

The Power to Transform

Online learning will play an even more pivotal role in improving the quality of life for mankind in the 21st century and beyond than it has in the recent past. It will likely be the source of thousands of new jobs in the future. For example, new jobs will be created when educators require more sophisticated animations, interactive diagrams, and simulations to teach topics in every subject including population changes, forces and motion, supply and demand, growth of universes, spread of viruses, effects of medications, real time demonstrations of how organs work, melting polar ice caps, rising ocean levels, and the list goes on.

Just like farmers needed the plough (and ploughing skills) to be more effective, citizens of the 21st century will need technology tools and skills to be successful. Teachers in every field will have the responsibility and opportunities to provide these technology tools and skills. Perhaps more importantly, they will have opportunities to be role models who demonstrate, through their own practice, how to apply the technology tools and skills they want their students to master and promulgate.

Without a doubt, web-based learning tools have the potential to transform how educators communicate and how students learn in the 21st century. In fact, without it, the vast majority of the 21st century inhabitants of the earth will not be able to get a decent education. Used effectively, online learning could substantially improve the quality of instruction and the amount of learning that takes place every time learners learn.

This means that online learning could be used to help teachers, professors and corporate trainers be more effective as they educate their very specific clientele. With online learning tools and “train the trainer” models, effective educators can multiply their impact. They can mentor and coach, as well as provide real digital examples of their creativity for their students/trainees to use as models of excellence. Video clips of the experts in action, for example, can be used by student teachers during instruction, to build on what is already excellent, rather than reinvent the wheel. The next generation of teachers will be able to use technology and their creativity to excite their students and facilitate learning.

Today, as we stand upon the threshold of the second decade of the 21st century, experts in every field could be teleconferenced into classrooms to increase learning. Digital recordings of experts’ excellent presentations could be used over and over at very low cost. When used in an asynchronous presentation style, digital materials are available to students upon demand, anytime they need it and as often as they need it, at no additional cost to the learner, and at zero additional expense to the teacher. On the other hand, synchronous scheduling of “live” presentations with experts provides students with the opportunity for dynamic human interaction. They can collaborate, ask questions and obtain answers in real time. Today, synchronous sessions are digitized, stored in libraries and made available for study, including review by students who were absent during the “live” presentation.

Moving forward, comprehensive online education programs are likely to have both asynchronous and synchronous components available to students of virtually any subject. In addition, the educational

research literature suggests that online learning used in combination with face to face instruction, has a positive impact on learners' understanding and retention. This so-called "blended" format holds much promise for education in the 21st century, and is likely to become the norm as brick-and-mortar organizations adapt in response to the challenges of providing a high-quality education for billions of learners around the globe. The next decade will see dramatic shifts in this direction. These shifts are likely to be accompanied by some turbulence, and even upheaval, as scarce educational investment dollars move from providing buildings to providing online web access.

Access will be required "just-in-time", exactly when the learner is ready to learn. Already, mobile devices such as smart phones and pda's enable learners to get access to the information they want - upon demand but with limited views, restricted navigation functionality and constrained screen size. All of this will change with the new devices like the iPad from Apple Computer. This portable collaborative, web-based, media rich, large screen device promises to overcome many of the limiting factors present in today's mobile devices. With such learning tools in hand, learning will become a totally new adventure. One can access online learning, download relevant books, collaborate with subject experts and join groups with similar interests; all on a high quality large screen portable device. Additionally, with voice over internet protocol (VOiP), learners will have access to audio conferences, as well as collaborative multimedia learning programs. As technologies merge, potential learning opportunities will multiply, thereby empowering learners to learn anytime they choose from the convenience of their own device.

Changing Roles

In the context of schooling, the teacher's role will continue to evolve in the direction of facilitator of learning. Rather than being the "learned sage" who disseminates information, the superlative teachers will be more like "librarians and tour guides" providing access to information. Like tour guides they will provide relevant "big picture" overviews of the topics to be learned. To be engaging, even riveting, these overviews will be packed with multi-sensory stimulation - video, audio, games, "hands-on" activities – and incorporate discussion groups, presentations, group projects, and individual projects. People from the neighborhood, alumni, parents, school board members, and experts from businesses will be invited to share their knowledge and experiences to make the content more real, usable, practical and personally relevant to learners.

Additionally, students will be taught how to make choices and distinctions. Based on their interests and talents, students will be able to collaborate with teachers to chart their own learning course. The hopes and dreams espoused by Rogers, Dewey, Montessori, Piaget, Ausubel, Hunter and others will finally be realized. Teachers will be facilitators of learning rather than disseminators of information. Like librarians, they would seek to understand what the learners want to learn and provide multiple points of access to multiple relevant sources of information. As learners grow in knowledge and understanding, they will have multiple opportunities to interact with their teachers and peers to have intellectually stimulating discussions and collaborative learning sessions. Courses will not be compartmentalized into subjects. Instead, the relevant content from many subject areas and sources will be brought together

and integrated to produce holistic, synergistic opportunities for learning. Learners of the 21st century will truly be the most fortunate learners in all of human history up to this point.

Challenge faced by Teachers' Colleges Today

Ensuring that Teachers' College graduates of the 21st century are competent and confident in using technology to facilitate learning is a major challenge that needs to be addressed by colleges, universities and educational institutions of the future. In order to improve teaching and learning, professors of pre-service programs need to "practice what they preach". In this way, the new, emerging generation of K-12 teachers will have role models whom they can emulate. This will ensure they are better equipped with the skills they need, and more comfortable incorporating advances in technology as an integral part of their teaching, learning and assessment processes.

Convenience and Access

Today, as we enter the second decade of the 21st century, online learning allows adults, including single parents, to handle the competing demands of family, work and school life. This is of paramount importance when adult students are faced with the challenges of efficiently managing finite, limited, personal time, energy and financial resources. As people strive to acquire new skills to provide a better quality of life for themselves and their families, online learning allows them to choose the times, places, learning sequences and pace that works for them and fits in well with their other important life activities. In this way, online learning provides opportunities for many more learners to have access to a high quality education, 24 hours per day, seven days per week, throughout the year. Many colleges, like MIT, currently offer free online, college lectures to encourage ongoing learning from experts.

Customized Instruction

For understanding, consolidation and long-term retention, brain research and research from the learning sciences suggest that what's more important than convenient access, is the opportunity for learners to progress at their own pace. The critical element being that learners have the opportunity to invest as much time as they choose to study the material, and to then to receive feedback, upon demand, as often as needed, until they have attained mastery. Accurate assessments are required to create a feedback loop that helps learners evaluate their progress towards mastery, and to know for certain when they have attained mastery. These assessments must be available upon demand, in real-time, exactly when the learner wants feedback. They need to focus on the exact learning objectives the learner is interested in getting feedback about, and they must provide accurate information to help the learner understand what needs to be done to move forward with the learning process.

Research in the area of cognition and learning, recommends that students be given the opportunity to apply what they have learned immediately after they are taught a lesson or a segment of a lesson. Teachers' responsibility while students apply what they have learned, is to observe the students technique and the correctness of their reasoning. Because unlearning errors is difficult, especially after learners practice using the errors in skill and logic as though they were correct, teachers need to observe the students, identify the errors before they become permanent, and help the learners to replace

flawed techniques and reasoning with **flawless techniques and reasoning**. In the education literature, this teaching strategy is referred to as “guided practice”. In today’s world, teachers at the cutting edge of effective instruction use guided practice every day. It will become standard practice in the future.

What is Guided Practice?

Guided practice is the process of providing students with the opportunity to apply what they learned soon after learning it, and then providing them with feedback on the correctness of their application with actionable suggestions for improvement of technique and reasoning. When students are performing at levels of excellence they need confirmation regarding what they are doing correctly and what they need to practice to maintain their reasoning and skills at levels of excellence. When students make errors, they need to understand what they are doing wrong and what they need to do in order to fix their errors in reasoning and skill performance.

The Need for High Quality Feedback

A significant challenge that teachers have not been able to deal with adequately and consistently, is that of providing immediate, high quality feedback to large numbers of students while the students are simultaneously trying to apply what they just learned. This need is crying out loud for a solution, and presents a fantastic opportunity where online learning could come to the rescue. Teachers could be taught how to use software to provide high-quality feedback to individuals in real time. Students could answer questions, and then receive the teacher’s feedback for comparison with their own work. Currently available software packages like the ALTS Assessment Management System™ do this well today. (For more information visit www.alts.com)

Students can be taught how to identify the gap between their current performance state and the desired outcome state, and how to take actions to close the gap. When needed, teachers can be resources to help students create an action plan for moving from their current state to a state of mastery of the desired learning goals.

Individualized attention from a digital tutor

In the second decade of the 21st century, immediate feedback and personalized instruction will be provided by avatars that function as digital tutors. These digital tutors will not mind repeating the same information over and over again, without becoming upset. More importantly, they can be programmed to reteach the same content using multiple approaches. Thus, learners can choose the approach that works best for them - based on their sensory preferences and learning styles.

All of the available approaches are likely to be media-rich making ample use of audio, video and hands-on activities. Learners in the 21st century will be the luckiest humans to have ever inhabited the planet, because for them learning will be fun and engaging. They will have the opportunity to use their strengths, learning preferences and interests to choose the lesson they want, and the experts they want to learn it from, in order to learn most efficiently. In every subject, on every topic, they will have opportunities to choose lessons that are interactive and facilitated by people they want to learn from.

All of the senses – sight, hearing, smell, taste, touch – will be involved in the learning process. In this way lessons will become more memorable and learners will be excited about learning at every opportunity.

As happens in some places today, the starting point for the individualized customization or “tailoring” process could be automated by having learners take a sensory preferences inventory which creates their personal learning preferences profile. Then, with this information stored in their profile and updated as they learn and grow, any time they choose to learn something new, the teaching approaches and resources that best meet their needs will be suggested.

Today, organizations like Microsoft, Intel and Cisco are currently involved in using the online technology to make learning more interesting and interactive. A significant part of this research, involving researchers from around the globe, is focused on the development of games that facilitate learning. Games make learning fun and enable learners to learn without realizing how much time and mental effort they are investing in the process. In this way, the amount of time and attention learners invest could be increased to deepen the learning experience and thereby contribute to long-term retention.

Simulations can play a role in Instruction

Games can include realistic simulations. Much research, time and resources have already been invested in creating flight simulators that let trainee pilots experience decision-making in crisis situations, and provide opportunities for them to review and study the consequences of their reactions and choices. These flight simulators are very useful for training and learning as they provide classic emergencies and give all pilots the opportunity to solve them. When the trainees have the opportunity to compare their solutions with those of others, it becomes plain that there is not always one best solution, but that there can be several practical solutions worthy of emulation. Each solution, including the trainee’s own, could be archived and studied. The processes of observation, analysis, reflection and discussion are useful for significant learning to take place and for each trainee pilot to have a repertoire of responses to choose from, when spur of the moment decisions need to be made. The logic is simple: If you’ve played the “game” before and you know what works and what does not work, you are in a better position to make quick decisions that can save lives. In fact, thousands of human lives have already been saved as a result of flight simulator training.

If flight simulators could be used to teach the complex decision making process of responding effectively to emergencies during flight, then learning simulators could be developed for a variety of industries and jobs. These simulators do not need to be as complex and costly as those that simulate flight in aircraft, helicopters and space shuttles. In fact, with current advances in nanotechnology, simulators for use in healthcare, hospitality, education and manufacturing could be as small as a pair of 3-D glasses used at the IMAX theater today. For many jobs such simulators are already in production, and will soon be available to learners everywhere.

Simulations can play a role in Assessment

Another application of simulations that will have a significant impact on education in general, and learning in particular, is their use in assessment. Well-designed assessments provide feedback to learners about the progress they are making on the road to mastery. For this feedback to be useful, it must be accurate, and provided in a timely manner.

Medical professionals have been doing pioneering work with simulations for decades. They have in fact, already created a “digital human”. Thus, doctors, nurses and other healthcare professionals have access to three-dimensional views of organs, bones and other structures in their current online learning materials. In the past, when medical students needed to learn about diseases or practice doing surgery, they were each provided with a unique cadaver. Then when assessment time came, surgeons would operate on their unique cadaver or live human beings.

Apart from the dire potential consequences of small mistakes during surgery on live human beings, during assessment there is a serious comparability of scores problem when different human patients are used to evaluate each surgeon’s expertise. The challenge arises precisely because each patient’s case is unique. With the advent of the “digital human”, each student surgeon could be provided with the same challenge and be graded on the quality of the solution. As a result of this, the comparability of results issue is now nonexistent for universities that use “digital humans”. In these institutions, the focus has changed from comparing students’ results, to ensuring that each student has attained mastery of all the essential learning objectives. This change in focus has moved the energy of assessment to a better place. Assessment is now seen as integral to the learning process, and contributes to learning by providing feedback to learners for them to remove errors in technique and reasoning, as well as for them to grow in confidence by affirming the information and skills they have mastered.

If realistic, three dimensional simulations with parts of the human body, or of the entire body, could be used to teach and assess doctors, nurses and other healthcare professionals, then it stands to reason that less complex simulations could be used to teach and assess learners in virtually every other field. It is high time to create appropriate simulations and employ them to make online learning more relevant, exciting and meaningful to learners in every field. As the demand for simulations and games increases significantly, this area is likely to receive much attention in the next decade, and become the source on many jobs.

Conclusion

In the longer term future, as technology evolves to produce realistic three-dimensional virtual worlds in which simulations can be run - learning is likely to be even more intense, engaging and fun. Learners will have the opportunity to learn through actual life experiences; make errors and correct them without having to live with the loss of limb or life that might occur during a “virtual” experience. Like the concept of the Star Trek “holodeck”, virtual experiences will be used, not only for vacationing and recreation, but also for learning and preparation for life. Just as the cell phone, only a figment of the imagination 50 years ago, has become a common household item that even children are comfortable

Online Learning and Online Assessment in the 21st Century
Dennison S. Bholá & Fritz Petree

using every day, it is likely that “holodecks” will be another tool available to teachers and learners of the 21st century to facilitate customized, self directed, intentional learning experiences.

Undoubtedly, online learning and online assessment have the potential to transform how educators teach and how students learn in the 21st century. In fact, for the vast majority of 21st century learners around the globe to get a useful education, the full potential of online learning and online assessment must be harnessed to substantially improve the quality of instruction and feedback learners receive during the learning process. As education adapts to make the best use of online learning and online assessment, thousands of jobs that do not yet exist will be created. These new jobs will require the innovative application of science, history, mathematics, art, music, languages, engineering and technology skills to develop animations, interactive diagrams, and simulations to facilitate learning of topics in every subject. A bright future, full of opportunity, is before us!