

## Focus Group Study on Student Perception of Electronic Textbooks

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**Abstract**— Electronic textbooks are a common topic in academic research, yet the future is not being investigated from a student perspective. This paper aims to add to the current research by outlining students' reading habits in physical and electronic textbooks and identify what students believe they need to properly study. This study utilized focus groups with design and engineering students. These disciplines were chosen due to their similar goals, yet different approaches. Findings showed that the two groups of students approach their academic readings in a different way and when looking towards future electronic textbooks require some discipline specific components. Yet, their similarities caused some of their views and ideas to be the same, such as being able to insert their own images into the textbooks and the desire for less text and more interactive components to facilitate their learning. Understanding discipline needs and including student input based on their perceived needs will assist in designing future electronic textbooks that will meet academic needs.

**Keywords** - focus group; electronic textbooks; academic reading; design education; engineering education.

### I. INTRODUCTION

Electronic textbooks are considered the future of textbooks in higher education. Yet, students are not as excited about this trend as many universities. While 60% of students reported using electronic textbooks during their academic studies, with half being required to by their instructors, student preference for physical textbooks has not waned [1]. In fact, many studies have shown that student preferences of some components, such as search functions and long blocks of text, negatively impacted student opinion of electronic textbooks [2].

While electronic textbooks are starting to evolve past simple .pdf representations of the physical text, they are in their infancy. It has been individual schools creating their own interactive electronic textbooks, which are shifting away from the textbook metaphor [3] and creating this evolution. This shift from the textbook metaphor will allow for additional materials and components, which will enhance and assist with the reading task [4]. Yet, creating this type of electronic textbook for individual courses is time consuming and impractical on a larger scale. On the other hand,

electronic textbooks coming from major publishers tend to follow a one size fits all mentality, assuming that all components included in electronic textbooks can be used broadly across disciplines. This is already accepted as incorrect reasoning, as different disciplines are known to approach their education in different ways [5], yet is still in broad practice. Regardless of creating electronic textbooks specifically tailored for courses or broader textbooks, there is still the challenge of selecting and creating new supplemental materials and components for this new type of electronic textbook [6].

Not only would academics and publishers find creating new content difficult, advancing technology and the use of electronic textbooks may have altered the ways in which students use textbooks. Students can now easily read in cafes or while travelling [7], moving away from the desks and tables that used to confine students. Being able to study in more locations may seem positive, but without normal study aides such as highlighters and notebooks, students may find themselves slipping from the deep reading required during revision, which allows for in-depth comprehension and recall [8] to surface reading, which provides students with a more limited understanding of the materials [9]. While some components included in current electronic textbooks seem similar to the support activities students employ during reading, they are noticeably different. For example, many students take notes in the margins of their physical textbooks to support their studying. While electronic textbooks commonly offer notation software, notes are typically not displayed on the screen and require clicking on a small icon to later revisit. This could cause the students to miss their notes or interrupt their reading process leading them to become distracted. In fact, electronic annotation software is used less often than traditional note taking done with a physical textbook [10]. The lack of tangibility associated with electronic textbooks also negatively affects the reading task [11]. Past research has stated that electronic textbooks should enhance current physical active reading activities while presenting an interface that is easy to use [12].

Currently, the components being designed for future electronic textbooks are not being decided by the students [13]. This could lead to new textbooks not being able to

fully support students' study habits and not only failing the student but becoming something that is looked on with derision. The purpose of the focus groups outlined in this paper was to identify, which components are important to students during their studies. Since each discipline has different approaches to studying and different needs, focus groups were separated based on the two disciplines studied: engineering and design. This allows for a better understanding of how these groups of students approach their studies. It also assists in identifying what type of supplemental content needs to be created and what tools need to be included to support academic reading in these different disciplines.

This paper also aims to bring a deeper understanding to the data from an earlier survey released at The Hong Kong Polytechnic University [14]. It also provides insights into how students complete their academic readings in physical and electronic mediums and how they envision their future electronic textbooks based on their discipline specific needs. The rest of this paper is organized the following way. Section II describes the method employed in this paper. Section III presents the results of the focus groups. Section IV discusses the results within the literature and in a more general context. Section V presents the main conclusions and presents some future areas that should be explored.

## II. METHOD

The method chosen to uncover student needs and approaches in-depth was focus group [15]. The focus group method allows for internal validity, a better understanding of the phenomenon that would not be possible through methods that use quantitative analysis, and assists in understanding truly complex issues [15], which are necessary in this type of research.

### A. Participants

Students were recruited from The Hong Kong Polytechnic University. There were two requirements for participation. The first, students need to be enrolled in either an undergraduate design or engineering program. The second, the students needed to have prior experience using electronic textbooks during their academic studies. Once students volunteered for participation, they were placed into three person focus groups made up of participants only from their discipline. Students were overall balanced male and female aged between 18 and 23.

### B. Session Design

Each focus group session was designed to last approximately one hour. The sessions were made up of sixteen semi-structured interview questions, which were followed up with questions related to the answers. Students also participated in two activities during the session. The first activity asked them how they define current electronic textbooks. The second activity asked them to envision their future electronic textbooks, without considering the limitations of current technology. In this activity, students were asked to include components they wanted in their discipline specific electronic textbooks and then asked

questions about how they would interact with these new textbooks. Each session was audio taped and later transcribed.

### C. Data Analysis

Once each session was transcribed, the data was coded. The codes used in this research were grounded in the data [16] and used to organize the data into recurring topics and subtopics for easier analysis and development of theory.

## III. RESULTS

The semi-structured interview questions investigated the habits, task requirements, and preferences of students in regards to textbooks. The questions were broken up into three segments on physical textbooks, electronic textbooks, and future electronic textbooks. The same questions were used for both design and engineering focus groups, although follow up questions differed slightly based on the responses given by students. During the future electronic textbook segment, students were also asked for feedback based on ranking data gained from an earlier survey. Two activities were also completed by students, one during the electronic textbook segment and one during the future electronic textbook section. The results presented in this paper are the detailed results from one design focus group and one engineering focus group. These focus groups were a part of a larger set of focus groups conducted until homogeneity was reached [17, 18, 19].

### A. Physical Textbooks

The questions regarding physical textbooks mostly dealt with student habits regarding physical textbook reading. Overall, design students reported to using physical textbooks around 80% of their time while doing academic readings at a desk at home for around two hours in the morning before lectures. They reported using the textbooks as the main source of learning concepts. The location preference is related to the reported issue of dizziness from reading physical textbooks on transportation. Engineering students reported to using physical textbooks less than 50% of their time while doing academic readings. How often engineering students did academic reading varied greatly from only during exam times to one hour per day in the afternoons and evenings. They agreed that it should be done in the school library due to the quiet environment away from the distractions at home. Engineering students reported that the purpose of their academic reading was to review that they had learned during the lecture.

Investigation into the task requirements of academic reading in a physical textbook was undertaken. Students were questioned about what types of supporting activities they did during physical textbook reading to help them comprehend the material. Design students reported different supporting activities such as summarizing important points from the text into lists, highlighting, and searching for more information by keywords. These students make notes in the margins of the text, or if on a separate piece of paper, they attach it to the original text. Similarly engineering students

reported taking notes in the margins, highlighting, looking over drafts from class, and looking up definitions in the dictionary.

Students also reported some ergonomics issues and other considerations when deciding to use physical textbooks. Both groups of students reported that physical textbooks are very difficult to carry around and that they are much more expensive than their electronic counterparts. Yet, they believe that physical textbooks are much more convenient to take notes in.

## B. *Electronic Textbooks*

### 1) *Definition*

Before answering questions similar to those asked during the physical textbook segment, students were asked to complete an activity in which they defined the term electronic textbook. Design students defined electronic textbooks as “a tool for learning without physical barriers. It contains lots of text, with additional elements including pictures, audio, and video.” During this process, they also highlighted several components as important to their current electronic textbooks such as text, animations, images, video, dictionaries, and infographics. Text was considered especially vital to the electronic textbook as students felt that without text, the textbook loses its main purpose. They also highlighted some ways that electronic textbooks have enriched their learning experience such as facilitating communication, increased mobility, and increased interaction between the reader and the text. Engineering students defined electronic textbooks as “a portable device which includes all notes or text, video, and pictures into one appliance. It is cheap, environmentally friendly, and convenient when comparing to the physical textbook.” Engineering students placed value on the electronic textbook’s ability to search for keywords and additional components such as animations, video, and images that help facilitate their learning. They believe that the main purpose of electronic textbooks is to help students revise concepts they’ve learned in the classroom.

### 2) *Usage*

The questions regarding electronic textbooks mostly dealt with student habits regarding electronic textbook reading. Overall, design students reported that they spent around 20% of their time reading in electronic textbooks in the classroom at their desk during the lecture. The majority of the time they access electronic textbooks, they use laptops. They will use the phone if they need to do a short reading and they feel the convenience outweighs the limitations. Engineering students reported that they spent around 10% of their time reading in electronic textbooks at home or while travelling in the afternoon and evenings. The students access their electronic textbooks on computers most of the time.

Investigation into the task requirements of academic reading in an electronic textbook was undertaken. Students were questioned about what types of supporting activities they did during electronic textbook reading to help them comprehend the material. Design students reported using highlighting tools, music to help them focus, and Microsoft

Word or the comment function to take notes. While design students reported taking notes while reading electronic textbooks, they reported taking less notes than when using physical textbooks. Engineering students reported using built in encyclopedia functions, search functions, highlighting, and screen capture functions most often.

While not explicitly asked about physical and cognitive ergonomics issues related to electronic textbooks, both engineering students and design students brought this subject up. Both groups cited eye fatigue as a major concern associated with the use of electronic textbooks, so students prefer to use them for shorter readings. Design students also discussed how they would rather print long readings instead of viewing them online to facilitate their learning, believing that the addition of too many components may destroy their creativity, and difficulties reading paragraphs in the digital form. While engineering students stressed electronic textbooks were easier to carry and allowed for more mobility.

Students also reported several technical issues and other aspects, which influence their interaction with electronic textbooks. Design students repeatedly reported the battery on their mobile devices as negatively impacting their academic reading along with the scrolling times and the size of the text. Both sets of students also discussed how the ease of sharing and downloading electronic textbooks facilitated their learning. In addition, the ability to take digital notes makes them less likely to lose said notes. Yet, students felt like typing instead of writing made it more difficult to remember and digest the concepts. Engineering students also wished for the ability to draw or write manually in their electronic textbooks, but reported that the current technology that allows these actions are buggy and slow making them unusable. These students also discussed how cost, mobility, and environmental friendliness made using electronic textbooks more desirable.

## C. *Future Electronic Textbooks*

The future of electronic textbooks was investigated in many ways. Overall, design students reported that they would be more likely to use electronic textbooks if they were more interactive. They also desire more features such as accurate text to speech and improved bookmarks that used a sentence or word as the placer. Engineering students also agreed that they would be more likely to use electronic textbooks that were more interactive. They believed that this type of electronic textbook would facilitate their learning, speed up their work progress, and make them more efficient students. They wanted less text and more components such as 3D and manipulatable pictures and videos to help illuminate the concepts.

When students were presented with information regarding the answers from the previous survey, design students agreed that the top five components chosen were appropriate. They believed that text was more vital to the learning experience than students in the survey rated it, but agreed that the readings they have to read are diverse and that a lot of it seems unimportant to them, which could have influenced the ranking. Design students also reported that

the findings of the undesirable components from the survey were valid. Engineering students thought survey respondents had overestimated the importance of text and underestimated components such as 3D images. They believed that this was because respondents chose components they were more familiar with and could envision. Other than that, students believed the other components chosen as desirable and undesirable were valid.

After this general information was gathered, students were asked to complete the final activity in which they were given free rein to create the perfect representation of an electronic textbook for their discipline. As this was without the constraints of current technology, many of the solutions students presented would not be fully functional at this time. Design students produced a sketch of their electronic textbook, keeping notes on functionality and features surrounding the sketch (see Figure 1).

Their electronic textbook took inspiration from Adobe Illustrator’s interface and included the ability to add notes or photos directly inline, bullet form text instead of paragraphs, adjustable line spacing and text size, a table of contents, video, audio, adjustable images, bookmarks, the ability to synchronize across devices, translations, a dictionary, and an encyclopedia. They felt that highlighting and annotation tools would no longer be needed in their future electronic textbook because there would be much less text. Students built in the ability to hide unimportant content automatically by extending the text by clicking on the bullet point text. Many similar components appeared in the engineering future electronic textbook, yet the representation students chose to convey their textbook was a list form (see Figure 2). This electronic textbook also relied on less text, yet included some discipline specific aspects like interactive equations.

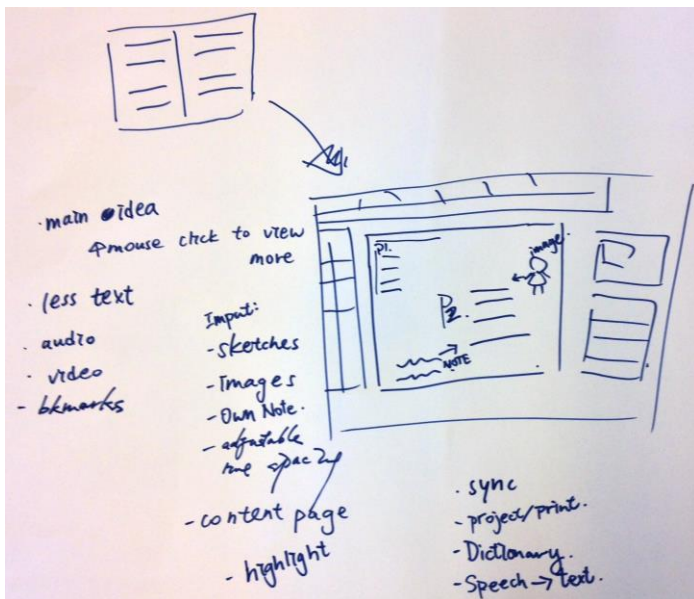


Figure 1. Future electronic textbook by Design Students.

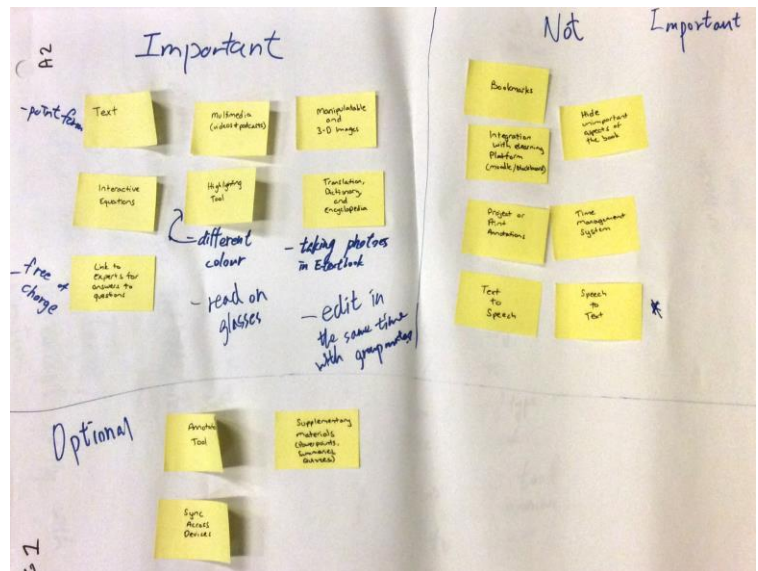


Figure 2. Future electronic textbook by Engineering Students.

#### IV. DISCUSSION

##### A. Student Usage

Student usage of physical and electronic textbooks differed in both disciplines in all aspects of use. The mobility offered to students by electronic textbooks change where and when they do their studies. Even with this ease of downloading and mobility, students still reported that they preferred physical textbooks [1]. Similar to what past research has uncovered, students do not want to read long blocks of text in an electronic textbook [2]. Many of the focus group participants reported that they would print out long readings, rather than printing them on the screen. Printing out pages from electronic textbooks allows for students to continue to experience the four affordances of spatial flexibility, manipulability, tangibility, and tailorability which students are nostalgic about in regard to print textbooks [11]. Supporting activities also changed for many students. They found themselves taking notes less and becoming frustrated with built in functions such as bookmarking and annotation tools [10]. Repeatedly, students reported taking notes in the physical form was easier and allowed them to see their notes with the concepts, which later assisted in revising the material. By investigating current use of both types of textbooks, the differences in usage, and understanding the reasoning behind the usage design recommendations, such as shortening blocks of text and finding opportunities to incorporate aspects reminiscent of the four affordances, such as the ability to see notes on the page instead of hidden within an icon, can be made for future electronic textbooks.

##### B. Future Textbooks

Student preference for design attributes of electronic

textbooks was similar in both fields of design and engineering, yet several components differed. Overall, all students agreed that text should be limited to the most important information presented in a bullet point form. More information could then be accessed through hovering over the text. Students also felt that creating textbooks that were more interactive would facilitate their learning and allow them to truly understand the material. Based on student responses, making this type of change would rectify the change in reading style from surface reading back to deep reading [8, 9], which is necessary for succeeding academically. While these reported changes may make electronic textbooks more appropriate for the type of reading required, reported interaction may have been influenced by current ideas of electronic textbooks like the students in the focus group found with the past survey results [14]. In addition, student enthusiasm for these components may later wane yet that should do little to the effectiveness of the components [20].

Because of the issues associated with students' dislike of long blocks of text and subsequent effect on reading quality, it is recommended that designers incorporate short blocks of text with extended information hidden. The loss of information in long form can be supplemented with components such as multimedia or other engaging components.

### C. Comparison of Disciplines

While there are many similarities in responses from both engineering students and design students, there were some fundamental differences. One of these differences was illuminated during the second activity in which it became apparent that while similar requirements may be requested, the way students think and interact are different. Design students felt comfortable creating a visual representation of what they thought their perfect discipline specific future electronic textbook was and worked together from the start to create their ultimate proposal. This can be associated with the nature of design being undertaken as a team project. On the contrary, engineering students presented their answers in a list form and instead of compromising and discussing opinions during the creation process, waited until after their individual lists were made to try and unify their answers. This can be attributed to the often solitary nature of engineering projects.

When examining the differences in component inclusion, the discipline requirements become apparent. While both groups of students wanted to be able to add their own photos to the text inline and have text represented in bullet form, engineering students did not feel that taking their own notes were necessary in the new textbook. When asked about this, they stated that the information was now in point form and they no longer needed to take notes. On the contrary, design students still wanted to take their own notes because of the interdisciplinary and creative aspects of the design process. Engineering students also requested the component interactive equations be included in their future textbook, which is consistent with a discipline that requires equations

over those that do not such as design. Based on the educational requirements of both disciplines of students, it is important to ensure that components change based on the needs of the students.

## V. CONCLUSION AND FUTURE WORK

Overall, students believe that future electronic textbooks need to be improved to become more interactive to facilitate their learning and help them fully engage with the material. Although, students can agree on this, when comparing two similar disciplines that share many fundamental characteristics with differences in approaches, it becomes apparent that the one-size fits all approach to textbook design needs to be abandoned. Generally, students place high priority on making future electronic textbooks more interactive, discipline specific, and with less text. Yet, students also note discipline specific components as vital, such as interactive equations, in facilitating the understanding of their work.

While design recommendations such as these have important applications to industry and academia, more research should be conducted to truly verify the practical validity of the components suggested. The educational perspective should also be investigated to understand the use of electronic textbooks as a teaching aid. This perspective is best investigated on an individual basis because of the changing opinions of instructors.

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