

# NOTE TAKING AND THE TABLET PC

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## 1. ABSTRACT

Note taking is a common and important classroom activity. The Tablet PC seems to be an obvious choice to support this task. In this paper, we explore its use and some of effects on note taking. To do this, we surveyed students about their note taking styles and observed the Tablet PC's use as a note taking device in lecture settings. From this we found that, due to variations in the speed at which they could use the device, in the size of their handwriting, and in how they dealt with the digital nature of the platform, the Tablet PC does not meet everyone's needs equally. While our evaluations occurred at the college level, the findings are relevant to many other educational venues.

## 2. PROBLEM STATEMENT AND CONTEXT

The activity of note taking in the classroom is an interesting one. Note taking and note reviewing in classroom settings have been studied for years. It is clear that these activities are an essential part of everyday classroom activities, possibly playing a more crucial role in large lecture-based classrooms. There is evidence that note taking benefits students (Intons-Peterson and Fournier, 1986). Some of the issues in note taking activities are discussed in (Grabe, 2005).

What has traditionally been a very simple endeavor, which used little technology, is being radically transformed. Now, the use of computers in a classroom has become common. PowerPoint slides and projector have replaced blackboards in many places. It is quite common to find students who bring notebook computers to class to take their notes; and to a lesser extend, we now find universities that require their students to have notebook computers. Both of these trends may increase as hardware prices decrease and more usable note taking software becomes available. This provides opportunities to leverage this technology and enhance the potential learning of the students. However, it also presents possible pitfalls if we simply assume that the presence of the technology alone is a guarantee of success.

Part of our work has centered on studying the Tablets PC's effectiveness as a note taking device. We want to better understand its potential benefits and its potential drawbacks. With those in mind, we can more clearly identify the technological needs of note takers and we can then explore how to best use this technology in the classroom.

## 3. SOLUTION EMPLOYED

To understand how the Tablet PC could be used in note taking, we first had to know what practices students currently employed while taking notes. We surveyed thirty-five students about how and when they took notes, their opinions of electronic note taking, how they reviewed, shared, or revised their notes, and what kinds of extra information would be useful to them for note taking (e.g. lecture slides, audio, video, etc.). The second part of our work

involved two separate observations of students' behavior in classroom lectures. The first of the two studies involved the comparison of notes taken on Tablet PCs, PDAs, and paper. The second study focused solely on the Tablet PC. All studies were approved by the Institutional Review Board at Virginia Tech.

### *3.1 Experimental Design*

Thirty-five computer science (CS) graduate students and HCI researchers were surveyed about their note taking methods and preferences. Student volunteers were recruited via announcements on student mailing lists. With all participants being in CS, we can speculate this subject group has higher acceptance rates for new technologies and is inherently curious for exploring new gadgets. The survey consisted of a total of thirteen questions that covered current note taking practices on paper and on the computer, the preferred method of input, review habits, the references that are useful for context, and the use of electronic systems. We used multiple choice, multiple answer, and essay questions.

For the second part of our work, we attempted to create a typical note taking environment for students and studied their note taking practices. We conducted two studies in this part. The first study compared Tablet PCs, PDAs and paper as note taking devices. The second studied Tablet PCs in more depth.

For the first study, the experimenters gave a short presentation on the topic of Digital Divide; a topic chosen because it required no previous knowledge was likely to be unfamiliar to many of the participants. This study was run late in the Fall 2004 semester. Thirteen students were recruited through announcement email lists and some word of mouth. Of the thirteen students recruited, five people used paper and pen, four used PDAs, and four used Tablet PCs. The participants ranged in class level from freshman to graduate and had majors that covered Computer Science, several Engineering disciplines, Chemistry, Statistics, Media Studies, Nursing, and Interior Design. Two were female.

The students were given a Tablet PC, a PDA, or just paper, and were asked to take notes of the lecture. Their notes were collected at the end of the session. Those that used the Tablet PCs took notes with a prototype program that allows for the creation and manipulation of ink drawings. At the conclusion of the presentation, they were given a short quiz on the material. They were allowed to use their notes while taking the test. The quizzes consisted of six open ended short answer questions, designed to help gauge the material learned. These were followed by five questions about note taking and the interface that they used.

For the second study, the participants were asked to attend a seminar presented by a visiting professor as part of a lecture series. The study was conducted in the Fall of 2005. Recruitment was done through email announcements. A total of seven graduate students participated; four of them were female. The students were paid \$10 for participation. The participants were provided with Tablet PCs and were asked to use Microsoft *OneNote*<sup>TM</sup> to take notes at the seminar. None of them indicated that they had prior familiarity with *OneNote*<sup>TM</sup>. They were given approximately 20 minutes to explore the program. For the seminar, all of the students except one were seated in chairs where they had no writing area. The other student sat at a table (to be near a power outlet). At the conclusion of the seminar, the notes were collected and the students were surveyed about their experience. The session ended with a short roundtable discussion about their note taking habits.

## 4. EVALUATION

The biggest lesson we learned from our experiences was that, for note taking, one style does not fit all. We found that people varied widely in how they took notes, how they used their notes, and how they felt about and responded to the addition of technology to the process. What seemed to work well for one person was absolutely the wrong thing for another.

### 4.1 Survey Results

As part of the survey, students were asked if they preferred writing out or typing in their notes. For those who liked typing better, some of the reasons they gave were the ability to search, the data entry speed, the neatness of typing over their handwriting, and a perception that the data was safer. Even so, several mentioned that the lack of diagrams, arrows between topics, and similar drawings was a major issue with their notes. For those who favored writing, flexibility in placement, the amount of expression, and the writing speed were the most often given reasons. It is interesting to note that the rate at which they could enter the data was a major reason for both groups.

There were a number of very important responses to why people liked writing that need to be considered. Several people remarked that placement of the notes was important. When taking notes on slides, the “notes are located at [the] relevant location.” Others were concerned with editing issues. “...I can more freely write my thought[s] on paper using various size or shape font without selecting any menu.” One person mentioned the “instant responsiveness” of paper and the lack of controls. By “instant responsiveness,” we believe the participant meant the lack of device booting, program loading, and other processing delays that are associated with current devices. Another related the act of writing to the amount of recall:

*I remember much more of what I hand write than what I type. In fact, most of the time, I won't remember much of anything that I type while I can remember a great deal more of what I hand write.*

The results from a study by Intons-Peterson and Fournier (1986) confirm that the act of taking notes does improve the recall of the material, whether or not the notes are used later.

At first glance it would seem that the Tablet PC is an obvious solution since it supports both writing and typing with ease. Students should be able to choose the functionality that they prefer and work in the way that they wish. However, as discussed later, the situation is not that simple.

Other results from the survey deal with the how computers affect the note taking process. While there were indications that notes in digital form would be easier to share and revise, they did not seem to be extremely pressing needs. In fact, the responses seemed to indicate that annotating notes after class was not important to many of the people. Other people noted that the computers could be a problem in themselves. One responder stated, “I don't use a computer, it distracts me.” Another remarked, “I can strongly state that a laptop or desktop available to me in class will always be used to do work which I deem more important than the contents of the class.” These are issues that need to be considered.

### 4.2 Comparison of Note Taking across Devices

When comparing the Tablet PC to the other interfaces, we found some interesting similarities and differences. In general, the notes were shorter and less verbose than those taken on paper. They also, in general, did not use arrows, underlining, or other such symbols to

enhance the notes. The notes covered little of the lecture material. However, one participant's notes were in stark contrast to the others in the group. In fact, the notes were nearly identical, in form and style, to those from the paper and pen group. They had a length longer than any of the ones on paper and were well fleshed out. They covered all the material and used underlining to differentiate sections. This supports the idea that the Tablet PC can be used as substitute for paper and pen, but the other results show that it may not be a trouble free transition.

When asked about the interface, one of the big concerns was that it did not feel like paper and pen. From looking at the notes, it seems obvious that the users wrote larger than they normally do and that their penmanship was worse. One person remarked that she had to change writing styles to understand what she was writing. This may be partially due to the prototype software that they were using.

Another person mentioned that the screen size was a limiting factor. Since the users were writing larger, there would be more navigation required and fewer notes visible at the same time. This could certainly adversely affect the quality of the notes. Partially to blame here is the fineness of the pen input, so this effect may be ameliorated as the hardware improves.

#### *4.3 Note Taking with the Tablet PC*

Our second study dealt only with the Tablet PC using Microsoft *OneNote*<sup>TM</sup> as our note taking software. In this study, we found many of the same issues that we saw in the first study. Some people responded to the Tablet PC very well; others had more trouble. One person remarked that it was as good as pen and paper while another had difficulty getting OneNote into the correct mode. She would try to draw bullet points and OneNote would highlight a selected area instead. Overall, four of the participants said that they felt limited by the interface while two said that they did not. One person was neutral on the topic. While it is true that some of the negative feelings will decrease as people get more experience with the hardware and the software and as technological improvements are made, some may not.

During the course of the lecture, the participant sitting at the table switched a few times between writing and typing. To do this, she had to rotate the screen of her tablet back and forth. She remarked in her survey that she wanted to take her notes quickly, which meant typing at times and writing at others, but to do this she had to keep changing the orientation of the screen. As mentioned before, speed is a big factor in note taking and, in this case, the Tablet PC did not quite support what she wanted to do.

In the first study, we remarked that the participants' handwriting was noticeably larger and worse when they used the Tablet PC. The use of OneNote<sup>TM</sup> seems to have alleviated most of this problem. While it does appear that people wrote slightly larger, it was not nearly as pronounced. However, it does seem that this will still be an issue with those that write extremely small. The fineness of the stylus point and of the input resolution will limit how small the writing can be.

One participant mentioned that she did not like the "computer reaction" to her actions. While she did not elaborate on this in her survey, we feel that her sentiments echo those found in our initial survey. The very nature of the computer feels different from paper. Both the software, including everything running in the background, and the hardware impose some limitations that change the note taking task.

One student discovered this first hand when his tablet hibernated towards the end of the lecture because the battery ran out. Another complained about the physical size of the screen.

The Tablet PC tries to emulate a single physical page (or most of a page), but that does create a rather small, fixed area to work in. With paper, it is extremely common to have at least two pages immediately viewable and available to work in, such as with an open notebook. This area can grow or shrink depending on the environment unlike the Tablet PC's.

#### *4.4 Conclusions*

In our exploration of the Tablet PC as a note taking device, we found that it did not meet everyone's needs equally. Similar results have been found in other domains (Edwards and Barnette 2004). Some of the factors affecting this included the speed at which people could use the Tablet PC, the size of their writing, and how they reacted to the digital nature of the device. People want to take notes quickly. That may be writing, typing, or a combination of the two. While it would seem the Tablet PC is ideal for this, it imposes its own limitations. Switching between writing and typing may slow some people down. Changing modes, from selection to pen to highlighter to typing, may impede others. The size of the note taking area could also cause the users to spend more time navigating through their notes. Depending on their style, this may limit them too much to be useful.

The user's writing size can be a difficulty here as well. The fineness at which one can write on the current tablet devices is not close to the fineness at which one can write on paper. Writers, especially those who write small, may find that they have to write larger or write slower to be able to read what they put down.

There are also other computer related issues to consider. Batteries can run down, devices can fail and programs can crash. Even aside from those more dire events, programs take time to load and have to share resources with other programs. This may mean that they do not respond as quickly as the user may desire. It is extremely annoying to try to write with a pen that is running out of ink and it is just as annoying to try to write when the program is in a selection mode or when it loses focus to another window. Some people will consider this a reasonable trade for the extra functionality, but others will not.

We know that taking notes is a beneficial activity (Intons-Peterson and Fournier, 1986), so we want to support the students in this behavior. That may be providing students with access to the devices but not forcing their use. Why try to fix something that is not broken?

## **5. ACKNOWLEDGEMENTS**

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## **6. REFERENCES**

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