Instructional Technology:
Past, Present, and Future Trends

Marie Dennany Lara

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"The number one benefit of information technology is that it empowers people to do what they want to do. It lets people be creative. It lets people be productive. It lets people learn things they didn't think they could learn before, and so in a sense it is all about potential."

(Ballmer, 2013)

Introduction

The Organization for Economic Cooperation and Development just put out a report documenting the results of the *Survey of Adult Skills* – which collated data on adults' proficiency in literacy, numeracy and technology-driven problem solving around the globe. (Ferdman, 2013) The group did not need to state that the rankings and information contained were highly anticipated by business and government leaders alike in this highly competitive global economy. Governments hope to promote their labor markets and show how they are invested in the skills, lives and education of their citizens. While the fact that "Americans rank well below the worldwide average in just about every measure of skill. In math, reading, and technology-driven problem-solving, the United States performed worse than nearly every other country in the group of developed nations. (Ferdman, 2013) It was surprising to learn that an apparent deficiency was not the lack of computer literacy per se but an apparent deficiency in Americans "ability to understand, evaluate, use and engage with written texts to participate in society, to achieve one's goals, and to develop one's knowledge and potential" (p. 63). This factor points to the fact that while we know that these tools must be made available to our students many elements come to

play in their education. The tools we chose must be able to facilitate the learning process and improve performance. We must be able to evaluate the results of the assessments and the benefit and utility must be apparent or the course must be changed.

Naming and Defining Our Field

Instructional technology and/or *Educational technology* have numerous definitions depending on the context and source in which the terms are utilized. For the most part the definition provided by EdTech (Review, 2013), which states that educational technology is the "study and ethical practice for facilitating learning and improving performance by creating, using and managing appropriate technological processes and resources (para.1)" seems the most appropriate for the purposes of this report. To begin the process of understanding the field we first analyze the nature of discipline and where it originated.

Past Instructional Technologies

Some believe that instructional technology can be traced back to the beginning of human education. The privileged paid the *Sophists* to teach their young men to speak well, orate and utilize the *techne* of rhetoric. Plato criticized the fact that the *Sophists* charged for this training and he believed these men to be immoral, catering to the interests of Greek city-states. (Adams, Ph.D., 2000) Actually these "professional teachers" practiced the Ionian scientific tradition, which challenged conventions of the time and touted new and different beliefs. They are said to have been the first to promote the theory of cognitive knowledge and the concept of human excellence. Much of what we know about what they preached comes from criticisms by Aristotle, the renowned teacher of Alexander the Great. As further developments in educational theories developed the pedagogy for thousands of years remained similar to that of the Greeks. The teacher lectured the students and encouraged rote memorization of mathematical facts,

theories and formulas. Some were encouraged to utilize their innate talents to experiment but for the most part this was limited to privileged males. As time went on girls and women were taught in a few fields such as secretarial, as seamstresses and elementary teachers. Eventually as technology began to represent smarter and efficient methods for getting things done businesses got into the *business* of education and built schools to train and educate the populace to operate their machines and do the jobs they wanted and needed to get done. These technologies represented progress and the money generated from sales helped the country build weapons, ships, planes, roads and skyscrapers. The United States of America won wars and sold our latest technologies abroad.

As we developed into a privileged modern society we looked to educate our children, and to the latest technologies that might help accomplish our instructional objectives. Prior to the 21st Century we did not ask educators to design the training and curriculums for our schools and other institutions but businessmen and government officials did. Late 19th century and early 20th century classrooms contained books, chalk boards, and desks, later attempting to implement the use of radios, filmstrip projectors, and slides into the mix. The cynical or observant might note that the businessmen that touted their instructional technology solutions have frequently predicted the elimination of textbooks and even teachers.

In the 2006 book, Future *Hype: The Myths of Technology Change* by Bob Seidensticker states that in 1922 Thomas Edison predicted that movies would replace textbooks. In 1945 one forecaster imagined radios as common as blackboards in classrooms. In the 1960s, B.F. Skinner predicted that teaching machines and programmed instruction would double the amount of information students could learn in a given time. Filmstrips and other audiovisual aids were fads thirty years ago, and the television, now

seen as a supplier of brain candy, once had a sterling reputation as an education machine. (p.103)

This period saw the prevalence of new learning theories such as that of Russian physiologist Ivan Pavlov, who described classical conditioning theory which could help parents and educators, understand the origins of disruptive classroom behavior. These learning theories were the catalyst for many to develop educational technology solutions utilizing the basic premises garnering attention at the time. For example, behaviorist guru, B. F. Skinner emphasized stimulus response patterns of conditioned behaviors could be taught utilizing "drill and practice" instructional technology design solutions. The teacher would provide positive feedback to reinforce desired outcomes. (Whelan, 2013) Jean Piaget's Stage Theory of Cognitive Development was seminal in the field and highly utilized in various form or fashion in numerous instructional technologies. His collaborator Seymour Papert expounded on this theory to develop his own constructionism learning theory which incorporated the instructional principle of problem-based learning into the classroom. Papert proposed that we do this with a form of experiential learning in which the instructors brought IT (instructional technology) into the classroom and teach the children programming at a very young age. He eventually developed a computer language for this called LOGO whereas the students could immediately see the results of their programming in a written, visual format. An interesting fact is that Seymour Papert is said to have prophesied in *Popular Computing* in 1984, that:

> There won't be schools in the future …. I think the computer will blow up the school. That is, the school defined as something where there are classes, teachers running exams, people structured in groups by age, following a curriculum—all of that (p. 11) (Cuban, 2010)

Coinciding with the development of these new learning theories were the tools used to implement them. The audio visual room began to have much more than an old reel-to-reel film projector, it gained a television. The television manufacturers wanted to put a television into every classroom and they pushed for higher quality effective productions. One of the biggest success stories of the time is the development of Sesame Street, which combined behavior modeling with cognitive and affective goals. The Children's Television Workshop did this with repetition and humor at a steady pace. It was quickly noted that this worked best for the younger student. Many began to note that older students and adults' interest waned in educational films and television. To this day one of the primary goals is to keep the interest or focus of the student in the development of learning theories and instructional technologies. The tool cannot be effective if it is not utilized in some form or fashion. Some concentrated on the software development of programs to incorporate devices that educators saw lacking in the older computer labs that were mostly used for "drill and practice" sessions in the past. States and districts did not want to invest millions in computers that were not contributing more to the education of the student. Educators and administrators coming of age in the new digital era began to contribute insights into the direction of technology implementation in the classroom and in business training rooms across the nation. As discussed in Bloom's Digital Taxonomy, there has been an update to the original form of the learning process and much of the methods of instruction can often be facilitated by digital media. (Churches, 2009) Any educator looking to incorporate the skills needed today into a curriculum would know that the student can best accomplish these tasks with the tools made available in smartphones, tablets, laptops and on the internet. The speed and ease with which a student can find a relevant book or article online has increased exponentially since the days of manual card catalogs and travelling to your local

library. The abundance of relevant sources has caused different, newer concerns that the

educational field has been fearful of since the incorporation of the internet in the classroom.

Many teachers were hesitant to allow online encyclopedias and other information they did not

understand for fear of plagiarism, cut/paste paperwork, irrelevant and just plain *wrong*

information. Classrooms were quickly aided by plagiarism detection programs and instructors

were trained more and more in the utilization of computer aided instruction and curriculum tools.

The technology continues to adapt to the concerns of the consumer.

The following graphic illustrates the Instructional Technology Timeline from 1840 to a projected

date in the near future. (Thomas, 2012)
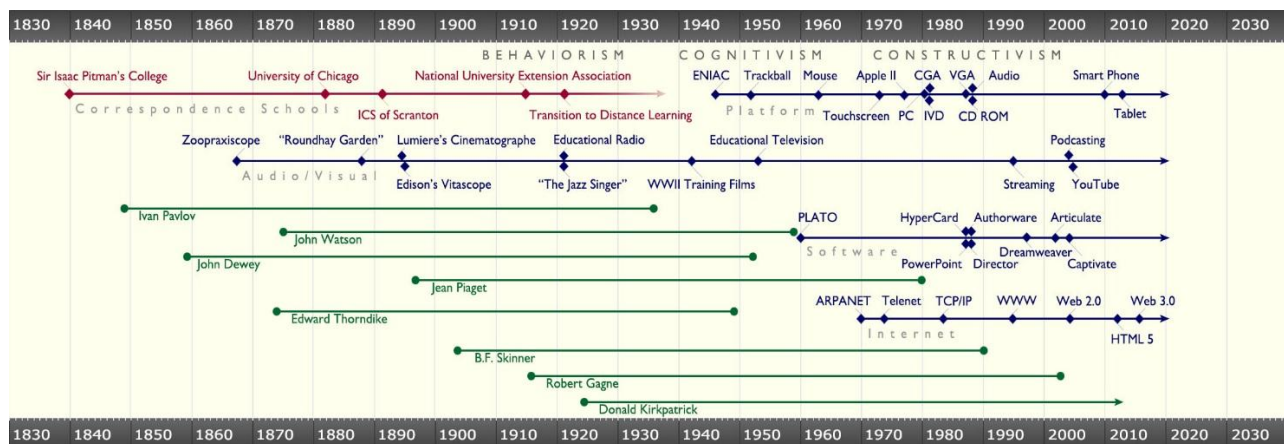
Present Instructional Technologies

With the increased reliance on computers in every corner of our life from banking,

design, medicine, writing, printing, music and film the view has developed that these new skills

are not only skills that need to be learned, but essentials that need to be taught. The student of

today is a *digital native* and his teacher may be as well. The classroom is now buzzing with tools

to help us to do more, learn more and collaborate with almost anyone, anywhere. The latest thing

may be the *flipped classroom,* where the teacher has filmed her didactic introductory lecture and

the student reviews this for homework, on a tablet, their phone, iPad or in the library ahead of time. The student then develops questions or if he has none returns to the classroom to implement what skill or idea was being addressed in the digital video. The student has more time with the teacher on examples, labs, experiments or problems in the classroom.

Another technology that has come a long way is eLearning, distance learning or the online classroom. Various formats of essentially the same type of program has changed and grown since it was first thought of in some way, shape or form back at the turn of the twentieth century. World War II saw the proliferation of "training films" and now the latest trend is the MOOC or the Massive Open Online Classroom. Khan's Academy, a repository of thousands of online videos that have been viewed over 300 million times started as a couple of personal YouTube videos for a cousin in another state having trouble with algebra concepts. It has now been adopted for use in numerous classrooms, added many more subject areas and has Common Core State Standard resources for teachers incorporated into the lesson guides and exercises. (contributors, 2013) MOOC's have been *trending* and been getting highly criticized from universities and professors who believe it is just the latest fad. Some have decided that a *blended classroom* which utilizes technology as an essential tool is the way we should move forward to solve some of the issues that have become increasingly apparent.

As many virtual campuses have been designed and variations of technology integrated or blended classrooms abound some are asking for results. We have incorporated the technology, but do we have the data, research and results to show these new pedagogies are working? Clearly as we see in our aforementioned report by the OECD (Organization for Economic Cooperation and Development), there is something lacking. The data seems to suggest what many educators have been clamoring for, a move to core curriculum and traditional education methods to better

strengthen the educational foundations necessary for the student to be *ready* to learn and better able to utilize these new digital media tools.

Many classrooms and school districts are experimenting with BYOT (Bring your own technology) or offering iPads, laptops and wireless access. Some allow different environments to *Race to the Top,* offering innovative teaching solutions; but, "Rarely is the question asked: Is our children learning?" (Mikkelson, 2008) As the promise of better educated children ready to succeed in colleges and universities has faded many have seen the lowering of expectations and larger numbers of drop outs entering an already crowded workforce to compete for low paying, minimal skills positions. Some have seen foreign students being encouraged to study and work in our universities, Silicon Valley and high tech arenas. So the ubiquitous, experiential instructional technology classroom continues to get *blended, flipped and turned inside out* as well.

Future Instructional Technologies

As classrooms continue to experiment and diversify the technologies they have at hand, one can imagine that results will become the issue to address, if not now in the very near future. The pedagogical theories of the past have been utilized proven and disputed, but we never faltered this badly as we moved toward the future. Granted the United States was persistently at the top of the ranks when we invested the most time and money in our numerous instructional/educational technology theories and immediately implemented them all with a fervor. Since we have become a highly competitive global economy competing for jobs, manufacturing and the best and the brightest again, we begin again to intervene in a more effectual manner in the incorporation of better solutions. Many Instructional Design firms still utilize at their core an ADDIE model that is Analysis, Design, Development, Implement, and

Evaluate. Some have said let us look outside of this process and have gone to other methods, such as SAM or the Successive Approximation Model which the developers ensures learning and retention utilizing an iterative approach. (Edwards, 2012) Trainers are looking at adapting the process at various points along the way. Some think we should all the way back to the beginning and utilize *traditional, proven* methods of instruction and leave the tools and technology out of the mix completely until we are sure the student can benefit from its use.

In the same manner as many became highly concerned about the abbreviated language of *texting* and *instant messages*, many *digitally native* teachers now incorporate that same technology in the classroom, texting themselves. Parents believed this did not help their child to learn to spell nor write in a correct manner. The resulting degradation in our literacy tests score may reflect the truth of this concern. As we move towards the future are we going to need to step back? Professors and teachers demanded to be a part of the process, but the expectations placed on the instructors regarding digital skills as well as results are increasingly demanding.

Some believe the MOOC (Massive open online classroom) will be a pervasive winner in the arena of higher education as Google entered the fray by teaming up with edX and has already highly invested in Khan's Academy. We see *Coursera* and *Udacity, Inc.* from elite universities partnering with big business and this becomes an eventual blueprint for what is to come prevalent in the future of higher education. (Arnold, 2013) The faculty at these institutions initially found little to do except to film their best didactic lectures and upload them to the campus server but now are asked to answer questions, provide exercises, feedback and grading if the student is working for badges or credit of some kind. The popularity of this universal access virtual campus style proves it will definitely be a part of the future of instructional technology.

Conclusions

Just as smaller, touch screen computers and Google Glass develop into the future trend of technological tools innovation alters or moves the educational benefit of these developments. Like getting the kinks out of anything *new* and untested we will need to develop the research and collect the data to analyze and develop effective instruction for the children of tomorrow. It seems almost unnecessary to analyze as one can plainly see the advantageous benefits of Google Glass for an instructor. An instructor can record an experiment, demonstrate a theory, and describe a national landmark he is currently visiting, narrating all along the way while transmitting video back to the classroom. The student can see this in real time from the perspective of the teacher. Yet, we have been in the position before in 1957 whereas B. F. Skinner was so thrilled with his new *teaching machine*, and sure it was the answer to every student's needs, he insisted we could throw out all the books!

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