Shifting To The Inevitable Reality of the Online Classroom in the Public School: A Practitioner's Model

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Introduction

The current economic climate poses challenges for most every sector of the American landscape. Administrators, staff and faculty at public schools are feeling the financial pressure. No one is immune. Adding to this anxiety is the lack of revenue states are receiving as businesses and individuals become more discriminate in their spending during this prolonged recession. Texas is now beginning to feel the discomfort. Yet amid the uncertainty there exists a communications infrastructure supported by sophisticated inexpensive computer technology allowing access to information resources that become more abundant daily. Specifically, using the Internet to deliver educational content makes more sense as the economic challenges linger on and states adjust budgets to adapt to the new economic reality. Higher education and career institutions have started creating virtual classrooms and the move is afoot to establish online classrooms at the secondary level as well. All this has school districts considering how they will be affected and raising the issue of how should they react. Given the economic direction, a shift from on-ground to the online educational system is inevitable and offers more questions than solutions:

1. In addition to the inherent communications technology supporting the online classroom, what are the characteristics of media rich technologies that can be used to deliver content?
2. How should students and teachers be prepared for success as the traditional classroom becomes an online classroom?
3. What form should content take, where should it come from, and how should it be made available to students?
4. What will an online class look like and how can partnerships be formed to service an online environment?
5. How will we use the new technologies to change the way we teach? Rather that teaching about technology, students need to develop a "digital fluency" technology (Resinck, 2007).

The purpose of this paper is to examine the issues and raise questions to report on the circumstances and resources that create opportunities for effective use of technology in education.

Currently, six sections of high school Technology Systems are being taught in the growing suburban school district of Mansfield, south of Dallas, Texas. A survey conducted of personal computer availability and usage outside of the classroom found 95% of students have access to a PC outside of the classroom. About 50% have their own PC's. Of those having computers most have high speed Internet connection. The remaining 5% don't have computers. Most have personal music listening devices, and all have cell phones. Interestingly enough the strictest school policies restricting the use of technology are directed toward the technologies students have the greatest access to and use the most. One characteristic of a powerful technology is defined as what people actually use. Prominent among current technologies is the personal computer, which is generally used as a content delivery device or terminal. Generally, given the natural recreational tendency, students will use the computer as a device to play Internet based games. Games are interactive and provide intrinsic rewards for the user. Games actually reflect the most powerful aspect of computer technology and perhaps the least used -- simulation. A simulation is a rules based environment that has been constructed allowing the user to embrace a particular experience without encountering the negative outcomes of reality. The aviation industry discovered the value of flight simulators in its infancy. After a series of tragic accidents, the Army Air Corps (predecessor to the Air Force) bought several Link Pilot Trainers to teach new pilots in 1934. Mr. Link's second customer was the Japanese Imperial Navy in 1935 (The Link Trainer, 2008). This was the beginning of the flight simulator, which has become an absolute necessity in aviation not only for the obvious safety requirements, but the resulting significant economic savings. This type of simulation is totally immersive and reproduces the physical, mechanical, and navigational environment of flight. Many aspects of a flight simulator are currently available commercially to consumers in the form of entertainment and are classified as games. After patenting his Trainer in 1931, Edwin Link's first sales were to amusement parks as a form of entertainment (The Link Trainer, 2008). Simulations and games are the same thing, with different outcomes, containing the same intrinsic rewards. What happens when a simulation becomes indistinguishable from reality? This is virtualization and only the consequences differ between the two. The experiences encountered with a flight simulator for a pilot-less drone and the actual aircraft flown in a war zone can be identical. Therefore a student prepared by simulation experiences 100% knowledge transfer. Simulators can be applied to aviation, computer information technology, physics, chemistry, medicine, genetics, economics, and communications technology as a few examples.

Simulations represent the most powerful use of computer technology, but are the most difficult to implement. W. Edwards Deming's notion of "Profound Knowledge" is applicable here. His teachings in the field of business management suggest that a comprehensive knowledge of a system is necessary to achieve meaningful change. The development effort must be multifaceted for a simulation's full value to be realized as an educational tool. Simulations allow students to experience situations that are too dangerous or difficult to implement in real life. A teacher must have grounding in the reality and theory of a content area to effectively develop an effective simulation (Lorenzet, Salas, and Tannenbaum, 2005). The flight simulator has been in development for nearly 80 years, by people that have experience in aviation, education, human engineering, and software development. By any measure simulations produce an immersive learning solution with dramatic results, but are the most difficult to implement.

Success Factors for Online Students and Teachers

There are dozens of higher education and career education institutions offering degree programs today. Some institutions are completely Internet based, while others, public institutions in particular, have some online or blended offering. The occurrence of online secondary institutions is occurring (Red Oak, 2008), while many community college systems offering online courses have dual credit offerings and articulation agreements with high schools within their local service areas. Research supports the contention that educational content delivered from online and on-ground sources is equivalent (Iverson, Colky, and Cyboran, 2005). The research evaluated four factors. Self-efficacy, motivation to learn, goal orientation, meta-cognition and their effects through online delivery were examined. The participant's reaction to the program, their learning, and planned job behavior changes were also addressed. Compared to the traditional classroom, the findings found online learners were more positive about their training, had a higher level of enjoyment, and found greater utility from their experience to invest as they returned to the workplace. Online students perceived the course work more difficult, the research found no significant difference in learning between the two delivery systems. However, this research investigated the "outcomes and mediators of differences" in the online and traditional (face-to-face) course delivery methods using graduate students as the sample population. Because of the newness of secondary online programs, equivalent research for the high school level was not discovered.

Iverson et al. (2005) describes the successful online learner as being self confident, highly motivated with strong meta-cognitive skills and goal oriented. The education process becomes learner driven and content delivery is shifted to the student from the teacher. In many respects the student assumes some of the teacher's duties and must acquire sufficient self-evaluation skills to insure the content is being understood. This suggests a phenomenon inherent in maturing technology that is descriptive as the telephone operator effect. In the early days of telephony, a human operator was required to intervene and mechanically connect every call a subscriber placed. As telephone central office technology advanced, operators were not required to perform complicated mechanical connections to place a subscriber's call. Dial telephones further lessoned an operator's involvement to long distance and eventually only to international calls. Today with telephone touch tone technology, calls rarely require any form of human operator intervention. Essentially the subscriber has assumed the role of the traditional telephone operator. The same sort of scenario has happened with theatrical entertainment. From live stage productions, movie theaters developed, and have since become home theaters (complete with large screen high quality audio and video delivery systems). The patron becomes the theater owner, projectionist, and concessionaire. The student is not only the learner, but the content manager, computer technology support, technical attendance clerk, custodian, teacher, and must be technically savvy with effective communication skills. The teacher who is generally remote, becomes a mentor, facilitator, online course manager, and provides rapid response to students. In the six Mansfield high school classes surveyed earlier, generally 20 percent of the class was left behind simply for technology reasons. i.e. inadequate computing resources, equipment failures, and poor Internet access. Successful students had to possess strong Internet skills, be able to read and follow directions, set goals, meet deadlines, raise issues in a timely fashion, and be

multi-faceted communicators. In all cases both the student and teacher must be committed to a successful outcome.

What Will Content Look Like and Where Will It Come From?

Technology decisions at MISD have been made to improve practical functionality with investments being made in creating a stable network infrastructure that prevents systematic problems from occurring. Implementing the district telephone system using Cisco Voice over IP (VoIP) has allowed the expansion of district telephone service while lowering telephone system operating costs. The MISD information technology budget has not been increased in five years. The IT staff is comprised of twelve computer support people and four network support people. This group supports over 18,000 desktop computers and over 150 server systems. The district is sensitive to and asks many of the same questions raised on the FischBowl Internet Blog site maintained by Colorado educator, Karl Fisch. The observations made by this resource are helping shape the district technology direction. Improving the methods of teaching students is of constant concern to the district. Expanding the data communications network to support the district is a priority. A recent example of this thinking was shown with the implementation of a new attendance system that integrates current parent/guardian information, and eventually will include the grade book system with the potential of additional tools. The system is easy to use and has added no administrative burden for the teaching staff, while using district resources more efficiently. MISD is also piloting the Google Internet integration system. In addition to being recognized as the standard Internet search technology, Google also offers a suite of applications and services that subscribers can use on their own personal computer. All that is required is a basic computer and all essential services are available at no cost to the user. Google provides a special education edition to schools. These services are offered anytime, anywhere with a formal support relationship at no charge to school districts. Google services are reliable, high quality, and offer true value to users. The district has essentially formed a partnership with Google that potentially could replace the existing email system. This type of system has several benefits, some less obvious, than others.

1. If the Google were to replace the current mail system, the yearly license fees expended for the existing proprietary mail system could be eliminated or reduced. This creates a single mail system, eliminating district infrastructure required for desktop and web based employee email systems. Backup and support resources can be eliminated or redirected for other purposes. This amounts to hundreds of thousands of dollars in yearly savings and more efficient use of human resources (Raymond Jaksa, MISD CTO Interview February 28, 2008).

2. Google mail provides not only a state of the art Internet based email system, but it also extends into the community, which has the effect of including the community in the school's environment.

3. Google is unique in the industry with the amount of free storage it offers to users. Currently, over 6.5GB of storage is offered to users. This not only allows for the storage of virtually all emails but provides a storage location for student and teacher class work. This is backed up by Google and makes information available any time, any place. Students and teachers, who use this efficiently, can never misplace their data. Google also offers the necessary

classroom productivity applications to users at no cost. This means no student, parent, or teacher will be denied access to the necessary software resources.

MISD is also considering the implications of accessible hardware. For students to have access to online curriculum, abundant software is one part of the equation. Hardware to run and access resources is also a requirement. Even when families have computing resources in their homes, students may be limited in their amount and freedom of access. Students should have access to their own computers. The hardware should be a battery operated portable device, with the ability to run necessary software, include wireless Internet access, and be available at low or no cost to students. MISD is evaluating viable hardware solutions at a final cost of about $150 paid by each student. This also includes district subsidy contribution (Jaksa interview, 2008).

The final part of the equation is Internet connectivity. Most, but not all students have Internet connectivity at home. Ideally, high speed Internet connectivity should be a community resource in the same fashion, the road system and public utilities. Many communities have established community wide Wi-Fi Internet connectivity for its citizens and visitors. (Corpus Christi, 2008). Mansfield ISD has plans to implement Wi-Fi wireless systems district-wide in the 2008-2009 school year (Jaksa Interview, 2008).

Establishing the Online High School Classroom

When every student has software, hardware, and Internet access the critical mass is in place for effective Internet based education. No student is lacking the basic resources. Mr. Jaksa says plans are in place to offer at least two senior level courses, *Government* and *Economics*. This means 20 percent fewer seniors on campus. Campus classrooms can become open labs to accommodate students who require an alternative location, lack the self-discipline or motivation to manage a pure online class. Content can either be generated by the district or it could be supplied by curriculum vendors.

After initial startup costs have been invested, savings accrue. This could allow funding to be directed to be invested in teacher training and building infrastructure that supports the online classroom. Virtual classrooms lessen the need for physical facilities so requirements for additional buildings and land lessen as do utilities, maintenance and other associated costs. Fewer students in classes mean fewer busses and lower transportation costs. As online courseware is developed the teacher's role changes to class manager. Because learning becomes more students centered, fewer teachers can handle greater class loads (Jaksa Interview, 2008). The help desk costs could increase to meet the inevitable end user support requirements and the school day becomes 24/7. Over all it is believed that after a two year startup period, overall costs would substantially decrease.

Teaching Digital Fluency with Google and Scratch

MISD gave permission to classroom test the Google tools to teach a content area and the results were positive. Google mail was used to distribute and collect assignments. A game design lesson for the purpose of improving the students' digital fluency had been considered for some time. Fortunately, a programming language called *Scratch* was discovered that was

released by the Massachusetts Institute of Technology (MIT) in May 2007 (Fildes, 2007). Scratch is a low threshold, high ceiling language suitable for pre-school users to adults. Scratch is also a high quality, well supported product. The development of Scratch has been supported by funding from the National Science Foundation, the Intel Foundation, and the MIT Media Lab research consortia. Scratch is offered at no charge to users and is endowed with the graphical power for users to quickly learn a programming language and create sophisticated video games. Video gaming is a naturally engaging topic for students and makes them active participants using tools to create digital content (Pepler and Kafai, 2007). [If one considers that early flight simulators were marketed in amusement parks, the notion of new sophisticated programming technology being introduced using video games renders credibility and a note of consistency.] Scratch also has an Internet publishing feature for users to share their projects internationally on the Internet. Together, Google and Scratch offer the software foundation for teaching game design in a virtual classroom setting at no addition costs to the district or students.

For the classroom test of Google tools students were given only their first assignment on paper with subsequent assignments distributed by email. The students had the opportunity to work on assignments outside of class and all of the content was available via the Internet. Students could store all of their work on Google mail or Scratch and never had a reason to be without their school work. Not only were digital content creation tools being taught, but data management skills were being learned as well. Selected student projects can be viewed at http://scratch.mit.edu/galleries/view/13841. The Google/Scratch lesson was well accepted by the students. The students enjoyed being completely immersed in computer and Internet activities. Feedback and grading was handled through email, which worked well. Even though this was a remote process, it was a method that students were comfortable with and had the flavor of a personal one-on-one communication. This lesson was a successful exercise, but not truly a remote classroom situation. This was by design so students could see both ends of the communication link and improve their understanding of the online process.

Conclusions and Recommendations

The inclusion of the Internet introduces options for schools that did not exist a few years ago. Commercial organizations like Google offer their services free to consumers and schools. This is not entirely a benevolent relationship in much the same way as beverage companies compete for the rights to advertise and be an exclusive campus vendor. The relationship makes good business sense. They do gain user mindshare which is a marketable asset and worth supporting and cultivating. They can replace proprietary systems, which ultimately can reduce and/or eliminate license fees and reduce support costs. Web based organizations like Google provide services not only to the district, but to the community, which creates the critical mass that will support virtual classroom activities. Media and content rich environments exist on the Internet as raw materials to support curriculum. These can supplement and perhaps even replace subscription materials. Administrators should be aware of quality resources that are available and nurture partnerships in non-traditional as well as traditional sources. Teachers need to be trained on how to use these resources.

Districts will need to be selective of learning technologies. Core technologies merit the greater training effort for teachers and students. For example, it is better to teach how graphical

spread sheets work rather than teach a specific spreadsheet product. Graphical spreadsheet theory has been essentially unchanged for nearly 30 years. Operating systems change about every 3 years, but how data is stored on a disk and in a network environment has changed little. Rather than using paper journals, teachers may want to teach the same principles using web Blogs. By understanding the core technological concepts students learn computer survival skills. According to Fisch, "we are preparing student for jobs that don't yet exist, using technologies that haven't been invented in order to solve problems we don't even know are problems yet" (Fisch, 2008).

Teachers have to rethink technology and its ubiquitous presence in students' lives. Harnessing the technology to accomplish the goals of the classroom is one of the many challenges teachers must address. Prevailing economics is changing how content will be delivered. As higher bandwidth networks arrive (FAQs about Internet2, 2007) teachers can expect media rich resources to be available at any desktop. Declining computer hardware prices will place super computer resources in the hands of all users (Fisch, 2008). Along with universal Internet access, the critical mass will exist for the concept of the classroom to change entirely. It will not be limited to a geographic location, specific content base, or time frame. Teachers will be able to use prescribed content with the expectation to use digital tools and resources to build meaningful student content units. Ultimately teachers will have to be fluent in the use of technology.

Students will have to learn to become self-supporting, construct their own learning strategies, and evaluate if they are "getting it". Internet learners are described as being highly motivated and goal oriented. Students that do not meet these criteria may have difficulty adjusting to an Internet based classroom. Blended or hybrid programs will need to be available that help students use the online classroom efficiently. Providing some one-on-one contact will probably be more the norm than the pure online experience. However, presenting purely rote content in a dedicated online class may be the best option.

Social issues may drive students to online programs (Virginia Family Chooses, 2008). Online classrooms offer an alternative to schools with problem populations. They provide many of the same options and benefits of home schooling. Behavior and discipline problems can be redirected or avoided. Fewer students requiring physical facilities also mean less physical construction of new facilities. Existing school resources may be used as open computer labs to meet the needs of students needing additional support. Brick and mortar institutions will not go away. They are tied to the community and schools by any measure are community leadership organizations. Athletic, music, fine art, and technology programs requiring laboratory space will use physical facilities. Classrooms have already changed at some higher education institutions. Some graduate programs at proprietary institutions are being offered totally on line. Ultimately, the online classroom will be part of the secondary institution. When, how fast, and to what extent is not clear. At this point in time all we can plan for are teaching the core skills that will be needed by students, teachers, and parents. Technology is not intuitive and has to be re-taught to every succeeding generation. Even though it tends to be an acculturated process, the more sophisticated the technology, the steeper the learning curve. Unlike pencil and paper which has a straight forward learning curve, digital technologies, are layered on existing technologies

demanding longer assimilation times. To that end these issues are the ones that merit attention as technology, economics, and society change our view and use of the classroom.

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