THE USE OF INSTRUCTIONAL TECHNOLOGY IN THE CLASSROOM: SELECTION AND EFFECTIVENESS

RYAN E. DUNMIRE

Introduction:

In the 21st century, mentioning technology generally inspires thoughts of advancement, improvement, and progress. On the contrary, the lack of technology stirs feelings towards a practice as antiquated, ineffective, and clumsy. The classroom has not been exempt from this general thinking. Over the past thirty years, instructional technology is being integrated into the classroom at alarming rates. As fast as integration has been, the development of new technologies has even been faster. The literature in the area of instructional technology is vast and sometimes overwhelming. Often times, articles will focus on how to integrate technology into the classroom and the recommendation of new technologies. A significant amount of research on instructional technology is associated with faculty competency and teaching effectiveness.

In evaluating the use of any teaching style, educators will often use Benjamin Bloom's Taxonomy as a beginning point of planning. Certain principles of human cognitive learning are well-established to be used by educators wanting to teach in ways most likely to produce learning. Three of these principles according to Joseph Lowman are that "It is better for college students to be active seekers than passive recipients of learning; For students to be fully engaged in learning, their attention must be focused on the material;" and "Students learn images as well as words, and images are more easily remembered, especially if the images are vivid and emotionally tinged." All three of these principles touch upon the use of technology in the classroom. Using these principles, instructors have sought technological means to increase learning. Early literature in this area first looked at whether any technology in the classroom was beneficial. Despite this early argument on whether technology in the classroom is good or bad, technological advancements occurred and students demanded use in the classroom. Between grades 6 and 12, ninety percent of students have been found to use computers on a daily basis according to the Geneva Logic Report.

Recent trends in literature on technology in the classroom focus more on teacher effectiveness and proficiency in using technology. Since the 1920s, film, radio, television, and microcomputers began to be used as teaching tools. These first cousins to modern technology reveal the insistent quest by educators for increased productivity and efficiency in teaching. However, this quest does not often originate, according to Larry Cuban, with the picture of how technology has been thrust open teachers, who must be reactive in being forced to implement it. Technology and its evaluation is often the duty of individual instructors, including those that are not in disciplines that would normally utilize technology. For example, how does a teacher in English literature know what technology will be beneficial and if using technology, how to actually make it effective in increasing Lowman's principles of human cognitive learning. Moreover, it is not technology itself that may be bad, but how it is utilized by teachers.

Selection of Technology:

Not all new technology is good and the adoption of technology because it is new is not a desirable action. A teacher should look at a new technology and ask how it fits in their learning objectives not the other way around where new technology is received and then a teacher tries to

fit it into class. For example, Cynthia Lanius stated that she was once told by a teacher that "all our students are getting laptops and now we are desperate to figure out something for them to do on them." Use of technology in the classroom needs to be a proactive practice by educators.

Early articles and research asked whether certain kinds of computer-based activities improved student learning. According to James Kulik, studies did find improvements in student scores on tests related to material covered in computer-assisted instructional packages. But these studies do not help educators understand how technologies might, or might not, help to support cognitive learning and the kind of analysis by students that is desired. Moreover, newer articles continue along this trend. There are several articles on what technologies should be used in the classroom. Often times, these advocate one particular platform, usually the "it" technology. For example, in perusing the articles online by date, there was a movement from computers, to online course management, to now gaming and digital books. See Nagel, David (2010) *6 Technologies That Will Shape Education.* These articles also ignore how a specific technology fits into the larger goal of cognitive learning.

In order to be effective, innovative and robust technologies must be used to support the desired outcome of teachers. In a larger sense, a change in an educational environment by the use of new technology must take into account simultaneous changes in curriculum, time and space constraints, and a range of other logistical and social factors (Margaret Honey, Katherine McMillan Culp, and Fred Carrigg). As a result, researchers are increasingly asking questions about how technology is integrated into educational settings; how new electronic resources are interpreted and adapted by their users; how best to match technological capacities with students' learning needs; and how technological change can interact with and support changes in many other parts of the educational process, such as assessment, administration, communication, and curriculum development.

In selecting what technology will be the most useful in achieving individual or department goals, Cynthia Roberts establishes a framework for a change process that can be utilized by educators for the purpose of the selection as well as successful implementation of educational technologies. Her four step process includes strategic analysis, strategy making, strategic plan design, and strategic plan implementation.

During the planning and preparation of the use of technology and before moving on the stage of implementation, the following is a list of lessons and advice by Andrew Sackville:

• Do not dismiss the chance to review/ adopt innovations simply because you don't want to make a fool of yourself
• Spend time thinking. Search for alternative ideas and don't restrict your search to your own discipline or employment sector. Think outside the box.
• Be skeptical. Do your homework and ask questions – where does the innovation come from? Who stands to benefit from it?
• Find out as much as you can about the idea. Ask the big educational questions. How will it support our students' learning? How will my colleagues accept the suggestion?
• Work out possible consequences of introducing an innovative teaching practice. Will it be accessible to all students? Will some be disadvantaged if we adopt this teaching method or this technology?

• Identify likely change agents, early adopters – work with them.
• Avoid telling people exactly what to do and how to do it. Instead, describe the end results you are looking for, and ask them to generate their own ideas for how to approach it.
• Challenge staff members to be more innovative by encouraging them to question how things are done.
• Encourage experimentation. When faced with a tough challenge, ask others to brainstorm options or changes that could succeed where current practice fails. Allow them to try new things.
• Be prepared to change your mind. As you evaluate the success or otherwise of your innovation, be prepared to abandon it if necessary.

<u>Effectiveness</u>:

Once technology is selected for implementation, its use can be a necessary evil or a useful tool in the classroom. According to Edward Tufte, "If your words or images are not on point, making them dance in color won't make them relevant. Audience boredom is usually a content failure, not a decoration failure." Although selection of a good technology is the first step, use of it by instructors will dictate its effectiveness in the classroom. According to Cynthia Lanius, this aspect of instructional technologies is often overlooked. The reality is that teachers tend to be less technology savvy than the very students that they are teaching. As such, teachers often desire to utilize technology, but lack proficiency in the actual use. Presentations are often botched because the teacher is unfamiliar with the technology. Additionally, teachers may attempt to use, for example, collaborative technology, but because of their lack of proficiency, they do not utilize the benefits of the technology. As such, the process becomes troublesome for the teacher and "more trouble than it's worth."

The majority of articles that are against the use of technology in the classroom do not actually focus on the technology, but rather, its effective use of teachers. Microsoft PowerPoint tends to be at the forefront of the literature on this subject. Some say that PowerPoint is a great slide manager, but rather than supplementing a presentation, teachers have mistakenly used it as a substitute for a presentation. In other words, PowerPoint cannot create a good presentation. The teacher uses PowerPoint to create a good presentation. Just like the overhead projector before it, PowerPoint will not turn a bad presentation into a good one, and it will not convert an ineffective presenter into an effective one.

If effective use of technology is a problem, how can it be improved? As part of Roberts' fourth step, strategic plan implementation, educators should be instructed on the capabilities and use of the technology. Teachers should also brainstorm together on how to use the technology themselves and how to utilize it effectively in the classroom.

<u>Summary:</u>

Complaints on technology in the classroom often focus on using technology merely because it is novel and innovative or the misuse of technology by instructors. These two problems can be overcome with planning and forethought. In selecting technology during the

strategic analysis and planning phases, educators need to be proactive and contemplate how the change will positively increase learning. Also, educators must factor into the adoption analysis, the ease of use of the technology. Once adoption of a technology occurs, the desired effect of increased learning can only be achieved if teachers understand the technology and understand how to manipulate it. Through proper selection and training, technology in the classroom can improve student learning and comprehension.

REFERENCES

Bloom, Benjamin (1956). *Taxonomy of Educational Objectives, Handbook I: The Cognitive Domain.* New York: David McKay Co Inc.

Classroom Technology and Teacher-Student Interaction. 2007 GenevaLogic Report.

Cuban, Larry (1986) *Teachers and Machines: The Classroom Use of Technology Since 1920.* Teachers College Press.

Kulik, James (2003) *Effects of Using Instructional Technology in Elementary and Secondary Schools: What Controlled Evaluation Studies Say.* SRI International, May 2003. http://www.sri.com/policy/csted/reports/sandt/it/Kulik_ITinK-12_Main_Report.pdf

Lanius, Cynthia (2004) *PowerPoint, Not Your Grandmother's Presentations, but is it Evil?* Cell Biology Education, Fall 2004.

Lowman, Joseph (1995) *Mastering the Techniques of Teaching.* 2nd ed. Jossey-Bass.

Margaret Honey, Katherine McMillan Culp, and Fred Carrigg (1999) *Perspectives on Technology and Education Research: Lessons from the Past and Present.* The Secretary's Conference on Educational Technology 1999. http://www2.ed.gov/rschstat/eval/tech/techconf99/whitepapers/paper1.html

Nagel, David (2010) *6 Technologies That Will Shape Education.* The Journal. http://thejournal.com/Articles/2010/04/13/6-Technologies-That-Will-Shape-Education.asp

Roberts, Cynthia (2008) *Implementing Educational Technology in Higher Education: A Strategic Approach*, The Journal of Educators Online. http://www.thejeo.com/Volume5Number1/RobertsPaper.pdf

Sackville, Andrew (2003). The emperor's new clothes: Navigating Innovations in Teaching and Learning, *British Journal of Sociology of Education*. http://www.iutconference.org/2009/pdf/Sackville_The%20EmperorsNew%20Clothes%20.pdf

Tufte, Edward (2003) *PowerPoint is Evil: Power Corrupts. PowerPoint Corrupts Absolutely.* Wired Magazine 2003, September http://www.wired.com/wired/archive/11.09/ppt2.html

ANNOTATED BIBLIOGRAPHY

Allitt, Patrick (2005) *Professors, Stop Your Microchips*. The Chronicle Review, volume 51, Issue 42
He argues that teaching technologies make teaching worse and distract professor and students from actual education. The areas she says detract from learning are the likelihood of a technical problem, the use of PowerPoint sends a signal to students that machines are necessary, and email removes any likelihood that a personal relationship will build between a teacher and student. He argues software encourages a lazy approach to editing and teachers should revert back to blackboards and lecturing without any technology.

Barone, Carole (2003) *Technology and the Changing Teaching and Learning Landscape: Meeting the Needs of Today's Internet-Defined Students*. AAHEBulletin.com, May 2003.
This work focuses on the premise that students today learn visually and socially. Therefore, the classroom must be adapted in order to teach effectively. There is some discussion of the use of online communities as a teaching tool and infers that it is every teacher's responsibility to scan new technology in order to implement it in the classroom.

Bates, A. W., & Poole, Gary (2003). *Effective Teaching with Technology with Higher Education: Foundations for Success*. San Francisco: Jossey-Bass.
The book explores educational and organizational principles that should drive the use of technology for teaching. The book provides guidance on how best to plan, design, develop and deliver courses using electronic technology.

Camarda, Bill (2010) *Technology in Schools: The Next Revolution Begins.* http://www.eduplace.com/science/profdev/articles/camarda/html
The author previously wrote fourteen computer books. This article discusses how educators can use new technology and how the internet can be used to improve teaching. It is a forecast that internet-centered devices will help teachers in assessment, collaboration, and data collection and analysis to support student research.

Cesarone, Bernard (2003) *Using Technology in the Classroom to Foster Student Learning.* Childhood Education http://findarticles.com/p/articles/mi_qa3614/is_200301/ai_n9189028/
This is a good reference publication that is an annotated bibliography of articles on technology in the classroom. The articles focus more on how to implement technology and not on its overall effectiveness.

Chang, H., Honey, M., Light, D., Moeller, B., & Ross, N. (1998). *The Union City story: Education reform and technology: Students' performance on standardized tests*. New York: Education Development Center/Center for Children & Technology.
The reading looked at a Union City, New Jersey research project in which the school was looked at over a 10 year period. According to the project, approximately 85% of the 2,200 instructional computers -- those in classrooms, media centers, and computer labs -- are part of a district-wide network that connects the schools, two public libraries, city hall, and the local daycare center. With a ratio of four students per computer, the report looks at the implementation of computers for classroom use and the effects.

Cordes, C., Miller, E. (1999) *Fool's Gold: A Critical Look at Computers in Childhood*, Alliance

For Childhood, http://drupal6.allianceforchildhood.org/fools_gold

       This article looks at the hazards of computers on child development and has the overall approach that technology is bad for education. The author calls for a refocusing in education on the essentials of a healthy childhood. These are "strong bonds with caring adults; time for spontaneous, creative play; a curriculum rich in music and the other arts; reading books aloud; storytelling and poetry; rhythm and movement; cooking, building things, and other handcrafts; and gardening and other hands-on experiences of nature and the physical world."

Donald Roberts, Ulla Foehr, and Victoria Rideout (2005) *Generation M: Media in the Lives of 8-18 Year-Olds*. Kaiser Family Foundation Study http://www.kff.org/entmedia/upload/Generation-M-Media-in-the-Lives-of-8-18-Year-olds-Report.pdf

       Looks at the media habits of 2,000 third through 12th grade students nationwide. The study found that students spend more than 8 ½ hours daily consuming media. This is a great study with extremely detailed reporting. The survey documents which media young people have in their homes, which media young people use, the duration of their media use, where and with whom they use media, which media genres and activities are preferred, what young people's home media environment is like, what rules, if any, govern their media behavior, what relationships, if any, exist between both overall media use and exposure to individual media and various demographic variables, and what relationships, if any, exist between both overall media use and exposure to individual media and young people's media environment, school grades, contentedness, and other non-media activities.

Honey, M., Carrigg, F., Hawkins, J. (1998). Union City Online: An Architecture for Networking and Reform. *Learning with technology: The 1998 yearbook of the Association for Supervision and Curriculum Development*. Alexandria, VA: ASCD.

       This paper looks back on the past three decades of educational technology research as a basis for discussing where this field of research is heading, and identifying some of the most promising directions for the future development of technology's role in education.

Kamenetz, Anya (2010) *A Is for App: How Smartphones, Handheld Computers Sparked an Educational Revolution*. Fast Company.com at http://www.fastcompany.com/magazine/144/a-is-for-app.html

       An excellent article that focuses on the use of technology, and handheld devices in particular, to teach young children. American children spend 7.5 hours a day absorbing and creating media. This is more time than they spend in school. Citing Sesame Street as the start of educational technology, using handheld devices for active learning, she argues, makes kids smarter. The author takes an in depth look at the impact of one machine, the TeacherMate, which is being used in 500 schools in 14 states as of the fall of 2009, and its effectiveness. Some time in the article is also spent on the effect of handheld learning around the world, even in poor areas or where access to education is limited. Additionally, the author discusses technologies threat to the educational status quo and how people must fundamentally rethink how education is delivered and what education means.

Keefe, David and Willett, James (2004) *A Case for PowerPoint as a Faculty Authoring System.* Cell Biology Education, Fall 2004.

The authors argue that PowerPoint has developed and teachers have gotten better at utilizing it. States that the three most compelling arguments for the use of PowerPoint in the classroom are "its suitability as a powerful and easily learned authoring system for course material; its ubiquitous availability to students, courtesy of the free Microsoft PowerPoint viewer; and its capability of coexisting with an overall course management environment."

Keller, Julia (2003) *Is PowerPoint the Devil?* Chicago Tribune
http://boomerang.e2magic.org/content/Powerpoint_the_devil.pdf.
She cites a Microsoft spokesperson in stating that PowerPoint has more than 300 million users worldwide. Then, refers to George Orwell's book 1984, the year PowerPoint was designed, and argues that it suppresses creativity. She also argues that PowerPoint squeezes ideas into a preconceived format, organizing and condensing material as well as the viewers way of thinking about and looking at the material.

Mattioli, Dana (2007) *Recommended Reading: Using Technology in the Classroom.* The Wall Street Journal, October 22, 2007.
This article highlights the recommended books by Mr. Tim Magner, director of the office of educational technology for the U.S. Department of Education, on the intersection of technology and the classroom. This is a good annotated bibliography of approximately nine sources on the subject.

McDonald, Kim (2004) *Examining PowerPointlessness.* Cell Biology Education, Fall 2004.
The author argues that PowerPoint is used as a crutch and a replacement for effective communication. She provides various other arguments on why PowerPoint is bad.

Muir-Herzig, R.M. (2004) *Technology and its Impact in the Classroom.* Computers and Education. 42, 111-131
The study determined the effect that the level of computer technology use in the classroom has on at-risk students' grades and attendance. Results of the study indicate that teachers' technology use, students' technology use, and overall technology use have no significant positive effect on the grades and attendance of at-risk students.

Nagel, David (2010) *6 Technologies That Will Shape Education.* The Journal
http://thejournal.com/Articles/2010/04/13/6-Technologies-That-Will-Shape-Education.asp
This article summarizes and interprets "The 2020 Horizon Report: K-12 Edition." Game-based learning, mobile technologies, and collaborative learning will play a key role in future education. Gaming, in particular, will promote active learning and will transform education. Focusing on the implementation of technology in the classroom, the report cited five critical challenges. These are: inadequate digital media literacy training for teachers; out of date learning materials and teaching practices; lack of agreement on how education should evolve; a failure of education institutions to adapt to informal education, online education, and home-based learning; and lack of support for or acknowledgement of forms of learning that occur outside the classroom.

Nagel, David (2010) *The Myths and Mechanics of Innovation*. The Journal
http://thejournal.com/Articles/2010/03/01/The-Myths-and-Mechanics-of-Innovation.aspx?

Attempts at innovation fail all the time and nobody knows what innovation is or how to make it happen. This is a discussion by the author and Larry Keeley, who is considered an expert on innovation. The interview is on the eve of his address to the Consortium for School Networking, one of the major policy and advocacy groups focused on education technology. The discussion focuses on innovation in the classroom and education technology. Mr. Keeley argues for greater innovation and highlights some of the problems of integrating technology into the classroom. One such problem is the attitude in much of the educational community that innovation is bad until it is proven to be good and it is proven efficacy is lost in current practices.

Norris, C., Sullivan, T., Poirot, J., Soloway, E. (2003) No Access, No Use, No Impact: Snapshot Surveys of Educational Technology in K-12," Journal of Research on Technology in Education, ISTE, Volume 36, Number 1, Fall 2003, pages 15-28.
    A study based on the data collected from administering surveys in districts around the country to approximately 4,000 K-12 classroom teachers. The results show that the reason there has not been a very large impact of technology is that students have actually not used the technology available to them.

Roberts, G. (1993). *Educational technology and the mass lecture: A restatement of fundamental issues.* Australian Journal of Educational Technology, 9(2), 182-187. http://www.ascilite.org.au/ajet/ajet9/roberts.html
    The article acknowledges the use of computer technology as a major impact on learning. It focuses on issues of implementation, including space design, system design for the delivery of technology, and the need for constant training of teachers.

Shurville, Simon, Browne, Tom, and Whitaker, Marian (2008) *Employing the new educational technologists: A Call for Evidenced Change.* Proceedings Ascilite Melbourne. http://www.ascilite.org.au/conferences/melbourne08/procs/shurville.pdf.
    This article deals with the more practical side of educating teachers on new technology. In particular, the cost for universities of employing experts with up-to-date knowledge of both education and technology is a key issue. Creating, introducing and maintaining effective educational and institutional systems require specialist knowledge of education, educational management and technology which is hard to acquire and update. Technology gurus who can keep pace with such changing knowledge are expensive.

Slyvia Martinez and Dennis Harper (2002) *Generation Y: Student Inclusion = Technology Infusion*. New Horizons for Learning http://www.newhorizons.org/strategies/technology/martinez/htm
    This article discusses the results of collaboration between student with project-based learning and the teachers to bring effective technology into the classroom. The result was "Generation Y," which is an innovative, technology-based curriculum for grades 3-12 that promotes technology infusion in the classroom. When asked their opinion about using technology in education after participating in Gen Y, 98% of teachers said they felt technology facilitates positive changes in classroom teaching and learning.

Smith, Gabie (2010) *Student Perceptions of Technology in the Classroom: The good, the bad, and the ugly.* http://faculty.mckendree.edu/ATLAS/student_perceptions.htm

A psychology professor at Elon University conducted a study on the use of technology in the classroom. Of the students surveyed, 9.4% said they want to see less technology in the classroom, 18.7% said they want to see more use of technology in the classroom, and 71.9% said they want the use of technology to remain about the same. The survey had surprising results on the bad and ugly side of technology use. The author states that technology leads to glossing over of complex topics and that some faculty "hide behind" technology.

Thompson, C. (2003). *PowerPoint Makes You Dumb*. New York Times, December 14, 2003.
In the article he provides an example of pitfalls of PowerPoint. In particular, a great example was a NASA investigation into the Space Shuttle Columbia accident. On why the shuttle crashed, the investigation board asserted that NASA had become too reliant on presenting complex information via PowerPoint, instead of by means of traditional paper technical reports.

Voss, Diana (2004) *PowerPoint in the Classroom, Is it Really Necessary?* Cell Biology Education, Fall 2004.
The writer is a teacher at SUNY Stony Brook and states that "PowerPoint can be a useful tool when it is used to display images that students normally would not be able to see or when instructors use it as an outline to keep them focused on their lectures." However, students feel ignored in lecture halls when the instructor is focusing on the presentation and not paying attention to the class. Her students explained that they were insulted when instructors read word for word from slides in class.