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Effective Models of Teaching and Learning for New Type of Students

ABSTRACT: Educators are faced with the challenge of adapting their teaching styles to accommodate a new generation of digital learners. These digital learners, who are now entering colleges and universities, have learning expectations, styles, and needs different from past students. The question is how to adapt teaching strategies to accommodate the digital learners, in light of their preferences for digital literacy, experiential learning, interactivity, and immediacy? Meanwhile, the higher education today has also the opportunity to reshape itself and play an important role in the future of our society. Whether that role is ultimately fulfilled will depend on fresh, creative thinking, and a firm commitment to move teaching, learning, and the university into the digital age. The manner in which students are taught will not truly change until the manner in which we teach and evaluate students change. This working paper tries to elaborate the multiple studies that suggest moving students from consumers of information to producers of information. This is the key to engaging digital learning. However, until teachers are trained to expect and accept content gathered through social networks with emphasis on teaching students how to check validity and reliability of the web, the full power of the digital natives can not be released or expanded. Finally, this working paper recommends that teachers must allow students to publish broadly then promote peer and expert outside evaluation. These new learners are instructed by teachers who, for the majority, spent childhoods engulfed in television programs that fed information for consumption, rather than interaction, omitting the choices and short snippets that lead to further discovery.

KEY WORD: Teaching and learning styles, digital era, higher education roles, and digital capabilities of teacher and student.

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INTRODUCTION [1]

> Young learners today are not growing up at the foot of the family radio or spend a good portion of their childhood glued to the television while Sesame Street and Mr. Rogers disseminated information in a constant stream as did previous generations. Rather, this generation of young learners continues to spend many out-of-school hours in a digital world composed of cell phones, MP3 players, computers, and video gaming. This very simple beginning is changing the horizon of learning (Jackson & Crawford, 2008).

Educators are faced with the challenge of adapting their teaching styles to accommodate a new generation of digital learners. These digital learners, who are now entering colleges and universities, have learning expectations, styles, and needs different from past students. The question is how to adapt teaching strategies to accommodate the digital learners, in light of their preferences for digital literacy, experiential learning, interactivity, and immediacy? (Skiba & Barton, 2006). Today's digital kids thinks of information and communication technology (ICT) as somethings akin to oxygen: they expect it, it's what they breathe, and it's how they live (Brown, 2000). They use ICT to meet, play, date, and learn. It's an intergral part of their social life; it's how they acknowledge each other and form their personal identities. Furthermore, ICT to some degree has been supporting their learning activities since their first web search and surf years ago (Brown, 2010).

J.S. Brown (2000 and 2010) describes the dimensional shifts of the digital learners. The first dimensional shift encompasses the envolving nature of literacy, which today involves not only text but also image and screen literacy. The ability to comprehed multimedia text and to feel comfortable with new multimedia genres is decidedly nontrivial. Digital students have developed their own vernacular, a screen language for their digital culture. The ability to communicate and express oneself with image (still and moving), sound and other media is a crucial aspect of the new literacy. Beyond this, information navigation is perhaps the key component of literacy in the digital age. Web-smart kids hone their judgment skills through experience and triangulation as they surf the sheer scope and variety of resources the web presents, the magnitude of which largely befuddles the adult unfamiliar with digital technology.

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The next dimension shift learning from an authority-based learning. Young learnes are constantly discovering new things as they browse through emergent digital libraries and other web resources. Indeed, web surfing fuses learning and entertainment, creating infotainment. The third shift, pertaining to reasoning, connects to discovery-based learning in an extremely important way. Classically, reasoning is linked with digital media seem to focus more on the concrete, suggesting a form of *bricolage* – a concept having to do with one's abilities to find something (perhaps a tool, some open source code, image, music, text) that can be used or transformed to build something new. Enormously popular "mass-ups", where music from various internet sites is mixed together to create digital hybrids, is a prime example of this phenomenon. The final dimensional shift has to do with a bias to action to try new things without reading the manual or taking a course. This tendency shift the focus to learning *in situ* with and from each other. Learning becomes situated in action; it becomes as much social as cognitive. It's concrete rather than abstract, and it becomes intertwined with judgment and explanation.

CHALLENGES

The year 2002 marked an important turning point in the history of information and communication technologies in which the total number mobile phone subscribers overtook the number of fixed line phones on a global scale (Maag, 2006). Moreover, with then advent of personalized and always on communications, the impact of technology on the socio-economic landscape is becoming more and more significant. The widespread use of mobile phones has affected the way in which humans learn, interact, and socialize. Yet, we are only witnessing the early beginnings of this social transformation.

Based on initial findings from a study of uses and ownership of mobile phones among learners at the Open University Malaysia (OUM). About 90% of the students owned mobile phones. The use of SMS (Sort Message Service) messaging has grown at a phenomenal rate. In 2003, as much as 6.16 billion text message transactions were made by mobile phone subscribes in Malaysia. In 2003, 11 millions of the population owned mobile phones. Mobile phone has become a gadget that teens use to define their personal space in relationship to friends and parents. Teens struggling between independence and dependence on parents may not always appreaciate parent's attempts to be part of their social space.

Young people have acted as developers and pioneers of SMS culture. Text messaging may be one of the strategies for teenagers to present their more courageous selves.

The development of mobile wireless technologies has generated a considerable amount of excitement among practitioners and academics because it results in shifting the academic enviroment from traditional settings to mobile learning (m-learning). Increasing number of institutions of higher education offer course using mobile wireless technologies as alternative teaching and learning tools. The nature of learning is closely linked to the concept of mobility. Learning is mobile in terms of space, for example, it happens at the workplace, at home, and at places of leisure; it is mobile between different areas of life; it may relate to work demands, self improvement or leisure; and it is mobile with respect to time; it happens at different times during the day, on working days, or on weekends.

Mobile technologies offer learning experiences which can effectively engage and educate contemporary learners and which are often markedly different from those afforded by conventional desktop computers. Well suited to engaging learners in individualized learning experiences and to giving them increased ownership over their own work.

Despite the significant potential of mobile technologies to be used as powerful learning tools in higher education, their current use appears to be predominantly within a didactic, teacher-centered paradigm, rather than a more constructivist enviroment. It can be argued that the current use of mobile devices in higher education is pedagogically regressive. Their adoption is following a typical pattern where educators revert to old pedagogies as they come to terms with the capabilities of new technologies, referred to by Mioduser *et al.* as "*one stop forward for the technology, two steps backward for the pedagogy*" (cited in Huffaker & Calvert, 2003). Meanwhile, Patten *et al.* argued that the benefits of mobile learning can be gained through collaborative, contextual, constructionist and constructivist learning enviroments. Authentic learning enviroments in higher education typically involve these characteristics (cited in Sweeney, 2005).

A NEW KNOWLEDGE ARCHITECTURE AND UBIQUITOUS COMPUTING ENVIRONMENT

According to M. Brown (2005), we are witnessing a profound blurring of the classical boundaries separating teaching, learning, research, administration, communication, media, and play, all brought about by new

technologies. For today's students, ICT (Information and Communication Technology) is not so much a tool as it is a way of life. It's deeply embedded in all aspects of their lives: living and learning are interwoven, and, likewise, they expect their institutional environment to present a seamless web connecting the academic, social, and administrative uses of computing. A framework, or architecture, that unifies these traditionally separate *infospheres* to produce a new form of a learning ecology – an active place where the virtual and the physical seamlessly and synergistically coexist – is necessary.

Today's generation of digital students communicates in a language that many academics don't yet understand. It's an ever-evolving language of interpretation and expression, an interactive approach to learning, creating, and responding to information through a complex montage of images, sound, and communication. Students are pushing learning into a new dimension. It's a mistake to continue to try to teach them in time-worn ways. Their choices of communication need to be diversified to include, for example, visual interpretations of texts and historical figures or soundtracks for poetry. Students can take advantage of the enormous resources of the web, transforming what they find there by using digital technologies to create something new and expressive. The potential to invigorate investigation in the humanities with this approach is clear.

A change in the basic vehicle used for learning today, from archetypical courses, lectures, and textbooks to various interactive, electronically portable media could be a mode for enhancing our education system. Future classroom envisions entertainment-quality, web-based modules that use animation, voice and video clips, caption, and text, all combined in accurate, well organized, pedagogically solid productions. A powerful implication of converting entire courses into modules is that students would not necessarily have to be on campus to complete them. Large introductory courses taught at the undergraduate level offer ripe possibilities for moving toward this new architecture.

More advanced and specialized courses could also be converted, although some level of face-to-face contact is certainly necessary to master such material. Indeed, several institutions and NASA recently announced a partnership to produce highly interactive learning modules to teach aerospace engineering. In some of the modules, students will wear virtual glasses that would allow them to see aerospace systems and mechanics, along with animated reproductions of their professor and other students. Such environments are beginning to acknowledge to interactive and social basis of learning and are finding ways to achieve a balance between

discovery and reflection *in situ*. But, as impressive as this sound, we must facilitate off-campus student to construct their own understanding of these multimedia lectures through some form of social interaction. To this effect, off-campus virtual discussion groups can be created. We must also find ways to support the emergent aspects of learning that come from witnessing not just a wide range of courses, but also from experiencing a wide range of communities of scholars and practices.

Graduate education today immerses students deeply into their chosen community of practice. Its nature is highly intensive and interpersonal and, thus, calls for more on-campus contact than a typical undergraduate course of study. This is entirely appropriate in light of the social nature of learning. Nevertheless, we can better leverage the resources harbored in the well established learning communities throughout higher education by rethinking their architecture.

Research universities of the 21st century should support the development of graduate education that focuses on problems rather than disciplines. The roots of problems are almost inevitably found in the space between disciplines. In-depth explorations at the intersection of disciplines, where ideas collide, will lead to new methods and new concepts to help move knowledge forward. A typical graduate student could be mentored by two or three faculty members, each form a different disciplines, who, together, would advise the student on how to pursue the problem to its root. The student then becomes the boundary object between the disciplines, increasing both the professors' and his or her understanding of the space there.

Ubiquitous computing aims to "*enhance computer use by making many computers available throughout the physical environment, but them effectively invisible to the user*" (Tapscott, 1998). From the proliferation mobile telephones, to the widespread acceptance of personal digital assistants (PDAs) and the tendency to replace desktop machines with portable laptop computers, users are increasingly starting to own and/or interact with a number of computing devices, a primary characteristic of which being that they are mobile. As these devices increasingly more powerful; users are starting to carry with them mobile processing environments of respectful computing ability.

In addition to the convenience of the wireless computer, there are also economic benefits. The cost of mobile wireless computers and services has come down dramatically and mobile wireless phones benefits identified: (1) Providing students with freedom of location and time; (2) Increasing speed in teaching and learning; (3) Enabling one-to-one learning based on individual educational histories test results; and (4) Allowing teachers to keep

up the new educational subjects for future education (Prensky, 2001a).

Mobile wireless phones provide professors and students with much better communication opportunities than other mobile wireless devices.

THEORETICAL FRAMEWORK

According to theoretical framework of cultural studies of technology, technologies emerge out of processes of choice and flexibility, or the different meanings that various relevant social groups hold (Carlson, 2005). Rather than mere physical objects, technologies can be seen as a socially construed part of human action and information production (Oblinger, 2005). Technology and its impacts are construed and defined culturally – technologies do not speak for themselves or have impact outside of people's interpretations. The perception of technology as a social construction refers here to the interpretations and meanings produced in social interaction between people: the ways in which mobile technology is seen and observed subjectively and the meaning that is given to these observations.

The internet and other technologies honor multiple forms of intelligence – abstract, textual, visual, musical, social, or kinetic. They present tremendous opportunities to design new learning environments that enhance the natural ways that individual learn. Literacy in the 21st century has expanded from an emphasis on comprehending page text and listening to lectures to include a wider, more encompassing tool set, requiring more activity-based competencies. Though previously didactic learning was the mainstay in the classroom, it has since been recognized that other learning styles maybe more suited to the online learning experiences and that the expansion of learning may begin early on.

M. Prensky (2001b) claims that "digital natives" having had exposure to technology from an early age, now may have brains that are wired differently. In his claim, information is processed in a random access manner, rather than linear, yielding to a simple "stepping stone" effect in lieu of the winding "side walk model" of thinking. Though in either case, this is still considered logical thinking. Youth have now added robust multi-tasking to their learning skill set. In support of this adaptation, a 2003 survey of 1,065 US parents requesting information concerning computer usage found that computer usage generally began in the parent's lap by age two and by age three, children could control the mouse, load a CD, and turn on the computer (Calvert *et al.*, 2005). This suggests that students are learning to incorporate digital tools about the time they are acquiring and incorporating language and verbal skills yielding the incorporation of

these skills early on (Brown, 2000).

Beyond comprehending text and early computer skills, learners must be competent in image and screen navigation in order to perform as fully literate (Brown, 2000). Twenty-first century literacy demands the ability to use technology, including visuals and audio segments to enhance personal learning and to communicate more effectively with others (Looney, 2005:58). Computers, DVD players, cell phones, game consoles, and iPODs (Apple Computer) are now the norm in students' pre-and post-school day activities video game world.

The US National Research Council found in a two-year study that youths require a level of control over their learning in order to make needed transfers of information (cited in Huffaker & Calvert, 2003). Similar to researching on the web, students would prefer to follow multi-topics in multi-logical directions much like brainstorming techniques and lateral thinking introduced by Edward DeBono (1997) rather than being fed a constant unidirectional message (http://www.edwdebono.com/debono/lateral.htm, 9/10/2010).

The new science of learning recognizes the importance of allowing children to take control of their own learning experiences. The term "active learning" describes the learner taking an active role in the learning process; "metacognition" is defined as the student monitors and regulates their own learning; and "transfer of knowledge" as learners apply information learned to multiple settings and tasks are now a part of the educational nomenclature. Digital gaming may bring all of these elements into play (Merritt, 2002).

S.L. Calvert *et al.* (2005) suggest that when young children spent time with the computer, it most often involved game play. Though "digital immigrants" may profess gaming to be a waste of time. F.C. Blumberg and L.M. Sokol. (2004) demonstrate that good games contain multiple elements of current learning theory. Good games provide players with stimuli and allow responses, positively reinforcing players and providing motivation for repeated response. This is indicative of behaviorism and operant conditioning.

Research into areas such as internal locus of control, problems solving strategies, visual and divided attention, and spatial abilities demonstrates the impact of action video gaming on cognitive abilities. Again, F.C. Blumberg and L.M. Sokol (2004) found that older children and children who described themselves as frequent video game players tended to rely more heavily in on internal strategies such as reading instructions or trial and error than external strategies such as asking for help or watching someone else play when learning a new game than did younger children

and those that did not play video games. The most frequently used internal strategy was trial and error, thereby driving a strong need for logical and intuitive interface designs for good programs.

P.M. Greenfield *et al.* (1994) indicate that strategies employed by video game players may transfer to other areas that require split attention. C.S. Green and D. Bavelier (2003) provide evidence that action –game training led to greater performance improvement in visual attention to multiple fields which switch rapidly, leading to detectable effects on new tasks within a short time period.

Though when students are assessed for both static and dynamic spatial ability, gaming led to significant improvement in dynamic spatial skills in specific subjects. To cap off these findings, D.L. Crawford (2006) notes that there is a tendency for positive multi-tasking ability differences in those that do not; suggesting that those who complete online courses have a higher level ability. Hence, K. Subrahmanyam and P. Greenfield (1994) found that in the evolution of video game development, programs have moved from a player outside the game to a player inside the game format. Though online gaming communities have broadened access to this engaging, construct, the educational community has yet to embrace it on a wide scale.

The North Central Regional Educational Laboratory (NCREL) described online reading comprehension as utilizing a different skill set compared to a traditional print comprehension. Though traditional comprehension encompasses the ability to locate and filter materials, and share the findings, online reading comprehension has added to these skill sets the ability to navigate through systems, to evaluate, to synthesize information and then to communicate findings in new formats (Leu *et al.*, 2005).

Added to online comprehension ability, recent cognitive research notes a new understanding of the way memory functions. Multiple studies, such as R.E. Mayer and R. Moreno's (1998) investigation on split-attention, demonstrate that memory has both a visual and auditory components. In this particular study, findings indicated that multimedia presentations with both visual and auditory components can improve retention.

A new type of literacy relying less on text, but requiring integration of images in the form of both graphics and videos will be necessary for students to communicate effectively. Literacy no longer encompasses only what is taken in from presented material, but also concludes the production of materials, such as the products yielded through Bloom's Synthesis Level (http://www.center.k12.mo.us/edtech/blooms/synthesis.htm, 9/10/2010). Written English language has evolved into two completely

competing genres, the formal language of business and school, and the abbreviated and initialized version utilized in text messaging and other digital formats.

Educators have acknowledged the optimal time for learning content maybe an internal process tied to individual development. Giving students a choice in how and when they learn content should also be considered within their curriculum. Information synthesis from multiple sources is required with long been valued at the graduate study level, the sheer volume of new information (http://www.lps.k12.co.us/schools/araphoe/fisch/didiyoknow/didyouknow.ppt#260, 9/10/2010) produced daily requires acquisition at a very early age.

ON THE DIGITAL LEARNERS

The digital learners have unique characteristics that differentiate these students from other generations. These unique characteristics are challenging the traditional classroom teaching structure, and faculty are realizing that traditional classroom teaching is no longer effective with these students. As M. Prensky (2001:1) stated, "*Our students have changed radically. Today's students are no longer the people our educational system was designed to teach*".

Several authors, such as D. Tapscott (1998), J. Frand (2000), J.S. Brown (2000), N. Howe and W. Strauss (2000), S. Merritt (2002), and D. Oblinger (2003), have written on the characteristics of the digital learners. Then, D. Tapscott (1998) described the digital learners member as an assertive, self-reliant, curious person who is enmeshed in an interactive culture that centers around 10 board themes. These themes include:

First, Fierce independence: Their sense of autonomy derives from their experiences of being an active information seeker and creator of information and knowledge.

Second, Emotional and intellectual openness: The N-Geners (Net-Generations) value the openness of the online environment, like anonymity, and communicate through numerous tools.

Third, Inclusion: They view the world in a global context and move toward greater inclusion of diversity.

Fourth, Free expression and strong views: With access to knowledge resources at their fingertips, the N-Geners are assertive and confident.

Fifth, Innovation: This group is constantly trying to push the technology to its next level and figure out how to create a better world.

Sixth, Preoccupation with maturity: Armed with knowledge, they strive

to be more mature than their predecessors.

Seventh, Investigations: Curiosity, discovery, and exploration are key for this generation.

Eighth, Immediacy: This generation views the world as 24 x 7 x 365 and demands real time and fast processing.

Nineth, Sensitivity to corporate interest: Consumer savvy, these customers like customization and want to have options and to try before they buy.

Tenth, Authentication and trust: Net savvy individuals, they know the need to verify and check resources and authenticate people.

Meanwhile, N. Howe and W. Strauss (2000) described additional characteristics such as their fascination with new technologies, their need for group activity, their emphasis on extracurricular activities, and their focus on grades. The digital learners think being smart is cool. They are close to their parents and are one of the most ethnically and racially diverse group of students in academia. Given these characteristics, it is obvious that this generation demands a new learning paradigm.

The traditional teaching paradigm, prevalent in higher education for many years, focused on the role of instructor as the "sage on the stage" who disseminated knowledge through lectures and PowerPoint slides. J.S. Brown (2000) refers to it as the authoritarian, lecture-based model of education. This traditional teaching emphasized the acquisition of facts or, as D. Oblinger (2005) noted, content-focused learning. Faculty from previous generations were text-based; focused on logical sequencing of knowledge; emphasized memorization, repetition, and recall; believed "one size fit all"; and saw the teacher as master and commander.

As we will see in the next section, the digital learners requires a learner-centered model of education with a shift from the traditional teaching paradigm to a constructivist learning paradigm. Digital learners focus on understanding, constructing knowledge using discovery methods, and active engagement; want tailored and option rich learning; and view the teacher as expert and mentor (Brown, 2005).

DIGITAL LEARNER CHARACTERISTICS AND TEACHING ADAPTATION EXAMPLES

Digital learner characteristics include digital literacy, experiential and engaging learning, interactivity and collaboration, and immediacy and connectivity. To illustrate the implications of the paradigm shift described above to these new ways of knowing, the following section will highlight

major characteristics of the digital learners related to these characteristics and describe how lecturers might adapt their teaching to accommodate the learning needs of the digital learners.

First, Digital Literacy. The digital learner grew up and is comfortable in a digital world. Action and what the technology enables them to do is more important than the particular technology (Oblinger & Oblinger, 2005). As a part of this digital literacy, Net-geners are both information and multimedia literate (Brown, 2000). They have the ability to read visual images and have visual spatial skills (Howe & Strauss, 2000). As D.G. Oblinger and J.L. Oblinger (2005) stated, "*They are more comfortable in image-rich environments than with text*". This is best illustrated in the situation described also by D.G. Oblinger (2005) in which a student in a lecture realizes that he/she does not understand the teacher's lecture, and even the PowerPoint (text) slides provide no new insights. This student, using his/her wireless laptop, canvasses other students in the class via text messaging and IM (instant messaging) and discovers they too do not understand the lecture. To solve this problem, the student googles the concept, finds a URL with simulations that better explain the concept, and immediately transits this URL to others in the class. It is important to remember that the digital learners seeks immediate information and knowledge not by finding it in a textbook, but by connecting to the Internet.

Digital Literacy Examples. In order to teach digital learners effectively, wired classrooms are a must. Since they don't respond to lecture format, it is important to take advantage of their multi-tasking ability by posting course notes with relevant web links so that students can explore relevant resources and become engaged with the content. It is especially important to direct students to discipline-specific databases such as CINAHL, MEDLINE, or Web of Science rather than relying solely on Internet search engines. In nursing education, it is particularly important for students to learn how to use handheld devices, such as PDAs, to facilitate evidence retrieval at the point of care. Incorporating technologies that facilitate the nurse's role as a knowledge worker will not only engage Net geners, but may help transform the nursing profession as well (Skiba, 2006).

To meet the needs of students, think about developing a web page for each course. The web component can contain class materials, notes, slides, a webliography, and other pertinent multimedia. This is not only important to the net geners but also to nontraditional learners who appreciate the flexibility of finding class materials while perhaps living off campus. One may also want to consider having a blended course with some face-to-

face time and some web-based interactions; this is particularly relevant for the nontraditional student. What is important is that the web-based component needs to be interactive and engaging not just a static web page dispensing content. The digital learners lives in a mobile world which facilitates their multitasking nature. Think about podcasting some important lectures so that students can listen to these lectures on their iPods or other MP3 devices.

Second, Experiential and Engaging. Digital learners want to construct their knowledge. They have a bias towards action (Brown, 2000) or – as D.G. Oblinger and J.L. Oblinger (2005) described it – they are first person learners. They want to immediately engage in the process. Discovery learning (Brown, 2000) builds upon their characteristics of fierce independence and investigative nature. Digital learners like to express their views and incorporate their experiences into their learning (Tapscott, 1998). Learning is not done in isolation and they learn by doing. According to J. Frand (2000:17), this is the Nintendo Generation and "*the key to winning Nintendo is the persistent trial and error to discover the hidden doors*". Meanwhile, J.S. Brown (2010) referred to the learners as digital bricoleurs. He noted that this generation collects bits of information, objects, or tools to create something new. Visualizations, simulations, case analyses, and other methods of participatory learning such as fieldwork are all part of the learning repertoire.

Experiential and Engaging Examples. The use of simulation technologies will help engage learners in a process that provides the interaction they desire with the feedback they need in real-time situations. Through the design of pertinent scenarios, faculty can direct learning in a way that facilitates student understanding of subtle changes that occur in patient care. This may help prepare digital learners for the transition to the work force as new nurses by nature "*tend not to focus on individual client needs*" and "*may be unaware of relevant cues in changing client situations*" (Ferguson & Day, 2004:490). Blogging is another method that allows students to interact and become engaged in the course. In short, a blog is a web-log which allows students to contribute and to comment on the blog entries. Learners can research their information and provide their reflections on their learning through the blog (Skiba, 2005b).

Another example is that of an interactive, engaging web environment that allows learners to interact with the instructor, other learners, or with the content. One example of having learners interacting with content is the use of a dynamic web page, such as the National League for Nursing chapters in a *Living Book*. As learners work their way through the chapters

of this electronic book, they are directed to web sites to find information and respond to questions. In one of our classes, we assign learners a chapter in this book to learn about the digital learners.

Third, Interactivity and Collaboration. Learning is a social activity (Tapscott, 1998); and as such should be engaging and interactive. Interactivity can occur with students, faculty, other professionals such as experts in the field, and with the content itself. Digital learners gravitate toward group work (Howe & Strauss, 2000). Net learners do best when they construct their knowledge (Tapscott, 1998; Brown, 2000; and Oblinger & Oblinger, 2005). The TTT (talk, text, test) approach is not valued by the digital learners. TTT represents the traditional teaching paradigm of lecturing, asking students to read text, and giving a test to insure they have recall and acquisition of facts (Oblinger & Oblinger, 2005:13). Rather, the digital learners prefer to work in teams and participate in peer interactions. According to S. Crittenden (2002), the wired generation is more social and inclined to participate in learning activities that promote social interactions. Social interactions reinforce their use of IM (Instant Messaging), blogging, gaming, and their large global network. As D.G. Oblinger and J.L. Oblinger (2005) point out that interaction is a key element of learning. If classroom or online teaching does not provide opportunities for interactions, the digital learners will not come to class.

Interactivity and Collaboration Examples. The interactivity and collaboration desires of the digital learners allow for the implementation of creative teaching strategies in the area of collaborative learning. While previous generations have consistently rallied against the concept of "group work", Net geners embrace collaborative learning in both face-to-face and virtual venues. Think about the incorporation of chat rooms and web-based collaborative learning centers that allow students to share a common workspace with group members by using white boards and document sharing. For example, at the University of Colorado at Denver and Health Sciences Center, informatics specialty students interact with each other in a web environment (I-Collaboratory) that allows collaborative workspace. Learners can co-edit documents and interact using chat rooms, audio, or video conferencing (Skiba *et al.*, 2004). In the I-Collaboratory, students can designate space to work with each other. They can store documents and schedule synchronous meetings over the Internet. The collaboratory concept facilitates collaboration and sharing while requiring learners to be active participants in the learning process.

In the classroom, the use of clickers or interactive response devices is another example of fostering interaction within a lecture hall environment.

The faculty member can create higher interactive learning experiences by asking learners to use these devices to select responses to questions, thus interacting with the content. Responses are then automatically displayed for all in the class to see.

Once responses are displayed, faculty member can ask learners to talk with each other as to why they choose their particular response. Then the class can select responses again and the new results can be displayed. Use of these devices engages the students in the content, promotes interactivity with colleagues, and takes advantage of teachable moments in the classroom. Another example of interactive and collaborative learning is the increasing use of wikis by the digital learners. According to Wikipedia (2005), "*A wiki is a website that allows users to add content, as on an internet forum, but also allows anyone to edit the content. It also refers to the collaborative software used to create such a website*". And according to D. Skiba:

> The defining characteristics of a wiki are: social software that allows the ability to edit and add to a wiki document with relative ease; a simplified hypertext mark up language for creating documents; and open editing philosophy in which the community can edit and add to the document. For digital learners, the notion of collaboratively constructing knowledge within a social community is very appealing (Skiba, 2005a:120).

Fourth, Immediacy, Connectivity, and Communications. As J. Frand (2000) puts it, the digital learners has little tolerance of delays. They live in a 24 x 7 x 365 world. They expect instant access and instant responses. Email is "so yesterday" when you can IM (Instant Message) or text message someone immediately. Net geners are multitaskers (Brown, 2000); and used to being bombarded by multiple processes at twitch speed (Prensky, 2001). They are mobile nomads who are always connected (Rheingold, 2003). Their connectivity via cell phones, wireless PDAs, or laptops fosters fast and quick communication. They use short hand communications that seem like hieroglyphics to the digital immigrant population. As a part of their networked society, they have an emotional and intellectual openness as well as a respect for diversity and free expression (Tapscott, 1998).

Immediacy, Connectivity, and Communication Examples. The immediacy expectations of the digital learners are a challenge to digital immigrant faculty. While email is used regularly for communication, responses don't fit within "instant messaging" (IM) time frames. It is important for faculty members to communicate with students up front so they know when they can expect to receive feedback. Basically, there are three different forms

of communication that a faculty member and learners can use: One-on-one (email, IM); One-to-many (news groups, message boards); and Many-to-many (chat rooms, wikis, and webcasts).

Try using IM during your office hours. Make sure to tell learners when you are available and that IM does not work 24/7. In our program, we also set up video conferences over the internet. The need for connectivity and communication can be exploited to remove mundane tasks from the classroom. For example, at our institution, clinical placement scheduling has been centralized for all clinical courses. It is conducted via a web-interface two months prior to the clinical rotation. Students indicate their preferences by rank ordering the clinical site and shift schedule. A random number generator is used to sort students and fill site rosters based on student preference. Students know their clinical schedule more than a month in advance and are able to adjust work and childcare responsibilities as needed.

TEACHING STRATEGIES AND MULTIMEDIA LITERACY PROGRAM

Digital learner portfolios are of growing importance in higher education as the sector seeks new teaching–learning–assessment methods which promote students, autonomy as managers of their own virtual learning environment (Clark, 2001). Meanwhile, R. Blomeyer (2002) describes a vast and dynamic networked model for learning and teaching that already exists; computer games, particularly online multiplayer role-playing games (RPGs), whose worlds persist whether or not an individual player is logged on at any given time. Participants not only compete in these games, but also form clans to collaborate and creative new content. RPGs present a valuable model for higher education both as a means to build a networked learning environment and to leverage the technological skills of 21st century students. Their key characteristics is that they facilitate peripheral, or "edge", activities such as the interaction that occurs through and around games as players swap discoveries and techniques among themselves, train and extend their avatars, add new constructs to the game, and more generally learn from each other.

A suggestion for evaluating these games (for those us who did not grow up digital) is to carefully separate the content of the games from the social context that emerges learning to be an expert player. The context can become a learning ecology with substantial richness. In other words, we must be careful to separate the center, the game itself, from the

activities materializing around the edge, where players not only learn from each other but often make their own extensions and modifications to the game, an activity typical of open source communities.

Similarly, universities could shape online activities into socially contextualized learning environments in which students actively contextualized learning experience and immediately use their course content. An open, persistent system not bound by semesters or strict discipline borders could allow students to develop over time and track that the development along several paths. This system could form the basis of a liberal education grounded in practice. R. Blomeyer's vision expands learning from the classroom to the ongoing 24 x 7 world of the next generation of students and takes advantage of their digital culture through a learning environment based on a creative, interactive screen language rather than lectures and textbook (Blomeyer, 2002).

The University of Southern California (USC) formed a multimedia literacy program (MLP) several years ago that has served more than 1,500 students with over 40 university courses, including Asian Religion, Russian History, Communication Theory, Archeology, Political Science, Women's Studies, and Quantum Mechanics. The purpose of the MLP is not to teach students the new tools of rich media, but rather to expose them to critical thinking in the visual arts, as well as in their subject matter, and to explore new means of expression and argumentation in nonlinear, interactive, and time-based media. Such media are recognized for their influence on our popular culture; however, the notion that literacy now requires the ability to both read and write with them as well has yet to gain either credibility or clear understanding.

The intent of this ambitious program can be best summarized by MLP's Director, Stephanie Barish, as follows:

> It is imperative that we expand our concept of literacy to include visual, audio, interactive, and combined media and ask ourselves: what will it mean to be truly literate, and by extension, educated in the 21st century? (as cited in NASBE, 2001).

One especially interesting point about the MLP courses is that their impact is felt as much by the faculty as by the students. Nearly all the class projects involve intense collaboration among the students, teaching assistants from the subject matter, teaching assistant from the film school, and the professors. Designing the projects often requires a substantial rethinking of the course material and sometimes the curriculum. Most academics are not used to rendering their thoughts concretely, let alone

considering how to structure in the interplay among text, image, and sound to enhance a student's understanding of a concept or situation. More generally the focus is exclusively on content, ignoring how to shape context to facilitate comprehension.

NEW DIRECTIONS IN HIGHER EDUCATION

On the Virtual Universities. The social view of learning that relies on personal interaction, communication, and peripheral participation runs counter to that belief that virtual universities will eventually replace brick-and-mortar universities as physical and cultural institutions. The idea of the virtual university both underestimates how universities work as institutions and overestimates what communications technology can do.

The virtual, however, can augment the physical and undoubtedly will transform many of the interactions of researchers and students, of teacher and learners. Its contribution to the university of the future will be immense, yet the feasibility and financial viability of technological intervention are as much issues for concern as celebration. Implemented without due understanding, intervention might only further polarize an already deeply divided system. Instead of disappearing, the conventional campus with its rich and respected resources could easily become the exclusive preserve of those who can afford it. Those who cannot would have to make do with the internet.

An alternative approach is not to divide the student body into those who get to go to the campus and those who only get to go online. It may be wiser to consider ways to divide each student‘s career between time spent on campus or in communities and time spent online so that more students have the opportunity to experience the best of worlds. This view is not based simply on a naive desire for a more egalitarian education system. It's also based on what it is that universities do, why people think of them as worthy of huge investment, and most importantly on leveraging the natural ways that people learn and the possibilites that technology presents.

By the large colleges and universities have embraced technology, a remarkable range of experiments is going on throughout higher education. Some are dramatic, some may prove to be simply daft. It's important to complete all of them, since as much might be learned from failure as from success. The examplars described below illustrate the range of possibilities that creative thinking can generate and provide a springboard from which to transform learning on campus and beyond.

First, Studios. Rennselaer Polytechnic Institute (RPI) has been reforming its undergraduate education in science, mathematics, engineering, and technology for more than a decade. One of the key innovations RPI has implemented is to replace large, introduction lecture-based courses with studio courses. These courses apply an intergrated, multidisciplinary approach, and incorporate technology to create a better learning environment for students and a better teaching environment for faculty members. They are designed to bring the interaction often found in small-enrollment classes to large introductory classes. Lecture, recitation, and laboratory are combined into one facility, the studio, capable of accommodating all three teaching methods, where the faculty members conducts hand-on interactive learning sessions. While the courses use advanced-function computing technology and tools, they are actually quite structured; their pace is determined by the faculty members rather than by student participants.

More recently, the Massachusetts Institute of Technology (MIT) Center for Advanced Educational Services has been working to dramatically restructure MIT's introductory physics course. The goal is to help students develop better intuition about physical phonomena in an area where such intuition can be quickly overwhelmed by the mathematical complexity of the subject. Similar to the RPI studios, the MIT prototype physics studio mixes lecture, recitation, and hand-on laboratory experience. The focus is on an active learning approach that is a highly collaborative hands-on environment with extensive use of desktop experiments and educational technology. The desktop experiments and computer-aided analysis of data will give students direct experience with basic phenomena, enhancing their conceptualization and understanding of the material.

Second, the MIT Media Lab. The MIT Media Lab is a grand experiment designed to organize inquiry for a new era. Disciplines tradisionally kept apart in academia are bought together in the Media Lab – as are basic and applied research – to create a dynamic and collaborative environment that generates workable solutions to real-life problems. Theory and practice are combined in a just in time approach to education, wherein students draw on educational resources as needed in support of their larger projects. For example, Neil Gershenfeld, Director of the Physics and Media Group at the Media Lab, has turned the traditional approach to scientific training inside out (as cited in Smith, Clark & Blomeyer, 2005).

Rather than extensive class work illustrated by occasional labs, he teaches just enough of each subject for student to understand where results come from and how they are used. Classes have taken on a supporting

role, providing the raw a material that is shaped into an education in the creative and stimulating enviroment of the lab. With this freedom the students have reinvented the organization of their education. They use the Media Lab for far more than what was originally envisioned. It has become their home the place where they learn how to think across diciplines and perhaps more importantly, where they learn to work collaboratively to solve hard problems.

Third, the Open University. Diana Laurillard describes how the Open University in the United Kingdom has undertaken a radical shift from the standard "transmission model" of teaching by moving beyond a curriculum focused on what is known to an emphasis on teaching how one comes to known (as cited in Bernard *et al.,* 2004). Conditions for the latter approach include engagement og both the individual and the learning community on many levels. Student's active participation with practitioners, working together on common projects, makes them part of the process of creating knowledge. Students learn by doing and gain the experience necessary to reason, strategize, and understand situations that occur in parctice, during their future careers, where they will be called upon to think beyond the facts and rules imparted in a typical classroom setting.

Technology-based courses at the Open University are designed within the conversational framework, which outlines the irreducible minimum for academic learning. The framework consists of an interactive dialogue between the teacher and the student that operates on two levels: the discursive theoretical, conceptual level and the active, practical experiential level. These levels are bridged by engaging each participant in the processes of adaptation of practise (in relation to theory) and adaptation of theory (in light of practice). The interplay between theory and practice – that is making the abstract concrete through a reflective practicum – is essential as is the continual dialogue between the teacher and the student. The traditional transmisson model is just one part of this much complex model for learning as shared understanding.

CONCLUSION

Learning technologies are not a panacea that will resolve the many issue that higher education faces today. Instead, new technologies lead directly to institutional issues, starkly highlighting them in contrast to the widespread need for education, and the possibilities technology presents to fill that need. Higher education today has the opportunity to reshape itself and play an important role in the future of our society. Whether that

role is ultimately fulfilled will depend on fresh, creative thinking, and a firm commitment to move teaching, learning, and the university into the digital age. The manner in which students are taught will not truly change until the manner in which we teach and evaluate students change.

Multiple studies suggest moving students from consumers of information to producers of information. This is the key to engaging digital learning. However, until teachers are trained to expect and accept content gathered through social networks with emphasis on teaching students how to check validity and reliability of the web, the full power of the digital natives can not be released or expanded. Teachers must allow students to publish broadly then promote peer and expert outside evaluation. Digital immigrant teachers will require support and training before they feel competent to allow students the freedom to explore their full digital capabilities. The DOMS [Digital Opportunity Measuring Stick] in 2005 confirmed that the majority of America's high school students are "digital natives" (Lazarus, Wainer & Lipper, 2005; and http://cjtc.ucsc.edu/docs/dd_highlights.pdf, 2/5/2011).

Research demonstrates that these new learners come to school with budding skills in new forms of literacy, possessing different strengths in cognitive abality, and finding motivation in different forms than did their predecessors. These new learners are instructed by teachers who, for the majority, spent childhoods engulfed in television programs that fed information for consumption, rather than interaction, omitting the choices and short snippets that lead to further discovery. New and different learning styles are evolving into new learning theories, new literacy, and new types of learners which research are cognitively impacted by digital experiences. This will surely require educational facilitators to revisit and ultimately expand the horizon of educational content and delivery.

SUGGESTIONS

First, Curricular Suggestions. A review of scope and sequence for various subjects at various educational levels will reveal an emphasis on subject area information to be delivered to students within a particular time frame. Reference page numbers in text that were probably outdated at time of publication (particulary in the areas of science and world events) guide teachers to curriculars decisions that vary little from the same format utilized in schools since the industrial revolution. A response that would more closely take into account the curricular analysis herein would focus on process skills, incorporating a kind of "twitch speed" for learning. A sope

and sequence that would determine information management, evaluation, and synthesis skills to be tought in a developmentally appropriate sequence would be a first step in changing traditional practice.

Game players are encouraged to place themselves within the action, to be producers rather than consumers to take risks solve problems think systemically and laterally and perform to reach competency, providing the opportunity to self select levels of difficulty get additional information on demand and reward levels of solutions (Greenfield *et al.,* 1994). Most importantly, multiple studies have demonstrated that the influence of video game play has altered the way individuals learn.

Subject area content sholud be outlined in overarching themes that allow for intergration across disciplines and flexible timeframes for discovery. Students should be challenged to investigate provocative age appropiate questions that motivate them to inquire and research for the answers and the communicate what they have found with others. The ability to quickly identify relevant sources of information and to synthesize this information into appropriate solutions is a critical skill for student to master if they are to succeed in an information rich enviroment.

Professional development with teachers should focus on their ability to manage and evaluate both information and students in the process of acquiring this information. Since most teachers are still of the digital immigrant generation, they use digital media for information gathering rather than production. Many are not comfortable with the skills of online researching and most are extremely lacking in the ability to evaluate the vadility of the information gathered. Digital immigrants attended school when written materials were generally peer reviewed before publication; therefore the web even if it not creditable. Students must be tought how to filter what they see online or hear through other media channels for reliability and validity.

Teachers must also be tought how to evaluate products. Students more adept at multimedia tools than their instructors can often create phenomenal productions largely devoid of any depth of purpose. Instructors must be trained to get beyond the glitz of the package to the content and push students to achieve both.

Second, Instructional Suggestions. Traditional instruction where content is delivered by any means then reiterated to the instructor for evaluation provides a linear flow from teacher to student and back. A model that places the student in a more active role of both learner and instructor would more closely align with the multi-dimensional digital world to which most learner have now become accustomed and foster

the filtering of information for vadility and reliability. The teachers provide a stimulus, which the student then begins to investigate using various structured methodology, such as frequent feedback that spurs students along the right path or steers those who stray back on track thus allowing the learner to utilize the internal strategy of trial and error. Guided peer review at designated stages of complements the need to network. Publication of exemplary works to a wider audience whether it is the local community or the World Wide Web offers a reason to monitor product quality. Most imprtantly, evaluation should take place throughtour the entire learning process and should not be limited to the completion of a rubric at the project's end.

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