Student Perceptions of Digital Textbook Features and Their Effects on Comprehension of Material Presented in a Digital Textbook Format

Doctoral Dissertation Research

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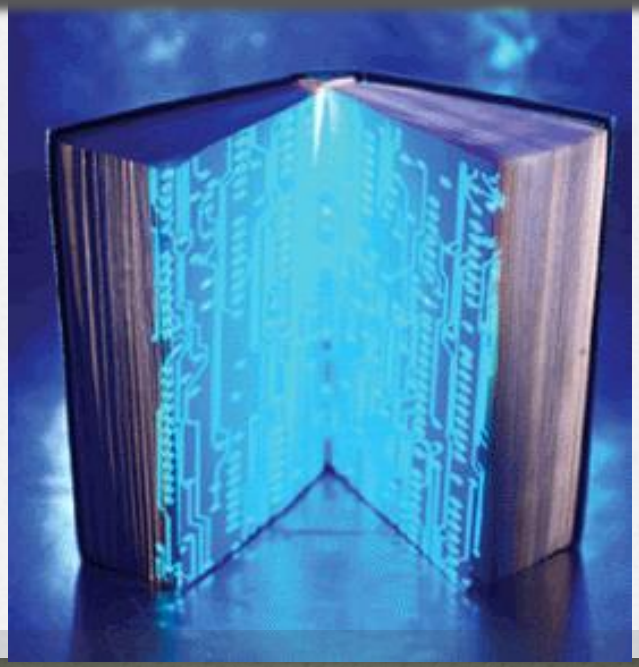
Chapter One Introduction



Chapter One
The Need for the Study

- Digital textbooks are becoming common across all platforms- On-ground, Hybrid and Online
- Legal mandates – NIMAS, 2006
- Students value digital technology:
  - Easy to use on multiple devices
  - Often less expensive than printed textbooks
  - Availability- often instant download upon purchase

Purpose of the Study

- To examine student responses towards specific digital textbook features which are the ***search***, ***highlighting*** and ***single-page display*** features

- To examine student perceptions of their comprehension of reading materials while using these features of digital textbook technology

Limitations

- Study may not address all of the information gathered
- Participants may not be completely truthful in responding – skewing findings
- Lack of control over participants who choose to participate
- Participant demographics may not be representative of target population
- Participants technology may not be able to access the digital features being studied

Delimitations

- One university in one location – realistic sampling of student participants
- Graduate students – targeted population
- Include both genders, 18 years and older, graduate students, digital and printed textbook usage
- Online survey format: asynchronous responses during survey time frame, promoting thoughtful and honest answers

Importance of the Study

- Contribute information to future digital textbook design
- Contribute information regarding student attitudes and use of digital textbook features
- Examine any correlations between feature use and age and gender of participants
- Examine student perceived comprehension of materials using digital textbook technology and features
- Examine student preference for choosing and using digital textbooks

Chapter Two
Literature Review

Introduction

- Technology - deeply impacting the educational landscape and the modern learner (Beetham & Sharpe, 2013)
- Modernizing traditional printed textbooks - digital textbook technology plus modern classroom technology creates a modern learning environment
- Modern students - “wired, networked, and computer savvy” (Blake, 2013, p. xi)

History - Textbooks

- Epic of Gilgamesh, 1300 BC – oldest literature
- The New England Primer, 1690 – oldest textbook
- Digital Textbooks - current technology
  - Enriching the classroom experience by providing an organized system to present information for learning
  - Meeting goals of educational laws: College Opportunity & Affordability Act 2007, SB48 College Textbooks & Electronic Versions 2009
  - Multiple readers available: tablets, smartphones & computers
  - Environmentally friendly and becoming widely available

Digital Textbook Features

- Features available
  - Natural User Interface – looks and reads like a printed text
  - Page turning feature, multiple tabs on one page, content search bars, navigation areas
  - Annotate, bookmark and highlight features
  - Print on demand

Course & Feature Design

- Enhance digital learning environments
- Online portals with search features, study problems, monitoring learning progress
- REVEL – offers interactive content and allows faculty to track student time and performance in assignments
- Quizzes, social notes, enlarge text and images, 3-D models
- Swiping text to scroll, increase/decrease text and images, hyperlinks in touchscreen interface
- Challenges – pirating/stealing information – resulting in move towards open-source free textbooks

Button, 2014

Ross & Johnson, 2012

Rosenwald, 2015

Schaffhauser, 2014

Teaching & Learning Styles

- Engaging students – laptops and tablets, videoconferencing, podcasts (Gill, 2013)
- Apps – WRApp app – web-based research app, allows collaboration between faculty and students, blended teaching style (Carr, 2014)
- Addresses visual-spatial, aural-auditory, verbal-linguistic, physical-kinesthetic, logical-mathematic, social-intrapersonal, and solitary-interpersonal learning styles (Learning Styles Online, 2015)

Institutional Issues

- Tech savvy students, non-tech faculty – slow to fully embrace digital textbook technology
- Digital devices invite distraction – surfing, social media
- Digital textbook shift – driven by publishers, slow evolution with uneven progress

Greenfield, 2013

Rosenwald, 2015

Summary

- Student preferences and attitudes regarding digital textbook technology may impact their comprehension and organization of the information they are studying
- Examining student perceptions and use of digital resources can provide information about how and why digital textbooks and their features are used or not used
- Student expectations for their education have changed with digital technology and it is critical for institutions and publishers to pay attention to the effectiveness of digital textbook technology on student learning

Chapter Three Methodology

Research Questions

- RQ 1: Is there a correlation between the level of use of the specified digital textbook features (Use of Features Score) and the age of the student?
- RQ 2: Is there a correlation between the Use of Features Score and the dummy-coded (with female coded as 1 and male coded as zero) gender of the student?
- RQ 3: Is there a correlation between the Use of Features Score and the students' rating of their ability to better understand what they are reading (Rate of Understanding Score)?
- RQ 4: Is there a correlation between the Use of Features Score and students' preference for using digital textbooks (Digital Textbook Preference Score)?

Research Design

- Quantitative analysis
- Using an online survey questionnaire
- Non-causal, descriptive and correlational approaches
  - Descriptive – if and how students use features, age and gender, printed/digital textbook usage
  - Correlational – relationship between:
    - student use of features and perceived comprehension of materials
    - availability of digital textbooks and use of features
    - availability of and preference for digital textbooks

Participants

- Non-profit, public university in University of Pennsylvania system
- Graduate students in various programs - including education and special education, counseling, criminal justice, English, history, business administration, physical therapy and physician assistant, nursing, and technology instruction
- Both genders, all participants of age 18 and older
- Current demographics as of Spring 2015 – most students in 22 – 29 age range, followed by 30 – 64 age range
- Majority of students are female at approximately 75%
- Exclusions – undergraduate students, any students under the age of 18

Sampling

- Current population of 967 graduate students (Spring 2015)
- Minimum participants needed – 85 participants with parameters:
  - .3 moderate effect size
  - .05 p-level of significance
  - Conventional power of 80%
- With the expectation of a one third to one half response, all graduate students were invited to participate
- An email invitation was sent with study information, access dates for the survey and an access link to the survey

Instrumentation

- The survey - an online survey questionnaire was created through SurveyMonkey and addressed the research questions
- Pilot study – conducted to ensure the survey questions clearly address the research questions being studied, to ensure that the survey questions are clear and focused, and so feedback on the survey questions is being addressed
- Four areas on the survey
  - PQ: preliminary demographic questions
  - DQ: digital textbook feature questions
  - CQ: comprehension scoring questions
  - DS: digital textbook preference scoring questions

SurveyMonkey, 2015

Data Processing and Analysis

- All variables for this correlation analysis were continuous
- Continuous variables – age, Use of Features Score, Rate of Understanding Score, Digital Textbook Preference Score
- Categorical variable – gender
  - Gender variable was converted to continuous variable by dummy-coding using 1 for female and 0 for male
  - Dummy coding allowed for measuring femaleness when correlating with other scores
  - Positive correlation would indicate women tend to have higher scores
  - Negative correlation would indicate men tend to have higher scores
  - All scores were presented in a correlation matrix table

Correlational Testing

- Each hypothesis was tested using correlational testing with SPSS software
  - The first research question was tested by examining the relationship between the age of the student and the Use of Features Score
  - The second research question was tested by examining the relationship between the dummy-coded gender of the student (femaleness) and the Use of Features Score
  - The third research question was tested by examining the Use of Features Score and the Rate of Understanding Score
  - The fourth research question was tested by examining the Use of Features Score and Digital Textbook Preference Score

Chapter Four Results

Sample Description

- One hundred twenty two graduate students responded
- Three students did not use digital textbooks and their survey information was not included in the data analysis
- Final participant count – 119 participants
- Females – 81 participants
- Males – 30 participants
- Decline to disclose gender – 8 participants
- Ages ranged from early 20's to late 50's
- Age mean was 32.03 with a standard deviation of 9.929

Data Collection

- Age and gender of the student participants
- Student use of print or digital textbooks, or both formats
- Student use of search and highlight feature
- Student perceptions of the usefulness of these features
- Student preference for and choice of digital over printed textbooks
- Student perceived usefulness of the single-page display feature

Data Process

- Gender data (normally categorical) was dummy-coded with male as zero and female as 1 to be continuous
- All other data were continuous
- Use of Features Score: scale measuring student use of the search and highlighting features
- Rate of Understanding Score: scale measuring student perceptions of the usefulness of these features
- Digital Textbook Preference Score: scale measuring student preference for and choice of digital over printed textbooks and their perceived usefulness of the single-page display feature
- Survey question answers were coded numerically for processing

Data Analysis Instruments

- SPSS software was used to test for significant positive and negative correlations between these variables:
  - Age
  - Gender
  - Use of Features Score
  - Rate of Understanding Score
  - Digital Textbook Preference Score
- Frequency charts and graphs were used in descriptive statistics and analysis procedures
- The bivariate Pearson Correlation coefficient was used to test for and measure any associations between these variables

Use of Feature Analysis Results

Determined by adding the student responses to their search and highlight features usage

- 5% of students indicated a ***frequent*** use of features
- 35% indicated a ***moderate to frequent*** use of features
- 23% indicated a ***moderate*** use of features
- 15% indicated a ***use of one feature***
- 13% indicated a ***no*** use of features
- 5% indicated ***one response*** to ***no*** use of features
- 5% of students declined to answer

Rate of Understanding Analysis Results

Determined by adding the student responses to their perceived level of attention and focus using a digital textbook, their ability to organize information using digital textbook features, and their ability to understand and better comprehend information presented digitally

- 2% of students indicated a ***maximum*** rate of understanding
- 2% indicated a ***frequent*** rate of understanding
- 10% indicated a ***moderate to frequent*** rate of understanding
- 15% indicated a ***moderate*** rate of understanding
- 25% indicated a ***minimal to moderate*** rate of understanding
- 18% indicated a ***minimal*** rate of understanding
- 23% indicated ***no*** rate of understanding
- 5% of students declined to answer

Digital Textbook Preference Analysis Results

Determined by adding the students' preference for and choice of digital over printed textbooks and the perceived usefulness of the single-page display feature

- 5% of students indicated a ***maximum*** preference
- 3% indicated a ***frequent to maximum*** preference
- 5% indicated a ***frequent*** preference
- 8% indicated a ***moderate to frequent*** preference
- 15% indicated a ***moderate*** preference
- 5% indicated a ***minimal to moderate*** preference
- 20% indicated a ***minimal*** preference
- 19% indicated ***no*** preference
- 2% of students declined to answer
- 18% responded to two or three of the questions, but not all questions

Correlation Table

Correlations for Use of Features Score

Measure	Age	Gender	Understanding	Digital Preference
Use of Features	.02	.12	.49*	.62*

* $p < .001$
Note: Gender = female coded as 1 and male coded as 0

RQ1: Age & Use of Features

- Is there a correlation between the level of use of the specified digital textbook features (Use of Features Score) and the age of the student?

- Pearson's Correlation coefficient for age is $r = 0.02$ and $p = 0.806$
- Indicating that there is no relationship between age and the Use of Features Score
- The null hypothesis is upheld

RQ2: Gender & Use of Features

- Is there a correlation between the Use of Features Score and the dummy-coded (with female coded as 1 and male coded as zero) gender of the student?

- Pearson's Correlation coefficient for gender is $r = 0.12$ and $p = 0.209$
- Indicating that there is no relationship between gender and the Use of Features Score
- The null hypothesis is upheld

RQ3: Use of Features and Rate of Understanding

- Is there a correlation between the Use of Features Score and the students' rating of their ability to better understand what they are reading (Rate of Understanding Score)?

- Pearson's Correlation coefficient for the Rate of Understanding is $r = 0.49$ and $p =< 0.001$
- Indicating that there is a significant relationship between the Use of Features Score and the Rate of Understanding Score
- The hypothesis is retained

RQ4: Use of Features and Digital Textbook Preference

- Is there a correlation between the Use of Features Score and students' preference for using digital textbooks (Digital Textbook Preference Score)?

- Pearson's Correlation coefficient for the Digital Textbook Preference is coefficient is $r = 0.62$ and $p =< 0.001$
- Indicating that there is a significant relationship between the Use of Features Score and the Digital Textbook Preference Score
- The hypothesis is retained

Chapter Five

Discussion, Conclusions Recommendations

Summary: Findings

- Age and gender were not necessarily a factor in digital textbook search and highlight feature use (Use of Features Score)
- The students' use of features (Use of Features Score) does have a significant relationship with their perceived level of comprehension and organization of information (Rate of Understanding Score)
- The students' use of features (Use of Features Score) does have significant relationship with their rate of usefulness of the single page display along with their preference and choice of digital over printed textbooks (Digital Textbook Preference Score)

Summary: Population Impact

- A significant number of the participants in this study used both digital and printed textbooks indicating the availability of this technology
- This institution in this study is making digital textbooks readily available to its graduate students
- Students do not always use the available features in digital textbooks, lessening the impact of studying using a digital textbook and keeping the preference for printed textbooks higher than the digital textbook preference

Summary: Consistencies

- This study's findings aligns with a recent study by Denoyelles, J. R., Raible, J. & Seilhamer, R., (2015)
  - Finding "the search (feature) came up several times as a way to read and study more efficiently" and the highlighting feature was instrumental in studying the information delivered digitally (Denoyelles et al., 2015, Adoption Factors, par. 5)
- This study's findings also align with Philip & Moon (2013)
  - Finding digital textbook features such as the search feature added to the appeal of digital textbook technology to students, enhancing the time efficiency searching for material in the textbook (Philip & Moon, 2013)
- This study's findings align with Anderson, J. Q., Boyles, J. L. & Rainie, L. (2012) and Thomas (2007)
  - Finding that students are very comfortable with digital textbook technology and the students who use this technology are more fully involved with their learning experiences and are more likely to be satisfied with this technology

Summary: Inconsistencies

- Findings from this study were inconsistent with a recent study by Denoyelles et al. (2015)
  - Denoyelles et al. (2015) found that that “older male graduate students specifically favored e-textbooks more than other groups” (Denoyelles et al., 2015, Key Issues, par. 3)
  - Findings from this study did not find any relationship between gender or age and preferring digital textbooks
  - The differing findings could be from a lower ratio of older male participants responding in this sample, so results did not concur with the results from Denoyelles et al. (2015)

Summary: Limitations of the Study

- Number of students who declined to answer survey questions could affect the accuracy of the analysis that was reached if the missing answers had been provided
- Some of the students may not have had experience with or access to the search and highlight features in their digital textbooks
- This could skew the feature usefulness findings as this question did not examine students who did not find these features useful because they did not use these features
- Some students may not have full access to the search and highlight features on their digital readers and this could skew the feature use and usefulness findings

Conclusions

- This study provides a window into the current perceptions of graduate students' acceptance and adoption of digital textbooks and features
- The age or gender of the student did not affect their use of the search or highlight features
- The Use of Features Score does have a significant relationship with the Rate of Understanding Score: ***using features can promote understanding***
- The Use of Features Score does have a significant relationship with the Digital Textbook Preference Score: ***using features can promote student preference for this technology***
- Findings may contribute information towards the advantages and disadvantages of this developing technology
- Designing easy to access and user friendly digital textbook features (such as the search and highlight features) and providing specific training in digital textbooks on how to access and use these features may contribute to and shape student learning experiences with this technology

Implications

- Institutions are following mandates like NIMAS and widely implementing digital textbooks (Office of Educational Technology, n.d)
- Institutions who comply with laws like NIMAS strengthen their credibility with stakeholders, strengthen accreditation and allow for more funding opportunities
- Digital textbook technology features can be used to address disabilities and multiple learning styles, and provide access to all students with a more affordable product (Rosenwald, 2015)
- Digital textbooks can provide lower costs than printed textbooks, availability of digital textbooks across multiple digital devices, ease of accessing and using digital textbook features and immediate access to digital textbooks, including print on demand
- Digital textbook designers, publishers, and institutions can stay on the cutting edge of digital textbook technology by continually assessing how students view and use this product – updating the product accordingly
- Digital textbook training can keep institutions relevant in the higher education sector and more relevant to students in choosing to attend the institution

Recommendations

- Varying demographics of institutions
  - Studying west coast, northern or southern institutions
  - Studying private institutions (for-profit and non-profit)
  - Studying various high schools – private, charter and public
  - Studying institutions outside of the United States
- Varying demographics of participants
  - Studying more current undergraduate or graduate students
  - Studying K-12 students
  - Studying physically or mentally impaired students of various grade levels

Questions?

Thank you for viewing this presentation!

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