

# Use of an e-Textbook and Web-Based Homework for an Undergraduate Business Course: Students' Perceptions

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## ABSTRACT

*More and more, employers are looking for workers that have a solid foundation in business statistics and data analysis. As businesses collect more and more information, the ability to efficiently and effectively utilize this information cause trained knowledge workers to be in greater demand. However, business statistics, where many of these high demand skills are taught, is a course that many students view in an unfavorable light. To revise the students' perceptions of business statistics there is a need to revise the way that undergraduate business statistics courses are taught. This has been noted by various authors throughout the years. In an effort to bring more student engagement into their business statistics education, this study looks at the use of a web-based homework and electronic textbook applications in an undergraduate business statistics course. Specifically, this study examines the business students' perceptions regarding the use of a web-based homework and electronic textbook combination in an undergraduate business statistics course. The use of web-based homework is relatively new in the context of business statistics so this study seeks to uncover the students' perceptions regarding this new use of technology outside of the classroom.*

## INTRODUCTION

Business statistics is a business core course that all undergraduate business students are required to take. Some colleges have a one semester undergraduate business statistics course and other colleges have a two semester course sequence of undergraduate business statistics. In 2001, McAlevey and Sullivan (2001) pointed to the usefulness of statistical knowledge in a business environment. Several years later the need for knowledge workers to have a solid understanding of business statistics and data analysis is even more apparent in a complex business environment where many businesses are measuring their stores of data in terabytes.

Nevertheless the students' view of statistics has been noted by many authors as being the most unpopular course in the business program (McAlevey and Stent, 1999). Perhaps the reason for the negative perception of statistics has to do with the math and statistics anxiety that many students have. Statistics anxiety is defined as "feelings of anxiety encountered when taking a statistics course or doing statistical analyses; that is gathering, processing and interpreting data" (Cruise, Cash, and Bolton, 1985). Six factors are used to measure statistics anxiety: worth of statistics (students' perception of the value of statistics), interpretation anxiety (determining

which statistical test to use), test and class anxiety (anxiety related to taking a statistics class or exam), computational self-concept (relates to anxiety associated with math computation), fear of asking for help, and fear of statistics teachers (perception of the statistics teacher not being able to relate to students) (Cruise et al., 1985). Statistics anxiety is often reflected in lower student performance in the business statistics class (Baloglu and Zelhart, 2003).

With technology becoming more and more prevalent at universities, many statistics instructors have sought ways to ease the statistics anxiety suffered by business students. Some instructors have brought technology into the classroom in the form of statistical applications like Minitab and SPSS in order to let the computer do the computations and then let the students focus only on interpreting the results (Spinelli, 2001; Steagall and Mason, 1994). Other studies have looked at replacing the traditional statistics classroom setting with statistics being taught through distance education (Lawrence and Singhanian, 2004; Grandzol, 2004).

One of the goals of bringing technology into the business statistics classroom is to improve the performance of business students in their statistics class. Technology has the potential to reduce statistics anxiety by taking out most of the computational part of statistics and allowing students to focus on interpreting larger and more realistic data sets.

This study addresses the need for changes in business statistics education as has been reported by many authors over several decades (e.g. Brightman, 1977; Hogg, 1972; Harrington and Schibik, 2004). In this study, the authors look at the use of technology outside of the classroom combined with traditional classroom instruction to help students learn business statistics. The technology incorporated included a web-based homework application that was included as part of an electronic textbook (e-textbook) for an undergraduate business statistics course. The authors examine the students' perceptions of using an e-textbook and the web-based homework application at the end of a business statistics course.

## **LITERATURE REVIEW**

How do you get to Carnegie Hall? Practice, practice, practice. Palocsay and Stevens (2008) found that this adage is also the key to success in Statistics. Students learn statistics or for that matter any quantitative subject is through extensive practice and feedback. The practice is usually achieved through the use of homework since there is limited classroom time. However, the practice is only useful if there is feedback involved that includes collecting, grading and commenting on the homework. Without the frequent and timely feedback (i.e. grades and explanations/comments), it is difficult to get the students to practice and with growing class sizes it is difficult for instructors to collect and grade the required number of practice problems for students to adequately master the material.

Previous research has shown the necessity of homework (Warton, 2001). With the growth of the Internet and the students' familiarity with the Internet, textbook publishers have started to introduce web-based homework applications as a way for students to receive the practice they need as well as receive immediate feedback on their solutions. Bonham, Deardorff, and Beichner (2003) define web-based homework systems as: being accessible from any standard Internet browser and connection, having password authentication, transmission of assignments to students and collection of their answers, and automatic grading and recording of the grades.

Given the short history of web-based homework applications, there have been few studies that examine the impact that web-based homework has on students' performance versus that of paper-based homework (see Hauk and Segalla, 2005; Bonham et al., 2003; Dufresne, Mestre,

Hart, and Rath, 2002; and Palocsay and Stevens, 2008). Most of the studies found that there was no significant difference in student performance between groups given web-based homework versus those that were given paper-based homework. Bonham et al. (2003) and Palocsay et al. (2008) both found that it was the student's GPA that influenced the student's performance and not the method of homework delivery. In addition, Dufresne et al. (2002), when examining the classes of four different instructors, found that the instructor contributed to a difference in student performance but not the homework delivery method.

While significant performance differences have not been found when using web-based homework, there still may be some benefits such as having students practice more and possibly improving their attitudes toward business statistics (Porter and Riley, 1996; Palocsay et al., 2008). In addition, web-based homework can provide immediate feedback to the student which has been found to be more effective than the delayed feedback associated with manually graded homework (Kulik and Kulik, 1988).

The web-based homework application used for this study is tied to an e-textbook published by Thomson-Southwestern. The concept of e-textbooks is not a new phenomenon but there currently is no universally accepted definition of what an e-textbook is (Bennett, 2006). There are many definitions of what an e-textbook or e-book in general is and most of the definitions refer back to the "traditional" book (Vassiliou and Rowley, 2008). Some of the definitions of an e-book are: a digital version of a print book (Reitz, 2004); a book composed in or converted to digital format for display (e-book, 2009); an electronic version of a text (EDUCAUSE, 2006); and an electronic equivalent of a conventional printed book (Gay, 2007).

A textbook that has been scanned into a static digital file would not be very useful beyond that of a printed textbook in terms of easing the statistics anxiety suffered by business students. Therefore, for this study we will use the two-part e-book definition proposed by Vassiliou and Rowley (2008).

- (1) An e-book is a digital object with textual and/or other content, which arises as a result of integrating the familiar concept of a book with features that can be provided in an electronic environment.
- (2) E-Books, typically have in-use features such as search and cross reference functions, hypertext links, bookmarks, annotations, highlights, multimedia objects and interactive tools.

The interactive tools are included in the web-based homework part of the e-textbook. Larson (2002) found that e-textbooks could support learning in areas such as business where information is disseminated in discrete blocks. This current study looks at students' perceptions of the use of an e-textbook and the associated web-based homework in the quantitative subject area of business statistics to determine if they have educational value to the students.

The web-based application used for the business statistics class was Aplia. Aplia was originally developed for use in economics courses but has recently added accounting and business statistics to their line-up. The application provides a database of questions from which to assign homework questions and it also allows the instructor to write their own questions. Both options provide the student with immediate feedback in both explanations specific to the question and in the form of a grade to let them know their progress and learn from their mistakes. Aplia also allows instructors to assess each individual student's performance and allows them to assess each assignment to see performance on individual topics. This allows instructors to see

what topics need to be emphasized more if they see that students are struggling with a specific topic.

The administration panel for Aplia allows instructors to view the course assignments, add assignments, assess assignments, assess students, and view the gradebook. There are three types of assignments that can be created in Aplia they are: Graded assignments where Aplia automatically grades the students' answers on a topic by topic basis and provides immediate feedback, Timed assignments where the instructor can limit the amount of time a student can spend on an assignment and Aplia does not reveal the student's grade until the due date, and the third type of assignment is a Practice assignment where students can practice and receive explanations but no grades are recorded.

Homework is very important in quantitative courses like undergraduate business statistics where out-of-class work is the main way that students practice and develop their problem-solving skills (Palocsay et al., 2008). When provided with non-graded practice problems, students rarely work through a sufficient number of problems. Providing large numbers of paper-based homework problems presents a time and quality issue for the instructors that have to grade problem sets from increasingly growing sections of statistics. The time issue has to do with the instructor having enough time to grade the assignments and return them to the students in a timely fashion. The quality issue has to do with the level of detail that the instructor can go into when writing comments on the students' work. Therefore, web-based homework is a good way to provide students with a way to practice developing their skills and a way to receive immediate feedback. But does it increase student performance in undergraduate business statistics classes and what do the students think about a combined web-based homework and e-textbook used in an undergraduate business statistics course? The following section will detail the methodology used to answer the second part of the question regarding the students' perceptions of the use of a combined web-based homework and e-textbook.

## **METHODOLOGY**

Two sections of an undergraduate business statistics course taught in the Fall semester of 2008 and one section of an undergraduate business statistics course taught in the Spring semester of 2009 were used for this study to uncover the student's perceptions of the use of web-based homework and an e-textbook combined for an undergraduate business statistics course. The three business statistics sections consisted of 108 students taught using the e-textbook and web-based delivery method for homework during the two semesters. The three sections were taught by the same instructor.

For this study, a direct survey was used to collect data regarding the students' perceptions of the web-based homework and e-textbook application used for the three business statistics sections. The survey instrument was designed specifically for this study for the purpose of gathering data on students' perceptions on the use of the web-based homework and e-textbook application in their business statistics course as well as to gather data on their demographics. To validate the clarity of the survey questions, two professors and one student were asked to read through the questions. Revisions to the instrument were made based on the feedback received.

A total of 30 items were created for the survey instrument. Survey items Q1 to Q14 collected demographic data. Survey items Q15 to Q29 were used as five-point Likert scaled questions with end points rating from "strongly disagree" to "strongly agree" and measured students' perceptions on the usage of the web-based homework and e-textbook application in their

business statistics course. Survey item Q30 measured the students' preference for the web-based homework and e-textbook application in their business statistics course.

## **DATA COLLECTION**

Surveys were distributed to 108 students enrolled in the three sections of an undergraduate business statistics course at a mid-sized four-year university. The participants were given the 30 item survey and allowed class time to complete the survey. All of the participants were informed that participation in the study was voluntary and that their responses would only be reported in aggregate. The students were asked to rate each of the survey items on a Likert-scale for 1 to 5 with 1 being "strongly disagree" and 5 being "strongly agree". Ninety-four of the 108 students completed and returned the survey instruments with virtually all of the questions answered.

Except for two respondents from the College of Arts & Humanities, were students pursuing degrees from the College of Business. The sample (college) was approximately 55 (54) percent male and 45 (46) percent female with an average age of 23.45 (24.2) years. Approximately 47.9 (47.2) percent of the respondents were Caucasian, 35.1 (32.7) percent were Hispanic, 9.6 percent Asian, 1 (3.5) percent African-American and 6.4 percent classified themselves as Other. Ninety-five percent of the respondents rated themselves as having an average or above average level of computer literacy. The respondents reported using the Internet an average of 29.31 times per week for an average of 21.02 hours spent on the Internet per week. In addition, 65 percent reported having used an e-textbook in a previous class.

Approximately 28 percent of the respondents agreed or strongly agreed with the statement that they prefer the web-based homework and e-textbook over paper-based homework and a printed textbook. Approximately 50 percent of the respondents preferred to have a printed textbook and paper-based homework. The remaining 22 percent were neutral in their preference regarding homework and textbook delivery.

## **ANALYSIS AND DISCUSSION**

Most of the survey instruments (87%) were returned with virtually all of the questions answered. The data collected demonstrated an internal consistency score (Cronbach's alpha) of 0.849, suggesting reliability of the data. Nevertheless, it should be noted that the acceptable level of reliability relates to the data resulting from the measurement and not the survey instrument itself.

To examine the students' perceptions of the use of web-based homework and an e-textbook in an undergraduate business statistics class, the mean responses to each question were calculated and are reported below. The survey items were on a Likert-scale from 1 to 5. The questions that scored a mean of 3.5 (out of 5) or better are listed in Table 1.

As far as the comparability of an e-textbook to that of a printed textbook, students perceive that the e-textbook has the same amount of information per page as a printed textbook. This is evidenced by students rating that question with an average of 3.93 out of a possible 5. Seventy-one percent of the students agreed or strongly agreed with this statement. This finding is no surprise since e-textbooks are usually printed textbooks that are updated with interactive searchable content when they are digitized.

Approximately seventy-five percent of the students found that the web-based homework problems were useful. The students provided that statement with an average rating of 3.89 out of

a possible 5. Since the web-based homework was assigned for a grade in the course, students were more likely to complete the homework. So as Palocsay and Stevens (2008) reported, working through practice problems is how students learn statistics. Hence, the students found the incentivized practice helpful.

**Table 1: Top Scoring Questions**

<b>Question</b>	<b>Mean</b>
The e-textbook provides comparable information per page to that of a printed textbook.	3.93
The Aplia practice problems were useful	3.89
The Aplia application was easy to navigate.	3.88
The Aplia practice problem explanations were useful.	3.81
The Aplia application made it easy to find information.	3.70
The Aplia application made it easier to understand the course material.	3.68

Students reported that the e-textbook and web-based homework were easy to navigate and they made it easy for the students to find information. The students rated the ease of navigation with an average score of 3.88 out of a possible 5 and they rated the ease of finding information with an average of 3.70 out of a possible 5.

Approximately 68 percent of the students agreed or strongly agreed with the statement that the homework problem explanations were useful. The average rating for this statement was 3.81 out of a possible 5. This finding is a little lower than expected since Kulik and Kulik (1988) reported that immediate feedback at the point of learning is preferred by students over delayed feedback.

In relation to the previous statement that students found the web-based homework useful, sixty-five percent of the students agreed or strongly agreed that the e-textbook and web-based homework made the course material easier to understand. The average rating for this statement was 3.68 out of a possible 5.

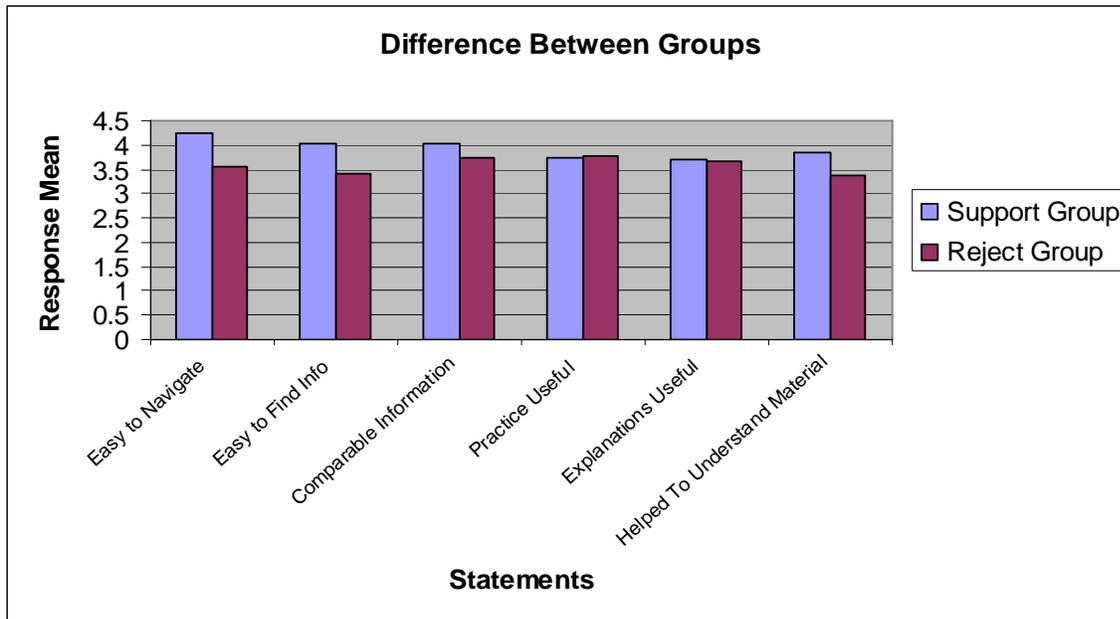
While the students reported the usefulness of the web-based homework exercises and explanations, fifty-one percent of the students disagreed or strongly disagreed with the statement that they preferred to read the e-textbook chapters online. In addition, forty-five percent of the students reported that they preferred to print out the e-textbook chapters and read them from the printed page. Possibly due to the dislike of reading the chapters online, 44 percent of the students disagreed or strongly disagreed with the statement that e-textbooks provided a better value than printed textbooks.

***Support Group vs. Reject Group***

It is also interesting to examine whether there are any differences between the students who preferred the e-textbook and web-based homework combination to those that did not prefer the combination in terms of their perceptions on each of the statements. The respondents were divided into two groups, one group that preferred the e-textbook and web-based homework (support group) and one group for those that did not prefer the e-textbook and web-based homework (reject group). The students who reported being uncertain in their preference were excluded from the comparison. T-tests were conducted to determine if there were any significant

differences between the support and reject group. Figure 1 below shows the response means for the top six statements between the two groups.

**Figure 1: Response Means Between the Support and Reject Groups**



Only the first two of the statements listed in Figure 1 demonstrated a significant difference between the two groups at a  $p$ -value  $< 0.05$ . There were significant differences in the perceived ease of navigation through the application and the ease at which students reported being able to find information. For both of the statements, the reject group recorded a lower response mean.

Interestingly there were no significant differences at the  $p$ -value  $< 0.05$  level for the last four statements listed in Figure 1. There was not a significant difference between the groups at the  $p$ -value  $< 0.05$  level for the statement: that the e-textbook and web-based homework helped the student to better understand the material. In addition, there were no significant differences between the two groups on the statements regarding the usefulness of the web-based homework and the usefulness of the web-based homework explanations.

Based on these results it appears that the reject group may have seen the value in the web-based homework but may not have liked the e-textbook. These findings suggest that there may be a benefit to pairing web-based homework delivery with a printed textbook.

## CONCLUSION

The ever increasing use of technology in business and the ever growing stores of data that businesses are collecting will increase the demand for knowledge workers that have a sound understanding of business statistics and data analysis. However, the common view of business statistics by most business students is one filled with anxiety where students just want to 'get it over with' without really mastering the material. This view has been noted and reported by researchers for many years resulting in a call for change in the way that undergraduate business statistics is taught.

With the ever increasing use of Internet technology in higher education and the ever increasing familiarity of the Internet by each new class of college students, web-based homework is emerging as one of the ways that may offer a change for the better in the way that undergraduate business statistics classes are taught.

This study identifies the students' perceptions on the use of a combined web-based homework and e-textbook application that was used in an undergraduate business statistics course. The results indicate that students, both those that preferred the Internet-based application and those that did not, saw value in the use of the web-based homework part of the application. The students thought that the web-based homework problems were useful and that the immediate feedback provided in the form of an explanation and a grade were useful in their understanding of the material.

Differences did exist between those that favored the web-based homework and e-textbook to those that did not favor the combination. The differences had mainly to do with the e-textbook and not the web-based homework. Significant differences were found in the ease of navigation through the e-textbook and finding information in the e-textbook. These differences could point to the need to break the content in the e-textbook up into even smaller chunks to match it to the students' Internet habits of reading multiple small chunks of information on the social networking sites that college students are increasing using.

These initial findings provide avenues for future research. To achieve a better understanding of the use of e-textbooks and web-based homework in an undergraduate business statistics course as well as other quantitative business courses, future research should look into the differences in performance and learning outcomes for students that use web-based homework and e-textbooks versus those that use printed textbooks and paper-based homework.

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**APPENDIX**

**Aplia Survey**

- 1. How would you rate yourself with respect to your knowledge about computers?  
1 (very poor)    2    3    4    5    6    7 (excellent)
- 2. How often do you use the Internet per week? \_\_\_\_\_times per week
- 3. How many hours per week do you use the Internet? \_\_\_\_\_hours per week
- 4. What is your classification?    1. Freshman    2. Sophomore    3. Junior    4. Senior    5. Graduate
- 5. Your college:    1. Arts & Humanities    2. Business    3. Education    4. Nursing    5. Science & Technology
- 6. Are you a first generation college student?    1. yes    2. no
- 7. Your gender:    1. male    2. female
- 8. Your age: \_\_\_\_\_Years
- 9. Your ethnicity:    1. African    2. Anglo    3. Asian    4. Hispanic    5. Native American    6. Other
- 10. In how many courses have you used an e-textbook? \_\_\_\_\_
- 11. How many e-textbooks have you used? \_\_\_\_\_
- 12. Have you ever purchased any e-books that were not part of a college course?    1. No    2. Yes, if so how many? \_\_\_\_\_
- 13. On average, how many hours per week do you spend using the electronic textbook for your ORMS 3310 course? \_\_\_\_\_
- 14. Which computer platform(s) do you use to view e-textbooks?    1. Windows    2. Macintosh    3. Unix    4. PDA    5. Other

**For the following statements, please circle for the answer that best represents your opinion.**  
**1--- strongly disagree    2 --- disagree    3 --- uncertain    4 --- agree    5 --- strongly agree**

The Aplia e-textbook .....

- 15. Contains a comparable number of pages and information per page as a printed textbook..... 1    2    3    4    5
- 16. Was easy to navigate. .... 1    2    3    4    5
- 17. Made it easy to find information. .... 1    2    3    4    5
- 18. Was effective for your learning style..... 1    2    3    4    5
- 19. Exercises helped me better understand the material. .... 1    2    3    4    5
- 20. Using Aplia made it easier to understand the course material..... 1    2    3    4    5

**For the following statements, please circle for the answer that best represents your usage of the e-textbook in your ORMS 3310 course.**

**1--- strongly disagree    2 --- disagree    3 --- uncertain    4 --- agree    5 --- strongly agree**

- 21. I read the chapters on the Aplia website before the material was covered in class. .... 1    2    3    4    5
- 22. I read the chapters on the Aplia website after the material was covered in class. .... 1    2    3    4    5

- 23. I prefer to print out the chapters to read them..... 1 2 3 4 5
- 24. I prefer to read the e-textbook chapters online. .... 1 2 3 4 5
- 25. The Apla practice problems were useful. .... 1 2 3 4 5
- 26. The Apla practice problem explanations were useful..... 1 2 3 4 5
- 27. I read the chapters in Apla before I completed the Apla homework problems. .... 1 2 3 4 5
- 28. I was better able to learn the material using Apla. .... 1 2 3 4 5
- 29. E-textbooks provide a better value than printed textbooks..... 1 2 3 4 5
- 30. I prefer an e-textbook over a printed textbook for the ORMS 3310 course. .... 1 2 3 4 5