

AC 2010-1823: TWO TECHNIQUES FOR EFFECTIVELY PRESENTING INFORMATION IN THE CLASSROOM WITH MULTIPLE TABLET PCS

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Two Techniques for Effectively Presenting Information in the Classroom with Multiple Tablet PCs

Abstract

There are many studies that show interactive learning is a better way to engage students. Different courses lend themselves to being taught with technology easier than others. Have you ever heard a faculty member say “I would use a tablet PC to teach my course, but I need more room” or “I need to refer back to a diagram (chart, table, etc) and don’t like flipping back and forth. Some course topics are easy to cover necessary material on a slide by slide basis, while others do not fit into a nice 11x8.5” slide. The University of Louisville’s J.B. Speed School of Engineering is in its second year of a tablet PC requirement of their students and as faculty have adopted the use of tablet PCs in their courses some of these issues have been confronted. This paper will discuss two techniques for handling classroom presentations using two tablet PCs, for when the data will not fit on a single slide. There are numerous courses that these techniques could be used and have, but the examples used will be from a course titled *Numerical Analysis for Engineers*.

There are different ways to deliver course content using tablet PCs, this paper will discuss two different techniques. While modifying the Numerical course to be taught using a tablet, there are numerous problems when going through the steps to calculate the answer that take a lot of space. When this happens and the instructor is only using one tablet pc the instructor will be required to scroll backward and forward during the lecture. The backward scrolling can be to fill in a table or chart, or may be to refer to previous calculations as the problem builds. This backward scrolling sometimes causes confusion with the students. The students feel as though the material is jumping around. These cases are where using two tablet PCs and two projectors allow for a more seamless presentation.

By using two tablet PCs and two projectors, it is possible to continuously project the table or previous calculations. This allows the instructor and students to refer to the intermediate steps on the other screen that is being controlled by the second tablet. The two course delivery techniques discussed here will use software that is available for tablet PCs. The first method uses Microsoft OneNote exclusively, and the second method uses DyKnow. This paper looks at course delivery methods and then describes in detail the process that is being used by a small number of faculty currently at the engineering school.

1. Introduction

The University of Louisville’s J.B. Speed School of Engineering introduced a Tablet PC requirement for the incoming students in 2007. This was the first year for a computer requirement of any sort for the engineering students. Tablets can be beneficial to students learning, as long as the technology doesn’t become distracting. There are many papers detailing student use of tablet PCs in the classroom and some on using a tablet PC to present a class.^{1,2,3,4,5} Some faculty adopted the use of tablets as a presentation medium sooner than others. As tablet PCs were adopted by faculty there have been some obstacles. One obstacle, that has been

reported, is how to handle presentation of information that cannot be broken into a single slide. This particular paper tries to address the use of two tablets and two projectors used by one instructor to present material to his/her class. The methods presented here have been implemented in the author's classroom as well as two of his department colleagues.

2. Two Tablet and Two Projectors

There are some engineering courses that do not lend themselves to having enough of the problem information and solution to be displayed on a single screen that is a projected 11x8.5" slide. As Stickel¹ reported one of the most significant drawbacks to instructors using a tablet PC is that there is only one virtual board to work with as opposed to the four to six chalkboards or whiteboards that exist in many classrooms. A course *Numerical Analysis for Engineers* is one such course that has many mathematic problems that cannot be shown or worked on a single screen. One of many possible examples of this is shown in Figure 2.1.

Example 2.1: Approximate $\frac{d}{dx}(e^x)|_{x=1}$ with six significant digit accuracy. $F(h) = \frac{\Delta f(1)}{h} = \frac{e^{1+h}-e^1}{h}$
 $O(h)$ forward approximation of $f'(1)$ For $h_0 = 0.01$ and $r = 10$, so $h_1 = \frac{h_0}{10} = 10^{-3}$, $h_2 = \frac{h_1}{10} = 10^{-4}$, $h_3 = \frac{h_2}{10} = 10^{-5}$ Be sure to create a Richardson' Improvement.

h	$F_0(h), O(h)$	$F_1(h), O(h^2)$	$F_2(h), O(h^3)$	$F_3(h), O(h^4)$
10^{-2}	2.7319186			
10^{-3}				
10^{-4}				
10^{-5}				

Figure 2.1: Example for Demonstrating Having a Table to Fill in

If you are familiar with Richardson's improvement you will realize that showing the fractions that are calculated to fill in the table will take up more than the remaining white space on the slide. The instructor started considering how to effectively use a tablet PC to present the information.

An example of a problem that would continue past one traditional slide is shown in Figure 2.2.

Example 2.2: Given $A = \begin{bmatrix} 4 & -1 & 1 \\ 8 & 3 & -1 \\ 3 & 1 & 1 \end{bmatrix}$. Use the Triangular Factorization to Solve $A\bar{x} = \bar{b} = \begin{bmatrix} 6 \\ 10 \\ 9 \end{bmatrix}$.

Figure 2.2: Example of a Problem That Needs Multiple Slides

In example 2.2, there would be a couple of slides of preliminary setup and calculations prior to solving the factorizations needed to solve the equation. This example normally takes between four or five slides to get to the final answer.

There is an issue with using two tablets/projectors. If you jump from one to the other, students seem to dislike the jumpiness. So the methods discussed in the following sections will allow for one tablet/projector to be a trailer and the other tablet will always be the current "slide". This removes any question from the students' mind as to which screen is being used.

The following two sections will focus on two methods that have been employed. The employed methods allow an instructor to use one screen as a panel back, to either refer to a formula on that page, to display a table to fill-in, or to refer to the previous slide of the problem being worked. Section 2.1 will focus on using OneNote as a course delivery system, and section 2.2 will discuss using DyKnow.

2.1 Using OneNote

Microsoft OneNote is a digital notebook. It is an integrated part of Microsoft Office, but it is offered as a standalone program. It is useful for note taking and can be used to replace a regular paper notebook. However, to only treat one note as a paper notebook replacement would be missing some of the great flexibility options it offers. OneNote allows freeform notes “written or drawn on a tablet”, images, documents, files from other Microsoft Office system programs, any other printable files and rich media. Microsoft has some helpful tutorials on how to use OneNote and how to organize your information. What OneNote doesn’t do, is tell you how it has to be organized, and it will let the user organize it in the way that works best for them.

The ability to print to OneNote allows for course notes to be created any application that has a print feature. This allows for note creation to occur in whatever the instructor is most comfortable (Word, PowerPoint, OneNote, paper and then scanning to PDF, etc). This allows for a gradual change for instructors that have previously been teaching with overheads, PowerPoint to start switching a course to a tablet PC presented course.

Setting up two tablets to share a common OneNote notebook is made easy by Microsoft. It is included in the default functionality of OneNote (Live Sharing Session under the Share menu). After starting the shared on one tablet, it is a matter of joining the session on the other tablet. To share a section, all computers that are going to be connected to the same session need to be on a network together. This can be via wireless or even wired with a crossover cable. When setting up the share, it probably should have password set to protect it so no one else can “grab” control of the session. Once the session is created, either tablet PC can be written on and the writing will be transferred to both. That way if tablet1 is scrolled say to the table in the above example 2.1 then tablet2 can be used to show the intermediate steps. As the steps are completed for the different parts of the table, tablet1 may be written on to fill in the table. Solving example 2.2 using OneNote, tablet1 could show previous calculations performed, while working the next step on tablet2. This method of working either of these examples allows for easy reference to the table or previously worked information, without the dreaded continuous scrolling.

2.2 Using DyKnow

The client/server software named DyKnow is available from the company DyKnow. DyKnow is a leader in interactive education, that combines sound teaching with intuitive software to create flexible and effective solutions for teaching and learning.⁶ The software has been available at the J.B. Speed School of Engineering since the inception of the tablet PC requirement. DyKnow has been well discussed in many papers at conferences such as WIPTE and ASEE.^{7,8,9,10,11,12} DyKnow allows for tight integration of tablet PCs with course instruction. It was designed to be an interactive education tool that would allow for student feedback as well as fostering a

collaborative learning environment. The other design feature allows for public ink to be transferred to all connected users to the session. However, there are times that the instructor may not want transmit their ink. When this occurs, the instructor may use private ink.

DyKnow provides a download for DyKnow Notebook Writer. DyKnow Writer allows you to print content from any application that is capable of printing into DyKnow compatible notebook. This is very similar to the ability to print to OneNote and has some of the same advantages.

Setting up two tablets to work with DyKnow is slightly more complicated than OneNote. The difficulty is being able to ensure that private ink will work properly and displayed properly. The concept of private ink is the class moderator may write something that will be displayed on the screen but not transmitted to the students. If two screens are being used in a classroom setting, then the moderator (instructor) will probably want his/her private ink to be able to be displayed on the second screen when the primary slide is advanced to a secondary role. In order for the instructor to be able to write on either tablet in private ink and be visible on either screen, the instructor needs to have two login accounts on the DyKnow server. In addition, each of these logins needs to be instructor accounts and have moderator privileges in the course being taught. Without these things, private ink will not be shared between the two tablets. After the course session is created, the two tablets can be used to display separate information. This method of working either of these examples will also allow for easy reference to the table or previously worked information, without the dreaded continuous scrolling.

3. Conclusions

A formal study of these two methods has not been performed. However, approximately ninety students were surveyed anonymously at the end of the 2009 summer semester. Table 3.1, lists some samples of the student feedback regarding the use of two screens that has been received.

If I trailed behind while taking notes, I could simply switch my view to the other screen. Very good idea.	Good program (DyKnow), very effective as far as presenting. I find using a tablet to take notes to be less effective.
The two screen system is very helpful.	OneNote is far superior to DyKnow
It was nice to see the current slide and the previous one.	Better presentation as I could view the previous slide along with the current.
I love using my tablet. It was a pain to get the money together to buy it, but now that I have it I wouldn't trade it.	Easier to follow the presentation and look back at where something came from.

Table 3.1: Sample Student Feedback

From the responses, it seems the students are happy with two screens being used. From the surveys, it is also visible that some students have a preference for either OneNote or DyKnow. The use of multiple screens and tablets should be further investigated, since there may be more efficient ways to display multiple slides simultaneously. Also, a means of auto advancing the trailing tablet would be beneficial. For the upcoming semester, the *Numerical Analysis for Engineers* instructor is going to use DyKnow and the method described in section 2.2. Future plans for these two methods include a more complete survey of the students that are in courses using one of these two methods.

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