The Use of iPad as a Learning Tool

Final Report

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Introduction

Today the scope of e-books is increasing, and people are adapting to use these form for consuming new material, both on computers and also on e-book readers such as the Amazon Kindle, Boox and the iPad. Although this is at an early stage, e-book readers have several advantages by being easy to access, user friendly and they have a lot of functionality (Springer.com, 2010).

The university library at the University of Oslo use 75 percent of its spending on electronic literature (Nipen, 2010). Some of these spending on electronic literature are curriculum and licenses to research articles for the students to use in their studies. The library wants the students to increase their use of resources such as these. This is part of the reason for the library to arrange this project. This fall 40 master students at the geology department, who are attending the master course “GEO4220 - Depositional environments and biostratigraphy”, have got their entire syllabus on an e-book reader, an iPad. On this device they can read the syllabus, take lecture notes, make annotations and highlight important passes in the curriculum. This should be a great way for the students to easy access the course material and other electronic material they will use in their study. Another aspect to this project is to examine the environmental purpose of e-book reader. Many students print out material such as articles and slides related to their studies. Providing them with e-book readers could be a great way to lower the printing of materials among the students.

Goals – Problem Space

There are several parties in this project, and each party has had different goals. Our goal was to see how the students interacted with the iPad and if it was suited for a learning tool. Questions like: “Can it replace the textbook?”, “Will the students print less?”, “Does it provide the necessary functionality?” and “How is the readability on the iPad?” are things we have tried to find answers to. We looked at how the students used the iPad in their studies, and for which purposes they used it for.

Our goal was not to convince the geology students that the iPad is perfect for studying, or make them use it against their will. The most important thing for us was to see if they used it or not, and the reasons for their choices. We have also looked at how the students use the iPad in their leisure time, with entertainment such as books, music, games and movies.

The university library’s goal was to be more eco-friendly. There are several reasons how this can be accomplished. When we started this project, many of the geology students printed out a lot of their syllabus, especially graphs and drawings. If they can annotate directly on the iPad, they do not have to print it out on paper, and that will be more eco-friendly. In addition, they do not have to buy books in the future if the iPad project is successful.

Another issue we have been looking at is the syllabus. Some electronic syllabus is made for reading on e-book readers, while other syllabus is just PDF files of copied books.

Apple iPad

The first commercially available tablet PC, GRIDPad, was released in 1989 (Wikipedia, 2010a). Over the years, several models have been released, but none has received so much attention as the iPad from Apple (Figure 1). Even before it was released in Norway, the estimated number of iPads in Norway was over 50,000 (Jørgenrud, 2010). This means that over one percent of the Norwegian
population had an iPad before the official release in Norway (11/30/2010). With the release of iPad, several other tablets by other manufacturers have found their way to the market, e.g. Samsung Galaxy Tab.

The iPad has a 9.7 inches capacitive touch screen. In addition to being a tablet, the iPad is also an e-book reader. There are also e-book readers made only for that purpose, with the most known being Amazon Kindle. Kindle uses an E Ink display, which requires no power to maintain a static image (E Ink, 2010). On the iPad you can use more features than on normal e-book readers, for example watch movies, listen to music, browse the web, play games and much more. The iPad also has access to thousands of applications from App Store (Apple Inc., 2010).

![Image of Apple iPad](image)

**Figure 1 - Apple iPad.**

**E-books**

Wikipedia defines e-books in the following manner: “Electronic book (also e-book) is a text and image-based publication in digital form produced on, published by, and readable on computers or other digital devices. Sometimes the equivalent of a conventional printed book, e-books can also be born digital. E-books are usually read on dedicated hardware devices known as e-Readers or e-book devices. Personal computers and some cell phones can also be used to read e-books” (Wikipedia, 2010b).

E-books have been available for a long period of time. In 1971 Michael S. Hart started the Project Gutenberg, which is a big volunteer based digital library. Michael S. Hart wanted to make available books belonging to the public domain in free electronic versions, because their copyright has expired. It got a slow start with only ten books online in 1981, but in the 1990s when people really started using the Internet, the numbers of titles in the Gutenberg library also increased. The number of
electronic books rose from 1,000 titles in 1997, to 25,000 in 2008, and these high-quality e-books are being downloaded by the tens of thousands every day (Lebert, 2008).

Figures from Amazon, which is one of America’s biggest booksellers, also show that e-books are becoming more and more popular, and that the consumption of e-books is steadily increasing. In the article “E-Books Top Hardcovers at Amazon” (Miller, 2010) Miller says that Amazon’s sales of e-books outnumbered sales of hardcover books. Amazon told that they now are selling 180 e-books for every 100 hardcover copy, and this also includes titles not available in electronic form.

In addition to this, we also see a trend in open access, and the interest of open access has grown significantly in the last two years. The publisher Springer bought the BioMed Central in 2008, and by that they became the largest open-access publisher on the in the world. The number of publishers who offers open-access to their writers and the journals they publish has increased from nine percent in 2005 up to 30 percent in 2008. By providing a great deal of journals and articles electronically that are accessible for everyone, it has became simpler to get the information once are looking for (Mort, 2009).

Other projects and research

iPad research at Stanford University

In August 2010, 91 new medicine students at Stanford University School of Medicine received an iPad in a pilot project where the university examined “mobile technology into academics”. All the medicine students got a stylus and an iPad cover in addition to the necessary applications. Stanford is one of several schools in the United States that are doing studies on this subject. The main focus they had was “experimenting with iPads as a way to lighten the load of textbook-toting students, and to learn how best to teach extremely tech-savvy generation of students who’ve grown up in a wired world” (White, 2010).

At the start of the project the students got facilitated all the necessary curriculum on the iPad, as well as an introduction to how to use the iPad. The students could choose themselves if they wanted to use the iPad for teaching or not.

Three months after the course started, there were 68 people that used the iPad to take notes in the lecture, while eight was using the laptop and the remaining used a combination of technology and pen and paper.

The e-reader pilot at Princeton

In 2009 a group of students at Princeton each got an Amazon Kindle DX to use for study purposes. They focused among other things on whether it could help reduce printing and photocopying, if the technology contributed to a better experience for the subject and on the strong and weak aspects of e-readers (Princeton University, 2009).

Their findings was that the amount of printing was less than half of the usual, compared to a control group who did not use e-readers. The responses they got from the students were that the reading experience on the e-readers was good. The classroom experience was not that good because the e-
book reader was slow to navigate and the writing tool was difficult to use compared to pen and paper.

Applications
The geology students had to download three apps to the iPad. It was iAnnotate PDF (55 NOK), Elements – Dropbox Powered Text Editor (29 NOK) and Dropbox. iAnnotate PDF is the app they can read the syllabus on, take notes and annotate. In Elements they can take longer notes and synchronize to their Dropbox account, which means that they can get access to all the notes from any computer in the world. With the Dropbox application they can log in to their Dropbox account and get access to all their files in their Dropbox account.

Users
The users in this project have been master students who have attended the course at the geology department called “GEO4220 - Depositional environments and biostratigraphy”. There were 40 students in total, who were mainly between 22-35 years with some exceptions. 50 percent of the students were from Scandinavia, 25 percent from Asia and the last 25 percent were from Africa or someplace in Europe. All the students got to lend an iPad the entire semester. They also got the necessary course material for free on the device. In order to download the course material and make it work properly, they had to set up some applications and the necessary accounts to both the iTunes Store and Dropbox.

In order to get to know our users, we met the participants of this project in the start of the semester. We then helped handing out the iPads, and we made sure everybody got the required applications, which are applications they needed for downloading the syllabus and to read the syllabus. Many of the students were not familiar with such touch devices, so we helped them to set up the required accounts and the installation process. We then showed them a little bit of how the iPad worked, how they could make annotations and highlighting words and sentences, and how to navigate through the syllabus. By getting to know the users, we hope the participants in the project will have more trust in us. By establishing a good relationship to our users, we hoped that it would be easier for the students to reply more accurately in the survey, and also, not because they have to, but wanting to participate in the workshop later in the semester.

The students that were attending the GEO4220 course are what we call direct users. They are the users who interact with the iPad directly and are the primary users of the device. However, there are others who also can be thought of as users. Examples of these are the teacher of the course, lab assistant and the people working in the library. We can say that they are secondary users. The last group is the tertiary users, which consists of the people in the university who make the purchasing decision. These tertiary users can also be put in the group of stakeholders, together with the manufacturer of the e-book readers and the developers of the different applications the students are supposed to use (Sharp, Rogers, & Preece, 2009).
Data gathering
We have done several types of data gathering during this project. The four key concepts in data gathering are goal setting, the relationship between the data collector and the data provider, triangulation, and pilot studies (Sharp, Rogers, & Preece, 2009). It’s important to have clear goals, and the goals will clearly influence the data gathering session.

Our goals for the data gathering were to see how the students interacted with the iPad. We also wanted to look at how the students used the iPad in their studies and spare time, and for which purposes they used it for. We had a professional relationship and a good dialogue to the students participating in this project. In the start of the semester, they signed a contract saying that they had to participate in one survey and one workshop. We also told them that the answers we got only were going to be used for study and research purposes. The third key concept, triangulation, means that you should use more than one source for the data you are gathering. The way we did this was to observe the students, having a survey and a workshop.

Observations
When we handed out the iPads in the beginning of the semester (Figure 2), we took the opportunity to do some observations. We observed how the students used the iPad for the first time. They had to do several tasks to get everything on the device up and running. We also asked them simple questions, e.g. “Have you used an iPad before”.

Survey
We made one survey the GEO4220 students had to answer. For the survey, see http://www.surveymonkey.com/s/DFVZQ83. We organized the survey in categories with relevant questions in each category. The questionnaire was primarily designed as a closed survey. We did this
because we wanted the participants to answer many questions in a relatively short time. By making a questionnaire with closed answers, it makes it easier to collect and analyze the answers. We made the survey in SurveyMonkey, which is an online survey software and questionnaire tool for creating web based surveys. This is a tool that is very widely used and has a lot of functionalities that are useful. The benefits of creating a web-based survey included:

- Faster response.
- Simple to change errors.
- No printing and dispatch costs.
- Simpler to analyze the answers.
- Saving time when analyzing the answers.

We spent a lot of time creating the survey since it is important that no questions are leading, and that it was easy to understand the questions (Sharp, Rogers, & Preece, 2009). The questionnaire was made in cooperation with two master students who write their master’s thesis on the same topic. We had several meetings where we discussed the various categories and questions before the survey was finished.

At the workshop, we separated the students into several different groups. The groups consisted of two interviewers and four to six geology students. We used a semi-structured interview. This interview type has both closed and open questions, and in this way we could get a conversation and discussion going (Sharp, Rogers, & Preece, 2009). For exactly remember what happened at the workshop, we recorded all the sessions and transcribed the recordings afterwards. By reading the transcriptions afterwards, all the interviewers could get a good hold of what happened in the other groups.

**Findings**

**Workshop**

It seemed to be an agreement of the students that it took too long time to do annotations on the iPad during lectures. The lecturer was moving too fast, and they did not have the time to do annotations on the iPad. This applied to both iAnnotate PDF and normal note applications, e.g. Elements or the native application Notes. Some of the students wanted to have a stylus to use on the iPad. They said that it would be much easier to annotate with that, because that was something they were familiar with. It would be faster, and they could also pay more attention to the lecture.

At the workshop, we showed them an application called WIRED Magazine (Wired, 2010). This is an app that is made to read Wired magazines, and what makes it good is that it combines text, images, movies and other interactive media very seamless. We got them to imagine that there were their curriculum that was the content in this app, and asked them what they thought about what they saw. They said that this was very easy to use, and it was cool how everything was so integrated in each other. They especially pointed out how they could use this if their own content was in the app. If they for example read about one kind of rock/mountain formation, they could read about that, and on the same “page” they could see a moving 3D model of the thing they read about. Or if they would see a small movie, they could do that too.
All in all the students concluded that it was easier to consume content on the iPad than to produce content.

**Personal use**

Today it is very common to have a smartphone; this could be a touch phone running Android or an iPhone. These mobile phones are very similar to the iPad, and are build upon the same touch conventions only the phones are smaller in physical size.

Several of the persons at the workshop were daily using smartphones. They used these devises for purposes like entertainment, such as watching movies and listen to music and also for keeping themselves updated with news, emails and social medias. One of the persons at the workshop told that he regularly uses an iPhone. He has used his phone both for watching movies, read email and browsing on the Internet. He likes the portability of the phone, but think the screen is to small for these purposes. Therefore he found the iPad very suitable for those purposes. He found the screen on the iPad to be perfect size and much more portable than a laptop. With the iPad he enjoyed watching movies while he was traveling. Because of the big screen on the iPad, he could view emails more detailed than on his phone. Also the virtual keyboard was much easier to write on.

Quote: “I have an iPhone and it’s not very good to watch movies at, because it has to small screen. So I think the iPad is much better for watching movies, it has a pretty large screen that is portable.”

Although several of the participants said that they probably do not need this device, they all agreed that the iPad is a good “travel mate”, that would be very practical to use if they should do a lot of travelling. With the iPad comes the chance to store enormous amounts of data. In this, it is possible to store everything from notes, to music, to films and e-books. It has this big screen, but yet it is very portable.

**Eco-friendly**

Many students are printing a lot of pages per semester. UiO bought 53 million sheets (UiO, 2010) in 2009 for the students to use for printing and copying. UiO wishes to be more eco-friendly, and hoped this project could get the students in the iPad project to print less curriculum and lecture notes than they used to do. Since the students have the curriculum available on the iPad, some of the research was to see if the students were printing less or not, and whether the iPad could take the place of the traditional books in the future. The result after the survey showed that 19 of 28 students had printed less because of the iPad. This indicates clearly that the iPad has an influence on the total number of copies and printed sheets.

50 percent of the students have also refrained to buy the curriculum book because they have the curriculum available on the iPad. This is also a good result considering that it was the first time many of the students have used an e-book reader.

When the geology students tried to use the virtual keyboard during the lecture, they seemed to fail because they didn’t manage to listen to the teacher while they were typing. One of the reasons was that very few of the students knew the virtual keyboard, and that the teacher often was drawing shapes, which turned out to be difficult with only their fingers on the iPad. Some said that they probably would have used the iPad more if they also were provided with a stylus.
The iPad combined with group sessions
During the workshop many participants told that they used the iPad during group lectures, were they worked with assignments and discussed the course material. They found the iPad more similar to a regular notebook compared to what a laptop is. They found it easier to “share” and show each other what was on the screen, like content from the textbook and the lecture slides. By working in that way, it was easy to discuss the curriculum and work together with tasks. Since the iPad has a Wi-Fi connection it could also be used as a good tool for collaboration through the Internet. What we heard during the workshop was that the students shared and collaborated with the iPad, but not in the way we thought they would. They did not know of the functions were you could share notes and drawings made in the curriculum through email. In the group sessions, where they were working on assignments, they meant that the iPad was quite handy, both for the easy way to share and collaborate with the iPad, and also the fact that they did not have any computers in the lab where they were working.

Taking notes on the iPad
One of the questions from the questionnaire was about taking notes in lectures (Figure 3). 82 percent answered that they were still using pen and paper, and not the Elements application provided to them for taking notes. On the workshop we wanted to investigate this further and found the following: The students said that adapting from their studying methods takes time. They have used pen and paper for notes since primary school, and therefore it is not that easy all of a sudden to adapt to these new methods. Many students also told that they had not started to read towards their exams yet, and in that way they have not used the iPad that much for studying purposes.

One of the students said: “I guess you just have to use the iPad. If you use it, then you get used to it. Like when the digital clock first came on the market.”

Both reading, highlighting and annotating on electronic syllabus was new for most students, and therefore it was hard to make this new adjustment to annotate and highlight in the syllabus on the iPad. On the question about the disadvantages about the iPad, about 40 percent answered that they found the function regarding the annotation in the syllabus hardest to use.

![Figure 3 - Question from questionnaire about how the users were taking notes.](image-url)
Ownership
After this semester is over, all the students have to hand in the iPad (they can buy it for 3,000 NOK, but this was something they were informed of after the workshop). Many of the students said that because of this, they would not make a big effort to annotate and highlight in the electronic syllabus. The participants told that if they bought the textbook in this course, they would put more effort in the annotation and highlighting part. In that way they could use the material later in their studies or in a future job. They also said that downloading applications and spend time and money on the iPad would not be that great since they had to hand it in anyway.

In the two meetings we had with the students, many of them were carrying the iPad in its original box. We thought that was a bit strange because of the portability. This also led back to the question about the ownership. In order to not damage the iPad they used this original box for protections. Since it was not their personal device, and also the fact that they were going to hand it in, they wanted to be extra careful with it. In the workshop they told about a protective case for the iPad. By getting one of those it would have protected the iPad more and the iPad would have been much more easy to work with in different locations.

No wireless Internet connection at the student dorm
We found out that many of the students in geology course lived on student dorm room where they did not have access to wireless Internet connection. Because of that, the iPad’s fully potential couldn’t be utilized at home. They still had the ability to read and take notes on the iPad, but the Internet issue was a factor to destroy the workflow. When they are not connected to the Internet, they were not able to search up other articles on the topic and communicate with classmates over the Internet.

Readability
In the article “eBooks - The End User Perspective” (Springer.com, 2010) they have made a study regarding readability of e-books in different formats. The users in this study said that it was some difficulties reading these e-books from the screen, and they rather preferred traditional printed books. Printed books gave them more reading comfort and printed books were also what they were used to. That was the main reason for not using e-books more often, and sticking to the paper based books.

In the article from Springer it said that: “The primary advantages of eBooks for end users revolve around convenience and information access. Users said that they value the ability to access eBooks anytime and anywhere and appreciate that access is fast and easy. Full-text searching was also named as a top eBook advantage”.

Also the students at the workshop preferred to read syllabus from paper based textbooks. One of the reasons for this was that reading from paper based books was the way they were used to read.

The application iAnnotate PDF provides functions like highlighting and searching through the syllabus. In other studies searching through digital content have been looked at as a great advantage. This advantage could save time and also be a good way for navigating. Feedback we got from the workshop was that the students found it difficult to navigate through the electronic curriculum. One of the reasons for this, they said, was the loading time for each page in the syllabus. In that way it was very easy to disrupt the workflow, and start doing something else on the iPad, like browse the
Internet or check their Facebook accounts. Another answer was that with a physical book it is easier to browse quick through content, and in that way find what you are looking for much easier. One of the students told that she always had a mental picture of the page she was looking for, and therefore browsing through a paper based book, which do not take that many seconds, it is much more easy to find what she was looking for.

Like we said earlier, all the students got the syllabus for free in PDF files on the iPad. The PDFs that are provided are direct copies of the printed textbooks used in the course. In the article “E-book acceptance: what will make users read on screen?” (Mercieca, 2004) there is a section about what to choose of between printed or digital books. The students who were a part of the study in this article said that they tried to read the PDF files from screen. But after reading continuous three or four pages, they said that they started to suffer from eyestrain. One of the reasons for this could be the 11-point font size used for the body text of the PDF document. This obstacle should not be an issue on the iPad, since the reading program iAnnotate PDF has good zoom functions. Also the article made by Reichenstein (Reichenstein, 2010) said that the iPad is much more pleasant to read on than a regular LCD display, because of its new screen technology. The participants on the workshop appreciated the zooming functionality. Although they have not used the iAnnotate PDF application that much, they liked the zooming functionality the iPad provides. If they for example got printed tasks and lecture slides with pictures of oil wells and graphs, it could on a printed copy be hard to see what the pictures was showing. But with using the iPad they could zoom in as much as they liked, as long as the pictures was good enough. This was for them a great advantage, and made it easier to work with the tasks they got in their group sessions.

**Prototyping**

**Introduction**

Our focus in this project hasn’t been on developing a good prototype, but we had to include the prototype and an evaluation in the final report to show that we have prototyped and evaluated it. For the midterm report we made a prototype to improve the user interface in iAnnotate PDF and change between tabs in iAnnotate PDF.

**Identifying the needs**

Before making a prototype, it is important to identify the needs of the user group that will make use of the product (Sharp, Rogers, & Preece, 2009).

In our case the needs of the students is to find out if there is lack of functionality in the applications, or what kind of applications they are missing on the iPad. We had to make two prototypes before the students started using the application regularly. Therefore it was difficult for us to find out what the needs were. We had to use the applications our selves to try to find something that could have been useful for the students in the geology course. We therefore had to learn the applications the students downloaded, and try to find out what functionality was missing in the applications, or if they needed some other applications. Optimal would have been that the students had used the applications for a period, and after that we could do a survey to find out what they actually needed.
Prototyping
We have not prototyped any new applications, but we have used and played around with the iAnnotate PDF application the students got for reading the syllabus, and we have come up with some new ideas for improving the existing user interface. We have made a couple of low-fidelity prototypes for more functionality and hope that it will improve the application in general.

Prototypes can be categorized into two categories, low-fidelity and high-fidelity. Low-fidelity prototypes are quick and easy to make, and are often made of paper or other cheap material. They are great for testing new concepts and test out new ideas without actually implementing the new ideas in an early stage of the project. You can produce several prototypes with different concepts in paper, and have users to test them. Then you can gather information from the user tests and make a design decision based on that. This is also a much cheaper way to test out your ideas, then implementing them in a system (Rudd, Stern, & Isensee, 1996).

High-fidelity prototypes on the other hand are often using materials you will find in the final product. It can for example be making a small part of the software or user interface. For this it is common to use prototyping programs like Axure, or you can make one in PowerPoint.

Prototyping to improve the user interface in iAnnotate PDF
We think that the main functions in iAnnotate PDF are to make annotations, do highlighting and be able to search through the syllabus. Therefore we have put the search bar in the top of the application. At the right side of the application we have placed an expandable panel. When the panel is not showing, the pages of the book will have more space on the screen. When it is expanded it will show the main functionality.

When the annotation button is pushed, all the annotations will show up. As you can see in Figure 4, they will appear as thumbnails. It is possible to scroll through them, and when you press one you will be taken to the page where that note is taken. Also the feature to share notes should be implemented. The application got a feature to send notes over email, which is a great thing. But since this application supports Dropbox, it should also have the opportunity to collaborate and share notes through a shared Dropbox folder. When being in “annotation mode”, you can also make notes in the text, simply by pressing the page where you want to make a note.

![Figure 4 - Prototype of iAnnotate PFD user interface.](image)
When the highlight button is pushed, the expandable panel will show the pages in the book as thumbnails. In Figure 5 you can see where highlight is done in the thumbnails, and you have the opportunity to navigate through the page thumbnails. Press a thumbnail, and the application will take you to that page.

Figure 5 - Prototype of iAnnotate PDF annotation functionality.

Figure 6 - Prototype of iAnnotate expandable panel.

The last button to push in the expandable panel is a tool button. Here you have preferences and settings.

The buttons on the expandable panel should be formed with different symbols. The annotation button should look like a pen and notebook, the highlight button should be formed like a marker and the preferences and settings button should be formed like a tool. In this way we avoid having to use text to all the buttons.
Prototype for switching between tabs
One of the things that can help the program to gain a better workflow and be faster to use, is the opportunity to swipe with three fingers to switch between open tabs. Apple has already included this on the multi-touch track pad on their notebook series, and therefore we will reuse this way of thinking in the application.

First draft
This (Figure 7) is a drawing of iAnnotate PDF where the three red lines indicate that it is possible to swipe three fingers to each side to change between the tabs.

Figure 7 - Prototype of iAnnotate three-finger swiping.

Illustration
On Figure 8 you can see that the article to the left is open. While the three fingers are touching the screen and swipes to the right, the meaning is that the next tab shall be the selected one, as you can see on Figure 9.
Evaluation

There are three different approaches to evaluation. It is the field studies, usability testing and analytical evaluation (Romero, 2009). The plan was to test the prototypes on the student at the workshop we had, but because of the time we had available and the fact that the prototype not was our main goals we had to drop that.

We were thinking of do a usability test on the improvement of the interface in iAnnotate prototype, but because we didn’t have time on the workshop to test it, we ended up test the other prototype with the DECIDE framework (Sharp, Rogers, & Preece, 2009).

Evaluation of Prototype for switching between tabs with DECIDE framework

We decided to evaluate the prototype for changing between tabs with the DECIDE framework. That is a framework to determine the goals, explore the questions, choose the evaluation approach and
methods, identify the practical issue, decide how to deal with the ethical issue and evaluate, analyze, interpret, and present data. Since this prototype is an extra function in iAnnotate PDF, the DECIDE framework isn’t the most suitable, but we wanted to use it to learn more about evaluation framework in interactive design.

**Goals:** The goal was to find out if this idea was something that could improve the workflow in iAnnotate PDF.

**Questions:** Is this function something the student had been using if they had the opportunity? That is the main question for this prototype.

**Evaluation methods:** The method we did use a kind of field studies were we asked questions whether they liked the idea or not.

**Practical issues:** The main problem is to get this function implemented. First of all we do not have the source code, so it is impossible for us to do it, and it is very time consuming to develop an application.

**Ethical issues:** We cannot find any important ethical issues for this prototype.

**The evaluation:** The response we got was positive. People liked the idea and thought they had used the function if it existed. It wasn’t a big problem to switch between two tabs, but in some cases they had to push several times on the tab before it switched to the desired tab.

**Discussions**

**General discussion**
When this project started we thought the students would be very excited about this project and also that they got to play with this new technical device. What we found out during both the questionnaire and the workshop was that the students had not used that much time with the iPad, both for entertainment and for studying purposes. One of the reasons was the feeling that this was not their own device, and that they had to hand it in at the end of the semester. But many said that they liked it for entertainment purposes, like watching movies, using Skype, Internet browsing and social medias. They thought it was a good size and would have been perfect if they did a lot of travel and wanted to bring with them many books and movies.

Many complained about the iAnnotate PDF application for highlighting and annotating. They said that it lacked functionality. One of the reasons for saying so could be the lack of information about the use of the application. With iAnnotate PDF it is possible to highlight and annotate in the text. In addition you have functions like bookmarks, searching through content, taking notes inside the syllabus and make drawings. For example all the notes and drawing could easily be transferred through email to their personal computer.

But we think the main reason for not taking notes and annotate on the iPad was the part of the ownership and also that the student not were used to this new technology. They have used other studying methods all their life and therefore it is a bit hard to change that all of a sudden.
Curriculum
As we have seen from the results of the survey and at the workshop, there have been some issues by having the curriculum on the iPad. The university faces many challenges when moving to digital curriculum.

The potential by having the syllabus on the iPad is huge. We have seen how e.g. the application WIRED Magazine utilizes the potential in the iPad. The way you can flow through different kind of media at the same time is a big advantage, especially for the geology students, because they depend on having models and figures when they are studying.

Today’s digital curriculum is only PDFs directly from the book, so it brings nothing new to the student, other than that it is on the iPad. This may be one of the reasons for why not many of the students read the syllabus on the iPad using iAnnotate PDF.

Another big problem was that iAnnotate PDF was very slow when rendering the PDFs from the syllabus. If you slide to another page, it uses several seconds to load. This is something that disrupts the workflow. And if you zoom with your fingers, it also uses many seconds to show the content. Other PDF files we tried (not the syllabus) rendered much faster. This may show that some of the problem lies in how the syllabus PDF files are made. We think that the rendering times would have been significant lower if the syllabus somehow was optimized for PDF files.

In a perfect world, the syllabus and the app used to read it would probably be much like WIRED Magazine. But this is probably far in the future. We think the biggest challenge is to make the textbooks and the syllabus into this format. We know that the technology is there, but to make 3D models digital is a time consuming job.

Eco-friendly
It is a good thing that the student is printing less because of the iPad, but we think it could have been even greater proportion that had printed less if the students had received a stylus to use on the iPad. Then maybe the gap between pen and paper to the iPad had been smaller.

But we can not know that for sure, because the iPad is made for finger use mainly, the stylus is an additional tool that third party companies has made to make it possible to write on the iPad with a pen. Several of the students asked for a tool like this at the workshop, but we can’t know for sure that all of the students would have used it.

Another factor that could have made the student print even less, is if they had better information about the possibility that they could download the lecture notes on the iPad as well. But we can’t know that for sure.

No wireless Internet connection at the student dorm
That many students didn’t have wireless Internet access may also have contributed to that fewer have adopted the iPad active to other things too. Since you need Internet to do many of the tasks on an iPad, as for example, all the applications available requires that you are on the Internet to download it. Some applications need Internet connection to use. When students are in school with Internet access they does not have the time to explore the entertainment portion of the iPad.
What could be done different?
We think that there are a couple of things that could have been done differently, or be done differently in similar projects:

- Every student should have received a cover to the iPad. It would contribute so the iPad had been more ergonomic and made it much easier to write on it. With the cover, the iPad is also more protected and the student doesn’t have to worry about destroying it.
- Had the students got a stylus, the transition from pen and paper could have been easier.
- At study startup, we believe that it would have been a good idea if it had been conducted a training lesson of how the iPad operates, and what opportunities it has. This had possibly been involved in creating a greater interest for the device.
- It turned out that the curriculum was not fully optimized, which led to a loading time of several seconds when zooming and open new pages in the curriculum. Optimized curriculum could contribute to a better workflow.

Conclusion
Based on the findings we did during the workshop and the questionnaire, we think that use of this new technology is at an early stage. Students have to adapt to new studying methods for making their studying efficient with this new device. It also requires both guidance and education in taking new tools, such as the iPad, in use.

With these new ways and opportunities to show content, the publishers have to work harder to meet the demands of the students. In order to start using such new technologies, students demand that it have to be more efficient than a regular book, and that it will give them a learning benefit, while it also should be fun. The publishers have to make the content interact with the student, with for example embedding 3D models and videos in the text. It cannot only display a direct copy of the textbook.

As we said in the beginning of this article, e-books are becoming extremely popular, and therefore it will be a good marked for e-book readers such as the iPad. The students find the iPad much more portable than a regular laptop computer, and they think it is an excellent device for use during traveling. They also think it is good for entertainment; they said that the screen is much bigger than a cellphone screen, but yet portable, and therefore got for entertainment use such as browsing the Internet, watch movies, read email, and stay in touch with people through different social medias.

Our findings indicate that the students have reduced their total amount of printing. This is consistent with the study conducted at Princeton. This could in the long run be more eco-friendly, and the university could save money both on buying printing sheets, and also equipment for printing and copying.

We think the students have to adapt to new studying methods, and also learn and be familiar with new technology. By introducing e-book readers in early stage of the education, it gives the students the opportunity to adapt to this technology and acquire study habits to suit this. We hope to see studies like this also in the future, with more interactive syllabus, optimized for the this new technology, which the iPad enables.
Bibliography


