

Textbook Ancillary Materials: Their Usefulness and Perceived Effectiveness to Educational Research Students

Prepared for:

Dr. Marcie Bober-Michel
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San Diego State University
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Prepared by:

Dan Comins
Lisa Waters

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Overview

Textbook publishing for higher education is a highly competitive industry. Instructors always have many options from which to choose when it comes time to decide on adopting a book for a particular class. Increasingly, textbook publishers aim to differentiate themselves by offering an array of ancillary materials to support student learning and instructional planning. These may include multimedia CD-ROMs, special websites, or even uniquely tailored classrooms within course management systems such as WebCt or Blackboard. However, the question must be asked -- do these various resources actually make a difference in academic performance or students' own perceptions of their learning experience?

To investigate the impact of such ancillary materials on academic performance and students' own perceptions of their utility, students enrolled in two sections of a graduate-level (introductory) educational research class at San Diego State University (SDSU) were asked to read/review learning assets pertaining to the quantitative analysis of data. One section included students attending class fully online; the other was taught more "traditionally" on-campus. The same instructor taught both class sections during the Fall 2010 semester. Both groups were assigned a chapter from the class text discussing descriptive statistics. In addition to their assigned text, students in the distance section were encouraged to read several chapters on the same subject from another specific textbook, while students in the campus section had access to (and were advised to) review the online supplemental material that the class textbook provides. It is important to note that students in the distance section also had access to the online supplemental material that the class textbook provides, but they were not reminded or encouraged to review it.

To measure student performance, the class instructor designed an online pre- and post-test covering the content. In addition, at the completion of the post-test, students were provided a link to an online survey and asked to report on their previous statistics

experience, their perceptions of the assigned class text, and their particular section's assigned ancillary materials and any other materials they may have accessed.

Impact of the Literature Review

Surprisingly, the researchers did have some trouble locating research focused directly on the effectiveness and perceived utility of textbook ancillary materials (digital or otherwise), especially regarding the chosen subject matter for the study -- educational research; however, they did manage to find several studies in literature regarding some other instructional contexts that helped to formulate the study methodology. The literature review focused on the following three areas:

- Student perceptions of textbook ancillary materials
- Educators perceptions of textbook ancillary materials
- The educational impact of textbook ancillary materials

Student Perceptions of Textbook Ancillary Materials

It may be that students do not understand the purpose or intent of ancillary materials—and thus don't see them as particularly helpful. A study conducted by Sellnow, Child, and Ahlfedlt (2005) focused on the perceptions of 792 students enrolled in 48 sections of an introductory public speaking course at mid-sized midwestern university.

Sellnow et al. (2005) organized students into two groups: those required to use the supplementary technology-based materials (CD-ROM exercises, Infotrac Exercises, Internet study guides, and Internet tutorial quizzes) and those who had to option to do so. Both groups were introduced to the tools—and then immediately surveyed; questions focused on which tools they thought would be most and least useful to them in preparing for their exams. The post-survey inquired as to which technology supplements students actually felt were most and least useful. Responses on both surveys were reported on a four-point scale ranging from *useless* to *very helpful* and space was provided for open-ended comments.

On the pre-survey, students expected the textbook technology supplements to be very

useful—in particular, the Internet study guides and Internet tutorial quizzes. They felt least “reassured” about the CD-ROM exercises. The post-test survey, however, yielded surprising results. Students expected technology supplements to be very useful, but they reported them to be less useful than they had anticipated. While student attitudes proved to be unfavorable to the technology supplements in general in both groups, students did feel that among their options, the Internet material, especially the quizzes, proved to be the most useful because they gave students a clearer idea of what would directly appear on the test. Those students who reported that they did not find the technology supplements to be helpful indicated that they did not feel the extra workload was necessary, found it somewhat overwhelming, and many chose not to use the materials at all. In fact, 78% of the students in the voluntary-use group did not use the supplemental materials after trying initially, complaining that, “All of the technology supplements were not helpful. They didn’t help at all and I learned nothing from them. They were just busy work to me” (Sellnow, et al., 2005, p. 250).

The idea of students having a fairly positive attitude regarding Internet quizzing was similarly found in a study that Johnston and Huczynski (2006) conducted. Here, business and management students at two United Kingdom universities had access to online test banks to confirm their understanding of their subject matter before taking their final exam. Students gave a very positive review of the range of topics covered, the corrective feedback provided, and the flexibility of study activities the question bank offered. Overall, students felt very prepared for their final exams with the use of the provided question bank.

Educators Perceptions of Textbook Ancillary Materials

Although teachers do tend to share the sentiment that textbook supplementary materials can be somewhat overwhelming for students (Rader, 2002), it appears that more and more educators in both secondary and post-secondary education are utilizing and actually depending on ancillary materials from textbook publishers according to a survey sponsored by the Association of American Publishers, conducted by an international research firm (Zogby International) and reported on by James Farmer

(2006). It seems that educators believe that ancillary materials enhance student performance and provide a unique way of presenting materials and are, in fact, essential to today's unique classroom environments. As technology advances so does the classroom, and since the higher education classroom revolves primarily around textbooks, educators are searching for ways to instruct learners using more non-traditional methods, including the utilization of online study materials, websites, tutorials, interactive CD/DVD's, videos, etc. Some college and university faculty members tend to view textbook supplements as so important that many are basing their class textbook requirements and recommendations on the inclusion of these materials (Farmer, 2006).

In the Association of American Publishers survey, faculty were surveyed in both 2004 and 2006 on their perceptions of publisher-provided instructional materials, the benefit of these for their students, and the actual results of student performance when using these materials. In 2004, 1,029 international faculty members were surveyed and in 2006 follow-up survey, 502 international faculty members were surveyed with a slightly expanded survey (Farmer, 2006). Some of the more interesting findings from this survey are listed here:

- 94% of faculty required or recommended a textbook in 2004; 90% in 2006, a decrease of 4%
- 75% required or recommended supplementary materials in 2004; 86% in 2006, an increase of 4%
- 90% of faculty believe less-prepared students would do better if they spent more time reading the textbook, 5% disagree
- 79% believe students would do better if they used supplementary materials, 11% disagree
- 30% of faculty use the textbook publishers' online homework; 19% use the publishers' online quizzes. (Farmer, 2006)

In his report, Farmer (2006), further broke down the results of the Association of American Publishers survey in terms of what sort of text and other support materials

teachers utilized in their classes:

- Study Guide 43%
- Online homework systems 30%
- Reading lists 28%
- Online quizzes 19%
- Online assignments 13%
- Journal articles 11%
- Study groups 9%
- Handouts 9%
- Solutions manual 8%
- Writing aids 7%
- Lecture notes 5%
- In-class activities 5%
- Research into current events 5%
- Case studies 3%
- Grammar help 3%
- Dictionary 2%
- Independent websites 2%

The financial benefits for both instructors and their respective universities by having textbook publishers design electronic supplemental materials (rather than instructors or universities designing their own), especially in light of current fiscal challenges in higher education in the United States, is also impossible to ignore. The cost of textbooks is rising, and at least at the college level, students are the ones paying for it. In the past, educational institutions and instructors used to have to put much time, energy, and money into prepping and designing lesson plans and creative support materials. However, since publishers are trying to use additional support materials to market themselves better (thus adding more perceived value to the cost of textbooks) anyway, that development cost is shifted away from institutions and back to the student (in the purchase of textbooks). In his report, Farmer (2006) suggests that it is not

unreasonable to speculate that publishers are being pressured into providing supplemental materials because colleges and universities do not have sufficient funds to do so. With many institutions currently facing budgetary issues, this idea is obviously a highly attractive prospect.

In the Secretary of Education's report, "A test of leadership," Margaret Spellings (2006) states that:

We may still have more than our share of the world's best universities. But a lot of other countries have followed our lead, and they are now educating more of their citizens to more advanced levels than we are. Worse, they are passing us by at a time when education is more important to our collective prosperity than ever...As higher education evolves in unexpected ways, this new landscape demands innovation and flexibility from the institutions that serve the nation's learners...We want postsecondary institutions to adapt to a world altered by technology (p. vii-viii).

It is interesting to note the differences between students and instructors in their perceptions and use of ancillary materials. The research gathered in this literature review suggests that whereas students seem to find electronic ancillary materials not altogether useful (Sellnow, et al., 2005), instructors are increasingly recommending or requiring them (Farmer, 2006); also, whereas students seem to find online quizzing to be the most helpful resource and much better than additional exercises or homework (Sellnow, et al., 2005), instructors are inclined to put more of an emphasis on the exercises provided by publishers rather than their quizzes (Farmer, 2006). The research gathered for this literature review definitely suggests a divergence in the perceptions and attitudes between instructors and students on the potential utility of electronic textbook supplements, but the educational impact of these materials is also worth investigating.

Educational Impact of Textbook Ancillary Materials

While opinions between students and teachers are different when it comes to the

usefulness of ancillary materials, research is mixed on whether these materials have a positive impact where it counts – student understanding as measured by improving test scores.

Johnston and Huczynski (2006) looked at examination performance based on student use of a business textbook's online question banks, the researchers discovered "that those who *always* used the bank had the highest mean class test grades, with those *rarely* using the bank having the lowest mean class test grades. Similarly, it appears those who *always* used it had the highest mean final examination grades, with those *rarely* using it had the lowest mean test grades" (p. 267).

Margaret Spellings (2006) describes a project that was completed from 1999 - 2004 that worked with 30 colleges and universities to try and enhance the quality of instruction in efforts to improve student learning. The schools redesigned courses and provided 24/7 online access to Internet-based tutorials, which resulted in more learning at a lower cost to the universities. Institutions also reported an increase in student engagement and learning. As an example, she reports that scores in a redesigned biology course at the University of Massachusetts increased by 20%.

The other factors that directly influence the impact of ancillary materials are how the materials are presented to the learners, and whether or not they are optional or required. Sellnow et al. (2005) found that students in the volunteer-use sections reported that supplements were considerably less useful than they expected them to be, and simply did not use them. They determined that these textbook supplements must be integrated into coursework and required of students or students will fail to make adequate use of them.

Finally, Frank, Shaw and Wilson (2008) did not focus on textbook ancillary materials per se, but it did focus on the effectiveness of a very common form of classroom supplemental material – the use of web-based PowerPoint slides, which are very common for textbooks to include as part of their electronic ancillary package. They

noted that while results were mixed, their findings (and the findings of several other researchers presented in their literature review) seem to suggest there is no significant difference in test scores between students who used the PowerPoint slides as study aids versus those who did not.

So do they work or don't they?

Based on this literature review, the actual effectiveness of ancillary materials on performance is still up for debate, but it is clear how the two primary user groups – instructors and students – perceive them. There is obviously a disconnect between teachers intentions for the use of textbook supplements and the students actual use of the materials. Sellnow et al. (2005) explain that:

. . . carefully selected assignments using textbook technology supplements as study aids and speech preparation tools must become course requirements if students are to realize the utility of them. Just as any assignment ought to be carefully planned in order to “foster the intellectual growth of students,” so must electronic textbook supplement assignments be carefully planned and integrated (p. 251).

In order for educators to better prepare and educate students, an understanding of how to incorporate materials needs to be addressed, as well as how ancillary materials are best utilized. Ancillary materials have the potential to be very beneficial for not only the student, but for the teacher and educational institution as well. It is clear that further research needs to be conducted in the area of the actual effectiveness of each type of ancillary materials in order for both textbook publishers and educators to better serve the educational community.

Contextual Factors

Several issues may have compromised the study results; each is detailed here:

- Study participants were not in a controlled environment. As such, there was no way to control or limit their access to materials other than their particular group's

assigned ancillary materials. To account for this, a survey question was designed inquiring on student use of supplemental materials other than the ones assigned.

- 17 (63%) of the 27 survey respondents in both groups reported using at least some ancillary materials other than the ones assigned.
- Pre- and Post-tests were done online and people were asked to complete them without the aid of the textbook or ancillary materials (students were told that these tests were ungraded). Based on the scores, it appears as though people followed instructions, however, this could not be controlled.
- The participation rate on the post-test was much higher than the participation rate on the pre-test, so the comparisons between the two scores may be slightly positively skewed. An incentive of extra credit was implemented for the post-test; clearly this incentive accounts for the higher participation rate.
- The number of students who completed the survey was lower than the number of students who completed the post-test. The survey link was embedded at the end of the online quiz, but some people may have been confused as to how to submit their quiz for grading while still continuing on to the online survey. There were a few comments on the class Moodle to this effect.
- People may have misinterpreted some of language/syntax used on the survey. Specifically, some introduction to statistics is required in high school, yet many people reported never having studied statistics before this particular section of this Educational Research class. The use of the term “descriptive” statistics, rather than merely stating “statistics” in this question may have confused some participants.

Methodology

The researchers attempted to address two main things: (a) the impact of ancillary materials on actual test performance and (b) student perceptions of the ancillary materials and to what extent they found them helpful in learning the content. The

following outlines the details associated with key aspects of the study design: participants, assigned materials, instruments, and procedures.

Study Participants

Participants consisted of a group of 52 students enrolled in ED 690: Methods of Inquiry, a required introductory research course that all graduate students in the College of Education at SDSU must complete. 18 students were part of a course section taught fully online; 34 students were enrolled in the section taught on campus. All distance students are earning the master's degree in Educational Technology (EDTEC); 12 of the 34 campus students are earning a degree in Curriculum and Instruction – not EDTEC; and the other 22 students in the campus section are earning the master's degree in EDTEC. Both sections were taught by the same instructor and were assigned the same “main” textbook for the semester – *How to Design and Evaluate Research in Education* (7th edition) by Jack R. Fraenkel and Norman E. Wallen (henceforth referred to as the F/W Text). Both groups were unaware they were participating in a research study until all the data were collected; instead, the materials were introduced as ways to boost their understanding of content that many felt was complex, and told they would earn extra points by completing the second post-test – no matter what score they earned.

Assigned Ancillary Study Materials

It was decided early on that the subject matter to be tested would be descriptive statistics. To that end, both the campus and distance sections of the class were to complete their normally assigned reading – Chapter 10: Descriptive Statistics of the F/W Text. The distance section was also assigned the first four chapters discussing the same subject matter from *Statistics for People Who (Think They) Hate Statistics* (3rd edition) by Neil J. Salkind. The campus section was reminded and strongly encouraged to use the F/W Text website instead (http://highered.mcgraw-hill.com/sites/0072981369/student_view0/) -- particularly the following sections: Main Points, Key Terms, Flash Cards, Weblinks and Articles, Quizzes, and Interactive Exercises.

Data Collection Instruments

Data were gathered via two instruments:

Test (see Appendix A). The class instructor designed 25-point pre- and post-tests using Quia (an online test generator; see: <http://www.quia.com>) to measure student general knowledge of the content. Both tests were identical in order to determine whether or not ancillary materials had a performance impact.

Questions consisted of several questions types: multiple choice, true/false, fill-in-the-blank, matching, and short answer (graded by instructor upon submission).

The 17 questions on the tests focused on a range of descriptive statistic topics:

- measures of central tendency (mean, median, mode)
- types of scales (nominal, ordinal, interval, ratio)
- continuous vs. discrete variables
- the normal curve (and skewed distributions)
- quartiles (and the interquartile range)
- variability (range, variance, standard deviation)
- measures of association (correlation coefficients)

Survey (see Appendices B and C). In addition, the posttest featured a link to a perceptual survey that students were asked to complete; it was developed in SurveyMonkey, an online survey generator (see: <http://surveymonkey.com>).

Because each group had worked with different ancillary materials, the surveys were similarly structured but not identical. Questions revolved around several themes:

- student's familiarity and previous encounters with statistics
- what study materials students used (the textbook, their assigned ancillary materials, and any other materials they used)
- how useful, understandable, and relevant students felt their assigned materials were
- how prepared they felt for particular statistics topics on the post-test:

- measures of central tendency
- types of scales (nominal, ordinal, interval, ratio)
- continuous vs. discrete variables
- the normal curve (and skewed distributions)
- quartiles (and the interquartile range)
- stem and leaf depictions of distributions
- variability (range, variance, standard deviation)
- measures of association (correlation coefficients)

Procedures

During week 7 of the 16-week class, the instructor e-mailed both groups a link to the pre-test. In order to maintain secrecy about the study, the instructor informed the students that this was a non-graded quiz on descriptive statistics that would help her to tailor and compile additional resources on statistics based on what students already knew (see Appendix D). Students did not know that they would be taking a post-test at the end of the unit on descriptive statistics. Students were given a week from when the message was sent out to submit their online quiz for review by the teacher.

During the following week, once the pre-test collection was complete, the instructor sent out a message to each group providing them access to their assigned materials; the four chapters of the Salkind text were e-mailed directly to the distance group and the campus group was strongly encouraged to use the F/W text website (http://highered.mcgraw-hill.com/sites/0072981369/student_view0/). Over a period of two weeks, descriptive statistics was the main focus of the weekly class lecture, going into the midterm, which all students took during week 10. The following week was spring break, and then, during week 11, the instructor sent out a message regarding availability of the post-test (see Appendix E). Students were informed that this was the same test as the pre-test, and that the instructor wanted a final measure as to what concepts with which students might still need some help. Students were provided incentives in the form of extra credit to complete the post-test; this helped to foster greater participation than during the pre-test. A link to the each group's survey

appeared at the end of their post-test, which most (though not all) students who took the post-test went on to complete.

Findings

Previous Knowledge of Statistics

It turns out that descriptive statistics was a good subject on which to base the pre- and post-tests and survey. Of the 10 distance students who completed the survey (out of 18, so 56% participation), only 3 (30%) people reported having studied descriptive statistics before – and none of them recently; the elapsed time ranged from 4 to more than 10 years.

Of the 17 campus students who completed the survey (out of 34, so 50% participation), 7 (41%) reported having studied descriptive statistics before ED 690—but it was at least a decade ago for more than half of them (57%). Interestingly, none of the 10 students with previous statistics course experience presently use statistics in their current job and half used the term *basic* to characterize their current understanding of statistics. While the researchers acknowledge that the term “descriptive” statistics may have confused some people taking the survey (as noted in the Contextual Factors section above), these findings suggest that most people taking the pre- and post-test were not overly familiar with the subject material, which allows for a cleaner look at how the differing materials used by the two classes impacted performance – if at all.

Student Perceptions of Ancillary Materials

The majority of those survey respondents from both groups who actually did use the assigned ancillary materials (13, 48%) found them to be at least *somewhat useful* and *relevant*, but the average rating of their preparedness for the concepts on the post-test fell between *quite prepared* and only *somewhat prepared* – slightly above neutral (see Appendices B and C, Question 10). Most students from both groups (9, 53%-campus; 6, 60%-distance) also felt that their assigned reading of the F/W Text on its own was not sufficient for learning the subject matter, lending credence to the idea that other support material was needed. In fact, when asked to what extent students agreed with the

statement, “the F/W text was sufficient in learning descriptive statistics *without additional supports*,” only 7 (25.9%) of the 27 survey respondents indicated agreement, while no one indicated *strong* agreement.

As it turns out, some of the most highly regarded ancillary materials were not necessarily ones being tested for this study. Interestingly, it was the podcast and handouts regarding descriptive statistics as well as individual’s own research on other Internet sites that, for the most part, were the most used and well-regarded ancillary materials.

The Campus Section

F/W Website vs. F/W Text

The campus section of ED 690 was assigned ancillary materials that corresponded with the specific chapter of the F/W Text (10) covering descriptive statistics – specifically the text’s companion website (http://highered.mcgraw-hill.com/sites/0072981369/student_view0/). Of the 17 survey respondents from the campus group, 12 (71%) reported reading the assigned chapter from the F/W Text, but 5 (29%) did not. In addition, 8 (47%) reported accessing the F/W website – but the majority (9, 53%) did not.

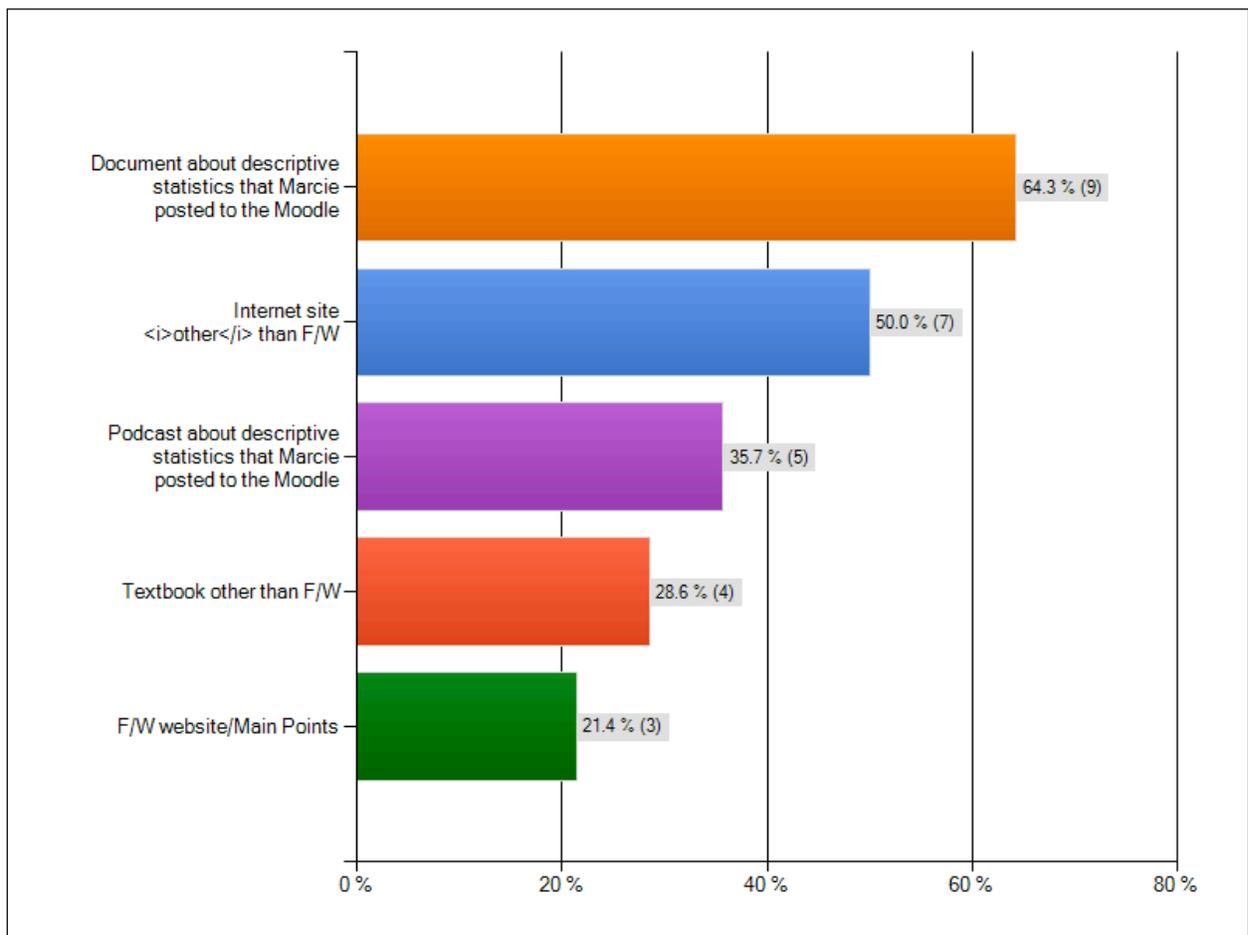
Seven (41%) of those who did read the text found it *very useful*. Unfortunately, only five of the eight campus students who indicated use of the F/W website responded to the survey questions focused on the website’s usefulness, relevance, and comprehensibility. Of those five, 3 (60%) found it at least *somewhat useful*; 4 (80%) at least *somewhat relevant*; and 3 (60%) *very easy to comprehend*.

When the participants that reported they used the F/W website (8 participants) were given the following statement, “The F/W website definitely helped me learn the material,” 5 (62.5%) respondents indicated that they neither agreed nor disagreed with the statement. 2 (25%) indicated they disagreed, while 1 (12.25%) indicated that they agreed

Other Materials

To assess what additional materials were utilized to assist in the preparation for the post-test, a survey question asked students to indicate what materials they actually used for study, listing several possible options. The list included all of the possible F/W website materials, and other materials provided by the instructor. Although they were not reminded of other ancillary materials to which they had access, most campus students (14, 82%) indicated that they had used other materials in their study of statistics and in preparation for the post-test. The two most used alternate materials were a document about descriptive statistics posted to the learning management system used by the instructor 9 (64.3%), and websites other than the F/W website (7, 50%, see Figure 1).

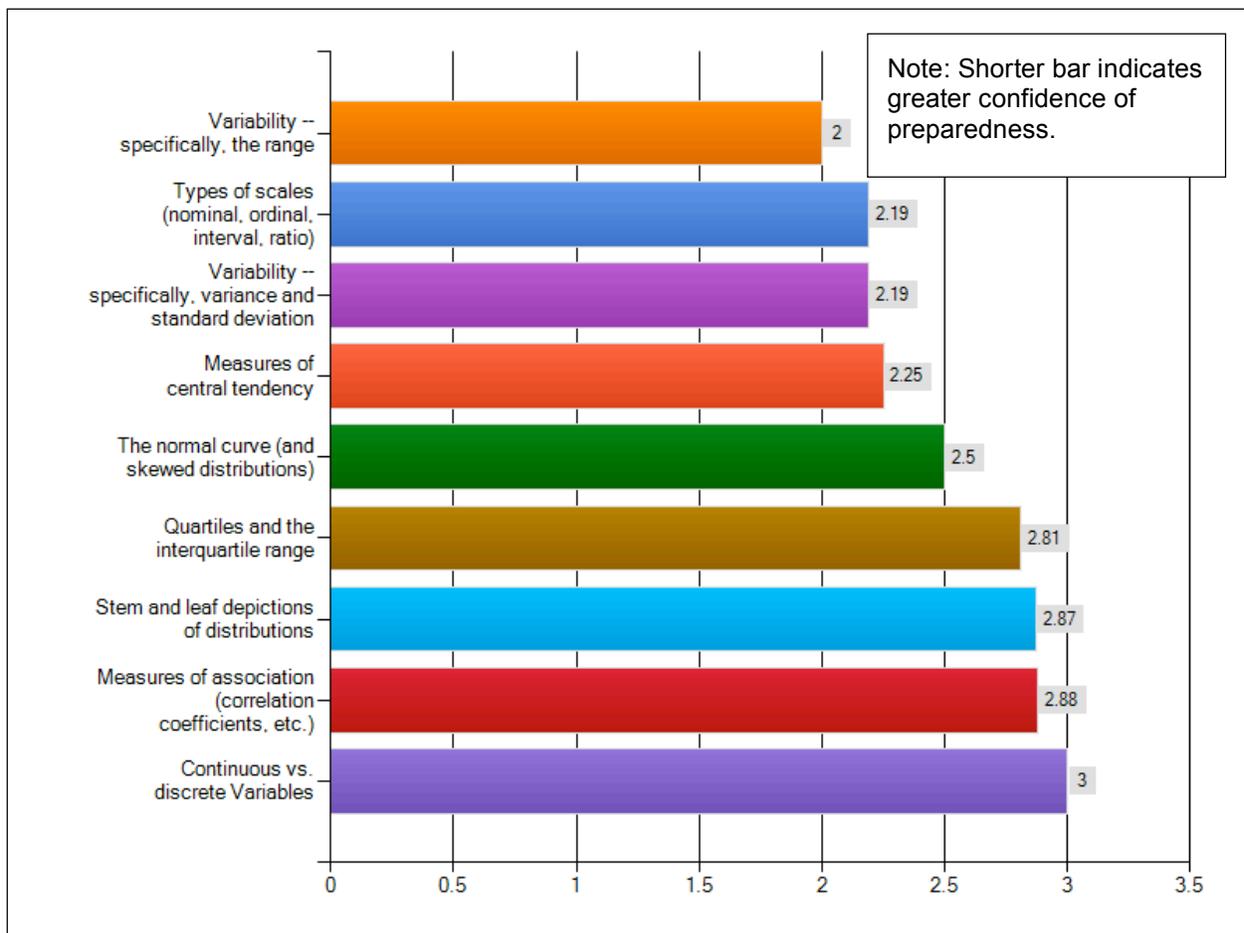
Figure 1 – Top 5 Ancillary Materials Used (Campus)



Perceived preparation on subject matter

To gauge campus student perceptions on how prepared they felt they were for the post-test exam, the descriptive statistics subject matter was broken up into the various topics for which they were expected to be prepared and students were asked to rate their confidence of preparedness on a 5-point scale (*extremely prepared, quite prepared, somewhat prepared, limitedly prepared, and not prepared at all*). When averaged, campus students fell between the *quite prepared* and *somewhat prepared* range on all topics; however, students felt most prepared for question topics related to: variability (range), types of scales (nominal, ordinal, interval, ratio), variability (variance and standard deviation) and measures of central tendency (mean, median, mode). Students felt the least prepared for: stem and leaf depictions, measures of association (correlation coefficients), and continuous vs. discrete variables (see Figure 2).

Figure 2 – Topic Preparedness (Campus)



The Distance Section

Salkind Text vs. F/W Text

The ancillary material provided to the distance section of ED 690 was four chapters on descriptive statistics from the Salkind text. While all 10 (100%) survey respondents reported reading the assigned chapter from the F/W text, only 4 (40%) reported using the additional Salkind text, although it should be noted that on other questions directly regarding the Salkind text, 5 people responded, which suggests that half of the distance students at least used Salkind minimally.

Of the 5 students that used Salkind, 3 (60%) people found it either *extremely or very useful*, 2 (40%) found it to be *extremely relevant* while 3 (60%) people thought it to be only somewhat relevant, and 3 (60%) people found the Salkind text to be neither easy or difficult to comprehend. It seems as though more people preferred the F/W text, however, as it received higher marks on usefulness. 7 (70%) found it to be *extremely or very useful* and 9 (90%) found it to be *extremely or very relevant*). Most people (8, 80%) felt neutral about the F/W text's comprehensibility, feeling it was *neither easy nor difficult* to comprehend the material.

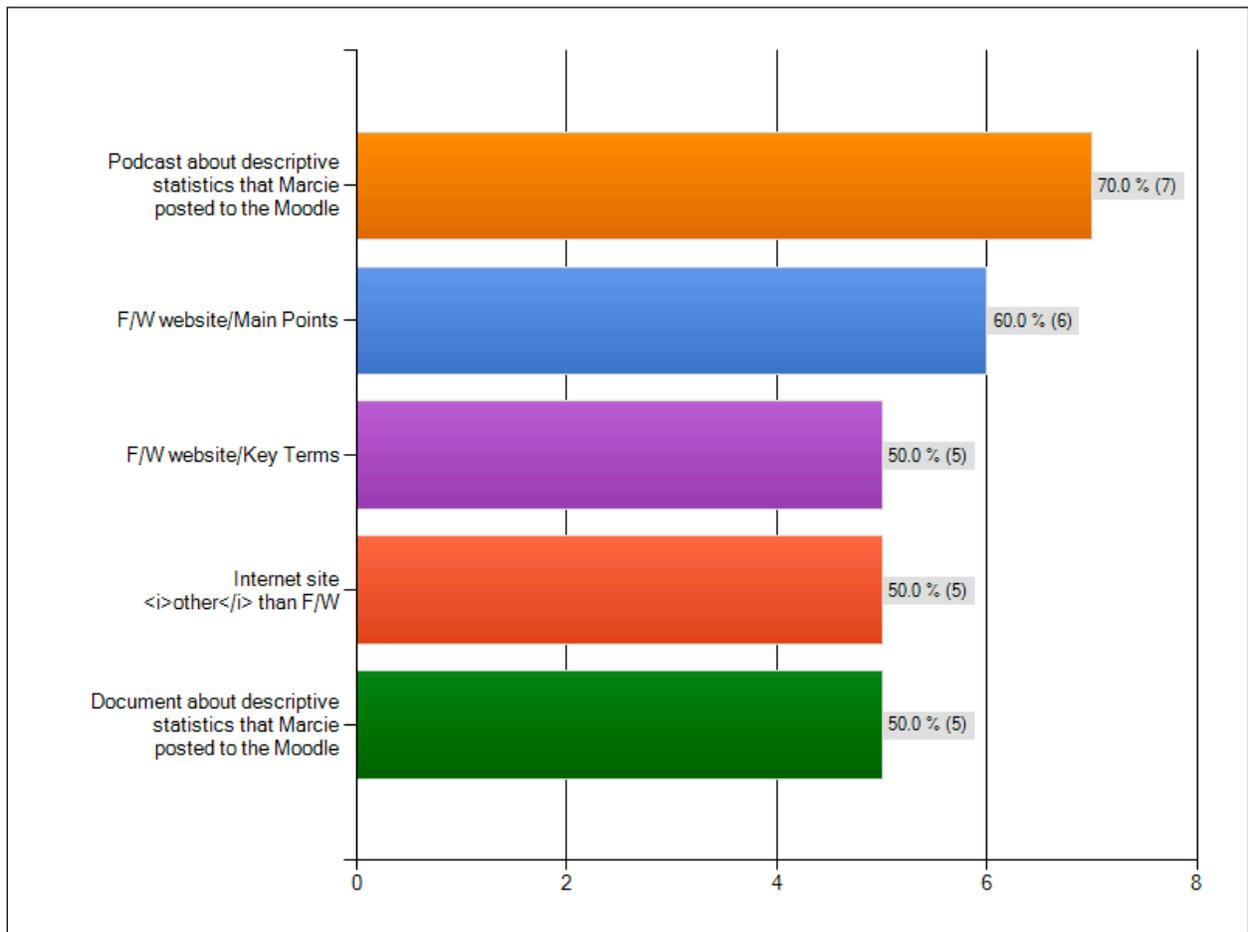
4 (40%) of the distance survey respondents *agreed* with the statement, "The F/W text was sufficient in learning descriptive statistics *without additional support*," but 6 people (60%) either *disagreed or strongly disagreed* with that same statement, indicating that more people felt some sort of additional materials were needed to help them in their understanding of statistics. All of the 5 people who read the Salkind chapters either *strongly agreed or agreed* with the statement, "The *Salkind reading* definitely helped me learn the material."

Other Materials

Although they weren't reminded of other support tools to which they had access (including the F/W website, an audio podcast, other textbooks, other Internet sites, etc.), many distance students indicated that they had consulted additional resources as they explored descriptive statistics and prepared for the post-test. The two most accessed materials were the *Main Points* section (Chapter 10) of the F/W website (6 of 10, 60%)

and an audio podcast that the instructor created/posted (7 of 10, 70%). In addition to use, the podcast proved also very popular with all people who used it either *agreeing* or *strongly agreeing* with the statement, “The posted podcast help me learn the material.” Among the other supports to which people turned, 5 (50%), reviewed the F/W website for key terms, a website other than the F/W website, or a document regarding descriptive statistics posted by the instructor (see Figure 3).

Figure 3 – Top 5 Ancillary Materials Used (Distance)

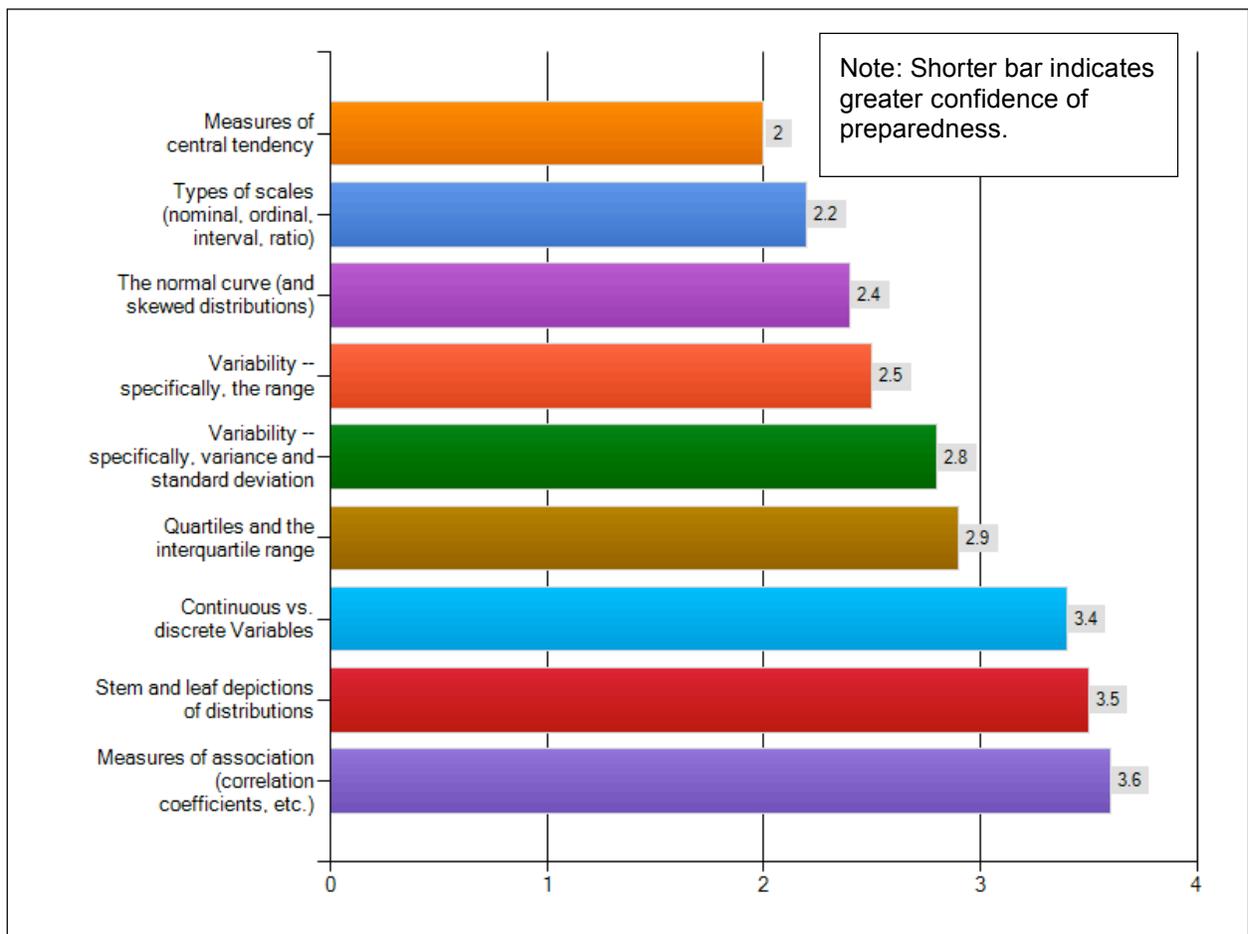


Perceived preparation on subject matter

To gauge distance student perceptions on how prepared they felt they were for the post-test exam, the descriptive statistics subject matter was broken up into the various topics for which they were expected to be prepared and students were asked to rate their confidence of preparedness on a 5-point scale (*extremely prepared, quite*

prepared, somewhat prepared, limitedly prepared, and not prepared at all). When averaged, distance students fell between the *quite prepared* and *limitedly prepared* range on all topics; however, students felt most prepared for question topics related to: measures of central tendency (mean, median, mode), types of scales (nominal, ordinal, interval, and ratio), and the normal curve. Students felt the least prepared for: continuous vs. discrete variables, stem and leaf depictions, and measures of association (correlation coefficients) (see Figure 4).

Figure 4 – Topic Preparedness (Distance)



Actual Performance on Tests

Perceptions are important, of course, but the researchers also explored whether or not the ancillary materials led to any actual academic performance benefits. Not surprisingly, student performance improved pre to post (by 15.75%), whether or not they

reviewed the ancillary materials specifically associated with this study or other tools/support options available on the course Moodle. However, the data also shows that those students from both the campus and distance groups who did use their assigned ancillary materials on average improved their scores more from pre to post than their counterparts who only read the F/W text.

Figure 5 – Pre- to Post-Test Improvement

Aggregate Scores (All Campus and Distance groups)		
	Pre-test:	Post-test:
Mean:	62.88%	78.63%
Median:	64%	78%
Mean Improvement: 15.75%		
Group 1: Distance – F/W Text Alone		
Caveat: May have used F/W Website materials		
	Pre-test:	Post-test:
Mean:	63.8%	74.25%
Median:	61%	73%
Mean Improvement: 10.45%		
Group 2: Distance – F/W and Salkind		
Caveat: May have used F/W Website materials		
	Pre-test:	Post-test:
Mean:	63.33%	78.5%
Median:	66%	78.5%
Mean Improvement: 15.7% (4.72% > Group 1)		
Group 3: Campus – F/W Text Alone		
	Pre-test:	Post-test:
Mean:	70%	76.6%
Median:	67%	75%
Mean Improvement: 6.6%		
Group 4: Campus – F/W Text and Website		
	Pre-test:	Post-test:
Mean:	73%	86.5%
Median:	80%	88.5%
Mean Improvement: 13.05% (6.45% > Group 3)		
Group 5: Distance – All		
	Pre-test:	Post-test:
Mean:	62.77%	76.8%
Median:	61%	78%
Mean Improvement: 14.03%		
Group 6: Campus – All		
	Pre-test:	Post-test:
Mean:	67.77%	75.76%
Median:	67%	78%
Mean Improvement: 7.99% (6.04% < Group 5)		

As Figure 5 indicates, the distance students who reported reading the Salkind text (5, 50%) improved their scores 4.72% more than the distance students who reported only reading the F/W text (5, 50%). Similarly, the campus students who reported using at least some of the F/W website materials (8, 47%) improved their scores 6.45% more than the campus students who reported only reading the F/W text (9, 53%). These findings suggest that there is some benefit to a combination of the F/W text and the use of ancillary materials rather than using the F/W text alone, especially if one considers the fact that many of the distance students also reported using some F/W website materials, and that both groups reported using unassigned ancillary materials

(the podcast, online document) during their studies before the post-test. What is not entirely clear is exactly what combination of ancillary materials, if any, led to a greater improvement of scores from pre- to post-test.

Recommendations

Although the data suggests that students seemed somewhat ambivalent about the specific ancillary materials provided for this study, it appears that supplemental materials did indeed make a difference in their exam performance. When tested, students who accessed resources other than their text, whether they were the assigned ancillary materials or those materials on the course Moodle that the instructor didn't particularly emphasize (such as the instructor-created podcast and handouts), outperformed those students who read the F/W textbook alone. However, it is impossible to determine which, if any, of the assigned ancillary materials truly led to this improvement because there was no way to control the materials to which students had access. Regardless, this study does suggest a positive correlation between student exposure to support materials of some sort in conjunction with their class text and higher academic performance; therefore, additional studies are recommended to confirm the exact utility of each specific ancillary material on the actual academic performance of the participant.

The researchers advocate for additional studies in which:

- Actual materials that are available to the participants are controlled, in order to ensure a more accurate comparison of what works and what does not.
- Feedback is consistent from all participants; in other words, ensure that the students that complete the initial pre-test follow through and complete a post-test and perception survey.
- There is a shorter amount of time between the pre-test, assigned "treatment" activities, and the post-test.
- Fewer types of ancillary materials are tested among several "treatment" groups for more direct comparison between the different types of supplemental materials.

- There is a true control group that receives no ancillary materials and only reads the chapter – for ethical reasons, it would be best to do this in a context where a student's performance would not affect their potential grade in a class.

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List of Appendices

Appendix A – Quia Pre/Post Test

Appendix B – Distance Survey

Appendix C – Campus Survey

Appendix D – Pre-Test Message

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