speed. The faster the RPM's on the hard drive, the quicker the data will be able to be sent back and forth between the processor. Users should always choose a hard drive that spins at a minimum of 7200 RPM. Many laptop manufacturers are placing 5400 RPM drives in their machines, but this is not as effective as a 7200 RPM drive. According to PC World magazine, "a 7200rpm drive should be able to stream data off a platter 33 percent faster than a 5400rpm drive" (2009) 10,000 RPM drives are also available, but they tend to be quite expensive, and unless users are working with heavy graphics or video production, they could be considered overkill.

Next, one should pay attention to the hard drive cache. Cache is the hard drive's built in memory. On a hard drive, this built in memory "acts as a buffer between the hard drive's main components and the computer itself" and that "having a larger cache buffer means that the drive can store frequently used data in its fast local RAM before writing it to disk. With a smaller buffer, the drive is limited in the amount of data it can store and often needs to look for it in the main system RAM, which can slow the process down" ("Hard Drive", 2009, para. 3). In other words, the larger the cache, the less system lag one will face. The average user will never be able to tell the difference between most hard drive cache sizes, but it may be important in extreme cases such as storage for heavy



traffic web and file servers. The same rule applies for seek time. Obviously the lower the seek time (or the time spent where the head moves across the platter to find the data on the hard drive) the quicker the response, but the average seek time should be sufficient.

Warranty is a very important issue as is quality of the product. Years ago, IBM mass produced the IBM Datastar hard drive which was sold both to consumers and placed in many different manufacturer computers. This particular hard drive was labeled the IBM Deathstar by computer enthusiasts due to it's nature of simply "blowing up" or crashing, losing all data in the process. If the hard drive fails, one can lose all of their family photos, important work, contacts, emails, software programs, etc., therefore having a backup procedure is absolutely crucial. If a hard drive does die, one can pay a company to retrieve the data from the drive, but this process involves taking the drive apart in a clean room and can cost upwards of \$5000.00 or more. This can be prevented by buying a quality item and spending a short amount of time backing up important files each week. One way users can protect their data is by having a RAID (Redundant Array of Independent/Inexpensive Disks) setup installed on the computer, which most manufacturers should offer for an extra fee (and some motherboards feature).

There are many different versions of RAID, but the most common is called Disk Mirroring. Essentially, there are 2 hard drives in the computer, and every time something is saved to one drive, duplicate data is saved to the second drive. The upside to this setup is that if one drive fails, there is a completely backed up version on the other drive and no data will be lost. The downside is that the computer has to use two drives to equal the same space as one drive. The question is, is it worth spending one hundred dollars now

to save thousands of dollars or hours of headache in the future? This author believes so. Another form of RAID is called disk stripping. Essentially the computer contains three separate hard drives, and when a file is saved, that file is broken down into small pieces and saved across all three drives. When one drive fails the other two drives still contain enough information about what was on the bad drive that it is able to recreate the lost files.

A recent trend in hard drives is leaning towards new “solid state” drives. A good example of a solid state drive is a USB flash drive or a “thumb drive/jump drive” as some users refer to them. It is storage space that is quick accessing, contains no moving parts, and runs completely soundless. In addition, they take little power, and are very compact. Soon, solid state technology may replace today’s hard drives that spin and are susceptible to damage. It is simply a matter of time until manufacturers begin using solid state drives over classic platter based hard drives. There are already 128 GB flash drives available and new hyper portable laptops and netbooks are already taking full advantage of this technology.

On the topic of USB flash drives, they can be a useful way to back up a computer’s hard drive. Other methods would be to purchase a solid state external hard drive, or a standard platter external hard drive. Both are inexpensive at around \$120.00 and many can backup important files with the push of a button. It is certainly a sound investment compared to paying for data retrieval.

### **Optical Drives**

Every computer should have some sort of an optical drive (although many of the new netbooks do not come with optical drives installed, but rather rely on external

drives). Most software today is purchased on some sort of a disc and without an optical drive, there is no way to load it on to the computer. There are three different types of drives currently available for purchase, the CD-ROM, the DVD-ROM, and the Blu-ray. CD-ROM discs hold approximately 600-700 megabytes of information, as where DVD-ROM discs and Blu-ray discs hold much more. According to Alleman, there are four different sizes of DVD discs, single-sided/single layer, which holds 4.38 gigabytes of information, a single-sided/double-layer disc which holds 7.95 gigabytes of information, a double-sided/single-layer disc which holds 8.75 gigabytes of information and a double-sided/double-layer disc which can hold 15.9 gigabytes of information (2009).

Table 4 DVD Storage Space

<b>Format</b>	<b>Capacity</b>	<b>Approx. Movie Time</b>
Single-sided/single-layer	4.38 GB	2 hours
Single-sided/double-layer	7.95 GB	4 hours
Double-sided/single-layer	8.75 GB	4.5 hours
Double-sided/double-layer	15.9 GB	Over 8 hours

(Alleman, 2009)

DVD drives hold much more information than a standard CD-ROM drives, and the DVD-ROM drive will also play regular CD-ROM discs. As technology has improved price has dropped so significantly. There is virtually no reason to buy a CD-ROM drive over a DVD-ROM drive as there is nearly zero cost difference. One should also purchase a DVD-ROM drive with burning capabilities also known as a DVD+RW or DVD Read and Write. It is a wonderful tool for backing up data or making information portable, and the costs of discs are so affordable it could quite possibly be the best purchase for the price in the computer industry.

Some “burners” or ROM drives with burning capabilities, have built in Lightscribe technology. “Lightscribe is an innovative technology that uses a special disc drive, special media, and label-making software to burn labels directly onto CDs and DVDs. Because the labels are laser-etched—not printed—there's no ink, no smudging, and no peeling (What Lightscribe Is, 2009, para. 2). The Lightscribe technology is particularly interesting due to the fact that a user can create professional looking discs with very little effort. No label makers or sharpie markers are needed as the drive etches the design directly on to the disc.

Blu-ray discs are relatively new technology. According to Blu-ray.com, “Blu-ray is currently supported by about 200 of the world's leading consumer electronics, personal computer, recording media, and video game and music companies. The format also has support from all Hollywood studios and countless smaller studios as a successor to today's DVD format” (“Blu-ray Disc”, 2009, para. 3). Blu-ray is named so because instead of the traditional red light used to scan CDs and DVDs, it uses a blue laser. “The benefit of using a blue-violet laser (405nm) is that it has a shorter wavelength than a red laser (650nm), which makes it possible to focus the laser spot with even greater precision. This allows data to be packed more tightly and stored in less space, so it's possible to fit more data on the disc even though it's the same size as a CD/DVD” (“Blu-ray Disc”, 2009, para. 2). The Blu-ray can hold 50 to 100 gigabytes of information, or around ten times the amount of information as the average DVD. Interestingly, Blu-ray was not created by a company, but instead an association of companies, one that includes powerhouses such as Dell, Sony, Sharp, Samsung, Mitsubishi, Hewlett Packard, Apple, and Warner brothers among many others (Huizenga, 2009).

Essentially, Blu-ray players are priming to replace DVDs the way that DVDs have replaced CD-ROM drives as the choice for computer users. The ability to hold mass amounts of data is exactly what the industry needed due to high definition filming. With the influx of high definition television sets on the market, it is the perfect companion for both television and computer systems alike.

### **Video Cards**

Video cards may or may not be important to a computer user. If a user is only using his or her computer for word processing, excel, power point presentations, email, and web surfing, then a standard GPU (graphical processing unit), built into the motherboard of the computer is sufficient. It isn't until a user needs more power for graphic design, heavy photo manipulation, photography and video editing and serious gaming does the need for a powerful video card arise, or in some cases, two or more video cards. The video card allows the computer to send graphical information to monitors and projectors (Fischer, 2009). As one could imagine, the more processing power the video card, the faster the video processes, and more video can be pushed through the card. Without going into great detail about how the video card functions, think about it as a miniature computer inside a computer. The card has its own processor, its own memory, and basically takes the load off a computer's processing by processing the video for the computer. So, if one were going to purchase a computer to do video editing, they would certainly not want a small and weak video card. Yet, if one does not require massive amounts of graphic processing power, then the onboard video is sufficient.

There are only a handful of companies that create the processors for video cards, ATI Technologies, who was recently acquired by CPU manufacturer AMD, the NVIDIA Corporation, Matrox, and new to the video card market, Intel. Once again the brand war resumes. Some consumers swear by no card other than ATI while others will never stray from NVIDIA. While ATI and NVIDIA are the two big players in the video card field, one should not dismiss Matrox and Intel. Matrox specializes in professional multi-display cards that enable multiple monitor use. The targeted user-base for Matrox video cards largely consists of 2D, 3D, video, scientific, medical, military and financial workstation users (“Matrox Graphics”, 2009). Another newcomer to the game of video card chipsets is the powerful Intel corporation, which while its market presence is currently unknown, will most likely be able to pull some market share from both AMD and NVIDIA due to the popular brand name recognition of its CPUs. Because Matrox is too high end for the average user, and Intel is too new to make a fair comparison, only ATI and NVIDIA cards will be discussed in this article. Both are industry giants and both make chipsets that are established, proven, and most of all, respected.

While ATI and NVIDIA both make chipsets for graphics cards, there are many different card manufacturers who buy these chips and create the actual graphics cards, including: EVGA, Jaton, Sparkle, XFX, ASUS, MSI, Apollo, BFG, Biostar, Diamond, ECS (elitegroup), Galaxy, GIGABYTE, Hightech Information System Ltd., PNY Technologies, Powercolor, Sapphire, VisionTek, and Zotac. This gives the consumer multiple different options, and several different price points. Yet, even with these multiple options available, the most well renowned card manufacturers, in this author’s opinion, would be EVGA for the NVIDIA chipset and Sapphire for the ATI chipset.

GIGABYTE would come in a close third as they also make nice video cards. Once again, the video card is not an item that one wants to go too cheap on, as a good video card can last a long time, and if powerful enough, can endure several years without the need for a new, more powerful, video card.

There are currently two types of video card interfaces, AGP cards and PCI-Express cards (better known as simply PCI-E). AGP cards are now considered outdated and nearly every single motherboard sold has a PCI-E socket for video cards. If a computer is a few years old, it may still require an AGP card. If one is purchasing or building a new computer, they may feel confident that they will need a PCI-E video card. For the sake of keeping this article as current as possible, only PCI-E cards will be discussed from this point.

Some things users want to look for when deciding on which video card to purchase are: Brand, Interface (even though we are focusing on the PCI-E we need to remember that one cannot place an AGP card in a PCI-E slot, and so forth), the chipset manufacturer (ATI or NVIDIA), the core clock, memory clock, memory size and type, ports, maximum resolution, and what type of power requirements the video card requires. When purchasing a video card, if it is decided that a higher end card is required, it may cost upwards of \$300-600 dollars, so verify that the card is a quality product that will last and has a good warranty. Once again, EVGA makes a nice NVIDIA chipset card and Sapphire makes quality cards featuring the ATI chipset. GIGABYTE makes nice cards out of both chipsets. This author cannot speculate how well the other cards function, but has sold all three brands for years, and will only purchase these specific brands as they have proven themselves to be powerful and reliable with very few returns.

ATI versus NVIDIA is as heated of a debate as PC versus Macintosh or Intel versus AMD. There is much debate in the computing and gaming community about who makes a better card, as one user tagged "Rubberband" on the Tom's Hardware forums states, "Today I'd recommend ATI to anyone. Who knows what I'll recommend in a year" which is this author's exact opinion. The average user will be happy with either chipset available as both make excellent chipsets and on any given month, one will have a better chipset than the other as they both release bigger and better chipsets.

The core clock is the speed at which the processor runs. The memory clock is how fast the memory speed is. Memory type and size are also significant. The more processing speed and memory the card has, the quicker it can render video, which is necessary for gaming and video editing processes. This author is not going to presume the use each and every individual reading this paper has for his or her computer, but a good 256 megabyte video card will run most games perfectly fine. Yet, if one is doing high end video production and graphic work, they may want to run two 512 megabyte to one gigabyte high end graphic cards, in tandem (SLI for NVIDIA and Xfire for ATI), to provide over one to two gigabytes of video processing power. Currently, some cards are offered with two gigabytes of memory on them. This means if ran in tandem via SLI, a user would have over four gigabytes of video memory and over a gigabyte of processing power. Of course these cards are over \$500.00 per card, so only consumers with an extreme need for this type of power (or a very generous budget) would be interested in this setup.

Ports are important as they determine what type of monitor can be used with a computer system. If the video card had the newer digital DVI ports, yet the computer



monitor still uses the old blue VGA ports, they will not work together without an adapter. Many of the newer, more powerful cards now come with dual DVI ports, or one DVI and one VGA port, allowing users to run two monitors at one time. On machines that allow SLI setup with NVIDIA cards (or the Xfire setup with ATI cards), technically one could run four monitors at one time. With NVIDIA working on their new quad SLI setup, that would raise the number to eight monitors. Does the average user need to run eight monitors at one time? Probably not, but the option may be available soon regardless. Many users are now interested in hooking up their computers to the newer high definition plasma, LCD and LED television sets. Typically, these sets come with an HDMI input cable. Some new video cards are being shipped with an HDMI port on the back of the card (as shown in the photos on the next page). Others are offering HDMI adapters so users may adapt their DVI graphics cards to HDMI television sets. Either way, if one plans to hook up their computer to their HDMI capable television set, this is an option that deserves consideration. Maximum resolution is important to notice as well, yet only to a very limited extent. Most of the higher end cards can display a maximum of 2500 x 1600 resolution which is much larger than any monitor or even HD television can display at, so unless the card is extremely low end, resolution should not be a major concern. If a user is planning to hook their computer to a large HD television or monitor, they must verify that the card is capable of running over 2000 lines of resolution.

Readers should note that some of the higher end cards require much larger power supplies to run. Some will require a minimum of at least a 500 watt power supply. This is something to consider before purchasing a video card as if it is placed in a computer with only a 300 watt power supply, it may not work correctly, or perhaps not at all.

Another important issue when determining which video card to purchase is if the user plans on capturing video or running satellite or cable through their computer. If this is the case, then a different type of video card needs to be purchased, a video capture card. With a video capture card, users can capture television programming directly onto their computer and essentially create their own version of a digital video recorder (DVR) or digital VCR. Typically the type of person who is interested in this type of setup is more technologically inclined, and above the means of this review, but it is interesting to note that this is indeed possible, and with the advent of the new USB capture cards, it is easier than ever to capture live television directly to a personal computer. On a side note, users who would like to record to school owned computers should request permission before doing so.

In summary, the most important thing to do before purchasing a video card is to 1) determine what ones needs are, 2) purchase more card than one may think they need, (but not to the extent of several hundreds of dollars more,) 3) be aware of the card Interface in the computer, is it AGP or PCI-E? 4) Pay attention to the memory and processing speed of the card and how it interacts with the motherboard, 5) buy a good quality brand name card, even if it costs a few more dollars; the quality and experience of the manufacturer is worth it, 6) Make sure to research. Use Google, look up reviews, ask questions on forums, or ask friends or relatives if they have any suggestions. Talk to local retailers and pick their brains, but do not go into buying a video card blindly especially if the power and versatility of a high end video card is needed.

## Other Parts

There are still a few more parts and pieces to discuss when determining what to purchase in a new computer, or what parts are needed to build a computer. One of the most obvious is computer networking. Does the computer need to be able to access the Internet? If so, what type of access is necessary (high speed, dialup)? If located in a rural area where Broadband (high-speed) Internet is not available, users need to make sure their computer contains a modem for dial-up internet. Most laptops do not come with a modem installed, so one will have to purchase an external type modem. The same rule applies when purchasing a new tower computer; it may or may not come with a modem installed, so double check before purchasing the computer. Most new computers no longer come with modems installed as high-speed networks have all but replaced the need for modems.

Every computer sold should come with a LAN port, which stands for Local Area Network. A CAT-5 cable plugs into this port and connects into a router or broadband modem allowing access to the service. Perhaps users do not want wires running all over their house or classroom. The simplest answer to this dilemma is the wireless network, otherwise known as WiFi. Nearly every single laptop on the market today comes with a WiFi connection, but most desktop or tower computers do not. Users can purchase WiFi cards that fit in the back of the computer with an antenna on it to access a WIFI network, or can simply purchase USB antenna which will work equally as well. Users will also need a wireless router or a built in wireless router on their Internet service providers modem in order to setup a WIFI network in the home or classroom.

Last, one needs to think about the Input/Output to the computer. What type of keyboard and mouse will be purchased? There are both wired and wireless keyboard/mouse combos. What about speakers? Buy a pair of external speakers, or try and find a monitor with built in speakers. What about monitors? They make them anywhere from small to enormous, or even hook into modern HD LCD and Plasma televisions. Which is more desirable, a standard screen or a wide screen monitor? Either way, make sure to purchase an LCD monitor, not an older style CRT monitor that is bulky, dated, and contain specific parts that must be recycled when disposed of.

As one can see, simply purchasing a computer can be an easy process, but to decide what exactly what will fit their needs is another. Too many people simply go to a website, not knowing what they are reading or looking for, make a purchase, and completely regret their decision after receiving the computer. Doing the research, understanding what is needed and knowing where to best spend the money is well worth the time invested. This author will nearly always suggest one buy local from a smaller “mom and pops” style computer store. The initial price may be slightly higher than a large brand name computer, but the warranty and expertise of the staff make it worth the extra cost and one may actually save money by not over-purchasing on their computer.

### **Purchasing a New Computer – A Price Comparison**

In order to connect all this knowledge together, this author will now compare three separate computers, one Macintosh, one Dell and one Custom Built. All three will be in the same price range and the differences and advantages/disadvantages will be pointed out. This is in effort to connect all previous information given to a real world scenario. The initial investigation will be at the \$550.00 price range. Note these options

were priced out in June of 2009. Prices and specifications most likely have changed since this date.

**Dell \$550.00.** For the cost of \$639.00 with a \$100.00 instant off savings (for a total of \$539.00), a consumer may purchase the Dell Inspiron 546 desktop computer. This computer comes with an AMD Phenom X3 8650 processor at 2.3 GHz. It contains three gigabytes of system memory, a 500 gigabyte 7200 RPM hard drive, integrated graphics and sound with 18.5" HD monitor and a copy of Windows Vista home. It is a basic computer but very solid and with excellent hardware, shy of a decent video card. Its average customer rating is 4 ½ stars out of 5. The computer also comes with the option of different colored cases, which is appealing to many users, especially teenagers. (Dell Desktop Computers, 2009)

**Custom \$550.00.** To build the equivalent of the Dell Inspiron 546 Desktop, parts will be selected from online super-retailer, Newegg.com. From experience, Newegg.com's prices are competitive with computer part distributors across the country, yet available to anyone with Internet access and a credit card.

Table 5 Parts Pricing for a \$550.00 Custom Computer

AMD Phenom X3 2.8 GHz triple-core CPU	\$119.00
ASUS M2N68-AM SE2 AM2+/AM2 NV GeForce 7025 / nForce 630a chipset AMD Motherboard	\$52.00
Crucial Ballistix 3GB 240-Pin DDR2 SDRAM DDR2 1066 (PC2 8500) Desktop Memory	\$51.00
LOGISYS Computer CS206BK Black Steel ATX Mid Tower Computer SOHO Case 480W Power Supply	\$32.00
Sony Optiarc Black 24X DVD+R 8X DVD+RW 12X DVD+R DL 24X DVD-R 6X DVD-RW 12X DVD-RAM 16X DVD-ROM 48X CD-R 32X CD-RW 48X CD-ROM 2MB Cache SATA DVD/CD Rewritable Drive - OEM	\$26.00

Seagate Barracuda 7200.12 ST3500418AS 500GB 7200 RPM 16MB Cache SATA 3.0Gb/s 3.5" Internal Hard Drive	\$60.00
Logitech 967973-0403 Black 104 Normal Keys PS/2 Standard Deluxe 250 Desktop	\$17.00
Microsoft Vista Home Operating System	\$189.00
TOTAL:	\$546.00

(Newegg.com, 2009)

Very close to the Dell's price of \$539.00, the custom built computer priced out at \$546.00, not including any labor charges if the consumer must pay a technician to put it together and load the software on the machine. There are quite a few differences between these two machines. The most obvious difference is that the Dell computer comes with a monitor, as where the custom computer does not.

For the sake of equality, the Dell was running a special of \$100.00 off while there were several 19" widescreen monitors listed on Newegg.com for \$99.00, which would make the prices almost identical if one were to buy a monitor with the custom built computer and if the Dell were not on sale. Yet, the main differences in this comparison are the parts used to build the machines. The custom built was designed using only top quality brand name parts like ASUS, Sony, Seagate, and Logitech. Most of the Dell parts are built by Dell and are, in this author's experience, not as high of quality as the custom parts. Seagate is an industry Giant and arguably makes the best hard drives on the planet. The same could be said for ASUS and Sony.

**Macintosh \$550.00.** The least expensive Macintosh computer available is the Mac Mini. For the entry level model, expect to pay \$599.00. The Mac Mini comes with the following: 2.0 GHz Core 2 duo dual core processor, one gigabyte of DDR3 memory, and a 120 gigabyte hard drive. Apple charges an additional \$98.00 for a keyboard and

mouse, and the price of \$599.00 did not include a monitor. Assuming any monitor would work with the Mac Mini, this would bring the price to \$699.00 with an inexpensive monitor, and one would still need to purchase the keyboard and mouse for another \$50.00 to \$100.00 bringing the least expensive Macintosh to a minimum of \$749.00 which is far out of the reach of a \$550.00 budget. Because of this, this author will now determine what \$1200.00 will buy between the three.

**Dell \$1200.00.** For \$1173.00 with a \$174.00 rebate (bringing the price to \$999.00) one could purchase a new Dell XPS 630 series desktop complete with the following: Intel Core 2 E8400 CPU at 3 GHz, 4 GB of DDR2 800 MHz memory, a 640 gigabyte hard drive, dual NVIDIA GeForce GTS 240 1 gb video cards, with a 16x DVD+RW burner and no monitor. Add a Newegg.com \$99.00 monitor and the machine fits perfectly within the \$1200.00 budget with \$100.00 to spare for a hard drive upgrade to 750 gigabytes. ("Dell Desktop Computers", 2009)

#### **Custom \$1200.00**

Table 6 Parts Pricing for a \$1200.00 Custom Computer

Intel Core 2 Quad Q8400 Yorkfield 2.66GHz 4MB L2 Cache LGA 775 95W Quad-Core Processor - Retail	\$169.00
ASUS P5Q Pro Turbo LGA 775 Intel P45 ATX Intel Motherboard - Retail	\$135.00
Kingston 2GB 240-Pin DDR2 SDRAM DDR2 800 (PC2 6400) Desktop Memory Model KVR800D2N5/2G – Retail (x2)	\$60.00
Antec Nine Hundred + EA650 Black Steel ATX Mid Tower Computer Case 650W Power Supply - Retail	\$165.00
Sony Optiarc Black 24X DVD+R 8X DVD+RW 12X DVD+R DL 24X DVD-R 6X DVD-RW 12X DVD-RAM 16X DVD-ROM 48X CD-R 32X CD-RW 48X CD-ROM 2MB Cache SATA DVD/CD Rewritable Drive - OEM	\$26.00
Seagate Barracuda 7200.12 ST31000528AS 1TB 7200 RPM 32MB Cache SATA 3.0Gb/s 3.5" Internal Hard Drive - OEM	\$89.00

Logitech 967973-0403 Black 104 Normal Keys PS/2 Standard Deluxe 250 Desktop	\$17.00
Microsoft Vista Home Operating System	\$189.00
SAPPHIRE 100266HDMI Radeon HD 4830 1GB 256-bit GDDR3 PCI Express 2.0 x16 HDCP Ready CrossFire Supported Video Card - Retail X2@\$110.00 each	\$220.00
TOTAL:	\$1070.00

(Newegg.com, 2009)

This author is hoping that the reader is noticing a trend. This trend is; while Dell can compete (and most likely easily beat) with the custom built computers at lower costs, as the price goes up, users get significantly more computer for their money if they build the computers themselves. This only becomes indubitable the more expensive the computer. This specific custom-built computer has an Intel quad-core processor at 2.66 GHz per processor, a pro turbo ASUS motherboard, 4 gigabytes of Kingston DDR2 RAM, an Antec case with a 650 watt power supply, Sony DVD burner, a one Terabyte hard drive, and two Sapphire HDMI Radeon HD4830 1GB video cards running in the crossfire (Xfire) setup for a total of two gigabytes of video processing power. Add a \$99.00 LCD monitor and the custom built comes in right at budget.

**Macintosh \$1200.00.** For \$1200.00 users can purchase a brand new 20" i-Mac complete with 2 gigabytes of DDR3 1066 memory, a 320 gigabyte hard drive, and a 2.66 GHz Intel Core2 Duo processor. This Macintosh comes standard with an NVIDIA GeForce 9400M graphics card, which according to Nvidia.com is a notebook (laptop) graphic card, the same one used in the Apple i-Book, Macintosh's laptop computer (GeForce 9400 M, 2009).

**Conclusion.** While this author has attempted to remain unbiased, the numbers speak for themselves. While the Dell and custom built computers are very similar in



price, this author believes that the quality of parts used in the custom built computer, combined with the control has in selecting ones own parts, just cannot be beat, even by a big corporation like Dell. The \$1200.00 model of the custom built clearly was much more powerful and sturdier than the Dell. On that note, there are several important benefits to buying a pre-made computer from Dell; 1) individuals do not have to know how to build a computer or load Microsoft windows. It simply gets shipped, plugged in, the user performs a quick setup and it works. 2) Dell offers a minimum one year warranty on their machines, so if something breaks or goes bad, users are covered. And 3) Dell offers financing options.

In comparison, benefits of the custom built computer are; 1) Users select their own parts and may go from mild to wild as they decide what they would like in their computer. 2) Custom computers are very upgradeable and the parts used typically carry warranties from 1 year such as the processor, to 5 years on the hard drive, and lifetime warranties on the memory. So, if one has the capability of building their own computer, or has a friend, family member or colleague who can build the computer for them, this author suggests building custom.

The Macintosh Apple computer is also a very nice choice at the \$1200.00 range. With its 20 inch widescreen monitor and the fact that it is an all-in-one machine, the look is unparalleled, but the speed of the processor, the lack of memory and the ridiculously small hard drive space combined with a weak graphics card means that in order to get serious with a Macintosh, users need to spend multiple thousands of dollars compared to a personal computer. These may be a great solution for everyday computing, but the parts are more inline with the \$550.00 PC pricing. This is not a putdown to Macintosh as

they obviously make an excellent product and retain the ability to demand premium prices for their computers. However, the majority of educators do not have the luxury of large budgets.

### **Laptop Computer Buyer's Guide**

While the previous section discussed the parts of the computer, what to look for in a computer, and a comparison of three different types and styles of computer at two different prices, laptop computers were omitted from the section for a reason. The purpose of this omission is due to the fact that the average classroom budget does not allow for laptop computers. Yet, this author understands that readers may be interested in purchasing a laptop for home and school use, and/or the school district may purchase laptops for teachers, para-eds, administrators, counselors, etc. Therefore it has earned its own segment.

Laptop computers are not much different from regular desktop computers in the sense that they both use processors, motherboards, video cards, etc. All the hardware is the same, only it has to be created more compactly to fit inside the laptop case. Laptops become very difficult to build as custom computers. There are kits that allow the technologically inclined to build their own laptops, but the quality of the computer, for the price, does not make it efficient. Laptops are very difficult to compare as they come in all different shapes, sizes and flavors. For example, one could purchase a laptop ranging from 9 inches to 17 inches and weighing three pounds to eleven pounds. When deciding on what type of laptop to purchase, the essential question should always be, "How portable does the laptop need to be?"

For a person who is traveling frequently and who takes their laptop with them everywhere they go, a small, lightweight computer that can fit in a day bag would be a great match. For one who wants to play serious games on their laptop, or work with video and graphics, a small laptop will not suffice as the screen will not be large enough, instead a heavier 17" widescreen laptop would be most suitable as there is more room in the case for more powerful video cards and a much more gratuitous viewing size due to the larger screen. The average laptop shopper falls somewhere in between the two extremes and a 15" widescreen laptop should suffice nicely as it is a excellent compromise to extremely small or extremely large laptops, as well as more affordable. As laptop sizes go up or down, the price goes up with it (with the exception of the new mini laptops, but those are not fully functioning laptops) Smaller laptops also have smaller keyboards as where a 17" widescreen laptop (or media center as some companies refer to it) have a full QWERTY keyboard complete with number pad to the right.

When purchasing a laptop, one should keep in mind that the same rules for purchasing a computer apply to laptops. The CPU in the laptop should at least be a dual core processor. The laptop should have a minimum of two gigabytes of memory, with preferably upwards of four gigabytes of memory. Laptop hard drives tend to be slightly smaller capacity than desktops. A good size for laptop hard drives today would be around 350 to 500 gigabytes but, if possible, a consumer wants the 7200 RPM hard drive in their laptop, not the 5400 RPM hard drive. There is a 33% speed difference between the two drives as stated in the previous section. The laptop should have WIFI, a network port, plenty of USB ports, and a DVD/CD burner. A higher quality of speaker built in to the laptop adds value as most people do not care to carry around a set of speakers in their

laptop bags. Of course, if one were using headphones, this would be a non-issue, but there are times where users may want to share audio or video with other people and if the speakers are weak, it may hamper the experience.

If one plans to use their laptop for gaming, video production, graphic design, or any other graphics intensive programs, they must make sure to invest in a laptop with a nice graphics card. Most laptops have the GPU (Graphics Processing Unit) built into the motherboard, so the card cannot be upgraded. If a user buys one that is not suitable for their needs, they will not be satisfied with their purchase. A good rule of thumb to live by is to purchase a laptop as if it can never be upgraded because essentially, it cannot be. Users should always backup data from their laptop as the drives are more susceptible to damage due to the mobility and use of the laptop. If there is not a VGA output on the back of the laptop (so one can hook it up to an external monitor) and the laptop screen manages to quit working or becomes damaged, there will be no way to retrieve data off the laptop. Therefore ensure any laptop purchased has some sort of external monitor hookup.

There are several good brands of laptops on the market today, Hewlett Packard, Sony, Toshiba, and Dell all make fine PC laptops, and the Mac i-Book is an engineering marvel (and Macintosh laptops are typically lighter than the comparable PC)h. Try to stay away from generic brand laptops unless purchasing a new laptop every year or two is planned. While many can be just as good as a brand name laptop, many are not, and are not worth the money saved. Make sure as with any computer to purchase a quality anti-virus program and ensure that the firewall is turned on to prevent any unwanted intruders from gaining access to the laptop in public WIFI access areas.

### **Miniature Computing in the Classroom**

Today's computers seem to be getting smaller and smaller yet more and more powerful. While many teachers and administrators frown upon students having this type of technology on school premises, there are many teachers who are serious advocates of using miniaturized computing devices in the classroom as a learning tool. The hand held computer, also known as a PDA, or personal digital assistant has grown into quite the machine. At one point in time, these machines were expensive, had a lackluster monochrome display, and low amounts of memory. Today, they boast full color screens, contain familiar operating systems such as Windows or Mac OS and have enough memory to store thousands of files. From the Palm Pilot to the HP Ipaq and even the Macintosh Iphone, these devices could become the future of educational technology.

Jason Cring, a teacher at Hilton High School in New York is a huge proponent of handheld computing devices. Mr. Cring uses these devices in an intuitive fashion. His students check their handheld devices every day for entry tasks and assignments for which students are given a daily grade. By doing this, not only do students know exactly what they are doing that day, they understand the goals and the rationales of the assignments they are to complete, and the information is always on the handheld device for students to refer back to. Mr. Cring keeps all of his assignments on a website, and students synch the handheld devices to the website, pulling the assignments onto the handheld computer. The teacher can also directly beam the assignments into the student's handheld computers via Bluetooth and WiFi connections.

Students are allowed to take the computers home, and when they come to school the next day, are able to print directly from the handheld device and turn in assignments, or once again, beam the completed work to the teacher for grading. States Cring, “In the past none or very few of my students planned their day and many had problems with time management. All of my students were given agendas in the past, but many of them would lose them shortly after receiving them. Now, that we are using handheld computers about 50% of my students plan their day without being asked, and the other 50% plan their day when they are told to put assignments in the handheld. (2009, para. 4)

One unique way Mr. Cring uses his handheld computers is as a hall pass. By writing the pass on the device and signing it, not only do the students enjoy this, but it keeps a stamped record of when students leave and return to class.

A study by SRI International stated that when asked, 96.5% of teachers believed that handheld computers were an effective instructional tool for teachers. 93% stated the use of handheld computers contributed positively to the quality of the learning activities their students completed, and 95.3% believed that the use of Palm computers in learning activities had the potential to have a positive impact on students’ learning (Ely, 2002).

There are several different ways that handheld computing devices can be used in the classroom:

- As a calculator
- Note taking
- As an organizational tool – File storage
- Creating To-Do Lists

- Keeping track of scientific calculations
- Conversions and equations
- Beaming of materials back and forth between students and teachers, increasing collaboration.
- Keeping logs or journals
- Self reflective essays
- Creating business documents
- Internet Research

With the new technologies available in these types of handheld devices, they are no longer simply glorified digital notepads. One example is the Apple I-Pod touch, or alternately, the Apple I-Phone. The I-Pod touch is very similar to the I-Phone only it does not have phone capabilities or a built in digital camera. While schools would most likely not wish to spend thousands of dollars to place cell phones in students hands (actually it would be quite the opposite, spending thousands of dollars to get the cell phones out of student hands) the I-phone and the I-Pod touch are modern marvels. With the ability to download hundreds to thousands of applications, many for free, the I-Phone/I-Pod Touch is the perfect example of a possible educational tool. As stated by Fryer, “technology tools offer the promise of further engaging students during teacher-directed lessons, since each student can have his or her own handheld device to manipulate and provide input immediately available to the teacher” (2003, p.3).

One particularly useful application is Convertbot. This is a free application for the Iphone and Ipod touch that converts time, temperature, speed, mass, length, data size for computing, currency, area and volume. Imagine a science lab where students had the ability to calculate and convert data with speed and ease. There are applications, such as

“palettes”, that allow a user to snap a photo with the I-phone’s camera, and then select a color from the image. Then the phone will then give the user the hexadecimal number for that color as well as the RGB and CMYK colors.

Graphic design and art students could use this application to determine real world colors and the ability to apply those colors to their designs. Perhaps students in a current world events class, or a social students class could spend the first five minutes of class reading an article directly from the front page of the New York Times or the Seattle PI (online of course) and then have a class discussion about the article they just read, or log their thoughts in a journal that is kept on the device. In English, entire books can be downloaded and read; papers can be written and beamed directly to the teacher. Students could look up lyrics for songs in choir class, or tune instruments in band by downloading an electronic tuning application. Even more important, teaching students how to remain organized by utilizing the tasks and to-do features of these handheld devices would help improve time management skills. There are so many educational uses for the I-phone and I-Touch that they could quite possibly fill up multiple pages just on their own merit.

All benefits aside, there are pitfalls as with any technology. Parts break, students are rough on equipment, and sometimes there are technical difficulties. If all students had I-phones or PDA’s that have Internet access or texting capabilities, how many will stay on task and/or not become distracted? There could be theft issues that arise, and of course with the rapid pace that technology increases, technology becomes outdated quickly. Another issue of course is the size of the handheld computer. Typing can be difficult when compared with a full size QWERTY keyboard, but with the new “mini” laptops that have arrived this year, this is now a non-issue.



The new Mini laptops are fully functioning laptops, although stripped down to remain extremely small and versatile. These machines are a mix between a handheld computer and a laptop. According to Dell.com, they have a keyboard that is 92% of the size of a standard QWERTY keyboard ("Mini Netbook Models", 2010). The mini's come with built in wireless, and if purchased through AT&T or Verizon, they may contain built in wireless than connect through the companies 3g phone system for internet access anywhere cell phone service is available. These computers run full versions of Windows XP or Linux, and can run Microsoft Office and any other programs a regular laptop can run. The only difference is, they are just very small laptops. Just imagine the possibilities of having these mini laptops available in a classroom connected through a WiFi network. Even more exciting is the advent of the new Macintosh I-Pad that was just announced in February 2010. More than a glorified Ipod Touch, it is a miniature computing system with access to the Internet via WiFi or the AT&T 3g network. With thousands of applications to choose from (many educationally relevant) there is a great possibility for the I-Pad in an educational environment.

If a school district either has the funding for this type of project, or if teachers can find a grant to fund this type of equipment, it would utilize a technology that students are already using, and teach them how to use it to learn, instead of just play. After all, an educator's goal should be to create lifelong learners. What could be better than to teach students how to utilize the technologies they have been using for so long as simple entertainment and transform them into educational tools?

### **Visual Technologies**

One of the most important educational technologies that an educator can use is some sort of visual technology. It could be a projector, a smart board, or even a document camera, but it is a necessity in today's classroom. Based on the principles of Gardner's theory of Multiple Intelligences, not all students learn the same way. While some students may be able to learn verbally, and others may learn more effectively through visual methods, it is a combination of multiple different styles that allow full learning in a classroom. Without the ability to reach multiple intelligences, it could be putting students at a risk of falling behind or not learning (this is especially true with ELL students). Gardner believes that the American education system is heavily focused on linguistic instruction/assessment as well as logical-quantitative modes as well (1993). Gardner's Multiple Intelligences are listed in the chart on the following page:

Table 7 Gardner's Theory of Multiple Intelligences

*Verbal-Linguistic Intelligence* -- well-developed verbal skills and sensitivity to the sounds, meanings and rhythms of words

*Mathematical-Logical Intelligence* -- ability to think conceptually and abstractly, and capacity to discern logical or numerical patterns

*Musical Intelligence* -- ability to produce and appreciate rhythm, pitch and timber

*Visual-Spatial Intelligence* -- capacity to think in images and pictures, to visualize accurately and abstractly

*Visual-Spatial Intelligence* -- capacity to think in images and pictures, to visualize accurately and abstractly

*Bodily-Kinesthetic Intelligence* -- ability to control one's body movements and to handle objects skillfully

*Interpersonal Intelligence* -- capacity to detect and respond appropriately to the moods, motivations and desires of others.

*Intrapersonal Intelligence* -- capacity to be self-aware and in tune with inner feelings, values, beliefs and thinking processes

*Naturalist Intelligence* -- ability to recognize and categorize plants, animals and other objects in nature

*Existential Intelligence* -- sensitivity and capacity to tackle deep questions about human existence, such as the meaning of life, why do we die, and how did we get here.

("Concept to Classroom", 2004)

## Projectors

By using some sort of a projection system, not only does an educator reinforce learning for visual learners, but the combination of visual and audio may help verbal linguistic learners as well. Yet, simply using a projector to give demonstrations, or doc cameras to show examples is nothing more than high tech direct instruction. The goal of today's educator should be to create a constructivist environment where students are the

ones conducting their own learning. Imagine a classroom where the teacher uses a projector to display images, words or phrases for writing prompts or teaching students how to edit and spell check using Microsoft Word.

Science and Social Studies teachers using Google Earth or maps found online to interactively explore the world and studying geography. Math students playing educational math games and solving complex mathematical equations. Students coming up and adding data directly to the teacher's spreadsheet and projecting graphs of their results. Teachers using a timer or stopwatch, projected onto the board so students can see how long they have been working on a specific project or how much time is left.

PowerPoint presentations which mimic popular game shows such as Jeopardy or other interactive quiz type games which involve all students in the class – even with students acting as the “host” of the game show. Where teachers, instead of asking students to come to the front of the classroom and write on the board, allow students to write on a piece of paper. Students could use software to create flowcharts, clusters and spider maps in groups. (Doyle, 2009)

For real world connections, students could view live lectures from real world professionals and guest speakers through online Webinars. Perhaps if guest speakers are not available, students could research and watch videos online and share them with the class via the projector. An inexpensive USB microscope hooked to a personal computer and then displayed to the classroom would be a lesson that many students would never forget. The list goes on and on. Yet, not every single lesson needs to be completely interactive with the students--there is no shame in using a projector for direct instruction, in fact this author encourages it. But instead of expecting students to try and keep up

with lectures, try guided notes, or at the very least, point out what information on the PowerPoint slides students should write down or focus on as many K-12 students often lack note taking skills.

### **Document Cameras**

Another very interesting piece of equipment that every educator should have if they are able to acquire the funds for are document cameras. For teachers who have never used one, these are amazing when compared to standard overhead projectors. No more cleaning sheets, no more nights of futile scrubbing of hands trying to remove the dreaded red, blue, or purple side palm. The document camera simply takes video of whatever is placed below it and projects it through the teacher's personal computer and onto the board. These items can be 2d, such as a piece of paper, or 3d such as an insect or a baseball.

Students can type reports, draw pictures, or even hand-write a poem, and their masterpiece can be displayed on the board within seconds. They may model writing, share approaches to math equation problem solving, science, reading, and writing for group evaluation purposes. Doc cameras are useful for displaying textbooks, newspapers, magazines, or even interesting artifacts and items teachers may not want placed in student hands, allowing the entire class to examine it without risk of damage to the object. The head of the camera can swivel so larger objects may be displayed as does the swing arm. One thing to keep in mind, these document cameras have no way of displaying the information to the screen on their own, they must be paired with an overhead projector or a computer screen in order to display.

## SMART Boards

SMART Boards are an intriguing technology with many possible uses for the classroom. According to the smarttech.com website, SMART Boards combine the simplicity of a whiteboard and the power of a computer bringing interactivity to any environment (“Smart Boards”, 2009). Essentially, a SMART Board allows users to interact with their computer via touching, dragging, drawing, etc. Some SMART Boards have a small projector unit attached above it as shown in the picture. According to the SMART website, a front projection SMART Board will start at \$1399.00 (“Smart Boards”, 2009). Of course with a front projection board, educators will need to make sure they have both a computer and an overhead projector available or the board will be rendered useless. A rear projected SMART Board on the other hand will run upwards of \$10,000.00, which is an unrealistic price for a school district to pay for a single piece of equipment.

There are many SMART Board friendly websites that offer excellent interactivity with games, video, pictures, mathematics, etc. Some of these sites even categorize lessons by grade. Some examples are linked from [http://its.leesummit.k12.mo.us/smartboard.htm#Interactive\\_Websites](http://its.leesummit.k12.mo.us/smartboard.htm#Interactive_Websites), with activities that include making vaccines, measuring cylinders, rating tornado damage, creating clouds, and links to other numerous whiteboard reference websites (“Smart Board”, 2009). Other websites located at <http://eduscapes.com/sessions/smartboard> (Lamb, 2006) or the Wichita Public Schools Educational Technology webpage, located at <http://technology.usd259.org/resources/whiteboards/interactive.htm> contain links to interactive sites such as Active Math for the Smartboard, human anatomy online, and

Amazon interactive. Yet, one does not need a SMART Board to visit these sites, any student or teacher may visit them on a regular computer. Yet the overwhelming power of the board cannot be denied. With its ability to interact with an entire classroom and to involve students in the learning process, this is one piece of technology that has the possibility to change the entire atmosphere of a classroom.

### **LCD Televisions**

Other useful technologies that should be mentioned would include LCD televisions, DVD and Blu-ray players, digital cameras and video cameras. An LCD television in the classroom is a useful piece of equipment. Prices have dropped significantly, and a 32 inch LCD high definition television can be purchased for around \$350.00 at any large retailer. Any teacher with an overhead projector or LCD television is able to display educational movies, digital video clips, images, and educational television shows directly through the projector. For those who may need to hook into the school's cable system, a USB television capture card, as discussed in the previous chapter, would work perfectly in conjunction with an overhead projector. This could work exceptionally well with a SMART Board as well. A DVD player and/or a Blu-ray player is a must have for all teachers, yet again, if the teacher has a DVD player or a Blu-ray player in their personal computer paired up with an overhead projector, there is no need for a standalone player.

### **Digital Cameras**

Digital cameras and digital video cameras can be excellent educational tools, not only for the students, but for the teacher as well. Professional athletes and professional sports organizations video tape their performances and then review the performances at a

later date to analyze, interpret, and refine their techniques. Teachers can use this technology for the same reasons as professional athletes, personal improvement. How much better would a teacher be if they could slow down and watch a “play by play” lesson plan fold out in front of their eyes? In addition, students love to work with video cameras and are natural actors. If students have access to video cameras, educators could give extra credit assignment where students create miniature movies instead of writing a papers. Perhaps students could film a process instead of demonstrating it in front of the class. This way, students are not only familiarizing the project with technology that they might already be familiar with, but it can add a new element to the assignment, making it more interesting for students and teaching them more about the process of how to manage a large scale project. There is much more to creating a video than pointing and shooting the camera. Students have to pre-plan what they are going to say, otherwise known as script writing. Next students have to plan their shots, shoot the video, and then upload the video into a computer where they can then edit the video into a final project. If no video camera is available, students can use regular digital cameras to take pictures and create storyboards with the images, creating captions for each image.

### **Digital Scanners**

Digital scanners are great for scanning in student work and placing on websites, or emailing home to parents as .PDF files. Students could scan their outstanding work to create portfolios, and teachers could save these examples of quality work for future classes. With a scanner a teacher can scan in photos for newsletters and power point presentations, or even use it as a copy machine/fax machine. Digital drawing tablets are a nice investment in digital art classes, and may be a viable solution for teachers who



enjoy hand writing on overhead projectors. With a digital pen, there are no more messy ink stained hands.

### **Video Technology**

Video technology has many uses, from displaying student work, to interactive gaming, website exploration, classroom discussion, viewing video clips and images, and much more. For districts that can afford the expense, the SMART Board takes this one step further with touch screen capabilities, and an unprecedented interactivity that may involve all students. Video cameras can be valuable tools for both students and educators alike. Projectors are a must have item in the classroom and if one can purchase a document camera, it just adds that much more interactivity to the classroom.

### **Computer Software**

There are hundreds if not thousands of educational software packages available today. The most useful for all involved and most likely the more obvious software package would be Microsoft Office.

### **Microsoft Office**

Long gone are the days of Microsoft Office containing just Word, Excel, PowerPoint, Outlook and Access. Today, Microsoft offers nine different versions of the Office Suite which contain the following programs: Microsoft Word, Microsoft Excel, Microsoft PowerPoint, Microsoft Outlook, Microsoft Outlook with Business Contact Manager, Microsoft OneNote, Microsoft Publisher, Microsoft Access, Microsoft Communicator, Microsoft InfoPath, and Microsoft Groove.

Table 8, on the next page, explains what Office Suites contain which of these Microsoft Programs.

Table 8 Programs Included in Microsoft Office Suites

Office Suite (Microsoft Office 2007)	Programs Included in Suite
Office Basic	Word, Excel, PowerPoint
Office Standard	Word, Excel, PowerPoint, Outlook
Office Home and Student	Word, Excel, PowerPoint, OneNote
Office Mobile	Word, Excel, PowerPoint Mobile Editions
Office Small Business	Word, Excel, PowerPoint, Publisher, Outlook with Business Contact Manager
Office Professional	Word, Excel, PowerPoint, Publisher, Access, Outlook with Business Contact Manager
Office Professional Plus	Word, Excel, PowerPoint, Publisher, Access, Communicator, Outlook
Office Enterprise	Word, Excel, PowerPoint, Publisher, Access, InfoPath, Groove, OneNote, Communicator, Outlook
Office Ultimate	Word, Excel, PowerPoint, Publisher, Access, InfoPath, Groove, OneNote, Outlook with Business Contact Manager
("Microsoft Office", 2009)	

Below are brief explanations of each Microsoft Office Program:

**Microsoft Word 2007.** Microsoft Word is a popular word processing program which allows users to write reports, edit content and share documents.

**Microsoft Excel 2007.** Microsoft Excel is a spreadsheet program which allows users to manipulate numbers and data. The power of Microsoft Excel is its ability to use formulas which perform mathematical equations and save the user time.

**Microsoft PowerPoint 2007.** Microsoft PowerPoint is presentation software which allows users to create multimedia presentations, quickly and easily.

**Microsoft Outlook 2007.** Microsoft Outlook is an email client which contains a

calendar, contacts list, and a task list.

**Microsoft Outlook with business contact manager 2007.** Microsoft Outlook is an email client which contains a calendar, contacts list, and a task list. Also allows organization of customer information.

**Microsoft OneNote 2007.** Microsoft OneNote is a program which allows users to organize data, and “gather notes, emails, and files all in one place” (“Microsoft Office”, 2009).

**Microsoft Publisher 2007.** Microsoft Publisher is a desktop publishing program that allows effortless creation of flyers, business cards, letterheads and other printable documents.

**Microsoft Access 2007.** Microsoft Access is a database program which is used to track and share data, making access to records and data quick and easy.

**Microsoft Communicator 2007.** “Microsoft Communicator is a program that contains instant messaging (IM), voice, desktop sharing and video. Integration with programs across the Microsoft Office system — including Word, Excel, PowerPoint, OneNote, Groove, and SharePoint — gives end users many different ways to communicate directly from the context of their task” (“Microsoft Office”, 2009).

**Microsoft InfoPath 2007.** Microsoft InfoPath is a program designed to create XML forms. These forms can be used to: collect specs for new employees, create electronic checklists that guide the user step by step through predefined work, or forms to coordinate work between multiple persons” (“Microsoft Office”, 2009).

**Microsoft Groove 2007.** Microsoft Groove is software designed to improve teamwork and collaboration. According to Microsoft.com, “Working in Groove

workspaces saves time, increases productivity, and strengthens the quality of team deliverables” (“Microsoft Office”, 2009).

### **Open Office**

For users or school districts that may not be able to afford the Microsoft Office Suite, a free office suite software package is available for download. This package, named Open Office, is an open-source suite, meaning that the base code is open to all developers. “The OpenOffice.org project is primarily sponsored by Sun Microsystems, which is the primary contributor of code to the Project. Our other major corporate contributors include Novell, RedHat, RedFlag CH2000, IBM, and Google. Additionally over 450,000 people from nearly every curve of the globe have joined this Project with the idea of creating the best possible office suite that all can use. This is the essence of an “open source community” (“Open Office”, 2009). While each program inside the suite may look slightly different than it’s Microsoft counterpart, it can open up Microsoft files, edit them, and save in the exact same format. This is an extraordinary opportunity for low-income families, or users who need the power of Office without the overwhelming cost. Open office contains the following programs in its suite:

**Open Office Writer.** Works just like Microsoft Word and although not all the features are identical or in the same place, opens all Microsoft Word files and has the ability to edit and save them. Anyone with Microsoft Word experience should be able to adapt to writer rather quickly and efficiently.

**Open Office Calc.** Open Office Calc is the equivalent to Microsoft Excel. Once again, almost identical in form and function. This author was unable to locate an auto sum button or a merge and center option, yet all other options were highly similar.

**Open Office Base.** Open Office Base is a database program, designed to work similarly to Microsoft Access. Users can create tables, form, reports and queries, just like Microsoft Access, “along with a set of predefined table definitions for tracking Assets, Customers, Sales Orders, Invoices and much more” (“Open Office”, 2009).

**Open Office Draw.** One unique program in this suite is the Open Office Draw program. In this author’s opinion, this program is like a glorified paint program, and is obviously Open Office’s version of Microsoft Publisher, only without any of the features and power that Publisher contains. Users could make flyers and brochures in this program, but not very easily.

**Open Office Math.** Open Office Math is like a digital white board where mathematicians can create and test mathematical equations. “MATH is OpenOffice.org's component for mathematical equations. It is most commonly used as an equation editor for text documents, but it can also be used with other types of documents or stand-alone” (“Open Office”, 2009).

**Open Office Impress.** Open Office Impress is a program that highly resembles Microsoft PowerPoint. Just like PowerPoint, users can choose specific layouts and a theme, add video, images, and text, and gives users full control over font size, type, color, etc. This program, like all Open Office programs, can open Microsoft Office files, edit and save to the same file type. Now that office suites have been covered, this author has some suggestions for creative use of Office Suite programs in the classroom.

### **Microsoft Word Ideas**

The following are some ideas on how students could benefit from the use of Microsoft Word in the classroom: Have students open up Microsoft Word at the very

beginning of the period. Determine a “word of the day” and make it available on the board or overhead projector. Have students write a sentence, or paragraph with the word of the day in it, or tell a story that connects the word of the day to their life somehow. A teacher could have students read a current event at the beginning of class and write a paragraph or two about how the event makes them feel, think, or how they would react to the situation, thus connecting their feelings with real world events through writing. Perhaps students could keep a journal, in a Microsoft Word file, where everyday they complete a new writing lesson. Perhaps this journal could incorporate the daily even or word of the day and at the end of the quarter, students could connect them all through a reflection paper.

Teach students how to check spelling and grammar using the spell check feature. Have students write a letter to the editor of a newspaper discussing their views on a topic that is important to them. Perhaps they could write a letter of request or a thank-you letter to a college, company, or local business. Have students pre-plan or brainstorm project ideas in Microsoft Word before actually starting the process. While it is incapable of creating flow-charts, it is still an excellent opportunity to familiarize them with using a computer and its software.

Obviously, Microsoft Word is simply a word editing program, and the majority of assignments that will utilize it are going to be writing assignments. This is not to say that students cannot use it to make basic web pages, or add images to their documents. If the only program students have is Word (i.e. Not Publisher) they still have the ability to make certificates, flyers, etc. It is just a bit more difficult and the teacher should download tutorials on how to do this.

### **Microsoft Excel Ideas**

While Excel is primarily software used to track numbers and data, and manipulate these numbers, this program is more powerful than many basic users can imagine. For example, one user has actually created a working version of the popular video game, Pac Man using nothing but Microsoft Excel (Kuchera, 2006). According to Karen Franker from the University of Wisconsin, not only can Excel be used for crunching numbers, but for some unique educational opportunities as well such as creating seating charts, interactive maps, timelines, crossword puzzles, bingo games, and self-correcting worksheets (2008). In this author's opinion, these types of interactive media created in Excel are best made by teachers and presented to students as the difficulty in creating them could be too much for the average student. Perhaps if a school has an advanced Excel class, the students in that class could create these types of materials for teachers in the district, giving students an opportunity to realize real-world value in what they are creating and at the same time, helping teachers with more creative technological tools they can use in their classroom.

One particularly good example for students is to each create a grade book and have students track their own grades as they receive their papers. This teaches them not only organization skills and basic computing skills, but also gives them direct feedback on their grade in the course and gives students an opportunity for self-reflection. The fact that Excel allows users to use text as well as numbers means that students could enter their self-reflections directly into the program.

Economics students could use Excel to track changes in the stock market. English students could keep track of what books they have and even log short entries about short

stories they have read. Stories and poems could be compared and contrasted and labeled with color and codes. Physical Education teachers and students could use Microsoft Excel to track progress in specific areas such as repetitions, BMI, weight, heart rate, etc. The possibility for this type of technology is seemingly endless.

### **Microsoft PowerPoint Ideas**

Microsoft PowerPoint is an effective presentation program which can help connect to learners to material. This is especially true in learners who favor a visual-spatial learning intelligence. Yet, there are many things users do which actually take away from their presentations often leaving viewers confused, annoyed, or in some cases, asleep. The following suggestions are what NOT to do when creating a PowerPoint presentation:

- Place too much information on one slide.
- Forget to use spell check
- Excessive use of bullets
- Bad color schemes
- Too many slides/presentation is too long
- Too much data in charts
- Too much animation/transitions
- Bad choice of font and/or font color
- Using photographs as background images

Too much information on one slide absolutely defeats the purpose of PowerPoint. The idea is to summarize key points on the slide, and then speak, from memory or experience about the topic. Lecturers can use the points to help them remember, but



reading directly off the page makes little sense. Users should always use spell check. There is no excuse for misspelling words and grammatical errors when there is a spell check option built into the program. Excessive use of bullets falls under the same category as placing too much information on one slide. By doing this, the presenter defeats the entire purpose of using PowerPoint and the key messages get buried under mounds of information.

Bad color schemes such as a yellow background with red text can make the viewers uncomfortable, or confused. The idea behind PowerPoint is to bring information to the audience and make them feel captivated and aware, not distracted and irritated. Too many cooks may spoil the pot and too long of a slide show will destroy what could be a perfect presentation. Know the limits of the audience and add in some effective group work or team building exercises to break up the monotony of the direct instruction. It could be anything from a 1 minute discussion with a neighbor, to breaking up in groups and performing a task, but it involves the audience, and an involved audience is a happy audience.

Adding too much data to a chart or graph simply makes it unreadable and ineffective. If a user has to use charts, keep them simple and effective. Animation can sometimes be necessary, but for the most part, there is no reason for transitions and animation in PowerPoint (there are exceptions to this rule). If a presenter must use transitions or animation, they need to make sure it is limited to only what is necessary. The last two, using photographs as background images and bad choice of font/font color go hand in hand. If a presenter chooses to use a photograph as a background image, eight times out of ten the text is going to be difficult for the audience to read. Even if the font

style and color is changed, there is always going to be at least one person in the audience who has difficulties with it.

A good rule of thumb is to always choose solid color backgrounds, or at least backgrounds that do not interfere with the text on the screen. Font choice is important from a designer's standpoint because a font can convey such strong feelings and emotions. What font a presenter chooses to use can reflect on the presenter's personality and may also affect the mood of the audience. A good rule of thumb is to stick with a standard font that is easy to read.

The Tuscaloosa City Schools web site has a nice list of suggestions on creative ways to use PowerPoint. These suggestions are located in table 9 on the following page.

Table 9 PowerPoint Ideas

- **Flash Cards** - Create Flashcard presentations for individual and group reinforcement. Topics may include: reinforcing math concepts; practicing parts of speech; practicing spelling; reinforcing story problems; and reinforcing numbers, letters, or colors.
- **Field Trip Slide Shows** - Develop field trip slide shows to review and apply knowledge learned on a field trip. Students can work together to make a slide show that presents what they saw, as well as what they learned.
- **Autobiographical Stories** - Students can create short autobiographical stories about themselves. Scanned photos can be inserted for interest. Once the slides are complete, you can put them together in a presentation to show an audience.
- **Interactive Book Reports** - Have students create a PowerPoint presentation about books they read.
- **Music Class Recitals** - For music teachers, PowerPoint is a useful tool for creating slide shows of student recitals. During a recital, take pictures of the students while they are performing and record a small portion of their music. On slides, include both each student's picture and music.
- **Group Slide Shows** - Have students research their assigned portions of the topic and develop slides to serve as a part of a group presentation about the topic.
- **Poetry Readings** - Students can create slides exhibiting their personal poetry along with a voice recording.
- **Science Presentations** - Use PowerPoint to teach processes and how things work. Teachers or students can add additional items to a diagram to illustrate how a process grows and changes.
- **Student Portfolios** - PowerPoint can be used to create portfolios of student work.
- **Class Yearbook-Type Presentations** - Collect photos; information about special events; examples of class and student projects, etc. throughout the year and create a year-in-review presentation. ("PowerPoint Tips", 2002)

## Classroom Management Software

Technology can also serve its purpose in the area of classroom management, especially for teachers with multiple computers, or in a computer lab environment. The first and most obvious type of management software would be a web filtering type of software. There are many different companies that make web filtering software, such as Blue Coat, Barracuda, Colorblind, Surf Control, Web Watcher, Safe Eyes, Cyber Sitter,

and Net Nanny among others. These software packages allow educators (and parents) to block individual websites such as You Tube, MySpace and Facebook, and automatically filter out pornographic materials as well as other inappropriate websites and materials. They create logs, allow restricted access of Instant Messaging programs and can even restrict the amount of time a user is allowed on the computer. More than likely, an educator's district will already have some sort of web filtering software in place, but in smaller districts this may not be the case. However, if a school district is accepting federal funding to pay for Internet access via the E-Rate program, it is required to have web filtering installed. This protection is mandated by the CIPA or Children's Internet Protection Act. CIPA does not affect school districts that do not receive E-Rate funding (Children's Internet Protection Act, 2009).

It is important to be aware of either the filter the district has put into place, or the filter that the educator has decided to put into place and realize that while they are effective, they are not perfect and pornographic images and materials can still make it through. Some prime examples include both Google and Yahoo's image search features. If students have access to turn off the "safe search" features on these websites, then pornographic material can easily be displayed. In addition, some students know what a proxy server is, and how to use a proxy to skirt a web filter.

In simple terms, a proxy is a web site that allows users to surf the Internet through its server. Once a user is using the proxy server, the web filtering software is not effective as they are now connecting through the proxy server. One should always filter out any sort of proxy web sites, including access to AOL which acts as a proxy server.

Also, educators should make sure to filter out any HTTPS proxy sites, as many filters do not filter HTTPS sites automatically.

### **Computer Hardware Management Software**

Another piece of software that is a very nice investment in a room with multiple computers or a computer lab is a program named Deep Freeze by Faronics. Deep Freeze allows a user to take a “screenshot” of exactly how the computer is setup and then “freezes” the computer into that state. From this point on, unless the computer is “unfrozen” through the administration software, nothing can be saved to the computer. If a student downloads a virus, the educator simply reboots the computer and it loads it back to its “frozen” state, virus free! As stated by Faronics, “With its reboot to restore technology, Faronics Deep Freeze offers the strongest protection available and eliminates the need for IT professionals to reconfigure, re-image, or troubleshoot computers, reducing support incidents by up to 63%” (“Reduce IT Support”, 2010).

This software is essential for good classroom management as students will not be able to install viruses, games, texting software, or any type of software at all. If they do manage to somehow get past security policies, a simple reboot will restore the computer to its original frozen state. Using Deep Freeze, educators can shut down an entire lab with the click of a button, and can freeze or unfreeze an entire lab as well. There are many different features that lend this software its great value. This software is available to place on single computers, or can be loaded onto a server to control multiple classrooms at once. If an educator chooses the single computer application, then each computer must be frozen and unfrozen individually. For educators with ten or more computers, it would be a wise investment to purchase the server software. In this

author's experience, Deep Freeze can prevent serious issues in a computer lab, from viruses and illegal downloads to simple errors and unintentional mishaps that can happen. It can save countless hours in full system reloads and restores.

### **Lab Management Software**

Last there are lab management software packages that allow full control over student computers. These packages can freeze the computers, displaying what only the teacher wants displayed. Students can be locked out of all applications, or just the internet. Student work can be demonstrated to the entire classroom with the click of a button. Best of all, this software allows real-time monitoring of every computer in the class at once. There are a few companies that make this software such as Synchroneyes, Vision, and SMART. One nice feature to these programs are the opportunity to immediately create polls for students, and quizzes that can be taken directly on their computers, with real-time data sent directly to the instructor for instant feedback. However, this software is most useful in lab settings.

### **Typing Software**

Typing software is one software program that all students can benefit from, especially if used at a young age. Today's employers are especially keen to hire employees with reasonable typing skills. "A typing speed of 40-60 words per minute (wpm), about 3-4 times faster than an average handwriting speed, is a commonly cited workplace standard. Some employers hiring for positions that involve a good deal of typing require even higher speeds" (Kinnif, 2009, para. 2). Typing benefits students in more ways than just employability. Throughout their twelve years of public school, students are going to have to write many papers and reports. They will have to be able to

create PowerPoint presentations, and search for information electronically. Being able to type will help students become academically successful.

There are many different typing programs on the market such as Typing Instructor Platinum, Mavis Beacon Teaches Typing, Typing Instructor, 21<sup>st</sup> Century Typing, Typing Master, Turbo Typing, Typing Pal and Microtype Pro. These programs begin by teaching students the basics of typing, from correct posture and hand placement, to adjusting their chairs properly and how to place their fingers directly on home row. As the lessons progress, more advanced techniques are introduced. Some of them will use games to reinforce the lesson. There are also a multitude of typing games available on the Internet for free, one needs only Google “Free Typing Game.” One website loaded with free typing games is <http://www.freotypinggame.net>. Many of the games are space themed and are reminiscent of space invaders or asteroids, yet to fire the laser, one must type the word marked on the asteroid. The best part about these games are that users can select specific keystroke areas they feel they need to improve upon, such as the home row, and only words in that specific group will be available (“Free typing”, 2009).

A nice single letter typing game named bubbles is available at <http://www.typingtest.com/games>. Bubbles start off slowly and increase in speed as the game progresses. This author would not suggest that beginning users learn to type with a single letter typing game as it is important to first learn the proper way to type words and sentences, yet, it is a nice reinforcement for advanced typists (“Online Typing Games”, 2009). Finally, <http://www.alfatyping.com/freotypinggames> offers a few different typing games including the popular QWERTY Warriors. This game contains enemies which approach the main character, and in order to save him, the user must type the word over

the enemy's head. The company has a more advanced version of QWERTY Warriors named QWERTY Warriors II which is designed for more advanced users ("Typing Games", 2009).

As a business education teacher, this author believes that anything an educator can do to reinforce typing skills is a plus. Whenever a student is hunting and pecking, or not typing properly, this behavior should be immediately corrected and proper techniques reinforced. Proper technique will not only help make students type faster, but will reduce the risk of carpal tunnel syndrome and other such physical injuries.

### **Graphic Design Programs**

Graphic design programs are very popular with students. They enjoy designing, drawing, coloring, or creating images on the computer. From this author's experience, students always seem to gravitate towards the Microsoft Paint program when they are bored or finished with an assignment. While Microsoft Paint is a versatile program, it lacks the form and function that serious graphic design programs such as Adobe Photoshop contain, yet, Adobe Photoshop is very expensive. Educators need an alternative solution. With reports that require high quality graphics and photos, or images that need to be resized to be placed on websites students need software that is dependable, capable, and best of all, free. There is one such program, GIMP. GIMP is a free graphic design program, created similarly to Open Office in the sense that it is "open source" software. GIMP looks, feels, and acts very similar to Adobe Photoshop and has many similar features. Both are built around a layers platform, which give graphic design programs their power. With layers, a user can rearrange graphic design elements with the drag of the mouse. If a mistake is made, because it was made on a separate layer from



the rest of the project, the student may simply discard that specific layer without affecting the rest of the project elements.

Another powerful feature of these graphic design programs are filters. Filters allow students to create very professional looking images without the necessary experience. For example, students can add a wind blown effect to an image or text, or add a smudge stick filter to add an artistic flair and originality. It is possible to make a photograph look like it was hand painted, turn it into a stamp, or even make it look like a poster. The possibilities seem limitless. With a Graphic Design program such as GIMP or Photoshop, students can:

- Color and Draw
- Enhance and edit digital photos
- Explore the color wheel including RGB, CYMK and other color settings and charts
- Create websites, flyers, and brochures
- Explore artistic capabilities in a consequence free environment (no more throwing away paper and starting over)
- Create posters, DVD covers, book covers, CD covers, etc.
- Enhance school projects with brilliant graphics and designs
- Design custom logos and introductions for film and movies
- Create graphics and designs for PowerPoint presentations
- Much, much more

This author cannot think of a better way to create a constructivist environment than by having available constructivist tools such as digital art programs which allow students to explore and construct their own learning. Graphic design can be added to nearly any

project in any subject. Take for example an English class where perhaps the teacher has assigned students to write a book of original poetry. Students could enhance the book by adding stunning graphics and a beautiful cover page.

With a graphic design program, students can easily perform this task. If students have a geography assignment and would like to digitally enhance a map, or place arrows to specific map locations, a graphic design program can do these things almost effortlessly. If a teacher has a computer in their classroom, they too would benefit by having GIMP or Photoshop installed on their computers as they will find many uses for it as well, from creating stunning images for PowerPoint presentations, to putting together flyers for parents or certificates for students. GIMP can be downloaded for free at [www.gimp.org](http://www.gimp.org). The website also offers a user manual and free tutorials to help beginning users.

### **Speech Recognition Software**

Another useful educational technology is SR software, or Speech Recognition Software. This incredible software is not cheap, but can be a useful tool in any classroom with one or more computers. There are many students who, due to physical handicaps or learning disabilities, cannot type properly, or at the same speeds as other students. This puts these students at a distinct disadvantage in both life and the classroom. According to charitable website AbilityNet, Speech Recognition Software "...is useful for people with physical disabilities who often find typing difficult, painful or impossible. Voice recognition software can also help those with spelling difficulties, including users with dyslexia, because recognized words are always correctly spelled" ("Voice Recognition", 2009). Speech Recognition Software, such as Dragon Naturally Speaking is the answer to

this dilemma. No typing is necessary as spoken commands will allow students to open software, run programs, and will type whatever is spoken into the microphone. Students can use this software for anything from surfing the Internet to writing research reports. It is even available as applications for smart phones, allowing users to dictate to their phone's notepad, or for searching for information on the smart phone.

According to the Dragon Naturally Speaking website, "Most people speak more than 120 words per minute, but type less than 40 words a minute. That means users can create documents and emails about three times faster with Dragon Naturally Speaking. Dragon never makes a spelling mistake and it actually gets smarter the more you use it" ("Dragon", 2009, para. 2). Yet, this type of software does require significant training as each person speaks in a different tone, dialect, and style. At first, the software can make multiple mistakes, but the longer a person uses it, the less mistakes it makes as it begins learning the individual's speech patterns. In other words, users are not going to be able to install the software and begin to use it immediately without error. Cost can also be a factor as a personal copy of Dragon Naturally Speaking 10, the most current version, costs anywhere from \$219.00 for preferred and \$899.00 for professional.

If cost is an issue, Microsoft Word 2003 and 2007 include free speech recognition (although it is this author's experience that it does not work as well as Dragon Naturally Speaking) which may be accessed by clicking "speech" on the tools menu. Users will then be required to setup a microphone and train the program to recognize their voice. Microsoft XP and Vista also contain Speech Recognition Software, yet it is not available as part of Windows, it must be downloaded separately. However, if Microsoft Office is installed, this software should already be placed on the user's

computer. According to Moskowitz one of the most important aspects of Speech Recognition is the microphone a user purchases. A poor quality microphone will lead to decreased word recognition. Few sound cards have powered microphone inputs, and almost none of the microphones are powered. First, users should check the package for a "batteries included" or "batteries required" notice. Or, they can purchase a USB microphone, the best way to go. These are usually powered. They're also Plug\_and\_play, virtually guaranteeing success (Moskowitz, 2003).

Users will need to first train the system by clicking "Start" then "Control Panel" and then the "Speech" icon. Users should determine if they are going to be the only person on the computer using the speech recognition software. If not, then individual accounts can be created by clicking the "new" button. Once a user profile is determined, the microphone needs to be configured by clicking the "configure microphone" button. Then, once the microphone has been configured, the "train profile" button may be pressed and training will begin. Upon completion of training, the Microsoft Windows "Language Bar" needs to be installed. This is done by clicking "Start" then "Control Panel." By selecting "Regional and Language Options" users will select the "Languages" tab and then click "Details" and then select "Language Bar."

Once the Language bar is in place, it may be turned on or off at will. Note that while using the Microsoft Speech Recognition package, users may not command the Windows operating system. As Moskowitz states, "this does not enable Windows XP to respond to commands for the operating system shell. You cannot use speech recognition to open the Windows XP Start menu, or the Windows XP Help and Support Center, for example" (2003). While Speech Recognition Software may or may not be beneficial to

students, it is certainly a direction that future computing is headed and it may be worthwhile to introduce these features in the classroom regardless of disabilities.

### **Other Educational Software**

There are countless amounts of educational software available for purchase, some are beneficial to students, others could be considered virtually worthless. Obviously, the majority of these software applications are best reserved for the home and perhaps even for the elementary education levels, but educators need to be aware that they do exist and that many good educational software programs are often displayed at local retailers such as Wal-Mart, Fred Meyer, Office Max and Office Depot in discount bins or other such areas. Frequently useful educational software can be purchased, such as 5000 free photos, Calendar Maker Professional, and other useful programs, for under \$10.00 per disc.

There are also exceptional free software packages such as GIMP, Open Office, and Microsoft's Movie Maker which are wonderful classroom utilities. Educators can perform Internet searches such as "best free educational software" or "top educational applications" and find numerous links. From there, it is the individual educator's discretion as to what they personally deem to be valuable software and their ability to either purchase or download the software packages. Most any software can be turned into a constructivist learning activity with the right amount of creativity.

### **The Internet**

Perhaps one of the most valuable innovations of the 20<sup>th</sup> century is the Internet. According to Thornburg, the key element of the past fifty years has been the exponential growth of our access to information (1999). However, before discussing further how

using the Internet as a resource for both students and educators, it is important to understand where the Internet came from and why it exists.

In 1969, the United States Government setup a network of computers which was named, ARPANET. It was created, in conjunction by a company named Bolt Beranek & Newman and researchers from Stanford University, based on concepts from MIT scientists Licklider and Kleinrock (Chandler, 2000). In the 1970's, email was created in order to send messages between computers across a network. With difficulties in different systems communicating, gateways were created to allow transmission between them. In the early 1990's, if users wanted to connect into this network, they had to go through specific providers such as Prodigy, CompuServe, AOL, and Delphi (Chandler, 2000).

It wasn't until 1989 when Tim Berners-Lee (named the hidden Rosebud of cyberspace by Quittner from Time Magazine in 1995) an Oxford graduate, created the World Wide Web, or the Internet as users know it today. Tim Berners-Lee "wrote the first web client and server in 1990. His specifications of URLs, HTTP and HTML were refined as Web technology spread" (Berners-Lee, 2010). To imagine what the Internet would have been like without Berner's-Lee's involvement, one would only have to envision an Internet without hyper-links (clickable links that take users from one page to another), without web addresses (think 101.255.21.38 instead of www.google.com) and without web pages in general. Only email and file transfers (FTP) would have been available. Instead of an enormous sea of information and free-speech, it would have simply been a stagnant pond of information, only available to those who had the tools and knew how to use them efficiently.

## Quality Information

With the advent of the Internet, information has never been easier to find, or more steadily available to users around the world. Yet, an important point to remember when accessing the Internet is not just the information, but the quality of the information.

Thornburg believes that all learners need to learn three foundational skills:

- How to find information
- How to determine if what is found is relevant to the task at hand.
- How to determine if the relevant information is accurate.(1999)

Many educators believe that print resources including books and scholarly journals are more credible than information found on the Internet, and in many cases, they are correct. Yet, what many educators fail to recognize is that many of these publications are now cataloged on the Internet and are available for students to view, download, and print.

According to Harmon, both educators and students need to realize and conceptualize the differences between the “open Internet” and the “closed Internet” (2007). For reference, the Open Internet is the Internet that average users know and use on a daily basis. Closed Internet includes password protected sites such as collegiate library sites and major journal publishers who require a fee or an access code to enter and view the materials. As Harmon further discusses, the Federal Government is moving away from printed reports and microform, instead, providing nearly all of its information on the Open Web. Similarly, major agencies such as the World Health Organization and the United Nations are following suit. (2007)

Also, educational sites such as Google Scholar include many peer-reviewed papers, theses, books, blueprints and abstracts, becoming one of the “most effective and popular

ways of searching for scholarly resources” (Harmon, 2007, p.55). This author would like to personally add that not only scholarly resources and primary sources are vital to student success. Many of the resources used in creating this handbook were taken from the “open Internet” and while are not peer-reviewed scholarly resources, were extremely important in providing technology information and pricing as well. The Internet is filled with excellent, relevant information, however one must be able to distinguish between the good information and the poor information.

With that said an educator’s goal should be to teach students to wisely determine the significance of the information found on the Internet, and be able to critically distinguish what is good information and what is poor information. They must educate students how to access closed website information, such as libraries and journals, as well as decipher useful information from Government websites, professional websites, and other primary source documents.

### **Wikipedia**

One website that should be addressed with students is Wikipedia.

In a 2005 study published in *Nature*, researchers compared articles from Wikipedia and the *Encyclopedia Britannica* for errors. In the forty-two articles compared, four from each source had serious errors. In addition, hundreds of minor errors were identified in the Wikipedia entries. *Britannica* refuted the study, claiming that the research methods were flawed. They additionally emphasized that *Britannica*’s articles are vetted and fact-checked by trained editors. This editorial review makes traditional encyclopedias more stable, but less able to adapt to new circumstances, than Wikipedia. (Ward, 2009, para. 2)



Wikipedia states in its disclaimer, "Wikipedia cannot guarantee the validity of the information found here" ("Wikipedia", 2010, para. 1) As a general rule of thumb, if Wikipedia is allowed, students should be required to cross reference the information with another source. Also, no information without references and reference notes should be allowed. While the idea behind Wikipedia is noble, and some topics contain excellent information, it is just not reliable enough to be used in research situations.

### **Primary Sources**

If students are taught the value of primary sources, or authentic original documents (i.e.: Declaration of Independence, transcripts of speeches, etc.), documents with clear authors, dates and references, and quality websites, there is no reason that students should not be allowed to tap into this vast digital vault of knowledge. One way to do this is to provide students with a list of websites to visit and retrieve information from. This way, the educator has control of the resources. Most schools should have access through their library to resources such as ERIC and Proquest for closed Internet resources. Typically, library resources include links to downloadable education videos and sites as well. Yet the most important thing educators can teach their students in regards to finding information on the Internet is to question everything and take nothing for granted. Just because something is printed on a webpage OR in a book, does not mean that information is correct. One needs to look no further than some textbooks that have been used in American schools over the past fifty years to understand this. This is why professors at the collegiate level would prefer peer-reviewed scholarly journals as they have been double checked by professors and deemed to be accurate.

Some links that may help educators and students distinguish resources for high quality, primary source information, are listed below:

**The ALA – using primary sources on the web.** This site defines primary sources, includes links on where and how to find primary sources on the Internet, and how to evaluate websites. Site location:

<http://www.ala.org/ala/mgrps/divs/rusa/sections/history/resources/pubs/usingprimarysources/index.cfm> (Godleski, Lincove, Mudrock, Oetting, Schwartz, Toth, Van Cleave & Wroth, 2009)

**A treasury of primary source documents.** An invaluable collection of historical works which contributed to the formation of American politics, culture, and ideals. Most likely the most comprehensive listing of primary sources this author has ever seen.

Located at: <http://www.constitution.org/primarysources/primarysources.html> (Gardiner, n.d.)

**Digital history primary source documents.** A comprehensive listing of original documents with more than 600 annotated documents from the Collection written by George Washington, Benjamin Franklin, Thomas Jefferson, and many others dealing with American history. Site located at

[http://www.digitalhistory.uh.edu/documents/documents\\_pl.cfm](http://www.digitalhistory.uh.edu/documents/documents_pl.cfm) (“Primary Source Documents”, 2009)

**Primary sources on the web.** A list of history related primary sources, located at <http://www.eduplace.com/ss/hmss/primary.html> (“Primary Sources”, 1999)

**Using primary sources on the Internet to teach and learn history.** Includes types and uses of primary sources, using the Internet to access primary sources, and a full

listing of exemplary primary sources. Site located at: <http://www.ericdigests.org/2001-1/history.html> (Shiroma, 2004).

Besides information for research and report writing, there are other numerous uses for the Internet in education. These include educational multimedia, videos, podcasts, RSS feeds, webcasts/webinars, and webquests.

### **Videos For the Classroom**

The Internet has very good resources some of which are interactive, multimedia, and live video feed resources. One such website that offers streaming educational video is the Discovery Education website, located at <http://streaming.discoveryeducation.com>. Discovery Education has over 9,000 digital video clips for educators, as well as over 71,000 content specific clips. This site also offers many different multimedia learning experiences and games as well as lesson plans to compliment the material (“Discovery Education Streaming”, 2009).

Another website offering streaming educational video is <http://www.mylearningtube.com>. This site offers free video in all subjects, from art and technology to home economics and mathematics. It also offers videos on classroom management for teachers who may be interested in honing their management skills. This site also offers a teacher’s lounge, and full RSS feeds (“My Learning Tube”, 2009). National Geographic offers a plethora of free educational videos located at <http://video.nationalgeographic.com/video>. These videos are categorized by animals, daily news, environment, kids, music, science and space, specials, and culture. This site also offers a wide variety of exotic photographs as well as maps, a green guide and much more (“National Geographic Video”, 2009).

PBS (Public Broadcast System) known for its educational programming, offers a site containing free educational video downloads as well. Located at <http://www.pbs.org/wgbh/nova/programs/index.html>, PBS offers its popular NOVA scienceNOW series for educators and students. Other videos are categorized by anthropology, disasters, earth, exploration, flight, health, history, investigations, nature, physics and math, space, and technology (“NOVA”, 2009). Prelinger Archives, located at <http://www.archive.org/details/prelinger>, offers over 2,000 films sorted into the following categories, animation and cartoons, arts and music, computers and technology, cultural and academic films, ephemeral films, home movies, movies, news, non-English videos, open source movies, spirituality and religion, sports videos, videogame videos, video blogs, and youth media. One particularly interesting area of this website contains antique educational videos (“Prelinger Archives”, 2009).

Edutopia is a website founded by Star Wars creator, George Lucas and is part of the George Lucas Educational Foundation. According to the website, they are attempting to change education for the better by connecting teachers with the resources and inspiration they need to prepare our students for 21st century success (“Edutopia”, 2009). At the following address, <http://www.edutopia.org/video>, free educational videos are available. Yet, these videos seem to be more focused on teacher training and information than for student viewing. Categories include assessment, integrated studies, project learning, social and emotional learning, teacher development, and technology integration (“Edutopia”, 2009).

Google video, located at <http://video.google.com> contains many different educational videos; only users will need to search for videos that they may find relevant.

Educators need to make sure that the safe search feature of this webpage is turned ON; otherwise it may locate pornographic materials and other materials inappropriate for students. Yet, with the correct search terms, Google video can find almost any different type of video an educator seeks from science and math to technology and art (“Google Videos”, 2009).

[Http://freesciencelectures.com](http://freesciencelectures.com) is a website devoted to science videos and lectures. Categories include animals, astronomy, biology, chemistry, physics, technology, water life, and weather. The majority of these videos seems geared towards the high school and collegiate level and may be too advanced for elementary education. For example, some topics include “Neutrophil Chemotaxis Chasing a Bacterium” and “HIV replication and life cycle” (Auckerman, n.d.).

E-How.com offers a wide selection of “how to” videos located at <http://www.ehow.com/videos.html>. These videos range anywhere from how to create music and shop safety to how to do side crunches and how to make pottery mugs. While not exactly dedicated educational videos, educators may find many of them useful for their particular lesson plans (“EHow”, 2009).

The History Channel is another educational video powerhouse known for their educational programming. The history channel offers streaming video with sample clips from their popular series as well as full episodes of select shows. Some of these shows include The Universe, That’s Impossible, Modern Marvels, Jurassic Fight Club, How the Earth Was Made, Expedition, Clash of the Gods, Battles B.C., and Ancient Discoveries. Learn more by visiting <http://www.history.com/video.do?action=home> (“History.com Videos”, 2009).

Teachers TV is a website that offers free educational videos in the following categories, art and design, business studies, citizenship, cross-curriculum, design and technology, engineering, English, geography, history, ICT, math, media literacy, foreign language, music, physical education, PSHE, religious education, science, and vocational education. Experience teacher's TV at <http://www.teachers.tv/video> ("Teachers TV", n.d.).

The PBS frontline website offers free educational videos complimented by lesson plans created in conjunction with the series. As per the PBS website, "Since 1983, FRONTLINE has served as American public television's flagship public affairs series. Hailed upon its debut on PBS as "the last best hope for broadcast documentaries," Frontline's stature over 25 seasons is reaffirmed each week through incisive documentaries covering the scope and complexity of the human experience" (PBS Frontline, 2009). Some videos include, "Bush's War", "Gangs of Iraq", "Living Old", "Dreams of Obama", and "Young and Restless in China." This site may be viewed at <http://www.pbs.org/wgbh/pages/frontline/view> ("PBS Frontline Online", 2009).

TeacherTube is the YouTube designed specifically for educators. According to the TeacherTube website, "TeacherTube community members are a major part of the evolution of the site. Members are encouraged to not only upload educationally relevant videos, but also to make constructive comments and use the rating system to show appreciation for videos of value to one as an educator or learner" Explore more at <http://www.teachertube.com> ("TeacherTube", 2009).

Table 10 Educational Video Quick Reference Guide

Name	Link	Brief Description
Discovery Education	<a href="http://streaming.discoveryeducation.com">http://streaming.discoveryeducation.com</a>	9,000 digital video clips, wide variety of subjects ("Discovery Education Streaming", 2009).
My Learning Tube	<a href="http://www.mylearningtube.com">http://www.mylearningtube.com</a>	Wide variety of subjects, Teachers Lounge, RSS feeds ("My Learning Tube", 2009).
National Geographic	<a href="http://video.nationalgeographic.com/video">http://video.nationalgeographic.com/video</a>	Animals, daily news, environment, kids, music, science and space, specials, and culture ("National Geographic Video", 2009).
PBS NOVA	<a href="http://www.pbs.org/wgbh/nova/programs/index.html">http://www.pbs.org/wgbh/nova/programs/index.html</a>	Anthropology, disasters, earth, exploration, flight, health, history, investigations, nature, physics and math, space, and technology ("NOVA", 2009).
Prelinger Archives	<a href="http://www.archive.org/details/prelinger">http://www.archive.org/details/prelinger</a>	Animation and cartoons, arts and music, computers and technology, cultural and academic films, ephemeral films, home movies, movies, news, non-English videos, open source movies, spirituality and religion, sports videos, videogame videos, video blogs, and youth media ("Prelinger Archives", 2009).
Edutopia	<a href="http://www.edutopia.org/video">http://www.edutopia.org/video</a>	Resources for teachers include: assessment, integrated studies, project learning, social and emotional learning, teacher development, and technology integration ("Edutopia", 2009).
Google Video	<a href="http://video.google.com">http://video.google.com</a>	Videos depend on what users search for ("Google Videos", 2009).
Free Science Lectures	<a href="http://freesciencelectures.com">http://freesciencelectures.com</a>	Higher learning. Animals, astronomy, biology, chemistry, physics, technology, water life, and weather (Auckerman, n.d.).
E-How	<a href="http://www.ehow.com/videos">http://www.ehow.com/videos</a>	Mostly how-to instructional videos ("EHow", 2009).
History Channel	<a href="http://www.history.com/video.do?action=home">http://www.history.com/video.do?action=home</a>	Clips and full episodes of favorite shows including The Universe, That's Impossible, Modern Marvels, Jurassic Fight Club, How the Earth Was Made, Expedition, Clash of the Gods, Battles B.C., and Ancient

		Discoveries (“History.com Videos”, 2009).
Teachers TV	<a href="http://www.teachers.tv/video">http://www.teachers.tv/video</a>	art and design, business studies, citizenship, cross-curriculum, design and technology, engineering, English, geography, history, ICT, math, media literacy, foreign language, music, physical education, PSHE, religious education, science, and vocational education (“Teachers TV”, n.d.).
PBS FRONTLINE	<a href="http://www.pbs.org/wgbh/pages/frontline/view">http://www.pbs.org/wgbh/pages/frontline/view</a>	Humanity documentaries including “Bush’s War”, “Gangs of Iraq”, “Living Old”, “Dreams of Obama”, and “Young and Restless in China” (“PBS Frontline”, 2009).
TeacherTube	<a href="http://www.teachertube.com">http://www.teachertube.com</a>	Educational videos uploaded and maintained by educators (“TeacherTube”, 2009).

While educational videos are often a wonderful supplement for certain lesson plans and curricula, educators can also incorporate video production into their curriculum to connect students with technology in a constructivist manner. Learners are motivated and encouraged by interactive multimedia to learn cooperatively and meaningfully (Faryadi, 2006). Using tools such as interactive multimedia, the students already know, use, and enjoy, it can change the environment of the classroom from a feeling of teacher directed to teacher supported, which is the ultimate goal of the constructivist educator.

### **Student Created Video in Projects**

Multimedia and Video Production are two technologies that are not only growing in popularity but are already utilized by a majority of students today. According to Davis, “over the next 50 years, we will witness an explosion of access to and production and distribution of video by communities that could not earlier afford to produce video in their homes, schools, and offices (1997, p. 43). One only needs to recognize the power of



mega-giant websites such as Youtube and Google Video to realize this future. Even students with families who may not afford to purchase video equipment are managing to create creative videos.

For example, one of this author's students wanted to make a skateboarding video for his senior project. He was able to borrow a basic digital camera (not a video camera) and film his entire video with the basic and limited recording capabilities of the camera. Once his filming was complete, he then used Microsoft Movie Maker, a free program included with Windows, to edit and organize his video. The final product was absolutely amazing, and this student received high reviews of his video by the Senior Project Presentation Panel, and later recommended for an excellence award.

Students are even using the video capabilities of their cell phones to record and edit short movies and skits. Educators should utilize this creative media outlet and allow students to make creative movies in lieu of dull written reports. This is not saying that all written reports are dull or that educators should do away with writing (especially if the writing is the focus), but rather to break the monotony of the direct-instruction classroom and to engage the students in a unique constructivist manner.

### **Live Video Feeds**

Another fashion of video that can be used in the classroom is live video feed. Web Conferencing, also known as Webcasts or "Webinars" are a wonderful way of connecting students and experts in the field without the hassle and expense of travel by either party. Many companies, such as Elluminate, Faronics, and NewTek, already use this technology to provide training for their customers. Some offer recordings that

customers may watch at their convenience, but many offer dates and times that customers may sign up for and receive live training on their software.

With free services such as Skype, webinars are easy to setup on both ends, and typically free to connect to. Equipment needed for a proper webinar includes: a personal computer, microphone of high enough quality student questions can be heard (or wireless so it may be passed around), a projector or monitor, so students may see the speaker(s) on the other end. Computer speakers are necessary so students may hear the speaker(s) on the other end. A broadband Internet connection, a video camera or web cam so speaker may see the class, and some sort of connectivity software such as Skype, Professional Live, or WebIQ.

To connect, both users create an account in the software. Next, they must ensure that their microphone and web camera or video camera works correctly with the software. Once both sides are working correctly, they simply connect, and the result is the equivalent of a digital telephone call, complete with audio and video. With a broadband connection, there should not be much latency or lag between the two parties and motion should be almost instantaneous.

At times users will experience some audio delay, which may sometimes interfere with communication between the two parties, but the benefits tend to outweigh the negatives as students are receiving information directly from experts in the field and connecting their education to real world issues and solutions. For more information about how to connect via Skype, users may visit their website at <http://www.skype.com/help/guides/callwithvideo> ("Call Someone", 2009). With Webinar technology, students can connect with web designers, video producers,

mathematicians, business owners, politicians, scientists, astronauts, the possibilities are endless.

### **Podcasts and RSS Feeds**

Podcast and RSS feed technologies are yet another way to use the Internet in an effective, creative manner. The Podcast (a mix of the terms Ipod and Broadcast) is a Series of digital media files, either audio or video that is released episodically and downloaded through web syndication. The mode of delivery is what differentiates podcasts from other ways of accessing media files over the Internet, such as simple download or streamed Webcasts: special client software applications known as *podcatchers* (like iTunes, Zune, Juice or Winamp) are used to automatically identify and download new files in the series when they are released, by accessing a centrally-maintained web feed that lists all files currently associated with that particular series. New files can thus be downloaded automatically by the podcatcher and stored locally on the user's computer or other device for offline use, making it simpler for a user to access episodic content. ("Podcasts", 2009, para. 1)

"Educational Podcasting is about capturing the imagination of learners, presenting materials and providing resources in the form of audio, enhanced or video podcasts in new and exciting ways" ("Educational Podcasts", 2009, para. 7)

Warlick claims "Podcasts are published as RSS feeds (most blogging software features RSS feed generation). Listeners are notified of new programs by their aggregators, which then download the programs and then transfer them to the listener's MP3 audio player, such as an Ipod" (2009, para. 3). In other words, a Podcast is simply a recording of something, such as a video or an audio program that is pushed from a server

to a user's computer. So, instead of a user having to go to a website and download the recordings, the website will push it out to subscribers when new episodes are available. Users can then listen or view the program at their convenience. As any educator can imagine, this could be an extremely useful tool in the classroom.

Similarly, OCLC.com defines an RSS feed as, "Really Simple Syndication (RSS) is an XML-based format for distributing information from websites to desktops. A newsreader application accesses the RSS feeds you choose to bring your favorite information sources to you" ("RSS Feeds", 2009, para. 1). The RSS feed and the Podcast have a distinct advantage. By pushing the information to users there is no searching, rather the search is done for a user and information brought exactly to them, in essence, a proverbial foot in the door. For educators, it is a time saving tool which allows useful content to be delivered directly to them without the hassle of searching for information and materials which may be conveniently perused at a later time.

Podcasting is not just for downloading, but rather teachers can use this technology to their advantage as well. According to Cole, Podcasting is an excellent means to distributing materials and information to students including video, images, and sound. Also, it can be used to send information to parents, a spoken newsletter of sorts (2007). All educators need to do to take advantage of the Podcast revolution is 1) Record their lesson(s) onto a computer, 2) convert the file to MP3 format in order to make the file size smaller and more manageable, and 3) Upload to a Podcast website of their choice. Some offer free services, and others may charge a small fee. From that point, users should be able to subscribe to the specific Podcast.

A list of Podcasts which Educators may find useful are found on Table 11 on the following page.

Table 11 Useful Podcast Links

PODCAST	SITE ADDRESS	DESCRIPTION
The Education Podcast Network	<a href="http://epnweb.org">http://epnweb.org</a>	"The Education Podcast Network is an effort to bring together into one place, the wide range of Podcast programming that may be helpful to teachers looking for content to teach with and about, and to explore issues of teaching and learning in the 21st century" (Warlick, 2009).
Open Culture	<a href="http://www.openculture.com">http://www.openculture.com</a>	Free audio and podcasts including books, university courses, foreign language lessons, ideas and culture, music, news, science, technology, travel, business and law ("Open Culture", 2009).
Apple iTunes U	<a href="http://www.apple.com/education/teachers-professors/mobile-learning.html">http://www.apple.com/education/teachers-professors/mobile-learning.html</a>	200,000 lectures, presentations, videos, readings, and podcasts from all over the world ("apple.com", 2009).
Podcast Alley	<a href="http://www.podcastalley.com">http://www.podcastalley.com</a>	Categories include: arts, comedy, environment, hobbies, government, family, news, science, sports, travel, business, education, health and more.(McIntyre, 2009)
Kidcast	<a href="http://www.intelligenic.com/blog">http://www.intelligenic.com/blog</a>	Information on Podcasting and how educators can utilize this technology in the classroom ("Kidcast", 2007).
Boomerang!	<a href="http://podcast.boomkids.com">http://podcast.boomkids.com</a>	"Audiomagazine for kids, where we tackle big ideas, go back in time to interview important people, tell great stories, and explore wonders of nature and science" ("BoomKids", 2009)
Online Education Database	<a href="http://oedb.org/library/beginning-online-learning/skip-the-tuition:-100-free-podcasts-from-the-best-colleges-in-the-world">http://oedb.org/library/beginning-online-learning/skip-the-tuition:-100-free-podcasts-from-the-best-colleges-in-the-world</a>	Entire courses in Podcast format. From giants such as Stanford, UC Berkeley, and MIT. ("Skip the Tuition", 2008)
Teacher's Podcast	<a href="http://www.teacherspodcast.org">http://www.teacherspodcast.org</a>	News, views, research and resources for all educators.(King & Gura, 2008)
Learn Out Loud	<a href="http://LearnOutLoud.com">http://LearnOutLoud.com</a>	Arts & Entertainment, Biography, Business, Education & Professional, History, Languages, Literature, Philosophy. Politics, Science, Social Sciences, Technology, and Travel (Kolenda, 2009)
NPR Podcast Directory	<a href="http://www.npr.org/rss/podcast/podcast_directory.php">http://www.npr.org/rss/podcast/podcast_directory.php</a>	Around the Nation, Arts & Life, Books, Business, Economy, Health, Music, News, Politics, Science, Technology, U.S., World ("NPR Podcast Directory", 2009)

## ListSrvs

Of course there are many other creative lesson plan ideas all over the Internet, and one of the best resources available are the minds of those who teach in America's classrooms. Interacting with other teachers is an excellent way to gain new perspectives and acquire fresh ideas. An excellent tool to interact with other educators are via educational ListSrvs. Short for list server, a ListServ is simply a mailing list a person can sign up for, and hold discussions with other like minded individuals. To subscribe to a ListServ, first users must know the email address of the group they would like to join. Once the address is known, they must subscribe to the service by emailing the address with the following in the subject line sub <<LISTNAME>><<Your Name>> an example would be sub EDTECH-L John Doe.

When users reply to a subject, even though they are only hitting reply, it is replying to everyone on the entire ListServ. This type of immediate collaboration increases the chance of receiving a quick reply to any questions asked. Teachers can quickly and efficiently share ideas. ListServ users should always remain respectful, clear, and help contribute to the group. For a comprehensive list of educational ListSrvs, visit [http://www.teacheruniverse.com/tools/links/ed\\_listsrvs.html](http://www.teacheruniverse.com/tools/links/ed_listsrvs.html) ("Educational ListSrvs", 2000). CataList is the official catalog of ListServ lists. It contains listings for over 60,000 available ListSrvs and should have a listing for virtually any topic an educator should wish to research or discuss. The URL for CataList is <http://www.lsoft.com/lists/listref.html> ("CataList", 2010) Both sites have detailed information about how to join specified ListSrvs.

As stated by Hopkins, "If you're a teacher or school administrator who has access to e-mail, you have no excuse -- you ought to join a listserv" (2004, para. 1). However, there are a few things to keep in mind before joining a ListServ. First, this author suggests creating a free email account before signing up for a ListServ as they can produce extreme amounts of email in a short amount of time. A free email provider such as hotmail.com, gmail.com or yahoo.com should work well for managing ListServ emails. In addition, as suggested by Hopkins, the ListServ confirmation e-mail should provide information about how to "un-subscribe" from a list. Getting off a list is as easy as getting on one is. But be sure to save the directions for unsubscribing. In a week or two, if it is decided that a particular listserv isn't useful, that information will be needed (2004).

### **WebQuests**

The possibilities provided by the Internet to incorporate multimedia enhanced educational opportunities are clearly abundant, yet there is one innovative use of the Internet that has not yet been discussed, and in this author's opinion is one of the greatest tools a teacher can utilize, the WebQuest. The WebQuest, created in 1995 by Bernie Dodge a professor at San Diego State University is an inquiry-based activity in which most (or all) of the information used is found or pulled from the Web (Dodge, 2001).

According to March, "A WebQuest is a scaffolded learning structure that uses links to essential resources on the World Wide Web and an authentic task to motivate students' investigation of an open-ended question, development of individual expertise, and participation in a group process that transforms newly acquired information into a more sophisticated understanding" (2003, para. 6). In other words, if the students are



able to simply cut and paste from the web and place the information into a word document, or PowerPoint slide, it is not a true WebQuest.

WebQuests are designed to use learners' time well, to focus on using information rather than looking for it, and to support learners' thinking at the levels of analysis, synthesis, and evaluation." (Dodge, 2001). WebQuests can be created for all grade levels, from kindergarten to the University level. Listed below are the five sections to a Webquest, each will subsequently be described in further detail.

- The Introduction
- The Task
- The Process
- Evaluation
- Conclusion

The introduction to the WebQuest is just as it sounds, a short introduction explaining what the WebQuest is about. It "sets the stage" and provides background information for the project. The task is one that is interesting to the students and something that they are capable of completing. The process should be broken down into smaller steps and are detailed instructions for students on how to complete the task. The evaluation is simply a rubric or means of how the project will be evaluated, and the conclusion is the closure of the WebQuest, reinforcing the entire project. The evaluation reminds the students of what they have learned, and encourages them to take their own learning to the next level.

Creating an excellent WebQuest is not an simple task. Even this author is guilty of creating WebQuests that Dodge or March would consider to be sub-par at best. The

most difficult aspect of WebQuest design is trying to pick a topic in which students will challenge their own belief systems in order to construct new knowledge. March states that all WebQuests should be designed with the three R's in mind, "Is it Real, Rich, and Relevant?" (2004). According to Dodge, there are five guiding principles to designing a WebQuest which he has given the acronym of FOCUS:

**F**ind great sites.

**O**rchestrate your learners and resources.

**C**hallenge your learners to think.

**U**se the medium.

**S**caffold high expectations. (Dodge, 2001).

Therefore, simply creating a WebQuest that sends students to a website to play games, or look up basic information would not qualify it as a true WebQuest. According to Dodge, these are some things to think about when designing a WebQuest.

A good WebQuest...

- Is wrapped around a doable and interesting task that is ideally a scaled down version of things that adults do as citizens or workers.
- Requires higher level thinking, not simply summarizing. This includes synthesis, analysis, problem-solving, creativity and judgment.
- Makes good use of the web. A WebQuest that isn't based on real resources from the web is probably just a traditional lesson in disguise. (Of course, books and other media can be used within a WebQuest, but if the Internet isn't at the heart of the lesson, it's not a WebQuest.)
- Is not a research report or a step-by-step science or math procedure. Having learners simply distilling web sites and making a presentation about them isn't enough.
- Is not just a series of web-based experiences. Having learners go look at this page, then go play this game, then go here and turn your name into hieroglyphs doesn't require higher level thinking skills and so, by definition, isn't a WebQuest.

(Dodge, 2001)

This author believes that WebQuests are a great way to merge constructivist learning and technology into an interesting and relevant lesson which provides students with well planned scenarios while building teamwork and interpersonal skills in the process. For more information, visit <http://webquest.org/index.php> (Dodge, 2001). The website has instructions on how to create a WebQuest, a searchable database for WebQuests made by other teachers, as well as a generous resources page with many links to topics regarding inquiry-based learning and constructivist teaching.

### **An Example WebQuest**

The following is a WebQuest that is used in this author's personal Microcomputer Applications course as an end of the semester project. The inspiration for this particular WebQuest was originally found on the Webquest.org database over four years ago, and, at the time, was not highly rated by teachers who had visited the site and rated it. It was highly modified and delivered three years ago as a final project to bring together all the skills learned over the semester in an interesting, real-world project, and has been recreated and readjusted several times since.

The idea behind this particular WebQuest is to introduce high school students to a workplace/real life scenario where they are responsible for researching and purchasing hotel rooms, airfare, car rentals, event tickets, equipment, etc. They are required to keep track of all expenses, create a budget, create a realistic timeline, and be able to follow a route and schedule. The most interesting part of this project is hearing the students' reactions and comments to the project. Any given semester, a student will claim, "I love that project! Before I didn't know how to rent a car, book an airline flight, or rent a hotel

room, and now I feel like this is something that I could do after I graduate!” or “I cannot believe how hard this project was, but I learned so much from it.”

This author's is particularly impressed when the students talk about what they will do with the left over money from the trip, for example, “We are planning on donating our left over money to cancer research.” Needless to say, the project is a difficult project, and placing four teenage students together to work on a project of this scope will often give random results in regards to quality. Because of this, all groups are teacher selected, and a formula has been devised to ensure that all students are graded fairly via a peer review form a further explanation follows.

The author presents students with a starting “professional points” value of fifty points per student. If students work well in their team and provide valuable work, they will then receive the full fifty points at the end of the project. However, if students do not participate or do their share of the work, they will then lose points. The students who are doing their work will inherit those points and therefore will receive a higher grade than the student who was not participating. This way, students who are working effectively do not get punished for the lack of effort from their peer.

The points are determined through a mix of teacher observation and peer review. At the end of the project, after all presentations have been completed, students are asked to sit apart from group members. They are then given a peer review form in which they rate their peers on a scale of one to ten, with one being the least amount of effort, and ten being the highest amount of effort. Students are given a space to make comments about their peer's performance. The numbers are then added up and if the average is nine to ten points, the student retains their points. If the number drops to seven to eight, they will

lose ten points. Five to six, students lose twenty points. This repeats itself until students run out of points.

For a detailed example of the aforementioned WebQuest along with the grading rubric, please refer to Appendix D.

### **Funding Technology**

As previously stated in the Introduction to this guide, technology is a key aspect of today's educational system and all students must have access to current equipment, software and Internet connections. However, school district budgets do not always take into consideration how rapidly technology changes. Matt Elliott, senior editor for the popular technology website, CNET believes that the average life for computer technology is roughly three to five years (2010). While one may argue that their home PC has lasted them several years longer, it must be taken into consideration how many students are using the computer, what the computer is being used for, the rapidity of which software changes (and therefore needs faster, more powerful hardware), etc.

Projectors need bulbs, software becomes outdated, licensing fees need to be renewed, and unfortunately, technology can break. Due to the high cost of technology, some school districts fall far behind in this area, and even educators who would like to use more technology in the classroom find it nearly impossible to integrate. Therefore students wind up only using technology in computer labs, and not directly in the classroom.

According to Schrum, it is important to use technology regularly and seamlessly rather than for short "disjoined" experiences in a computer lab. If students only perform drill and kill and remedial activities with a computer, they miss out on the opportunities

to explore the higher-level thinking skills such as synthesis, analysis, and problem-solving (2003). Is it possible to reach these higher order thinking skills with only a few hours per month in a computer lab? This author does not believe it can happen. The technology needs to be available on a daily basis and implemented into the curriculum.

The problem remains, where will the funding come from? If the school district's budget does not allot for classroom technology funding, the funding will have to be sought after by the individual teacher. Obviously paying for the technology out of their own pocket is an absurd notion, but there are many grant opportunities teachers may apply for to hopefully receive funding for their classroom technology needs. Therefore this final section of this handbook is simply a listing of several technology grant opportunities for educators.

## **Grants**

This section will contain tips for grant writing, but will not go into detail about how to write grants. It is best to consult a handbook or book written by a specialist in this area.

**NEA Foundation grants - \$varies:** Throughout the year, the NEA Foundation awards close to 200 grants to support educators' efforts to close the achievement gaps, develop creative learning opportunities for students, and enhance their own professional development ("Apply for NEA", 2009).

<http://www.neafoundation.org/pages/educators/grant-programs/grant-application>

**Best Buy technology inspired teaching grant - \$2000.00:** Rewarding Schools for Engaging Students- At Best Buy we believe technology can excite and engage students, creating a more valuable educational experience. Through Best Buy Teach

Awards we provide gift cards to schools to enable them to purchase more technology for their students to use and learn. Since 2004, the Best Buy Teach Award program has awarded over \$17 million to over 6,000 K-12 schools nationwide (“Technology Inspired”, 2007). <http://www.bbycommunications.com/crnew/teach.asp>

**Toshiba America Foundation - \$5000.00:** Toshiba America Foundation (TAF) is currently accepting applications for grants to support innovative projects designed by math and science teachers to make their own classrooms more exciting and successful for students (“Toshiba America Foundation”, 2009). <http://www.toshiba.com/tafpub/jsp/home/default.jsp>

**Verizon Foundation grants - \$varies:** Verizon wants to transform the way the private, public, and nonprofit sectors work together in building collaborative partnerships. “Dollar amounts are not the only measure of our grant making goals. The Verizon Foundation and our partners have much to offer above and beyond cash grants. Using our website you can find volunteers, Internet training, business advice and Web developers. Our online community has a wealth of resources that can help you every time you visit” (“Verizon Foundation”, 2009). <http://foundation.verizon.com/grant/application.shtml>

**Captain Planet Foundation - \$varies:** The mission of the Captain Planet Foundation is to fund and support hands-on, environmental projects for children and youths. Our objective is to encourage innovative programs that empower children and youth around the world to work individually and collectively to solve environmental problems in their neighborhoods and communities. Through environmental education, we believe that children can achieve a better understanding and appreciation for the world in

which they live (“Captain Planet Foundation”, 2007).

<http://captainplanetfoundation.org/default.aspx?pid=1&tab=about>

**P. Buckley Moss Grant Foundation - \$1000.00:** Each year the P. Buckley Moss Foundation for Children’s Education has made available five \$1,000 grants to be awarded to educators who need money to further their program goals (“P. Buckley Moss”, n.d.)

<http://www.mossfoundation.org/page.php?id=89>

**Sprint Character Education Grant Program - \$Varies:** Through the Sprint Character Education Grant Program, the Sprint Foundation will award grants to school districts and individual schools to fund the purchase of resource materials, supplies, equipment and software that facilitates and encourages character education among K-12 students. With a national reach, the program is open to all US public schools (K-12) and US public school districts (“Sprint Character Education”, 2009).

<http://www.sprint.com/responsibility/education/character/index.html?id8=vanity:educationalgrants>

**Adopt a Classroom - \$Varies:** Adopt-A-Classroom invites the community into the classroom in support of teachers and their students. By adopting a classroom, donors form partnerships with specific classrooms providing financial and moral support. The result is a meaningful contribution to education in which donors experience the impact of their efforts and celebrate in a classroom's success (“Adopt-a-Classroom”, 2009).

<http://www.adoptaclassroom.org/index.aspx?private=0&inter=0>

**Digital Wish - \$Varies:** “Just like a gift registry, you build a wish list of technology products for your classroom. Then you can tell prospective donors how their support will make a difference to your students. After a purchase, Digital Wish



automatically donates an additional 2%-10% in funding for your next technology project” (“Digital Wish”, 2009).

<http://www.digitalwish.com>

**Donors Choose - \$Varies:** “DonorsChoose.org is an online charity that makes it easy for anyone to help students in need. Here's how it works: public school teachers from every corner of America post classroom project requests on DonorsChoose.org. Requests range from pencils for a poetry writing unit, to violins for a school recital, to microscope slides for a biology class.

Then, you can browse project requests and give any amount to the one that inspires you. Once a project reaches its funding goal, we deliver the materials to the school” (“Donors Choose”, 2009).<http://www.donorschoose.org>

**Teachers Count- \$N/A:** Not a direct grant website, but contains many links to excellent grant resources for educators. Has list of grant opportunities available by subject, and general grants including technology grants (“Teachers Count”, 2009).  
<http://www.teacherscount.org/teacher/grants.shtml>

**Electronic Grants Online.** Owned and operated by the United States Department of Education. Users must sign up and then can search and apply for grants. Contains a comprehensive listing of grants offered by the Federal Government (“e-Grants Electronic Grants”, 2009). <http://e-grants.ed.gov/egHome.asp>

### **Grant Writing Tips**

These grants sites are only a fraction of what is available to educators. While some grants are much easier to find than others, there is no argument that any grant is a good grant. Yet, knowing where to find the grant is only part of the equation.

Convincing donors that a project is worth funding is the hard part. Below are some grant writing tips from experienced grant writer, Bryan Feci who has received over \$20,000 in grants in four years:

1. Have A Student-Centered Project in Mind: Grant committees like out of the box thinking that improve innovative learning strategies.
2. Stay Positive! Negativity does not equal success.
3. Be Selective in the Grants You Choose to Apply For: Only apply for grants you are interested in and know you will carry out.
4. Follow Directions: Many grants have strict rules and procedures. You are asking for the money, so the least you can do is follow the directions.
5. Proofread: Why would a grant committee give you money for educational funding if you cannot even check your work for misspellings and grammar errors?
6. Avoid the Word “Will”: It is too easy to become severely repetitive using this word.
7. Avoid Being Too Wordy: Get straight to the point. There are many applications for panels to read and review, be precise in your proposal. (Feci, 2008)

For more information about grant-writing, or help with grant writing skills, the following websites are available:

Grants Concept/Proposal Enhancement Guide  
[www.conserv.ca.gov](http://www.conserv.ca.gov) (“Grants Concept/Proposal”, n.d.)

A Guide to Proposal Planning and Writing  
[www.wm.edu/grants/PROP/propasst.html](http://www.wm.edu/grants/PROP/propasst.html) (“Grants and Research”, 2009)

Electronic Grants Online  
<http://e-grants.ed.gov/egHome.asp> (“e-Grants”, 2009)

Advice and Information on Grant Seeking and Proposal Writing  
<http://literacy.kent.edu/Oasis/grants/first.html> (Cugino, Luedke & Ponder, 2009)

Non-Profit Guides  
[www.npguides.org/index.html](http://www.npguides.org/index.html) (“Non-Profit”, n.d.)

### Grants Proposal Writing Tips

[www.cpb.org/grants/grantwriting.html](http://www.cpb.org/grants/grantwriting.html) (“Brooks-Young”, 2009)

In conclusion, it is this author’s opinion that many of today’s teachers are either a) not interested in using technology in their classroom, b) do not know how to use technology in their classroom or c) do not have funding or space to use technology in their classrooms. With the massive influx of technology, students are becoming more tech savvy every day. Schools need to adapt to the new learning styles of its students and use technology as a tool to promote constructivist learning.

## CHAPTER V.

### SUMMARY

In summary, the need for a technology handbook for educators was researched. Particular attention was placed on teacher technology knowledge and statistics on how educators are using technology in the classroom. It was determined that there was a need for an educational technology handbook designed for teachers who have basic technology knowledge, but are looking for ideas on technologies they can integrate into their classrooms. Therefore, a handbook was created to provide teachers with a resource guide to many different facets of educational technology including the computer and its parts, laptops, netbooks, and handheld computing devices. Also covered were visual technologies such as projectors, document cameras, SMART boards, LCD televisions, DVD and Blu-Ray discs, scanners and digital video and photography equipment. Educational software as well as information about educational aspects of the Internet were provided as well as a brief section on grant writing.

In the near future, the handbook will be presented and distributed among educators at the East Valley School District in Yakima, Washington. It is this author's hope that teachers will learn a great deal from the handbook and will incorporate some of the ideas into their working curriculum in order to help provide higher-learning activities and create a constructivist environment.

### **Suggestions for Further Work**

There are many different ideas and information that graduate students could do for further research. For example, the handbook only provides a very brief look at visual technologies, software and possible uses of the Internet. There are hundreds if not

thousands of examples available that could be added to this handbook, which could then be incorporated into a digital technology textbook or training guide.

Another idea is to provide more information on how to physically use the hardware, complete with instructions, photographs, and perhaps even a supplemental DVD with how-to videos. Sections could be added on how to fix computers, how to setup email accounts, how to manage computer networks, etc. The possibilities are seemingly endless. With the correct additions this handbook could become very useful for all educators in all subject areas.

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## APPENDIXES

### Appendix A

#### The ISTE National Educational Technology Standards (NETS•T) and Performance Indicators for Teachers

##### **1. Facilitate and Inspire Student Learning and Creativity**

- promote, support, and model creative and innovative thinking and inventiveness
- engage students in exploring real-world issues and solving authentic problems using digital tools and resources
- promote student reflection using collaborative tools to reveal and clarify students' conceptual understanding and thinking, planning, and creative processes
- model collaborative knowledge construction by engaging in learning with students, colleagues, and others in face-to-face and virtual environments

##### **2. Design and Develop Digital-Age Learning Experiences and Assessments**

- design or adapt relevant learning experiences that incorporate digital tools and resources to promote student learning and creativity
- develop technology-enriched learning environments that enable all students to pursue their individual curiosities and become active participants in setting their own educational goals, managing their own learning, and assessing their own progress
- customize and personalize learning activities to address students' diverse learning styles, working strategies, and abilities using digital tools and resources
- provide students with multiple and varied formative and summative assessments aligned with content and technology standards and use resulting data to inform learning and teaching

##### **3. Model Digital-Age Work and Learning**

- demonstrate fluency in technology systems and the transfer of current knowledge to new technologies and situations
- collaborate with students, peers, parents, and community members using digital tools and resources to support student success and innovation
- communicate relevant information and ideas effectively to students, parents, and peers using a variety of digital-age media and formats
- model and facilitate effective use of current and emerging digital tools to locate, analyze, evaluate, and use information resources to support research and learning

##### **4. Promote and Model Digital Citizenship and Responsibility**

- advocate, model, and teach safe, legal, and ethical use of digital information and technology, including respect for copyright,
- intellectual property, and the appropriate documentation of sources

- b. address the diverse needs of all learners by using learner-centered strategies and providing equitable access to appropriate digital tools and resources
- c. promote and model digital etiquette and responsible social interactions related to the use of technology and information
- d. develop and model cultural understanding and global

**5. Engage in Professional Growth and Leadership**

- participate in local and global learning communities to explore creative applications of technology to improve student learning
- exhibit leadership by demonstrating a vision of technology infusion, participating in shared decision making and community
- building, and developing the leadership and technology skills of others
- evaluate and reflect on current research and professional practice on a regular basis to make effective use of existing and emerging digital tools and resources in support of student learning
- contribute to the effectiveness, vitality, and self-renewal of the teaching profession and of their school and community

(“*NETS-T NETS Standards for Teachers*”, 2008)

For more information about the National Technology Education Standards (NETS) for students and administrators, or to research the International Society for Technology in Education material, please visit, <http://www.iste.org>

## Appendix B

### Digital Empowerment Checklist

The checklist can be used as a tool to reflect on attitudes, expectations, policies, practices, and standards. Place a check after items that could create a more empowered environment in your school, community or home (Pittman, 2003).

1. View the Internet as an essential skill.	11. Avoid diverting funds from needed resources to include technology by including it as a part of existing resources, not an add-on.
2. View technology as a vehicle for learning.	12. Provide learner and teacher access to support infrastructure 24/7.
3. Assess technology performance as a part of academic, school, and program evaluation.	13. Develop infrastructure that ensures classroom access to the Internet.
4. Teach individuals how to learn, along with what to learn.	14. Provide for ongoing commitment to readjust technology and Internet programs, since they are evolve resources that change.
5. Require technology as an essential motivational learning and teaching tool in and out of the classroom.	15. Provide local, state, and federal legislation that supports technology in education, schools, and community through categorical funding as opposed to supplemental appropriations that come and go.
6. Use technology to support targeted learning to include all genders and special needs of learners.	16. Provide grants and loans to individuals that community organizations for technology support.
7. Use technology to promote social, cross-cultural interaction.	17. Reduce rates for telecommunications to support universal service programs in homes.
8. Require technology as an essential knowledge and skill for all educators.	18. Provide implementation, planning, and coordination support through the state's school technology commission dedicated to technology integration.
9. Incorporate technology as part of educational pedagogy at all levels in all institutions or departments involved in preparing teachers.	19. Encourage ongoing technology training for teachers.
10. Provide training and technical support for ongoing implementation.	20. Support technology standards as part of school assessments and content expectations to inspire high-quality learning and teaching.

(Pittman, 2003)



## Appendix C

### Levels of Technology Implementation Framework

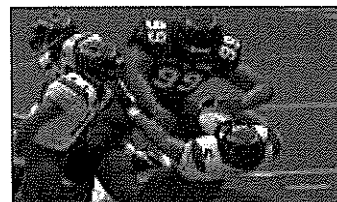
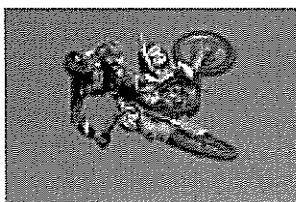
These frameworks were created by ISTE to help educators distinguish at what level their curriculum is challenging students regarding technology. (Moersch, 1999)

Level	Category	Description
0	Non-use	A perceived lack of access to technology-based tools or a lack of time to pursue electronic technology implementation. Existing technology is predominately text-based (e.g., ditto sheets, chalkboard, overhead projector).
1	Awareness	The use of computers is generally one step removed from the classroom teacher (e.g., integrated learning system labs, special computer-based pull-out programs, computer literacy classes, central word processing labs). Computer-based applications have little or no relevance to the individual teacher's instructional program.
2	Exploration	Technology-based tools serve as a supplement to existing instructional program (e.g., tutorials, educational games, simulations). The electronic technology is employed either as extension activities or as enrichment exercises to the instructional program.
3	Infusion	Technology-based tools including databases, spreadsheets, graphing packages, probes, calculators, multimedia applications, desktop publishing, and telecommunications augment selected instructional events (e.g., science kit experiment using spreadsheets/graphs to analyze results, telecommunications activity involving data sharing among schools).
4A	Integration (mechanical)	Technology-based tools are integrated in a mechanical manner that provides rich context for students' understanding of the pertinent concepts, themes, and processes. Heavy reliance is placed on prepackaged materials that aid the teacher in the daily operation of their instructional curriculum. Technology (e.g., multimedia, telecommunications, databases, spreadsheets, word processing) is perceived as a tool to identify and solve authentic problems relating to an overall theme/concept.
4B	Integration (Routine)	Teachers can readily create Level 4 (Integrated units) with little intervention from outside resources. Technology-based tools are easily integrated in a routine manner that provides rich context for students' understanding of the pertinent concepts, themes, and processes. Technology (e.g., multimedia, telecommunications, databases, spreadsheets, word processing) is perceived as a tool to identify and solve authentic problems relating to an overall theme/concept.
5	Expansion	Technology access is extended beyond the classroom. Classroom teachers actively elicit technology applications and networking from business enterprises, governmental agencies (e.g., contacting NASA to establish a link to an orbiting space shuttle on the Internet), research institutions, and universities to expand student experiences directed at problem-solving, issues resolution, and student activism surrounding a major theme/concept.
6	Refinement	Technology is perceived as a process, product (e.g., invention, patent, new software design), and tool toward students solving authentic problems related to an identified "real-world" problem or issue. Technology, in this context, provides a seamless medium for information queries, problem-solving, and/or product development. Students have ready access to and a complete understanding of a vast array of technology-based tools to accomplish any particular task.

## Appendix D

### A Sample WebQuest

#### EXTREME SPORTS WEBQUEST



#### THE GIG:

Here is the deal: You just graduated from college and landed a sweet job with a new sports/action magazine called "Extreme."

It is perfect because your boss would like you and your team to write a sports article for the magazine. The best part about this article is you, and 3 team mates will get to travel across the country (or world) to cover 6 separate sporting events in 6 separate locations!!

He is giving you almost full reign over this project as Gatorade has graciously sponsored you \$60,000 to cover all expenses.

You have the chance of a lifetime! You get to explore America (or the world!) as well as impress the editor with your amazing writing and planning abilities.

Remember, you have a lot of equipment to buy, plane costs, etc. so be wise on where you decide to travel, you only have that \$60,000 and not a penny more.

## EXTREME SPORTS WEBQUEST

### THE TASK:

Break down the team into the 4 jobs and assign tasks according to the chart below:

Position	Assignment
<b>Accountant</b>	<b>Create a spreadsheet</b> , using Microsoft Excel, for the entire expedition including: expenses for photographic equipment, travel, and lodging, car rental, food and gasoline, ETC (meaning more such as plane tickets, RV rentals, and more). Create a formula that will calculate total expenses and subtract them from your initial budget of \$60,000 (or any other necessary formulas).
<b>Reporter</b>	Use the Internet to <b>research</b> various sporting events that will be held across country during your trip. Your main job will be to lead the team when writing the article. You must know about each sporting event or this article will not come together properly. How much are tickets? How much for refreshments? What kind of event is it? Why are you covering it? Does it fit with the other sports you are covering? Etc. You need to be spot on.
<b>Photographer</b>	Use the Internet to <b>research prices</b> for photographic supplies including a digital camera, video camera, film and other supplies (camera bags, batteries, etc.) This information, along with prices, should be submitted to the accountant. <b>Pictures</b> of the travel locations will be taken from the Internet for use in the article as well as pictures of the events themselves, and <b>other interesting photographs</b> along the way.
<b>Agent</b>	Create <b>travel plans</b> based on the events that the reporter would like to cover. <b>Maps must be created</b> and lodging plans including hotels or campsites. Make sure to leave no stone unturned as it is your job to figure out <b>all the costs</b> of this trip including the food, gas, lodging, etc. Will you rent a car? Will you take a cab? A Limo? How much is your food allowance? Etc.
<b>Everyone</b>	Together, you will <b>write an article</b> discussing where you went, what you did, where you stayed, what you saw, etc. You will <b>write a memo</b> to your boss explaining why you chose the events you chose, and make suggestions for future trips. You will <b>create a letter of thank-you</b> to Gatorade, who sponsored your trip. You will create a <b>power point presentation</b> to share your adventure with the rest of your class. <b>BONUS POINTS:</b> Create a brochure about your adventure.

## EXTREME SPORTS WEBQUEST

### THE PROCESS:

1) Each member of your group has to select one of the 4 jobs (accountant, reporter, photographer and agent).

2) Your group must create an article covering your 6 sporting events.

The following information is **required** by your Editor

- A spreadsheet listing all expected expenses for this expedition. This should include expenses for all travel, auto, lodging, event admissions fees, equipment and any other anticipated expenses such as those listed above: photographic equipment, travel, and lodging, car rental, food and gasoline, etc. ***You must provide receipts for everything!***
- A graph must be created from the spreadsheet for comparison of expenses.
- Photographs simulating the events that you intend to cover must be taken from the Internet *as well as other interest photos.*
- Maps of the locations that you visited must be included.
- An article for print in "Extreme" magazine must be created and submitted.
- **Remember:** Together, you will write an article discussing where you went, what you did, where you stayed, what you saw, etc.
- You will write a memo to your boss explaining why you chose the events you chose, and make suggestions for future trips.
- You will create a letter of thank-you to Gatorade, who sponsored your trip.
- You will create a power point presentation to share your adventure with the rest of your class. Your group will present your final project to the class, no exceptions.
- Your group must present your trip to the class. See the attached rubric for scoring information.
- **BONUS POINTS:** Create a brochure about your adventure.

**EXTREME SPORTS WEBQUEST****RESOURCES:**

Google.com	Perfect for web queries and searching for information.
Yahoo.com	Another good link for web queries and information.
Altavista.com	Web queries and information.
Newegg.com	Good for purchasing electronic equipment.
Mwave.com	Also good for purchasing electronic equipment.
Beachcamera.com	A good start for your Photographic Equipment Needs.
Yahoo!	Yahoo Shopping.
Expedia.com	Cheap airfare, hotels, cars, etc.
Travelocity.com	Airfare, hotels, vacations, etc.
Mapquest.com	The standard for directions and maps.
Westcoasttickets.com	Event Ticketing
Ticketmaster.com	Event Ticketing
skateboarddirectory.com	Skateboard competitions and events which take place across Europe, the United States, Canada, and South America.
doctordanger.com	2008 surfing competitions & events
NFL.com	The Official Website of the National Football League
MLB.com	The Official Website of Major League Baseball

## EXTREME SPORTS WEBQUEST

## GRADING RUBRIC

**Total Points:** 300 pts  
**Project:** 200pts  
**PowerPoint:** 50pts  
**Leadership:** 50pts

Attribute	Excellent 5	Good 4	Fair 3	Poor 2	Missing 0
<b>Spreadsheet</b>	Detailed and formatted with descriptive graph. Receipts are given for all purchases.	Complete work with accompanying graph. Receipts are given for all purchases.	Missing information and minimal graph or missing receipts.	Inaccuracies in spreadsheet and graph, missing multiple receipts.	Spreadsheet is missing and/or all receipts are missing.
<b>Photographs &amp; Maps</b>	Many highly relevant photos of excellent quality. (15+) Maps are complete, well organized, and easy to follow. (10+)	Good photographs depicting the excursion. (10) Maps are organized with all information included. (8+)	Some photos submitted that correspond to some of the travel locations. (8) Most map information is included and some evidence of organization is evident. (6)	Few photos with little relevance to the trip. (5) Maps are incomplete and/or disorganized. (4)	Maps and/or photographs are not submitted. (Less than 5 photos and/or 2 maps)
<b>Correspondence</b>	Memo & Letter formatted perfectly. No spelling or grammar errors.	Few errors in memo & letter format. No spelling or grammar errors.	Few errors in memo & letter format. Few spelling or grammar errors.	Multiple errors in either format of memo and letter or spelling and grammar errors.	Memo and/or Letter were not submitted.
<b>Magazine Article</b>	Beautifully written, interesting and highly organized, descriptive account of the	Well written account accurately depicting the excursion. (6 paragraphs min)	Acceptably written article that is readable. (5 paragraphs min)	Unorganized and difficult to read. (3 paragraphs min)	Article is completely missing or in complete disarray. (less than 2 paragraphs)



	excursion. (8 paragraphs min)				
<b>Leadership</b>	Peer review rankings are of the highest regard. Took a leadership role and completed above and beyond your duty.  <b>50</b>	Peer review rankings are of the highest regard. You did your part to help the group.  <b>40</b>	Peer review rankings were acceptable. You did most of your own work.  <b>30</b>	Peer review rankings were low to unacceptable.  <b>20</b>	You really did not help yourself or your group.  <b>0</b>
<b>Presentation</b>	Presentation contains a minimum of 15 slides and each member of the group fully participates	Presentation contains a minimum of 12 slides and each member of the group fully participates	Presentation contains a minimum of 10 slides and most members of the group fully participate	Presentation contains a minimum of 8 slides and most members of the group fully participate	Presentation has less than 8 slides, and/or very few members decided to participate