A Technological Reinvention of the Textbook: A Wikibooks Project

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Abstract

Education traditionally has been defined as a one-way relationship between teacher and learner. However, new technologies are dramatically changing that relationship in a multitude of ways. In this article, the authors describe some of these changes and explore one example of the intersection between technology and pedagogy, describing a college course in which students compose the course text using the wiki platform. The process described proceeds from the premise that the needs and capacity of learners in the information age have been transformed and discusses one way that using an appropriate technology may address them. For this wikibook, the creators of the content become the prime users of the content as well. The authors discuss both the philosophical underpinnings and practical implications of this approach. Evaluation of the project suggests that the methodology produces an active, credible learning process. This study explores the advantages and disadvantages of this wiki process to provide context concerning the efficacy and utility of employing particular types of Web 2.0 tools. The course development rationale points to its potential for radically changing how students and teachers interact with the phenomenon of ubiquitous learning. (Keywords: Pedagogy, technology, textbooks, wikibooks)

This article proposes a relatively radical hypothesis: Textbooks as educational tools are outdated and in need of reconceptualization.

Furthermore, the authors believe that present technology affords us the opportunity to experiment with this reconceptualization in ways that not only facilitate teaching and learning but also redefine the role of the teacher in the classroom. We believe that the present textbook form is outdated in four important ways:

1. The lengthy publication schedule for textbooks, normally in the area of three years from beginning to end, means that textbooks inevitably include outdated information as part of the final product. Knowledge and information change too rapidly for this to be acceptable in an era of ubiquitous learning and knowledge creation.
2. Because there are a relatively small number of people involved in the production of a particular textbook, there is, by definition, a limitation on the perspectives that can be included.
3. Textbooks are a passive medium for transmitting information and as such are incomplete until read. The reader takes no active role in the knowledge construction of the text itself and is simply expected to read and digest information. This belies all that we know and have known since John Dewey about the importance of active learning.
4. Textbooks are limited by their physical form. The book itself cannot include video, audio, or other multimedia presentations, and although publishers have tried to minimize this issue by including CD-ROMs and Web links with their textbooks, these are, at best, "add-on" solutions that do nothing to improve the intrinsic limitations of the bound paper form.

Each of these four issues limits the teaching and learning process by placing barriers between the participants and the content. Unfortunately, these four weaknesses are inherent in the textbook format and cannot be overcome as long as educators continue to depend on textbooks as the primary source of knowledge.

Take, for example, the issue of textbook currency. In the past, a more sedate rate of change and knowledge creation made it possible for textbooks to claim a credible level of currency for many years after publication. For example, *Principles of Marketing* (Clark, 1922) was in widespread use from its time of publication in 1922 through the 1960s (Ferrell, 1998). It was revised three times, in 1932, 1942, and 1962. Today, the velocity of change and discovery makes such a life-cycle almost totally inappropriate and virtually unimaginable.

Acceleration in the rate of new discoveries (for example, Pluto's demotion from planet status, new research on the cause of the sinking of the Titanic, advances in our understanding of the functioning of the brain) render scientific and historical textbooks obsolete shortly after or even before they are published. Meanwhile, game-changing events occur at such a pace that textbooks purporting to cover current disciplines are outdated almost immediately. What international business textbook published only two years ago contains adequate coverage of the global financial crisis or accurately describes the status of formerly revered companies such as Toyota or BP? How relevant or current will these very examples be by the time this article is published?

Historical Context

Criticisms of the textbook and its limitations are not new. In 1936, the keynote speaker at an exhibition titled "The Textbook of the Future and Its Forerunners" lamented that "in regard to the textbook the goodwill and patience of the child have been called upon to an unreasonable degree" (Bryson, 1936, p. 6–7). This criticism would be as valid today for K–16 students as it was in 1936, if not more so. However, new technologies now give us powerful new ways to respond in positive and proactive ways. Live, collectively created, and continuously updated resources can and must be embraced in the 21st century classroom.

In 1990, the secretary of labor appointed a commission to examine the skills that young Americans would need to master for the country to create a high-performance economy and remain globally competitive. The commission's report (U.S. Department of Labor, 1991) outlined a series of competencies and foundation skills that not only would form the basis for a productive work life but also are, arguably, essential for an enhanced quality of life for all citizens in a democracy. These include "thinking creatively, making decisions, solving problems, seeing things in the mind's eye, knowing how to learn, and reasoning… individual responsibility, self-esteem, sociability, self-management, and integrity" (U.S. Department of Labor, 1991, iii). We feel it is critical to note that the Commission described these skills not as the end product of education but rather as the foundation upon which other learning depends. Responding to a call for education to prepare students as lifelong learners, the process of education joins content as figure rather than background.

Also in 1990, the American Psychological Association began publishing its Learner-Centered Psychological Principles. Revised in 1997, these principles, based on a century of research into teaching and learning, stress the importance of social interaction, relevancy, and opportunities for personal choice in learning and in constructing knowledge (APA, 1997). We believe that the approach this article describes meets many of the criteria enumerated by the APA.

In a similar vein, Educause's Learning Initiative (ELI) identifies developing information, digital and visual literacies as crucial challenges for 21st century education. ELI believes that "creating learning environments that promote active learning, critical thinking, collaborative learning, and knowledge creation" (¶ 2) must be incorporated into technologically mediated curriculum in order for learners to be prepared to meet the challenges of an increasingly complex world.

In an effort to maintain currency, authors and publishers have incorporated some changes into the traditional textbook. The inclusion of study guides, supplemental materials, corporate authoring, rapid new editions, multimedia support, and test-item databases have improved the format but have not altered in a substantial fashion the basic function of the textbook form. It remains a passive relationship between author and reader that purports to be accurate (sometimes wrongly so), and it is presented as an authority in a discipline. It is our contention that the type of learning experiences called for in the SCANS report and in the APA principles can be, and should be, facilitated by melding the appropriate technology with pedagogy.

Potential for Change

Although the textbook has had tremendous longevity as a content delivery method, modern technology has given us the means to explore radically new approaches to challenges long recognized. For example, the *Horizon Report* (Johnson, Levine, Smith, & Stone, 2010) identifies six emerging technologies that will affect education content and delivery during the next five years, including mobile computing, open content, electronic books, simple augmented reality, gesture-based computing, and visual data analysis. All of these have fundamental implications for the future of the textbook.

Take, for example, just one of these technologies, electronic books (e-books). The Horizon Report discusses e-books as "a cost-effective and portable alternative to heavy textbooks and supplemental reading selections" (Johnson, Levine, Smith, & Stone, 2010, p. 17). Although these attractions alone make a compelling case for the viability of the e-book, the vision is fairly limited. The e-book is portrayed as a desirable alternative vehicle for the words and phrases contained in textbooks and articles, and not, as we would argue, as an opportunity to re-imagine the teaching and learning process.

But the e-book also represents an entirely new palate upon which professional writers and students alike can paint. All six technologies listed in the report could be implemented and simultaneously utilized in any location via powerful multi-use readers such as the Apple iPad. Writer and reader alike could immediately offer and access real-time updates. A student team could share bookmarks, annotations, and highlights as they search a source for information of particular relevance to their own project. The static course pack could be made dynamic, with opportunity for students and faculty alike to post links to new sources as a course progresses. Articles and other sources could move seamlessly in and out of video as well as virtual worlds and visual databases. Linking material from multiple sources could bring new life to statistics. These capabilities exist right now and they are coming to a school or university near you!

Our Proposal

Working from a philosophical foundation of Constructionism, we propose that it is time to reconceptualize the textbook, especially given the needs and characteristics of learners in the information age. Constructionism, which Papert and Harel (1991) termed "learning-by-making" (¶ 1), focuses on the learning that occurs when students are actively involved with constructing an object, either physical or virtual. The power of the constructionist approach, combined with the need for skills such as problem solving; critical and analytical thinking; adaptability;

applying knowledge to real-world, novel situations; information literacy (meaning access to, and sense-making of, knowledge rather than acquisition of knowledge); the triangulation of information as a means of validation; and valuing and seeking multiple perspectives make it imperative to rethink such a passive means of content delivery. The compelling needs of 21st century learners demonstrate that the nature and structure of education is (or needs to be) on the brink of transformation. Indeed, "content is so abundant as to make it a poor foundation on which to base an educational system; rather context and meaning are the scarce but relevant commodities today" (McCombs & Vakili, 2005, p. 1582).

We believe that this transformation will hinge on how educators answer questions such as:

- How can classrooms be designed to facilitate active construction of knowledge by communities of collaborators?
- What is the role of peer-to-peer learning in such settings?
- Can educators develop new methods for evaluation where asking the right questions is as important as, or perhaps more important than, giving the right answers?
- Can educators redefine achievement to become a construct focusing on open-ended, criterion-referenced results?
- How must the role of teachers change to facilitate this transformation?
- What role can technology play in helping create a learner-centered community?

One way to explore the reconceptualization of the textbook is to experiment with new ways of creating, organizing, and disseminating knowledge. One such initiative is taking place at Old Dominion University (ODU), in Norfolk Virginia.

Description of Wikibook Project at Old Dominion University

Before describing the Wikibook project at Old Dominion University (ODU), it is important to state that this description is not intended to focus solely on the research aspects of this offering. This paper intends to explore the lessons that have been learned through this holistic implementation of this process, how it has adapted over time, and how it has altered the instructional paradigm of the class. Having said that, in the spring of 2006, the instructional staff of the Social and Cultural Foundations of Education course (ECI 301) at ODU began to discuss the idea of assigning students in the course the responsibility of writing their own textbook. Note that this pedagogy represents a significantly different approach than posting a textbook or course pack online or making a textbook available electronically. The students in the course, under the guidance of an instructional team, would, in fact, write their own textbook, evaluate and reflect on their own work, and post it in a wiki.

After initial discussions regarding the dimensions of such a project, the instructional team decided to submit a proposal for a faculty innovator grant to ODU to develop the framework for this pedagogy. This grant, which received funding in the summer of 2006, led to a series of planning meetings where the instructional design was developed and refined. Fundamental to the process was a review of traditional educational foundations textbooks to identify concepts, themes, and topics that are both essential and generally accepted in this discipline by a variety of authors. This review yielded 77 topics that the instructional team felt must be included to constitute a reasonable survey of the course. These topics, plus an additional 15 "wildcards" (blanks where students could submit a selection of their own if they felt a pertinent and germane area had been omitted from the other 77), were organized into 15 instructional chapters on the Wikibooks section of Wikimedia (Wikimedia Foundation, Inc., 2010), which was selected for its pre-existing availability and due to lack of substantial other options.

As in many courses, the textbook was not the only source of knowledge and perspective offered to the students. Professor-led lectures offered systematic coverage of the course material as well, providing integration, focus, depth, context, alternative viewpoints, and another source for the students to triangulate the information they had brought into the wikibook.

ECI 301, the Social and Cultural Foundations of Education, is a required course for preservice teachers and, as such, enrolls more than 200 students each semester. Consequently, it was necessary to design an inclusive process where all students would participate in writing the textbook. The instructional team weighed two options: (a) have groups of students work together to produce a submission, or (b) have several students cover each topic individually. As this writing project would be groundbreaking in nature, the instructors decided to avoid the additional complexities of group work. This decision led to a structure where up to three students could write on a given topic. Each student selected a topic that interested him or her, but no more than three students were allowed to write on the same topic. If three students had already selected that topic, then the student would be instructed to select a different topic.

The instructional staff soon realized that this structure would make it exceedingly difficult for students to effectively read the entire textbook, particularly as there would be three versions of content on which the students could be assessed. The solution to this concern was to incorporate a reading schedule that required students in the class to read individual sections and rate the content on a 3-point scale (good, average, and poor). The highest rated of the three submissions was then included in the product designated as the official textbook. It was through this methodology that the instructional staff hoped to leverage what Surowiecki (2004) called the "wisdom of crowds" and to encourage the students to reflect on the work of their peers in a critical fashion.

In addition, each submission had to conform to certain specifications. For instance, each had to be a minimum of 1,000 words. The author also had to include five references (two from scholarly sources

such as peer-reviewed journals, two that could be from popular sources such as newspapers, and one that could be from either), five multiple-choice questions appropriate to the topic, and one sidebar (an additional section of content—a quotation, video, cartoon, etc.—that would illustrate the main topic).

This instructors implemented this process first for the fall 2006 semester and have continued it each semester since. At the same time as the initial implementation in 2006, a graduate-level research class was assigned to analyze the methodology and course outcomes. The research class designed instruments to gather data on student perceptions concerning their comfort level with the material, the level of material that they believed they learned from the wikibook process, and their usage of the textbook. Findings from research indicated that the students used the wikibook more than they used traditional textbooks and felt more involved with the content (O'Shea et al., 2007).

In addition to the more structured research results, we undertook a formative evaluation to review the process itself. As a result of this formative evaluation, we made several iterative changes were made to the process. For example, the instructional staff decided to port the best content across semesters to seed the next textbook and provide students an exemplar. This permitted each new class to write their own textbook while maintaining the highest quality material from semester to semester. Another change indicated by the research involved the redesign of the rating scale. The students indicated that they needed further guidance on how to rate their classmates' material, so the rating scale was expanded to include four variables (importance, interest, credibility, and writing), each of which was to be rated on a 5-point scale.

This methodology persisted substantially unchanged until the spring of 2008, when the course was redesigned as the Foundations of Education and Instructional Assessment due to changes mandated by the Commonwealth of Virginia for all teacher preparatory courses. This change necessitated two distinct

texts: one on the foundations of education and one on assessment practices. Additional changes made to the process at this time included the addition of an About the Authors section that allowed all of the students to identify themselves (including their educational philosophy), greater use of feedback from readers (including the authors' reflections on their submissions based on the feedback received from peers), and an About Our Schools section that asked the students to reflect on their experiences observing in K–12 settings. The ease with which we accomplished these changes to the content of the course and to the process of implementing the wikibook pedagogy provides a vivid, and unanticipated, demonstration of the flexibility and strength of the model. The model effortlessly and fluidly accommodated itself to these changes and consistently maintained its focus on student authorship of material, peer ratings of content, and competition for inclusion in the official textbook. After all, building an outline for the textbook that met the needs of the new course structure was no more difficult than building any previous outline. The various editions of the texts can be found either on Wikibooks (http://en.wikibooks.org/wiki/Social_and_Cultural_Foundations_of_American_Education for the initial edition) or on the WiTTIE Project's website (http://www.wittieproject.org/wiki/In_Our_Schools/Fall_2010 for the most recent).

As this pedagogical approach evolves, several issues must be addressed to ensure successful development of the wikibook process. Chief among these issues is the concern surrounding the credibility of the product the students created. As is common when discussing the use of wikis to create content, critics have voiced concerns about how credible and accurate the material is in the student-authored wikibook. To address this, the instructional staff has assessed the credibility of this process by comparing the academic performance of students using the wikibook process to peers using a conventional textbook. Thus far, the research indicates that the students using the learner-created

wikibook score as well as traditional textbook readers (O'Shea et al., 2009) on a core competency examination that the instructional staff designed to measure academic outcomes. Although this does not necessarily settle the issue of the product's credibility, it suggests that the process has promise as a viable educational pedagogy.

As promising as these results are, we believe that even if "constructivism in practice" sometimes does lead to uneven results in the final product, this should not necessarily be interpreted as a failure of the process. If the process of learning is truly to be valued, then the learning experience must be assessed in its own right, where the teacher and course materials become guides to learning rather than simply serving as content experts. The roles of guide and process facilitator are frequently celebrated, but teachers often fail to fully realize them while using conventional classroom and textbook methodologies.

Advantages of the Wiki Approach

There are several obvious advantages to the wikibook approach in the educational process. First and foremost, this is a truly student-centered learning experience. As the consumers of the content are also the producers of the content, the learning experience is integrative, revolving around the students and their ability to find, analyze, and report information that is plentiful and available. In essence, this capitalizes on indigenous and discovered knowledge and information provided by the learners themselves. This dynamic, interactive process allows the students to build specific information-related skills in addition to simply acquiring information. The fact that the ODU program incorporates an element of competition does not preclude using this type of instructional model in a collaborative and cooperative form that fosters metacognitive skills associated with learning how to learn. This is also inherently a problem-centered method, which is often more engaging and motivating for students.

Second, this paradigm naturally facilitates the learning of a panoply of

information literacy skills. After all, in the modern, information-rich world, "it becomes less important for students to know, memorize, or recall information, and more important for them to be able to find, sort, analyze, share, discuss, critique, and create information" (Wesch, 2009, ¶ 3). Additionally, this format of instruction allows for much more currency of information, as the students are finding and evaluating information in real time and can incorporate the most recent additions to the knowledge base.

Third, and perhaps most importantly, is the adaptability and flexibility of this type of instructional design. In a very practical sense, a change in a course such as the one mandated by the Commonwealth of Virginia did not have a substantial impact on the process. There was no need to search for a new textbook to add to the course. All that was needed was a new outline for the wikibook, which the instructional staff was able to create in short order. This flexibility allows for the incorporation of new information and perspectives in real time.

Disadvantages of the Wiki Approach

We have summarized what we feel are the advantages of the wikibooks process, but it also has disadvantages. For example, there are practical problems of managing the technology and the process. The tools that are used for this type of activity, while improving, are still relatively difficult to incorporate seamlessly into the classroom setting. The lack of user-friendly interfaces means that a substantial amount of technological support is needed to ensure success.

This leads to another critical issue, alluded to earlier, that must be addressed: This pedagogical approach can reach its full potential only if the teacher's role changes. The idea of the teacher being the "guide on the side" rather than the "sage on the stage" has been repeated so often that it has become offensively trite. The challenge of evolving a new role for teachers stems from the fact that teachers are often told that they must make this transition but are seldom given guidance on how to do it or a context in which to make the change. The ODU

project provides a concrete example of how this transition can be facilitated, but many teachers will require substantial support as they take on this new role.

Another issue that must be confronted—but which is not unique to a wikibook approach to textbook creation—is that textbooks in general encourage students to think in "sound bites" rather than delving deeply into primary sources of information. It is the rare undergraduate or master's-level student who will actually have read Vygotsky, Bloom, Gardner, Piaget, or Dewey's primary works. The concept of writing a textbook does not necessarily ensure that students read primary sources any more than reading a traditional textbook does.

Conclusion

Perhaps the most important conclusion from this discussion deals with the credibility associated with the process and product. The issue of credibility will always arise in any project that attempts to supplant or even supplement content gatekeepers. The argument becomes more vociferous if the focus of the evaluation of this pedagogical approach is more on the product created rather than on the learning experience created. With the ubiquity of information and access, there is a need to rethink the old construct of credibility, which is largely self-referential. The new question of credibility that must be considered is: Can credibility be reconceptualized as a validation of a continual sequence of iterations, with changing criteria, expected transitions and transformations, unexpected sources and stimuli, and the expectation that all judgments are temporary?

Although we feel that the wikibook approach offers a good example of the appropriate use of technology in learning, we are also cognizant that the wikibook approach is "a" way to help the evolution of the teacher's role, not "the" way. In *The Doubter's Companion*, John Raulston Saul elucidates the difference between "a" and "the" in his definition, "*A* versus *the*. Indefinite versus definite. A suggestion that there is room for doubt, questioning, consideration. That

an inclusive approach may be more interesting than the exclusive" (Saul, 1994, p. 9). We would argue that the pedagogy we describe is a way to create such intellectual space and is one method, among what we hope becomes a suite of methods, for teachers to promote creativity and joy in teaching and learning.

The same can be said for the future of the textbook. The learner-authored wikibook is one way that textbooks may evolve to meet the needs of learners in the information age.

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