Evaluation of the VTEXT Electronic Textbook Framework

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Abstract

Electronic textbooks improve upon e-books in that they provide the user with the ability to go beyond just reading material on a computer screen. E-textbooks provide students with all of the abilities provided by a hardcopy text, but also add many functions only possible with computers and Internet communication. Ideal e-textbooks allow users to annotate in the text with e-ink, mark important sections, search over the e-ink and the text, look up items in online dictionaries or encyclopedias, perform interactive reinforcement drills, execute simulations, collaborate with fellow students and instructors, and many other operations afforded by the power of the underlying computer and the reach of the Internet connection.

The VText framework is designed to provide many of the desired features of an e-textbook in such a way that it provides pedagogical value rather than just convenience for students. Many so-called e-textbook solutions available today provide few features beyond those possible with hardcopy textbooks. The VText framework is built as an add-in to Microsoft's note-taking program, OneNote. OneNote provides many features which translate well from notebook to e-textbook such as inking and organization of content into pages, sections, and chapters. The add-in, once loaded into OneNote, provides features which facilitate the use of OneNote as a reader and as an educational tool while leaving in place OneNote's strengths in note-taking, collaboration and search.

This paper discusses the user experience, describes the evaluation of the VText framework, and discusses results and feedback from user testing. The evaluation will consider factors such as usability, student learning performance, and satisfaction. The main areas of interest for the evaluation include effective note-taking in the e-text, rehearsal skills, facilitation of collaboration, ease of use for the student, improvements in integrating lectures and individual study, and the general utility of tools included in the plug-in such as the Bluetooth Scanner which allows pictures to be integrated into the e-textbook from an Android device. These results will be used to generate suggestions for further improved work in this area.

Introduction

Computers, particularly tablet computers, provide a potential new platform for delivering textbook content to students. Shepperd et al. found in 2008 that students who tried an e-textbook, in their case simply the same as a paper copy but in digital form, spent less time studying although they performed as well as the students using a paper copy[1]. They also found that while students found the e-textbook easy to use, they did not find it convenient nor would they use it again or recommend it to a friend. However, based on their findings as well as those of an earlier study by Aust, it seems likely that computer screens are not fundamentally more difficult to study on then paper and using computers may increase the efficiency of studying[2]. While these studies seem positive, the results of a more recent study by Daniel seem to suggest

that electronic formats are not more efficient, though again not detrimental to performance[3]. Daniel found that e-textbooks tended to cause more multi-tasking and therefore longer study periods, while Shepperd found a reduction in weekly averages.

While the previous research found that simple e-textbooks are nearly equal to paper copies, other research shows the potential for feature-rich e-textbooks to be much greater. Guess reports findings that note-taking and highlighting were the major features that students were interested in[4]. Snowhill also identified note-taking as an important feature as well as multi-media, full text searching, reference linking, convenience, and portability among others[5]. A discussion at WIPTE 2010 identified many of the same features as desirable as well as text-to-speech, collaboration, internal and external searching, and individualized tutoring and assessment[6]. Work by Kiewra[7] and Martinez[8] also demonstrates the importance of note-taking for student achievement and the effect of difficult platforms on proper note-taking. This problem is best solved on digital systems by allowing free-form notes, including a variety of possible inputs, such as typing, pen, audio, and video. However, while there is agreement on useful features, there has been little testing of the effects of feature rich e-Textbook platform use on student performance.

One of the earlier featured e-textbook candidates tested in college classrooms was the Kindle DX. In 2008, a pilot study was performed at many schools across the country. The study at Reed College found that the Kindle DX provided a usable form factor, legible display, long battery life, convenient delivery mechanism, and paper savings[9]. However, there were few pedagogical improvements. The Kindle DX suffered flaws such as missing PDF capabilities such as annotation and highlighting, difficult distribution of reading materials beyond the course text, poor image display due to low resolution and lack of color, slow changing between pages and books, difficulties for the visually impaired, and cumbersome note-taking.

The Kno tablet was a promising full featured e-textbook hardware and software solution [10]. There were originally two systems proposed, one with a 14.1 inch touch screen and the other with two of the screens hinged together. This form factor would have allowed a paper book like experience with the benefits of a computer. The hardware also allowed for Bluetooth devices such as a keyboard to connect to the system. The software for textbooks included many features such as note-taking, highlighting, and search that would have made the Kno fit many of the requirements of a fully featured device. There was even a planned SDK for developers to extend the system including Google Documents, now Drive, and Microsoft Office Live support. Unfortunately, the project was cancelled in April 2011 in favor of a software only approach. The current Kno software is web-based and includes annotations and highlighting, however, no pen support. There is also no easy, built-in way to view two pages at one time as the two screened tablet would have allowed.

VText

VText is an e-textbook platform built as an add-in for Microsoft OneNote. The goal is to provide the tools and capabilities desirable in an e-textbook as identified by previous efforts while allowing OneNote to remain one of the most fully featured note-taking programs available today. By doing so, the add-in, along with OneNote, can improve both individual study and the lecture experience. VText also considers the role of publishers and authors by including mechanisms in addition to those included by default by OneNote to import various formats of material without losing capabilities. This project also intends to perform a formal analysis of the benefits of a fully featured e-textbook compared to simple e-textbooks and paper copies.

Because OneNote is not intended for textbook display, some changes had to be made to meet users' expectations for interacting with textbooks. The add-in adds controls, gestures, and screen configurations that allow users to flip through the pages with simple motions and easily choose how their screen real estate should be used based on the size and style of their device. To allow this, a control is added to allow a user to automatically have two windows open side-by-side or top-to-bottom, or simply only one window containing the contents of the book. It is also possible to have these two separate windows synchronized so that when one changes the other is also changed allowing a book like manner of flipping through pages or unsynchronized allowing the two windows to display content from different sections or different books entirely.

To ease the flipping of pages while preserving screen real estate taken up by the default OneNote UI, two mechanisms have been added to support those on both standard laptops and tablets. For those on standard laptops, two buttons can be added to the screen to allow easy flipping back and forth between pages. This works in both synchronized and unsynchronized modes by offering one or two sets of buttons, respectively.

For those on tablets, gestures can also be used. Simply moving a finger, pen, or the mouse left or right along the bottom of the window will flip the page backwards or forwards through the book. Which input devices can trigger the gestures is configurable by the user in the settings. While this gesture is in addition to the standard OneNote gestures, OneNote provides the ability to pan and to adjust the zoom by default.

VText provides two more gestures to allow for quick navigation and bookmarking. By moving a finger from the top left corner of the window in a diagonal direction down and right, a page will be pinned. To view the pinned pages, a user simply drags their finger from the top right in a diagonal direction down and left. This will bring up a window with a list of all pages that have been pinned allowing a user to quickly return to the page or remove it from the saved list. These functions can also be controlled through the Ribbon interface for those without touch or pen enabled. Figure 1 shows the gestures provided by VText.
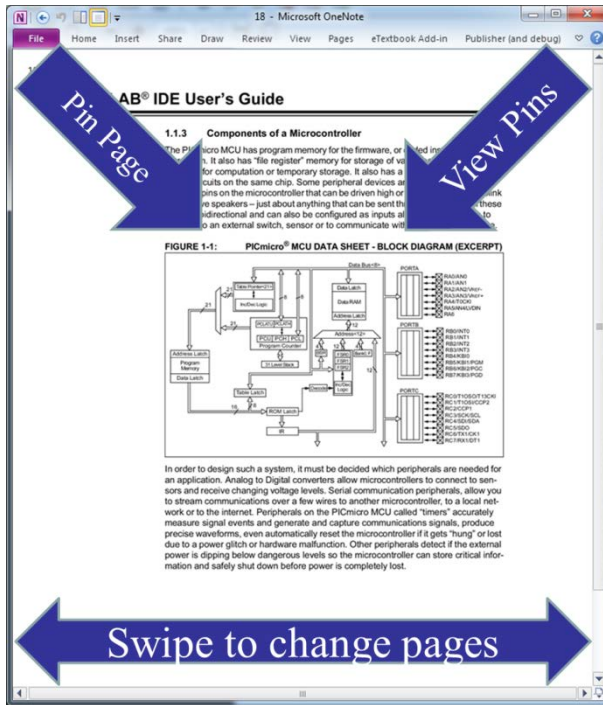
Figure 1 VText's Gestures

While OneNote already provides a mechanism for searching the contents of handwritten notes, images, and text inside any book, VText adds a mechanism to search the web using popular search engines such as Google, Yahoo!, and Wikipedia for any text content in the books quickly and easily. This feature, shown in Figure 2, can be accessed by selecting the desired search terms and right clicking (a press and hold on a touch screen) then selecting "Search the Web" or by clicking the button added to the Ribbon interface by the add-in.
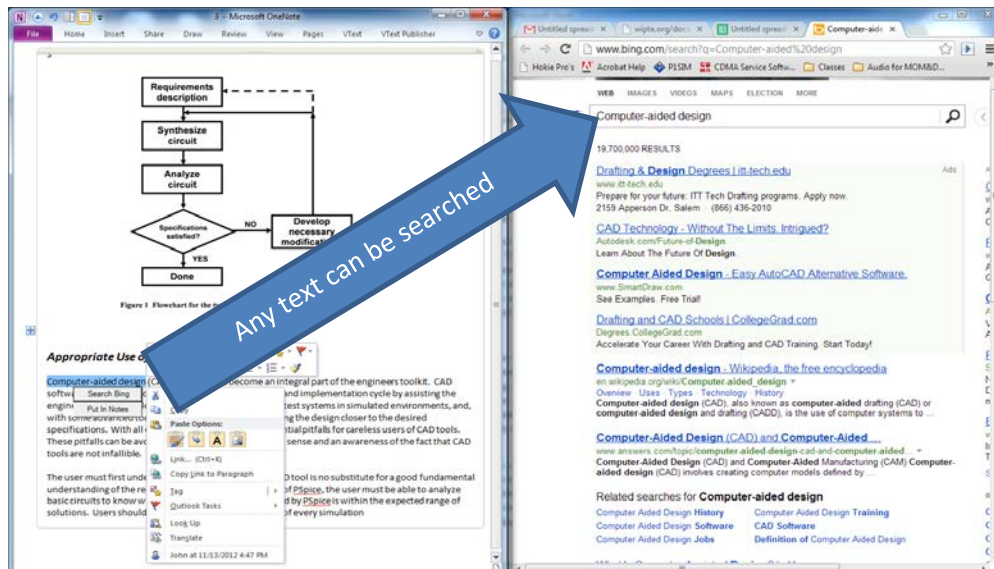

Figure 2 Example of the Search the Web Feature

VText adds the ability to aggregate important text from a chapter into a notes page. To add a note to this notes page, a user selects the text, right clicks, and then selects "Add to Notes." The selected text is then automatically copied to the notes page located at the beginning of the chapter or book. This should allow students to easily see sections they felt were important when reading the book or excerpts they felt they needed to review further.

By utilizing the features of OneNote, a student will have access to all of their notes on all of their devices. This can also be used to share notes from lectures and readings with other students. The add-in includes a mechanism to allow all students to synchronize the page they are viewing with their instructor allowing them to seamlessly follow along with discussions in the text. VText also enhances the lecture experience with a mechanism to quickly insert pictures, for instance of a chalkboard or handwritten notes if a tablet is unavailable, directly into the student's digital notebook from an Android device via Bluetooth. These abilities have potential to improve collaboration between students both in and out of the classroom.

While OneNote allows for a document to be printed into OneNote, essentially putting an image of the entire document on just one page, VText can import Rich Text Format (RTF) and Portable Document Format (PDF) documents preserving text as text and images as images as well as preserving one page from the document as one page in OneNote. This allows the content to be more easily selectable and therefore more easily copied to other notes, used in external programs, such as search engines, and converted to voice.

Planned Evaluation

VText has attempted to meet the features and requirements listed and inspired by previous research. While the use of OneNote as a base has been beneficial in developing this e-textbook platform, the design control of some features lost by using such a framework has caused some development problems. Nonetheless, VText has come together to the point where it is ready for testing and evaluation.

In order to test the effectiveness of VText and its features, the software and an accompanying text for the course will be provided to approximately 100 students enrolled in an introductory level C++ programming course. They will be asked to fill out a survey before use and again later in the semester. The survey will determine which features are most useful as well as determine if the students' perceptions of e-textbooks is changed by the experience. The goal of this research will be to determine best practices and guiding principles for further work on VText and other e-textbook solutions.

The first survey will determine a user's willingness to use an e-textbook instead of a paper textbook. Questions about the user's hardware will determine if there is a link between ownership of advanced hardware such as slates and tablets and willingness to use an e-textbook. Other questions will determine if there is a link between comfort with new technologies and

willingness to try use of an e-textbook. Users will also be asked if they have used an e-textbook before. Figure 3 shows these questions.

What is your comfort level with the following:					
	Not Comfortable	A little comfortable	Somewhat Comfortable	Mostly Comfortable	Very Comfortable
Computers					
Microsoft Office					
OneNote					

How often do you:					
	Never	Only When Requested	A few times per semester	Once per week	Always
Bring a computer to class					
Bring a textbook to class					
Study using online sources					
Complete course readings (Traditional book or eBook)					
Take notes					
Share notes					
Complete Assignments					

How willing are you to try the following when they are suggested by others					
	Not willing	A little willing	Somewhat willing	Mostly willing	Very willing
New Software					
New Devices					
Completing course readings on a computer					
Taking notes on your computer					

How motivated are you to try the following without recommendation from a trusted source

	Not motivated	A little motivated	Somewhat motivated	Mostly motivated	Very motivated
New Software					
New Devices					
Completing course readings on a computer					
Taking notes on your computer					

Figure 3 Survey questions to determine student technology background and motivation

Further questions will assess which characteristics of e-textbooks are most willing to affect the student's decision to use or not use e-textbooks. These can be categorized as financial value, study efficiency, and academic effectiveness. These questions are shown in Figure 4.

If you have considered using or have used eTextbooks, how important were these motivations?					
	Not Important	Somewhat Unimportant	Neither	Somewhat Important	Very Important
Price					
Prefer reading on a computer screen					
Prefer reading on paper					
Convenience of shopping					
Ability to carry one device instead of many books					
Share Notes					
Follow along in class					
Do you agree with the following?					
	Disagree	Somewhat Disagree	Neither	Somewhat Agree	Agree
Use of eTextbooks will encourage me to read more.					
Use of eTextbooks will reduce how often I read					
Use of eTextbooks will save me time.					
Use of eTextbooks will waste time					
Use of eTextbooks will improve my grades					
Use of eTextbooks will hurt my grades					
Use of eTextbooks will save me money.					

Use of eTextbooks will waste money.					
Use of eTextbooks will be challenging if the instructor doesn't use it.					
eTextbooks will help when studying with classmates.					
eTextbooks will help me communicate my problems and questions with Professors/TAs.					

Figure 4 Survey questions to determine students' decision motivation

After using VText, a second set of questions will be presented to the students to gauge changes in their perception of e-textbooks. This survey will attempt to see if users, having been introduced to an e-textbook, have changed their mind on the value of e-textbook use. For instance, a user may believe e-textbooks provide a more efficient way of studying or a more cost-effective way of gaining access to course materials. On the other hand, they may find the e-textbook to be cumbersome or too different from what they are used to. Figure 5 shows the questions that will be used to determine changes in the perceptions of e-textbooks.

If you used VText, how pleased were you with the following?	Not Pleased	Somewhat not	Neither	Somewhat Pleased	Very Pleased
Price					
Reading					
Gestures					
Speed					
Ability to carry one device instead of many books					
Ability to share notes					
Follow along in class					

Do you agree with the following	Disagree	Somewhat Disagree	Neither	Somewhat Agree	Agree
VText encouraged me to read more.					
VText reduced time spent reading.					
VText saved me time.					
VText wasted time.					
VText improved my grades					
VText hurt my grades.					
VText saved me money.					

VText wasted my money.					
VText helped me when studying with classmates					
VText helped me communicate problems and questions with Professors/TAs					

Figure 5 Survey questions to determine changes in student e-textbook perceptions

The next set of questions will ask about specific features in VText. This section will provide useful data as to what students are looking for in an e-textbook. These questions are shown in figure 6.

How often did you?	Never	Once or twice during the semester	Weekly	A few times per	Daily
Use VText					
Use touch/pen gestures					
Use the next page/previous page buttons					
Use "Classroom Sync"					
Use multiple window side-by-side					
Use the pin/bookmark pages feature					
Use the Bluetooth Scanner					
Use the take note feature					
Use the search the web feature					

How satisfied are you with?	Very unsatisfied	Somewhat unsatisfied	Neither	Somewhat satisfied	Very satisfied
Use VText					
Use touch/pen gestures					
Use the next page/previous page buttons					
Use "Classroom Sync"					
Use multiple window side-by-side					
Use the pin/bookmark pages feature					
Use the Bluetooth Scanner					
Use the take note feature					
Use the search the web feature					

Figure 6 Follow up questions about VText features.

The final questions are intended to determine an overall sense of the user's satisfaction with VText. The questions ask if they would use VText again, recommend VText to a friend, and if there were missing features that would change their mind.

Conclusion

VText attempts to demonstrate the value of e-textbooks by developing and testing potential features for e-textbooks. The goal of VText is to not only achieve the conveniences of utilizing an electronic platform for books, but also to introduce possibilities for the next paradigm of textbook use. The features of the add-in and those built-in to OneNote should facilitate easier connection between students and instructors. VText should also demonstrate the value of providing features in e-textbooks that differentiate e-textbook solutions such as utilizing internet connectivity to supplement the text and improving academic communication from simpler solutions. The described testing should begin to demonstrate if a feature-rich e-textbook is both desirable and useful. The final goal of this work is to provide suggestions for improving both student performance and satisfaction for both VText and other current and future e-textbook solutions. Survey results will be available by summer 2013.

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