

Integrating Technology into the Classroom

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We are living in the world of quickly advancing technology. Since the advent of the Internet and personal computers, we no longer compete with the people next door, city, or state but with the people around the world. We have a generation of students who have very different social experiences growing up through the changing times. They are used to surfing the Web looking for interesting information and things to buy. They post their photos and blogs to share with other members of global community. They frequently send and receive text messages and emails to family and friends via wired and wireless networks. Many educators argue that the only way to continue our dominance and prosperity in the world economy and politics is to educate our people as competitive and creative members of the global community, and the proper integration of technology in our education system is crucial to accomplish the goal. Numerous research papers, articles, and books were written on integrating technology into the classroom, and they often couple it with the ‘constructivist’ learning theory. Many of them focus on using technology to enhance teacher-student communication and to promote collaborative and active learning, which calls for a dramatic paradigm shift from the lecture based education model.

Historical Background

In order to discuss how best we can integrate technology into the classroom, we need to review the historical relationship between technological innovation and education. A “meaningful integration of technology in classroom” can be traced back to the early part of the 20th century when visual aids such as films, pictures, and lantern slides were commonly used in public schools (Reiser & Dempsey, 2007). Then came motion picture projectors, sound motion pictures, the radio, the television, Video Cassette Recorders (VCRs), computers and the Internet in chronological order. How did they change our learning and teaching? Here are some historical anecdotes which can give us some ideas. In 1913, Thomas Edison announced, “Books will soon be obsolete in the schools. . . . It is possible to teach every branch of human knowledge with the motion picture.” (cited Reiser & Dempsey, 2007). “A medium that gained a great deal of attention during this period (1920s and 1930s) was radio. By the early 1930s,

many audiovisual enthusiasts were hailing radio as the medium that would revolutionize education. . . . However, contrary to these sorts of predictions, over the next 20 years radio had very little impact on instructional practices (Cuban, 1986).” (Reiser & Dempsey, 2007). “Perhaps the most important factor to affect the audiovisual movement in the 1950s was the increased interest in television as a medium for delivering instruction. . . . By the mid 1960s, much of the interest in using television for instructional purposes abated.” (Reiser & Dempsey, 2007). “For example, in 1984, Papert indicated that the computer was going to be “catalyst of very deep and radical change in the educational system” (p. 422) and that by 1990 one computer per child would be very common state of affairs in schools in the United States.” (Reiser & Dempsey, 2007 -18-7). With the exception of computers and the Internet, Reiser and Dempsey argues, “As a new medium enters the educational scene, there is a great deal of initial interest and much enthusiasm about the effects it is likely to have on instructional practices. However, enthusiasm and interest eventually fade, and an examination reveals that the medium has had a minimal impact on such practices.” (Reiser & Dempsey, 2007 -18-7). During the last decade, the use of the Internet and personal computer in the classrooms at all levels has become very common as the speed of the Internet increased and the processing power of the PC climbed. The question is whether the recent development and classroom adoption of computer technology will effect the education in an effective way from which the past technological innovations have.

Motivation

The major driving force to adopt technology in the classroom comes from the three sectors; nonprofit organization, commerce, and education. Nonprofit and governmental organizations have been actively proposing guidelines for using technology in the classroom. For example, the International Standards for Technology in Education (ISTE) National Educational Technology Standards for Teachers (NETS-T), ISTE National Educational Technology Standards for Students (NETS-S), No Child Left Behind (NCLB), The National Education Technology Plan and the Learning for the 21st Century Report provide guidelines to promote technological proficiency in the classroom (Bitter & Legacy). Although they are mainly developed for K-12 classrooms, they are equally applicable to small general education college classrooms.

On the other hand, the private industry has been enjoying fairly successful application of technology to train their employees and help them expand their knowledge. Murry Christensen provides a reasonable cause for the business’ better adaptation of technology to educate their people that “Do you remember ‘re-engineering’? During the late 1970s through the 1980s and into the early 1990s, very large changes occurred throughout American business. Under the rubric of ‘maximizing shareholder value,’ large swath of middle management were cashiered and companies were combined, restructured, realigned, and recast in a new, “leaner” mode. The business environment was changing in response to information technology advances and investments, removing the need for an information “gate keeping” class. Foreign competition intensified, much of which had learned how to operate with faster cycle times and improved quality, at lower costs to consumers.”(Masie, 2005). The efficient adoption of technology in a business Learning Management System (LMS) is closely related to the business’ survival in a volatile economic environment and competition.

Although almost all educators agree that we should adopt technology extensively in the classroom, the way in which we should use it varies significantly. The educators have been pondering two main ideas for the technology in the classroom. One is to adopt the technology to improve the traditional lecture based teaching and learning. The chapter 18 of *McKeachie's Teaching Tips* (McKeachie, 2006), a popular collegiate instruction book, covers this approach in depth. The other is to reform the traditional approach into the constructivist approach and apply the technology to enhance the new learning paradigm. Constructivism is “a model of learning that asserts that knowledge is not passively received but is actively created inside the mind of every learner” (National Research Council, 2002). The constructivist educators wants to revolutionize learning and teaching by leveraging technology for student centered learning, project-based learning, real life problem-based learning, collaborative learning, active learning, and alternative assessments. Bain also present this approach as a characteristic of “the best college teachers” in his inspirational book, ‘what the best college teachers do’. He reports, “According to the traditional view, memory is a great storage bin. We put knowledge in it and pick out what we need. Thus you often hear people say, “My students must learn the material before they can think about it,” presumably meaning that they must store it somewhere for later use. The best teachers don’t think of memory that way, and neither do a lot of learning scientists. Instead, they say that we *construct* our sense of reality out of all the sensory input we receive, and that process begins in the crib.” (Bain, 2004). A typical classroom run by a constructivist may be characterized by the below (Wikipedia, constructivist teaching strategies, retrieved 6 Aug 07),

- The students are actively involved in classroom activities such as discussions and experiments.
- The environment is democratic, interactive, and student centered.
- The teacher prompts and facilitates the classroom activities in which students are encouraged to be responsible and autonomous.
- The students work on their real-world scenario problems and projects in groups, and discovery, learning, and knowledge construction and assimilation are interactive and dynamic.
- There are great focus and emphasis on social and communication skills as well as sharing, collaborating and exchange of ideas.

The characterization is in line with the new educational paradigm envisioned by ISTE (Wikipedia, Technology Integration, and Retrieved 6 Aug 07)

OLD PARADIGM	NEW PARADIGM
Teacher-centered instruction	Student-centered learning
Single sense stimulation	Multi-sensory stimulation
Single path progression	Multi-path progression
Single media	Multimedia
Isolated work	Collaborative work
Information delivery	Information exchange

Passive, receptive learning	Active, inquiry-based learning
Factual, knowledge-based	Critical thinking, informed decision making
Reactive response	Proactive, planned
Isolated, artificial context	Authentic, real-world context

Classroom Technology Examples

The typical use of technology in classroom includes basic computer and network functionalities such as word processing, spreadsheets, presentation software, the Web, and audio/video projectors. The below are some examples of recent classroom technology:

- **Interactive Whiteboard:** An Interactive Whiteboard, other than being a projected computer screen, provides interface between the computer and the instructor via touching the screen. It typically has touch sensors on the screen, which translate the user's writing on the board, and the software package that projects the writing to the screen. One can think of it as a huge tablet PC that the whole class can look at. It is often referred as a "SMART board", which is a commercial product of this technology. Although some teachers just use it as a whiteboard or flipchart replacement, it enables the user to capture or record his or her board writings, which later can be posted on the Web or transferred via other digital media such as a memory stick or thumb drive for sharing or review.
- **Classroom Management Software:** The Classroom Management Software projects the student's computer screen onto the classroom via typically a wireless network and enables the student to share what is happening on his or her desktop. This helps instructor to illustrate the examples of desirable or undesirable work as well as the class material. It also helps instructor to control the Internet access and desktop management of the class.
- **Student Response System:** A Student Response Systems (SRS), sometimes called "clickers", consists of remote-controller type wireless transmitters, unit receiver connected to the classroom computer, and a software package that manages the system. The students can 'click' their votes or choose answers via wireless computer network. It is favored by the instructors of a large class because of its functionality to assess student learning from a large group of students. The newer generation of SRS is being developed to support software deployment of the system via Personal Digital Assistants (PDA), laptop computers, or cell phones
- **Weblog (Blog):** Richardson defines Blog as a "an easily created, easily updateable, Website that allows an author (or authors) to publish instantly to the Internet from any Internet connection." (Richardson, 2006). Because of this easiness of posting new information in multimedia or text format, it can be a very powerful collaboration tool for class assignments or projects. Some examples of the educational use of Blog are class portals, online filing cabinets for student work, e-portfolios, collaborative space, knowledge management, and school Websites.

- **Wiki:** A wiki is a collaborative Webpage where anyone with permission can publish new content or edit the content that has been published (Richardson 2006-59). It is different from Weblog in that wiki does not track who does the publishing and editing whereas Weblog typically list the entry and the author in a reverse chronological order. The famous Wikipeedia is an on-line encyclopedia based on wiki technology. Its suggested use is similar to the Blog's.
- **RSS:** Really Simple Syndication (RSS) is a technology that allows Web users to subscribe to particular Web content feeds of interest, which often are updated frequently. The feeds can be headline pages of a news media website, certain Blog entries, or podcasts. This tool can help the teacher or student to better organize the Web resources for the lecture or research.
- **Multimedia Publishing:** Podcasting and screencasting are examples of this. Podcasting is producing a digital audio recording and publishing it on a website for sharing. Screen casting is done with an audio and video recording. There are free software packages available for download to help learners and teachers to do this. We can use them for project presentations, instruction aids, or distance learning.
- **Robots:** Robots provide tremendous opportunities for mathematics, science, and engineering classrooms. From design process to testing and application, using robots in appropriate classrooms can promote project-based learning, problem-based learning, engaging students in “authentic activities (in which they do “real things” to produce a “real effect” in their world)”, “alternative assessment (in which the students’ product or performance is evaluated instead of test scores)”, collaborative learning, and “applied learning” (Gura 2007, p13).

Concerns about Integrating Technology in Classroom

- **Unwilling Teachers:** Some teachers overextend the notion expressed by Lowman, that “It is important for a college instructor not to let “gee-whiz” technology obscure these fundamental and traditional purposes (of the lecture) – objectives that can also be accomplished by an exemplary teacher equipped with a single piece of chalk, a board, and a reasonably quiet place in which to talk with students.”(Lowman, 1995). Gura and Percy argue that “no contemporary institution can buck the tide of human intellectual evolution by avoiding the tools that shape it” and present the following as the key factors to the unwillingness to use technology in higher education classroom (Gura & Percy, 2005).
 - Reluctance to change
 - A culture that values independent iconoclasts
 - Cost of ownership, utilization, and increased workload (with increased use of technology)
 - Time and energy
 - Role of faculty: Vulcan mind melder, creator of knowledge, or . . .

- Evidence of success
- Accountability, recognition, and reward for technological innovation and utilization

Technology is a significant part of our students' lives academically and socially. Students learn better if they can relate the learning process to their lives.

- **Technology Dependency and Lack of Fundamental Skills:** There are concerns amongst teachers and parents alike that wrong approaches in technology in classroom will simply teach students to be users not innovators of technology. Some argue that technology based teaching only teaches procedural thinking and may distract them from focusing on deep ideas. Technology in classroom is not about just deploying or buying and installing the technology for instruction but encompassing the deployment and appropriately adapting to the new technology enabled educational environment by making pedagogical changes, sometimes significant changes. The history of the instructional technology teaches us how a technological advancement has been praised to be the thing to revolutionize our education but did not last long due to this reason.
- **Copyright Violations, Computer Network Security and Privacy Violations, and Plagiarism:** Although many of these unlawful activities are committed unknowingly or without criminal intent, they hinder the proper integration of technology in classroom if the students and teachers are not properly educated about them. Grabe and Grabe give the following advice to combat copyright violations: "Responsible Internet users respect copyright law. Both teachers and students need to know what resources they can take from online sources or present online as part of instructional or learning activities. Understanding what are called fair use guidelines is not always easy, and a familiarity with general principles and a willingness to ask permission are what must be expected of a responsible user" (Grabe & Grabe, 2007, p 399). Strong computer network defense, using up-to-date network defense and Internet filtering software, with convincing awareness training and supervision for the students and teachers can protect the classroom with technology. The teachers can try to recognize plagiarism by personal Web search or detection service and prevent it by adopting interactive processes into the grading event.
- **Digital Divide:** Digital divide is the gap between technology haves and have-nots. The gap exists between the rich and poor socio-economic status in families or school districts, white and minority races, and urban and rural areas. Technology in classroom requires funding to purchase equipment and software and an extensive life-cycle management plan to replace old technology with new one. Friedman addresses the gap between the rich and poor in a more general terms in his famous book, *The World Is Flat*, "Without any question the wealthiest school districts attracted the best teachers, principals, and curriculum planners, along with the most demanding parents and PTAs, while the poorest districts attracted the weakest teachers and principals and parents who had to work three jobs just to survive (leaving them with less time to help with their kids with their homework). . . . Americans have always wanted and expected their public schools to be the agent of social mobility, the principal means by which poor people can lift themselves

up by their bootstraps to grab the American brass ring. But that is longer the reality in too many parts of the country today, because of the disparities in funding.” (Friedman, 2006).

- Training and Hiring Teachers: A 2004 report by the National Council on Teacher Quality said that the teaching profession attracts ‘a disproportionately high number of candidates from the lower end of the distribution of academic ability.’ (National Center on Education and the Economy, 2006). A teacher in a technology enabled classroom needs to be a technology expert with which he or she wants to teach as well as a master of his or her subject. A comprehensive training program for current faculty and ambitious strategy to hire those who are qualified in subject and technologically oriented should be developed.

Recommendations

The following are my personal recommendations for good practice in using technology in classroom based on my references. Some are intended for teachers, and the others are for the policy makers.

- For those who want to start using technology in classroom first time, make a gradual change. Try one concept at a time and build confidence in managing the technology and intentional and unintentional pedagogical changes. For example, require innovative technology use for a project or larger scale homework.
- Be patient and plan ample time when integrating technology into classroom. The lesson preparation with technology may take more time than you plan for.
- Use technology to help students to visualize, simulate, solve real-world problems, collaborate, research, and design whenever possible.
- Be informed of technological changes in education and actively make necessary adjustments in your teaching practices.
- Educate the technology users on copyright laws and fair use guidelines.
- Discourage and prevent plagiarism.
- “Help the faculty learn about the potential of collaborative, learner-centered educational approaches” (National Research Council 2002).
- Support interdisciplinary collaboration to develop and implement innovative technological approaches (National Research Council 2002).
- Institutionalize policies for technology in the classroom. Set up a reward program to recognize innovative use of technology in classroom and pedagogical improvement to motivate the teachers to include technology in the lesson plan whenever possible.
- Identify the fundamental technology skills at all levels of education and make them part of the curriculum or develop the courses that teach them.
- Implement a system for the efficient procurement and lifecycle management of technological equipment.
- Maintain strong defense in computer networks. Protect the privacy of technology users.
- Develop and implement a national scale strategy to ‘recruit the top third of the high school graduates going on to college for the next generation of school teachers’ (National Center on Education and the Economy, 2007).

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