The state of the traditional textbook in the face of a technological onslaught

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If textbooks are treated as a vehicle for education, the living word of the teacher has very little value. A teacher who teaches from textbooks does not impart originality to his pupils. He himself becomes a slave of textbooks and has no opportunity or occasion to be original. It therefore seems that the less textbooks there are, the better it is for the teacher and his pupils.

~ Mahatma K. Gandhi, 1939

Overview

The traditional text for educational use is under fire and facing numerous existential threats, a condition likely to significantly alter a format that has been in place since the printing press was invented. It is more than a question of whether a page of text printed on paper will be replaced with an electronic replica. It is a matter of how information to support education is provided to students and scholars. Speech and communication in short bursts of text and visual media that are filled with rich meaning may well replace the written prose that nurtured the current generation of teachers, Bromley (2010). The old saying that a picture is worth a thousand words is even more true today as multi-media software allows one to create images with incredible amounts of embedded data that can be teased-out or revealed just-in-time to support an educational exercise. Even publishers are beginning to question the need for the textbook joining the mass of educators and students who are looking for alternatives in the methods for acquiring, sharing, archiving and tailoring the delivery of educational and reference materials. A new on-line educational support system, called Connect, has been developed by McGraw-Hill to support about 100 titles across 18 subjects for the 500,000 students currently enrolled in their subscription program. It turns out that this is actually a welcome change for a business that has been frustrated with losing sales due to a strong secondary book market, Nolan (2009).

When the printing press was invented, the written word could be shared and used to extend the boundaries of thought and learning. Earlier books had to be laboriously copied, ensuring a small quantity of supply and keeping the cost of transferring the written word extremely high. With the printing press came the renaissance in thinking and the beginnings of the democratization of learning and education that helped to transform many agrarian, feudal societies over time into industrialized communities. The digitalization of both the written word and the sounds and images behind it promise to similarly transform modern society, Ehrmann
This next transformation could help to lift-up the last vestiges of the feudal, agrarian societies left around the world as the transfer of knowledge becomes ever easier with reduced costs, reduced power requirements and increased wireless transmission capabilities.

Cost, Weight and Relevance

A typical college student currently spends on average $125 per textbook and as much as $1000 per year on the printed materials required to support two semesters of school, Miller and Eveleth (2010). These texts are the end result of feedback from many different sources to the publisher and the author(s), who are ultimately attempting maximize increase revenue. This guarantees that no single text will support a course optimally unless the course is designed around that text. In fact, many texts have increased significantly in size and girth as more information, example problems and pictures are packed-in to the tomes in an effort to appeal to a wider, more diverse group of learners.

Once a text is written, it may go through several editions with minor updates from time-to-time, but it is generally a static receptacle of dated knowledge. As a snapshot and reference for what was most current in a particular field at a point in time, it may still be useful. But with the ever increasing speed of transmission for information that exists today, the short-comings of texts are more evident. Moving reference and educational support material on-line, allows one to make periodic updates to ensure that ideas remain fresh.

Interactivity and Improved Learning

The key question for educators to answer is whether or not students can improve learning with educational support materials that have been re-cast to take advantage of the on-line, multi-media environments that increasingly abound. One study found that with well-planned integration of multi-media content into a curriculum, even students with learning disabilities improved math learning and retention significantly as compared to traditional text-based learning, Allsopp, et.al. (2010). Comprehension of text was found to be a strong obstacle to understanding. While most students are not in the learning disabled category, Hill (2011) notes that current studies indicate as many as half of the typical freshman class requires reading remediation.

Hii and Fong (2010) conducted a study with 240 students in middle schools in Malaysia to see how well they learned social studies topics when presented the information in a more traditional mode versus a multi-media mode. They found that even when they controlled for learning preferences, the students exposed to the multi-media learning environment performed significantly better on standardized tests. These results are very similar to results from an Iranian study that found foreign language comprehension increased when supporting instruction through multi-media channels was provided to the students, Shalmani and Sabet (2010). One common variable discussed in these and other such studies is the pacing of the instruction. Students exposed to multi-media instruction, especially through interactive software, are able to set the pace of instruction to best suit their own learning pace. Students will often re-visit the material outside of class if it is available on-line or with an instructional CD-ROM. Even when the material is retained in-class to further constrain the instructional pace
variable to the time allotted in a standard class, one study of 637 American students reported on by Kingsley and Boone (2009) still found statistically significant differences between the control and experimental groups. The experimental group was allocated 20% of the in-class instructional time to utilize interactive software in support of history instruction. This group performed better at the end of the year-long study when the pre and post-test results were analyzed.

Several other studies have focused on the mechanics of incorporating multi-media instruction methods into the classroom. One study by Day (2010) on the use of animated graphics to support science education concluded that an animation itself is not enough to enhance learning. It must be carefully crafted with concurrent narrative, written or spoken, to be fully effective in communicating the complex concepts. This study also noted that gender differences came to light during the results analysis as the performance of women was not improved by use of enhanced graphics. Men in this study, however, became significantly more engaged with the material and performed better between pre and post-testing. Passerini (2007) found that learning performance in a self-directed interactive media mode is sensitive to the complexity of the topic. Simple concepts were better retained through out-of-class interaction with on-line and CD-ROM delivered instruction at a student’s own pace. Complex, technical material still requires more time and attention through instruction delivered face-to-face in a more traditional setting.

**Educational Policy Implications**

Administrators and educators alike are just beginning to realize that this sea-change in educational support materials from two-dimensional print to more interactive media is going to require adjustments to policy and budget, especially for poorer school districts, Kinzer (2010). Those who teach literacy are going to find that they must update their methods to start helping students pull content and comprehension from multi-media passages. Librarians and literacy teachers will find themselves acting in the role of a facilitator or a coach as opposed to the more traditional role of the authoritarian teacher according to Koechlin at.al. (2011).

While some literacy teachers and college professors worry more about the lack of standard reading ability for students entering college, others feel that the real discussion should be centered on re-defining what we mean by ‘literacy.’ Lamb and Johnson (2010) speak to this new literacy focus for experiences that are based upon learning that is conducted within an immersive, trans-media environment. Librarians are not necessarily at risk for losing relevance as long as they recognize that their primary raison d’être is to help people navigate the waterways of information, regardless of the form for the information content. This change will shift more of the resource focus away from acquisition of knowledge located in physical documents to improved access to knowledge databases through subscriptions and better metadata search capabilities according to Luther and Kelly (2011).
Conclusions

Education is clearly in a stage of transition. Method of delivery and modes of archiving and sharing information are constantly changing as a result of rapid introduction of new digital technologies. While it is important to stay abreast of current developments in educational technologies, any adoption of technology to support instructional delivery must still be well-integrated into a solid plan of instruction based upon time-honored learning methods. While the standard form of the text may continue to evolve away from a physical tome, educators and students will likely reap the benefits of having access to active, relevant and customizable material at a reduced cost.

Annotated Bibliography


This article reviews the efficacy of utilizing multi-media methods to present mathematics instruction to students identified or at risk for identification as having a learning disability. The authors found that students with difficulty learning a technical topic like mathematics experienced measurable improvement when teaching methods incorporated technology to assist in overcoming learning barriers. Specifically, the review of the literature conducted in this study found that a common barrier to learning is comprehension of the written word in standard instructional texts. While multi-media presentation techniques were shown to be effective, the authors caution that there should be a systematic approach to integration of the technology into the learning curriculum and offer a recommendation for how to best incorporate such technology into mathematics instruction.


The author observes that our society is well into a major paradigm shift in terms of how young people communicate and learn. This sea change will challenge the current definition of literacy and the model for learning and development in K-16 curricula. This will force educators, whom he identifies as being members of generation text, to re-think their instructional model especially as it relates to use of the written word when attempting to teach members of generation next. The article suggests that it is not a change that should be resisted, as modes of communication (e.g. cave-painting, use of hieroglyphics, typing on a typewriter) have been subject to change throughout history.


This article explores the use of animations to enhance presentation of complex material for life science courses. The author presents results of studies that have shown students tend to
retain material better and longer when shown animations for complex processes as compared to viewing the same information in a static picture or graph. Follow-up studies by the author confirm earlier results which also indicated a difference in the effectiveness of the animations when gender is included as a variable for the students participating in the study. Results of these studies indicate that there is no statistically significant difference for women in terms of learning improvement whether the process is shown in a dynamic animation or a fixed graphic. Men, however, tend to learn the material better when the presentation mode incorporates animation. The studies also showed that enhanced animation itself is not enough to improve learning. The instructional delivery must be designed with concurrent narrative, written or spoken, to be fully effective in communicating the complex concepts.


In this paper, the author describes his recommendations for program improvement at universities. This includes the appropriate use of what he refers to as LTAs or Low-Threshold-Applications like technology that allows content to be shared with a wider community. He argues that such technology is improving access to educational content in much the same way that the printing press changed access to knowledge hundreds of years ago. The amount of content and low-cost of that content continues to provide major advantages over traditional methods of delivery. Educators should work to take advantage of these benefits in an effort to improve access for students who are resident as well as those who are interested from afar.


The authors present results of a study conducted to examine the impact of multi-media modes of presentation on learning core curriculum history topics. The study was conducted with 240 students aged 13 to 14 years of age across four different schools in Malaysia. The topic being taught was the emergence of nationalism with two modes of instruction utilized and compared. The first was multi-channel presentation (MCP) which included simultaneous modes of multimedia presentation that integrate text, graphics and still images with redundant video, sound and animation. The second mode was single-channel presentation (SCP), which was primarily based upon text, static graphs and pictures. The results showed that even when controlling for preferred learning style, students under the MCP mode of instruction learned the material better than the students exposed to the SCP mode. The students exposed to MCP in this study were allowed to control the pace of instruction. This may be a key factor in explaining why these results differ significantly from some previous studies that explained MCP could overload a student’s ability to learn. The students in MCP mode spent significantly more time engaged with the material as compared to their peers, who were exposed to more traditional means of instructional time and delivery.


The paper presents an argument for what appears to be a major disconnect in the expectations of K-12 educators and college teachers for student literacy ability as shown by the
complexity of reading material presented in the classroom for use in supporting instruction. The author describes a state of affairs where more than half of the incoming American college freshman class reads at a remedial level. Discussion centers on a lack of time to teach reading and reading comprehension in the typical K-12 classroom because of a requirement to cram too many other content-specific topics into the typical curricula. While the article argues that traditional learning suffers as a result of poor reading abilities, it does acknowledge that society may in fact be moving away from the written word as technology delivers content in newer and richer modes.


The author reports on a study conducted to examine the differences in learning styles between generations within the same families. The study included members of ten families living in Hong Kong, People’s Republic of China. The results were not unexpected: members of Generation X tend to be comfortable with text and more passive modes of learning such as receipt of classroom information through lecture, while Generation Y members tend to prefer learning through activity. They adopt an experimental, hands-on mode to almost all activities, often eschewing formal instruction and written guidelines. The implications made by the author are a little more intriguing as the arguments described in a variety of literature are brought together to conclude that the lines between student and teacher are blurring and will continue to blur further as technology and changed modes of learning are more difficult for succeeding generations to grasp. Teaching and learning will become much more of a shared experience especially in the informal setting that a family or peer group provides.


The authors conducted a study with 637 seventh-grade students attending public schools in the southwestern United States. Four teachers participated across three different middle schools in the effort to determine the effectiveness of adding interactive software to the presentation of history instruction. The study was conducted over a period of seven months with members of the control group receiving a textbook and classroom instruction through a standard lecture format. Members of the experimental group received the same textbook and lectures in class, but 20% of the instructional delivery in the classroom was conducted via interactive software. This group did not receive access to the instructional software outside of class. A pre and post-test were administered. The results indicated that all students improved from pre to post-test with the students in the experimental group improving twice as much as the students in the control group.


The argument presented in this article is based upon the idea that the term ‘literacy’ is rapidly acquiring new definition, a change that must be accepted and addressed by policy
mandates to support improved public education. The author contends that literacy will be increasingly defined with regards to the specific context of a communication mode such as social network communication, e-texts, paper texts, web-communication, etc. Currently many educators are concerned that students cannot interface well with the traditional written word and contend there is a corresponding decline in critical thinking and communication skills. Studies show that, on the contrary, students do in fact have very strong communication skills with the ability to engage in critical thinking. The issue may be more simply related to the fact that the experience of their teachers in learning and communicating was very different in the formative educational years. The author concludes with a series of recommendations that suggest digital media should be: widely available to support education, embraced as a form of communication, and taught and assessed as an important component of literacy in a K-12 curriculum.


This paper describes development of ‘Knowledge Building Centers’ to assist students in what are called ‘super learning experiences.’ These experiences occur in physical/virtual environments where teachers are considered to be learning coaches or facilitators in the effort to acquire knowledge. With an interface designed around a collaborative web-based portal, students have access to multiple adult facilitators, a myriad of on-line knowledge data-bases, the ability to store and recall information and control the pace of the interaction. The role of a literacy teacher is described as one that should incorporate much more time spent teaching students how to glean information from on-line, multi-media sources.


This article describes a number of resources that are available to enhance education through multi-media environments. The experiences should be ones that merge audio, video, text, graphics and physical interaction to promote active learning and not just passive reception of on-line delivered lecture or video material. A number of web references are provided for educational support across fields from literature to international relations and engineering design. The authors encourage teachers to begin to re-think educational experiences to ensure that these experiences are immersive, offering students the opportunity to direct the activities. This allows them to pace the learning activity and participate more in the experience itself.


This article discusses the changes in methods used by students and scholars to locate information in an era of digital formats. Libraries have been spending more time and resources gathering information in digital form partly in response to scholar desire for increased access and partly because of the reduced costs that are associated with storing digital information as opposed to information in printed text format. Because more of this information is available in an on-line format, scholars are spending a lot time attempting to sort through the large array of data returned by various search engines. The authors discuss the importance of consolidating
search access to various databases through meta-search engines that are better designed to filter scholarly work from other information that is accessible on-line.


The focus of this article is on best practices for integration of learning software into a classroom. It discusses a congressionally mandated national experiment in Effectiveness of Educational Technology Intervention (EETI), which studied the effectiveness of reading software utilized in grades 1-4 and math software used in grade 6 and for those students studying algebra. In one study described in the article, no significant difference in achievement could be attributed to groups of students that utilized the software. The authors also describe a larger, more holistic study conducted as part of EETI that focused on answering the following questions:

1) What classroom-level practices are associated with higher achievement gains in classrooms using reading or math software?
2) What school-level practices are associated with higher achievement gains in classrooms using reading or math software?

The results of this larger study included the determination that success for software integration into the curriculum included: establishment of a consistent instructional vision, support by the school principal for software use, teacher collaboration around software use, and satisfactory on-site technical support.


This study was carried out in Estonian schools to determine the appropriateness and effectiveness of textbooks for educational support in the classroom. The article specifically mentions that the key problems with textbooks are that they tend to be too difficult for students to comprehend alone. The result is that Estonian children are overwhelmed and demoralized by their interaction with school-issued textbooks. This ultimately hinders their engagement with learning materials and learning altogether. The article focuses primarily on the means by which to conduct a study to determine the efficacy of one textbook over another in a classroom.


The cost of textbooks has been increasing at a rate of about 6% each year with a standard textbook cost at about $125. A college student may easily spend $1000 each academic year for all the required texts. The author of this article discusses the benefits of having a custom-designed on-line text that is tailored for a particular class. These texts may be updated as the professor revises course material and can save the student significantly in terms of initial costs.
However, some printing costs are passed along as surveys in one school found that many students preferred to print out at least a portion of the text for studying.


Several chapters in this book on teaching discuss techniques for encouraging students to read prior to class and how to best incorporate technology into a course. The author notes that getting students to actually read anything is a difficult task at best. Reasons that students tend not to read include: poor study habits, no perceived need or payoff, and higher priority activities. The book also describes how to use various media to present material in a fashion that is both visually and intellectually stimulating.


The study described in this article compared student learning, based upon the results of pre and post-tests, when exposed to different methods of content delivery in a course on project management. Groups of students were provided information through a textbook, an interactive CD-ROM or an in-class presentation. The results of the study indicated that presentation mode efficacy was highly dependent upon the complexity of the topic. For complex, technical topics, in-class presentation was the most effective method for student learning and retention. For simpler topics, the interactive CD-ROM was the most effective method of content delivery.


This article describes a study in which 138 students in four different introductory accounting sections were evaluated to see which of two on-line homework systems was most effective in promoting learning. According to the authors, most of the studies in the literature heretofore have compared on-line homework with traditional paper and pencil methods. The results from this study indicated that the Intelligent Tutoring System (ITS) helped students learn more than the standard on-line homework system (OHS). While both methods will generate a near endless variety of homework problems for students to work and provide feedback on both interim and final answers, only the ITS provides students feedback on how well they are working through the problem-solving process itself.


This article presents the results of a study that was conducted on a group of students learning a foreign language. A group of 120 Iranian students studying English in Iran was divided into three study elements. The first learned English phrases and concepts in a picto-
textual context, i.e. pop-up visuals accompanied keywords as passages were read. The second group was exposed to text that accompanied the reading, and the third group listened to the passages read-aloud with accompanying pop-up images when keywords were mentioned. The results indicated that students retained new information better when the picto-textual method was utilized. The least retention was evident in the group that only viewed written text while the passages were read aloud.


The authors of this article look at the benefits of knowledge sharing in a tele-immersive environment. This environment is described a synthesis of physical and virtual reality. Generally speaking, video and networking equipment allow individuals in different locations to participate in shared knowledge activities by interfacing though a TV wall that projects video and audio to simulate near-physical interaction.

**References**