TECHNOLOGY AND ITS MANY VARIANTS: MYTHS, HALF-TRUTHS AND REALITIES

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Technology in education appears to be growing out of a desire by educators to provide classroom material in a manner that will encourage students to take more active roles in their education. The extent to which this is possible, however, is often directly related to how well educators understand and use instructional technologies to create learning environments that are dynamic, mentally stimulating, interactive, and challenging. A lack of understanding about the effective application of computer related Instructional Technologies (IT) could seriously impair one's ability to present classroom material in a manner that would aid the teaching and learning process. This article examines some of the myths and half-truths relating to the use of IT in classrooms and the realities experienced by those who have chosen to integrate technology as a tool in their educational practice.

INTRODUCTION

Human fascination with technology may be as old as civilization itself. From the earliest of times, humankind has employed technology as an aid to accomplish feats that would have been unthinkable and to some extent impossible. With technology we are able to exceed our limitations and natural abilities. Technology has made it possible to: fly within and outside of our physical environment; increase the speed with which we traverse our surroundings; increase food production, life expectancy, and our ability to lift objects beyond our physical abilities; process information at increasingly faster rates; and store the results of vast amounts of information for later retrieval. Indeed, technology has become such an integral part of our lives that we may very well find ourselves at a loss were we to be without certain types of technologies. Those in the field of education find themselves equally inundated with various types of technology with promises of increased student learning if such technologies are integrated into the curriculum.

Two general images of Instructional Technology (IT) emerge whenever it becomes the topic of discussion: an overly zealous image about the ability of technology to reform or revolutionize education and a critical, often skeptical image about the likelihood of technology to bring about any meaningful gains in student achievement. These two images, while at opposite ends of the instructional technology spectrum, are worthy of consideration by educators if they are to avoid the costly financial mistakes of the past: the procurement of expensive computer technologies which soon become obsolete due to an ever shortened life cycle; the high cost associated with maintenance and/or adequate technology support; the promises of educational reform similar to those suggested by Thomas Edison regarding the impact that the motion picture would have in schools, i.e., reform educational practice as we know it; or the possibility that the technology may sit idle because of a lack of teacher training. Additionally, an understanding of the issues raised by skeptics is essential in addressing the negativism and limitations that these individuals have about the topic of instructional technology, i.e., the lack of data which shows increased student gains in performance/ achievement (Oppenheimer, 1997) or whether the technology is making students smarter. It is hoped that an understanding of these two images would lead to the emergence of a third image, which is a compromise of the two earlier images: one which is represented by a reasonable, prudent, and effective approach to technologies of the present and the future. This third image may hold the key to an effective application of instructional technologies in a manner that would aid student comprehension and retention of classroom material.

BRIEF HISTORICAL PERSPECTIVE

Whenever the term 'instructional technology' is mentioned, most students and educators will begin to look around the room for a projection system or perhaps some computer-related technologies. To historian Paul Saettler, this perception is a vastly inaccurate one. Saettler (1968) credits Johann Amos Comenius (who lived from 1592-1670) as one of "the first real forerunners of modern instructional technology" (p. 22) with his illustrative materials in pictorial format. Comenius (Bardeen, 1887) proposed that we initially learn about things through our senses and, therefore, real objects and illustrations should be used to supplement oral and written instructions. This belief appears to be at the core of instructional strategies employed by early childhood educators where the practice of touching, feeling, and playing is central to their educational practice (Gordon & Browne-Williams, 1993). Saettler (1968) notes that in the 1620s, Comenius devised a set of instructional methods in which he defined both the nature and scope of instruction, its organization, sequence, and general principles. Indeed, his principles were so comprehensive that Saettler referred to Comenius as having "laid the foundation of a systematic understanding of the teaching-learning process and anticipated, to a remarkable extent, the modern concept of instructional technology as applied science of the practical arts" (p. 22). The concept of presenting information in a visual format could be presumed to have existed from the beginning of time dating back to the creation of humans. Its existence as a communication medium, though crude by today's standards, probably laid the foundation for what has become a rational, formalized, and informative system which dominates much of today's communication system.

Many forms of instructional technologies have been introduced since the introduction of Comenius' illustrative material some 380 years ago. Rudolph (1962) notes that earlier use of IT (periods between the 17th and 19th century) in the form of print and chalkboards served the educational needs of higher educators at that time because such technologies were understood and used on a regular basis. A similar situation may not exist today because of the complex nature of modern technology and the accompanying array of software. Another factor which may have contributed to the difficulty in understanding and using modern technologies was the lack of adequate training or modeling of IT by teacher education programs (Office of Technology Assessment, 1995). This fact has gained the attention of Microsoft and Intel who have forged relationships with educational institutions to address the issue of technology training for educators (Microsoft, 2000).

Earlier technologies according to Knirk and Gustafson (1986) came about as a result of necessity or desperation as in the case of Frenchman Claude Crozet who "painted a wall black and wrote on it with chalk" (p. 5) in an attempt to communicate with his students at West Point Academy. This technology could be considered effective because it achieved the desired outcome – effective communication between educator and students. The same, however, cannot be said of earlier instructional films which Saettler (1968) suggests were merely re-worked versions of theatrical, industrial, government or welfare films that sometimes had little educational content. Over time, however, as such technologies became more widespread, colleges and universities soon began to produce their own film versions with education as the focal point. Other technologies, notably the television, have had to undergo similar transformations to film before becoming an acceptable educational medium. Audio-visual equipment brought about by the merging of images with sound was largely popularized by the military during World War II for training purposes. However, it was not until the end of the war that it gained popularity among educators who, according to Saettler (1968), "developed an increased sensitivity to the applicability of scientific theories of learning to practical problems of instruction" (p. 180).

The computer as an instructional tool faces much the same fate as its earlier technological predecessors when it was first introduced. Its potential to merge multiple instructional elements makes it a viable tool in educational arenas but an understanding of how its programs can be manipu-

lated and peripheral devices integrated must be clearly understood if the power of this technology is to be of any benefit in educational settings.

TECHNOLOGY DEFINED

Many definitions of instructional technology suggest that is not an easy term to define. The word technology appears to owe its origin to the Greek word 'techne.' This word, suggests Volti (1995), "can be variously translated as art, craft, or skill" (p. 4). By adding instructional to the word technology, users are thus refining the term to a specific educational application. As a concept, technologies were developed as a way of allowing individuals to do things "cheaper, faster, and easier" (Volti, 1995, p. 4). Therefore, by extension, instructional technology, which involves people and machines, may benefit educators by allowing them to accomplish some teaching task in a more expeditious manner.

Oftentimes, however, the definition of instructional technology may be too broadly or narrowly defined. Some limit the definition of IT to only include overhead transparencies, televisions and VCRs. Others think of IT as more inclusive: pen, paper, chalkboard, or anything used in an academic setting. Perhaps, a more fitting way to think of instructional technology would be: the use of visual (text, graphic, animation, and video), auditory, and tactile equipment to facilitate the transfer and reception of some skill, concept, and information.

TECHNOLOGY AND ITS MANY VARIANTS

Perceived or actual use of instructional technology varies from educator to educator and also among those advocating its integration. Evidence of an over zealous approach may be apparent by the amount of money that is spent and the resulting market growth of new and existing companies advocating the use of computer related technologies in classrooms. Examples of such ventures are the joint alliances forged by Intel (Intel 2000), Microsoft and Massachusetts Institute of Technology (Microsoft 2000) and earlier contributions by Apple which were the basis for some of the work by Sandholtz, Ringstaff, and Dwyer (1997). This fascination with technology often results in individuals or groups going to great lengths to incorporate technology into many facets of their lives and indeed their work possibly without any real understanding of its benefits, effectiveness, or drawbacks. Educators are not immune to the promises of technology as tools in teaching and learning.

Manufacturers and sales representatives of radio/TV hardware and educational software aggressively promote their products for purposes of economic gain. Producers of equipment and programs typically picture the advantages of their own products in unduly optimistic terms while neglecting to mention the product's limitations. They advertise their products in educational journals, in brochures mailed to schools, and at curriculum workshops and professional conferences. They also seek to influence legislators and school-board members, who are influential in determining educational policies and expenditures. Sometimes a company will provide one piece of equipment such as a television receiver or a video recorder to a school free-of-charge. The purpose of the gift is to have administrators and teachers learn first-hand the instrument's advantages and, with their appetite now whetted, to purchase more such items for widespread use in the schools. (Thomas & Kobayashi, 1987, p. 107-108)

As Thomas noted, these promises were made at the introduction of radio and television and one sees evidence of similar promises today - - old habits, it appears, are hard to break.

Promises of increased learning as a result of integrating technology into educational practice can sometimes take on mythical-like proportions as state politicians and school districts adopt policies regarding technology literacy (Mellon 1999). So pervasive is the practice that it may have resulted in a message that is all too clear to educators: "Worship at the altar of technology, learn the ever-expanding rituals of software mastery and hardware management, and the good life will be yours" (Mellon, 1999, p. 28).

The rush to adoption and utilization of IT is

perhaps one of the greatest challenges facing education today and our responses to it may well determine how it is applied and the extent to which this relatively new medium 'computer instructional technology' will impact student learning and retention. Those advocating its use in educational settings suggest that the multisensory nature of modern day instructional technologies make it an ideal medium by which one can appeal to visual, auditory, and kinesthetic/tactile learners. Golden (1997) noted that schools of today are inundated with children who are multimedia learners and he believes that "as a result of this stimulation, our students' brains are 'wired' differently from students of earlier generations. They have been developing their learning capacities through multisensory stimulation" (p. 19). However, several other authors openly question the benefits of integrating instructional technology into classrooms across the country. Skinner (1997) felt that some technology might do less than educators think, i.e., provide students with less than substantive knowledge of a complex subject. Skinner notes that the entertainment value of multimedia pieces does little to provide meaningful understanding about the nature or complexity of a matter under investigation because of its scanty, often fragmented coverage compared to what may be available in printed form. A cadre of other instructional technology non-converts all question the prudence of adopting and using technology on little evidence of its effectiveness among learners (Oppenheimer, 1997; Cordes, 1998; Stoll, 1995; Postman, 1995).

A somewhat more reserved approach promoted by other technology users may provide some useful insight into how IT can be adapted for classroom use. It has been suggested by Grabe and Grabe (1998) that instructional technology, if used effectively, has the potential to ensure the relevancy of learning and the creation of a classroom environment in which learning is active rather than passive. Active, as Grabes define it, refers to the mental behavior or activity of students in the acquisition and synthesis of information. This behavior may be an important consideration in student learning since it is likely to promote engagement or involvement in classroom material with the probability of increased comprehension. Hyerle (1996) offers another possible reason why visual technology may be so attractive to students: it affords them the opportunity to have a bird's view of patterns, their interrelationships and interdependencies. This should come as no surprise, given that most of what is learned comes in the form of information that is processed through the eyes.

Many more viewpoints exist about approaches that should be used regarding the integration of IT in classrooms. Such is the nature of the ongoing discussion that many in educational settings have difficulty discerning the myths, half-truths, and realities concerning the use of instructional technologies.

MYTHS, HALF-TRUTHS, AND REALITIES

It has often been said that the classroom of the future will be different from the classroom of the past and the present. Such discussions often suggest a scenario in which traditional classrooms will become mere relics of the past and all instruction will be done via interactive media (computer, the Internet, video conferencing, etc.). This futuristic idea of the classroom may be responsible for creating and possibly promoting some of the myths and half-truths that are made directly by or implied by software and hardware vendors or overly zealous computer enthusiasts. Word of mouth is perhaps the most common method by which myths and half-truths are created and misinformation passed on. Another includes the evaluation ratings of computer related products in magazines targeted directly to educators such as THE Journal, Training, Converge, and Presentation. One soon discovers that products that are highly rated often require additional or new hardware if they are to perform satisfactorily. Advertisers also play a key role in promoting their products as viable teaching and learning tools for teachers and students, i.e., a software program called Interactive Physics by Knowledge Revolution. There are many questions which educators should ask before purchasing and using such programs, i.e.: How interactive is the program? How easy is it to understand and use? Is

the time spent learning how to use the program worth the effort? How will this software be integrated into the course and what would be its objective? What new learning experiences will be created by using this program and what would be the role of the teacher? Still another factor that contributes to myths and half-truths are the frequently suggested upgrades which are forced upon educators with promises of increased functionality and ease of operation. Admittedly, some products deliver on their promises but others fail to. Following are some of the more common myths, half-truths, and realities regarding instructional technology. Each of these will be followed with a rationale that examines the myth and half-truth and finally, a brief suggestion that will be italicized for the reader to consider.

Myths:

- Myth: It is necessary to have the latest hardware and software.
  Rationale: This myth is perpetuated by the frantic pace of innovation within the computer industry that results in newer products becoming obsolete shortly after they are introduced. Miller (1999) suggests that scarce educational dollars should not be invested in technologies but rather in "the strength and capacity of teachers" (p. 1).
  The general recommendation of a replacement cycle of two years for computer equipment could be considered a sure recipe for bankruptcy to educational institutions since the cost of such equipment already represents huge expenditures and schools do not have unlimited funds.
- Myth: Effective utilization of IT in classrooms requires the latest hardware, i.e., a minimum computer configuration and a projection system of some fixed number of lumens to properly display a PowerPoint presentation.
  Rationale: Many technology zealots believe that most technological problems are solved with newer and more advanced technology.
  Some limitations do exist with all types of technologies and adaptation but creativity may prove to be adequate in overcoming the limitations that exist. That is, it may be possible to use large screen television monitors which already exist in most schools to display a presentation for small classes in lieu of an expensive projection system.
- Myth: Software upgrades will increase user functionality thus increasing productivity.
- Rationale: Microsoft Office is perhaps one of the most frequently used software suites by business and educators and contains the presentation software PowerPoint.
  In an article titled "Microsoft Updates Office Suite, but it's Not for the Little Guy" Mossberg (1999) suggests that little or nothing will be gained by upgrading if the user already has one of the last two versions.
  It is conceivable that most individuals seldom employ the full power of their current software. Learning how to fully use the current owned version of software could eliminate the hype and sales pitch often associated with the release of newer versions of software. Being able to perform a task that is available in a new version with a few more keystrokes is more cost effective when compared to a purchase of an upgrade.
- Myth: The presenter's PowerPoint slides are adequate handouts for his/her audience and presenters should pass out the on-screen version of their PowerPoint slides so that students can take notes.
  Rationale: In the PowerPoint special issue of Presentations magazine (Ganzel, 2000) Gayle Brinkman was interviewed on the topic and suggests that if a handout is needed one should be developed.
  Handouts, it was implied, should offer much more information than a slide outline. Most slides are comprised of bulleted items, incomplete phrases/sentences, etc. which are cues for the presenter and as such may be unsuitable as a handout to anyone.

Half-truths:

- Half-truth: Instructional technology will completely revolutionize (radically change) the classroom by providing the tools for learning.

Rationale: While such tools provide opportunities for learning its mere presence does not imply that learning will take place (Mellon, 1999).

Individuals who subscribe to such ideas are assuming a lot about computer related technologies, and in the process, ignore the role that the teacher plays in the classroom. Oppenheimer (1997) argues that the glowing predictions about the potential of earlier technologies, notably film strips, television, and other media in education are yet to be realized.

- Half-truth: Students are expected to use the technology, so we should be exposing them to such technologies in the classroom.

  Rationale: Skinner (1997) argues that enhancing the career prospects of some students is an insufficient reason for advocating educational reform. Job training as a major reason for technology in schools fails to recognize the importance of well-rounded individuals and their overall educational achievement.

  One should consider the context of such a statement. It could be that individuals making these statements may be talking about two different things: developing proficiency in the use of a specific technology - employment settings, versus technology as a vehicle to teaching and learning - i.e. effective presentation techniques, taking advantage of teaching/learning styles to facilitate learning.
- Half-truth: Everyone is using PowerPoint or some other presentation software, so why aren't educators?

  Rationale: If one attends a workshop at any conference, one is likely to see presenters using PowerPoint, but not all do!

  *Some in the media would argue that the use of presentation software at conferences is fast becoming a turn-off because of inappropriate utilization, lack of effective presentations skills, etc. coupled with the fact that in some settings its use fails to achieve the desired objective (*Ganzel, *2000).*
- Half-truth: Students understand more technology than their instructors do.

  Rationale: Such assumptions do not take into consideration the many different uses of technology by educators and students.

  It may be that the student's approach to technology revolves around one of play or activity related to some specific task, hence the familiarity with a given technology (student may say, "I surf the web." This is not the same thing as knowing how to evaluate sources on the web). Familiarity and understanding may be two different concepts: "I am familiar with Microsoft (MS) Word" does not mean that I understand how to effectively use MS Word to create tables, mail merges, develop macros, etc.. Integration of technology into a classroom requires much more than just an understanding of how it works before it can be considered a viable educational tool.

Realities:

- Reality: Very little research has been conducted on the effects of technology in education.

  Rationale: It is assumed that a lot of research has been done on the effect of technology and its impact on student learning and retention. This, however, does not appear to be the case.

  According to Miller (1999) and Moll and Froese-Germain (1998) the little research that has been conducted does not support the belief that the use of IT works to increase comprehension, learning, and retention. Some critics such as Oppenheimer (1998) suggest that the little that exists is either inconclusive or shows no difference in student achievement scores.
- Reality: Many educators use presentation software but not many do so in the most effective manner.

  Rationale: Some educators act as simple 'page turners' as they transition from slide to slide as if the use of technology in this manner would aid the learning process.

  Mere reading of each bulleted item may not be engaging and does little to challenge students with thought provoking ideas.
- Reality: On occasion, the medium can be overused and draws attention to itself.
- Rationale: Elements of design, color, images,

animation, and sound must be carefully chosen to enhance rather than detract from the message or the messenger.

Educators need to remember that the messenger and student actions and interactions should be the focal point of attention. Overuse of any one element may leave some in the audience to wonder how or why something was done versus what was said.

- Reality: The time spent in developing an effective presentation, i.e. flow, transition, images, design, and video is often more than anticipated.

  Rationale: Many individuals advocating the use of presentation software often mislead new technology converts into believing that the process involves three or more simple steps. The implication is that "anyone with a little imagination can use a number of relatively inexpensive and easy-to-use computer (presentation) programs to produce highly sophisticated, professional visual aids" (Klinger & Siegel, p. 46. 1996). Learning a program is one thing, using it effectively is another.

  Spending an inordinate amount of time creating a highly sophisticated visual aid may not be a wise use of time, energy and resources. Sun Microsystems's president Scott McNealy banned PowerPoint at Sun's offices partly because he felt that employees were wasting too much time on the many features that are contained in the program (Forbes, 1997). While the many gee-whiz things/options available in PowerPoint can indeed enhance a presentation piece, it should be remembered, however, that using them appropriately could also prove to be very time intensive.

- Reality: Computer related technologies are prone to failures at the worse possible time.

  Rationale: This scenario has been played out many times resulting in educators spending an inordinate amount of time attempting to repair malfunctioning IT equipment. The traditional technologies (i.e., texts and the chalkboard) are reliable, fail-proof, and are very flexible technologies. They have demonstrated their ability to withstand crashes.

  One should therefore expect computer related IT equipment to malfunction at the most inappropriate time. Always have a back up set of overhead transparencies. The bulb in the projector may fail but the majority of overhead transparency machines include a spare bulb inside which quickly makes the unit operable again. At the worst, you could borrow another unit from an associate.

CONCLUSION

Instructional technology can be an effective tool in education when its role in the classroom has been clearly defined. This can only be accomplished if educators have an understanding of the possibilities and limitations of such technologies, and how they can be used to enhance teaching and learning. Educators faced with the question of how to integrate technology into their classrooms should strive for some middle ground if the extreme of over-use is to be avoided. A need exists to continually ask ourselves many questions in an effort to get beyond the myths and half-truths. Questions such as: what specific educational goals do we wish to accomplish that requires IT in the classroom? What type/s of training and support would be necessary? Is there a well thought out IT education plan? Does this plan take into account the short life cycle of computer related equipment and the costs associated with keeping pace with current hardware and software advances? How would IT be integrated into my lessons and how will students benefit from its use? Answers to these and other questions are very important to any successful use and integration of IT and require more than the rhetorical goal of preparing children for the workplace of the 21st century. It is hoped that these questions of necessity will ultimately help in the decision about which vehicle to choose to carry the content directly to the learner. Instructional technology may have a place in education if it is used to gain and hold students' attention, improve student comprehension, increase retention of course materials, and increase student achievement scores. Realizing this however, requires some homework and insightful thinking on the part of

each educator. The important elements of lesson planning should not change because of the presence or prevalence of instructional technologies. The important elements of lesson planning should continue to be the consideration of the subject matter and content, a determination of the course objectives, assessment strategies to measure student learning, and consideration of students' needs and their role in the classroom. These issues must first addressed before any discussion can be given to the best delivery medium. It is important to remember that instructional tools in the hands of a skillful and enthusiastic educator (who understands their use) can become an instrument that could aid in the creation of learning environments that are dynamic, mentally stimulating, interactive, and challenging.

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