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Use of an interactive iTextbook in a college nutrition course: effects on student comprehension, knowledge, application, and engagement

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BOSTON UNIVERSITY
SCHOOL OF EDUCATION

Dissertation

**USE OF AN INTERACTIVE iTEXTBOOK IN A COLLEGE NUTRITION
COURSE: EFFECTS ON STUDENT COMPREHENSION, KNOWLEDGE,
APPLICATION, AND ENGAGEMENT**

by

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Submitted in partial fulfillment of the
requirements for the degree of
Doctor of Education

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DEDICATION

I would like to dedicate this dissertation project to my family and friends who have supported me through the good and not-so-good times in achieving this academic milestone. Success is sweet only if you have loved ones to share it with, especially my ABC family.

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Lastly, I need to thank my husband, Craig Blake, for proofreading this tome, supporting me throughout this very long journey, and smiling when I was not.

**USE OF AN INTERACTIVE iTExTBOOK IN A COLLEGE NUTRITION
COURSE: EFFECTS ON STUDENT COMPREHENSION, KNOWLEDGE,
APPLICATION AND ENGAGEMENT**

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ABSTRACT

Colleges and universities have started to recognize the benefits of shifting from a professor-centered instructional paradigm that focuses on the dissemination of information to the learner to a student-centered paradigm. This latter paradigm is designed to provide an environment that enables the student to personalize, analyze, synthesize, and apply the information learned both inside and outside the classroom. Few would argue that such a paradigm shift would be best supported with the provision of a cost-effective, digitally interactive textbook that supports this type of personalized student-centered learning anywhere, anytime. Additionally, an Internet-based textbook would give the student more control of when, what, and how much he/she learns allowing for a potentially deeper exploration of content.

This quantitative study was conducted to ascertain if the use of an instructionally designed, interactive college nutrition textbook (iTextbook) with embedded links to digitally-rich supporting graphics, videos, figures, and self-assessments would significantly improve students' knowledge acquisition and application of the information as compared to the use of an identical print textbook and a static electronic textbook

(eTextbook) in a Portable Digital Format (PDF). This study also looked at the time-on-task for reading the textbook content in each of the three formats. Lastly, this study assessed if students would prefer this type of instructionally designed, digitally-rich iTextbook format rather than reading the same information in a print textbook or a PDF eTextbook.

The results of the study alluded that while there was a trend for a higher mean exam score measuring knowledge acquisition and application of the information read in the iTextbook group and a lower mean exam score in the eTextbook group, the scores among the three formats were not significantly different. The time-on-task spent by each group reading the textbook content was also similar among the three formats. However, the students reading the eTextbook spent a significantly longer amount of time reading the eTextbook compared to the iTextbook yet obtained the lowest average exam score among the three groups. In response to a final questionnaire, students significantly preferred the iTextbook rather than the print or eTextbook formats.

College students reading a textbook in an iTextbook format obtained similar exam scores as those reading the same content in a print or eTextbook format. Compared to the iTextbook, the time-on-task was not only longer for those reading the eTextbook format but this format also produced a lower exam score measuring knowledge acquisition and application. The iTextbook format was more favorably received by college students than the print or eTextbooks formats.

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CHAPTER ONE

Introduction

There has been a paradigm shift in post-secondary education. Colleges and universities have slowly shifted from an instructional paradigm to a learning paradigm (Barr and Tagg 1995). The former, a professor-centered approach, focuses on the delivery of knowledge from the professor to the student. In contrast, the latter paradigm is a student-centered approach focusing on learning (Barr and Tagg, 1995; Heider, Laverick, and Bennett, 2009; Brown, Dehoney, and Millichap, 2015). This shift has changed the primary role of the professor from transferring knowledge predominately via lectures to designing an environment that enables the student to analyze, synthesize, and apply the information learned (William, 2003).

With this shift, there has been a need to create classroom tools that provide students with guidance as they construct their own personal learning related to the course (Davidson and Carliner, 2012; Heider, Laverick, and Bennett, 2009; William, 2003) and also improve the application of knowledge learned in situations outside the classroom (Bransford, Brown, and Cocking, 2000). Instructionally designed digital textbooks can give the student more control of when, what, and how much he/she learns. Thus, in secondary and higher education, textbooks can be used as a tool to provide opportunities when creating personalized student-centered learning environments.

The need for personalized learning is also one of the recommendations set forth by the U.S. Department of Education's National Educational Technology Plan 2016. According to the Plan, "personalized learning refers to instruction in which the pace of

learning and the instructional approach are optimized for the needs of each learner” (U.S. Department of Education and Office of Education Technology 2016, p. 7). “In addition, learning activities are meaningful and relevant to learners, driven by their interests, and often self-initiated” (U.S. Department of Education and Office of Education Technology 2016, p. 7). Personalized learning prepares the student for lifelong learning (U.S. Department of Education and Office of Education Technology 2016).

Brown, Dehoney, and Millichap (2015) clarify that the personalized learning needs to be specific to the needs of the learner. For example, if the student interacting with the digital textbook incorrectly answers a multiple choice test question at the end of a section, he/she would immediately be linked to remedial information and/or suggestions that would help the student understand why a mistake occurred rather than merely be provided with the correct answer. Clark and Mayer (2008) call this tailoring of feedback “adaptive instruction,” which can immediately help the student.

If a student is interested learning more about a topic, a digital textbook can also provide additional resources for a deeper exploration of the learning. For example, if a student reading a nutrition textbook is learning about the need to avoid the protein, gluten, in the diet because he or she has [celiac disease](#), the embedded links to the Internet would provide immediate additional resources. The Internet links could provide the student with additional content for a deeper understanding of celiac disease, an extensive list of foods that contain gluten, and guidance on how to make diet adjustments to avoid this protein. In other words, a student can digitally personalize the learning using technology on demand to meet his or her needs (Project Tomorrow, 2012). In contrast,

the finite limitations of a static textbook may be frustrating college students who want to personalize their learning and explore information beyond what they are reading.

The U.S. Department of Education and Office of Educational Technology (2012) agree that the next generation of textbooks needs to be interactive, digital textbooks, not just digital copies of static textbooks. The Digital Textbook Collaborative, a collaborative assembled by the Federal Communications Commission and the U.S. Department of Education (2012), developed the Digital Textbook Playbook, a guide for K–12 educators and school administrators to promote the growth of digital learning in the classroom, including the creation and use of digital textbooks. While this collaborative recognizes that digital textbooks are evolving, they have identified that these Internet-based textbooks need to contain interactivity and personalized learning, multimedia educational videos and games, and other creative applications that provide immediate feedback to the student as well as the instructor (Federal Communications Commission and the U.S. Department of Education, 2012).

Purpose of Study

This quantitative study was conducted to ascertain if the use of an instructionally designed, interactive college nutrition textbook (iTextbook) with embedded links to digitally-rich supporting multimedia, enhanced graphics, videos, figures, self-assessments and problem-based activities would significantly improve the student's knowledge acquisition and application, as compared to the use of an identical print textbook and a static electronic textbook (eTextbook) in a Portable Digital Format (PDF) written by the same author and containing the same information. This study also assessed if students

spend more time-on-task reading the iTextbook and rate this format higher in quality as compared to a print or eTextbook format.

Project Goal and Research Questions

The proliferation of Internet-based resources and the opportunities of new digital technologies call into question the utility of printed textbooks. Professors need to engage in practice-based inquiry to find better options. This study furthers this research agenda by studying the potential advantages of an iTextbook. Four research questions drove this effort:

(1) Do college students who use an instructionally designed, interactive college nutrition textbook (iTextbook) with embedded links to digitally-rich supporting multimedia, enhanced graphics, videos, figures, self-assessments and problem-based activities, score higher on multiple choice exams designed to measure knowledge acquisition and application of the nutrition content when compared to college students who use a print nutrition textbook or eTextbook written by the same author with the same information?

(2) Do college students who use an instructionally designed, interactive college nutrition textbook (iTextbook) with embedded links to digitally-rich supporting multimedia, enhanced graphics, videos, figures, self-assessments and problem-based activities, spend more time-on-task interacting with the nutrition content compared to those college students who use a print textbook or eTextbook written by the same author with the same information?

(3) Do the college students who spend more time-on-task score higher on multiple choice exams designed to measure knowledge acquisition and application of the nutrition content?

(4) Do college students who use an instructionally designed, interactive college nutrition textbook (iTextbook) with embedded links to digitally-rich supporting multimedia, enhanced graphics, videos, figures, self-assessments and problem-based activities, rate the learning experience higher in quality as compared to reading the content in a print textbook or eTextbook format written by the same author with the same information?

Special Circumstances of the Study

I have created a print college level nutrition textbook, *Nutrition &You* (Blake, 2015). This book is used in colleges and universities in the United States and abroad. The publisher, Pearson Education, has made the textbook available as an eTextbook in a PDF. I also created a digitally enhanced iTextbook version of this textbook. The iTextbook contains the exact same content as the printed textbook and eTextbook, but the formatting allows the reader to engage with links to embedded information, such as digitally-rich supporting graphics, videos, figures, and self-assessments.

The design of the content in iTextbook was developed using the principles created by Lee and Owens (2000). The following is a table listing Lee and Owens' research-based principles on how people learn as well as their application of each principle when designing multimedia-based instruction. The table also contains examples of how Lee and Owens' principles were applied in the iTextbook that was created for this study:

Lee and Owens' Principle	Examples of Lee and Owens' Application of Each Principle	Example of the Application Used in the iTextbook
<p>1. Include Introductions and Specified Objectives Students learn more when lessons and activities are introduced and learning objectives are specified.</p>	<p>State the learning objective prior to the lesson so that students know what they are expected to understand and know after reviewing the content.</p>	<p>Each section begins with a learning objective:</p> <p>After reading this section of the Lipids chapter, you will be able to:</p> <p><i>Describe the three classifications of lipids and explain the differences in the structure of triglycerides, phospholipids, and cholesterol.</i></p>
<p>2. Be Sure Verbal Content is Effective Students learn more when verbal content is precise and presented fluently.</p>	<p>The content in the lesson is clear and transitions logically from text to activity.</p>	<p>The animation on fat digestion immediately follows the text discussion of this topic.</p>
<p>3. Use Examples and Demonstrations Students learn more when relevant examples and demonstrations illustrate concepts and skills.</p>	<p>Position the visuals (figures) in the lesson so that they are on the same screen with the supporting text to help the student conceptualize the learning.</p>	<p>The figure of the structure of a fatty acid is near the text discussion of the topic.</p>
<p>4. Build in Student Success Students learn more when they are able to handle tasks and questions with a high rate of success.</p>	<p>The lesson contains supplement materials, reviews, and summaries that ensure success for students who learn at different rates.</p>	<p>After the animation illustrating the types of lipids in the body, there is a drag and drop activity that allows the student to recall the structural differences among a chylomicron, fat, phospholipid, and sterol.</p>
<p>5. Tailor Course to the Audience Students learn more when lessons and instructional activities are presented through concepts and language that are</p>	<p>The text is written at the appropriate level. Unfamiliar terms are defined.</p>	<p>The student can obtain the definition for key vocabulary terms by clicking on the word, which launches a popup box with the definition.</p>

understandable and appropriate to the intended audience.		
<p>6. Keep Pace Brisk, with Variations</p> <p>Students learn more when lessons are presented at a brisk pace and when instruction slows to accommodate students' understanding but avoids unnecessary slowdowns.</p>	The pace of the lesson is tailored to each student's rate of learning.	The science-based animations on the digestion and absorption of fat in the body can be stopped and reviewed multiple times to accommodate the students' prior knowledge of physiology.
<p>7. Include Smooth Transitions</p> <p>Students learn more when transitions between lessons are made efficiently and smoothly.</p>	A summary of the lesson is provided before moving on to the next topic.	Each section ends with "The Take-Home Message," which summarizes the key concepts in that section.
<p>8. Use Clear Assignments and Directions</p> <p>Students learn more when clear and concise assignments and directions are given.</p>	The directions for the navigation of the interactivity are clear and concise.	All the self-assessments and drag and drop activities are preceded with clear and concise instructions to help the student navigate the multimedia.
<p>9. Maintain Proper Standards</p> <p>Students learn more when clear, firm, and reasonable standards are maintained.</p>	The content should be designed to allow the student to know what the expected standard is regarding knowledge acquisition and application of the content.	The Lipids Chapter has a "Check Your Understanding" multiple choice quiz at the end, which allows the student to assess their knowledge acquisition and application of the content. Once completed, there is an answer key that provides feedback and further instruction as to not only the correct answer but also why the potential other options are incorrect.
<p>11. Ask One Question at a Time</p> <p>Students learn more when questions are posed one at a time.</p>	All questions in quizzes should be provided one at a time with the answers immediately available after each question.	At the end of each section, there is a multiple choice quiz contain three questions. Each question is completed one at a time with the answers accessible immediately after completing each question.

<p>12. Work in Feedback Students learn more when instructional feedback on the correctness of their work is offered.</p>	<p>The multiple choice quizzes should praise the student for correct answers and give information about incorrect answers.</p>	<p>The Lipids Chapter has a “Check Your Understanding” multiple choice quiz at the end, which allows the student to assess their knowledge acquisition and application of the content. Once completed, there is an answer key that provides feedback and further instruction as to not only the correct answer but also why the potential other options are incorrect.</p>
<p>13. Material Should Motivate Students learn more effectively when the material motivates them.</p>	<p>The lesson and interactivity is created to hold the interest of the student.</p>	<p>A slice of pizza is used as the food in the figure and corresponding instructional video to explain how the fat in food is digested and absorbed in the body. Pizza is a popular food choice among college students.</p>
<p>14. Connect Material to the Real World Students learn more effectively when the concepts taught are closely related to the real world.</p>	<p>The lesson should allow the student to apply the knowledge learned in an activity that closely simulates real world activities.</p>	<p>The student can interact with a virtual salad bar, which provides a variety of food selections and immediate feedback regarding the nutrient content of each selection.</p>

Table 1: Lee and Owens' *Principles of Content Structure and Multimedia-Based*

Instructional Design

As a clinical associate professor in the nutrition program at Boston University, I was also in a position to be able to conduct this study by testing these various textbook formats in a simulated classroom setting with college-age students in an existing course that I teach for non-majors, HS201 *Introduction to Nutrition*. The nutrition course enrolls 200 students every spring semester, which affords me the opportunity to recruit subjects to test the three textbook formats: print textbook, eTextbook, and iTextbook.

Definition of Terms

- **Print Textbook:** A book, printed on paper and bound, designed to be used by individuals in an educational institution to learn about specific subject matter.
- **Digital Textbook:** A textbook provided in a digital format, which includes both eTextbooks and iTextbooks.
- **Electronic Textbook (eTextbook):** An electronic copy of a print textbook. The information is identically reproduced from the print textbook as a PDF. It is read by using a digital computer device or on paper printed from the electronic source.
- **Interactive Textbook (iTextbook):** An instructionally designed, digitally-rich, and interactive book embedded with links to engaging problem-based activities, videos, interactive graphs and figures, and self-assessments. The text is enhanced to be read and interacted with by the reader on a digital computer device.
- **Portable Document Format (PDF):** A file format, designed by Adobe Systems, which is an electronic replication of a print or digital document. PDFs can typically be read on a digital computer device and/or printed for viewing.
- **Digital Computer Device:** A desktop computer, laptop computer, smart phone, or tablet computer (e.g., iPad®).

CHAPTER TWO

Review of the Literature

Textbooks in Higher Education

Textbooks have been used as visual pedagogical tools in learning as early as 1658 when Johann Amos Comenius published *Orbis Pictus [The World in Pictures]*, a popular illustrated textbook for children (Saettler, 2004). According to Cronbach, “Only the teacher—and perhaps a chalkboard and writing materials—are found as universally as the textbook in classrooms from the first grade through college” (Cronbach, 1955, p. 3). In the United States, textbooks are universally used in education; “where there are schools there are textbooks” (Farrell and Tanner, 2002, p. 1).

Many professors continue to use the textbook as their core teaching resource to help guide their weekly class lectures, homework assignments, quizzes, and exams (Farrell and Tanner, 2002). Use of a textbook is designed to enable students to learn the course content. It has become such a key pedagogical course tool that college professors will assess the writing style, accuracy of the content, and quality of the pedagogical aids in the textbook before adopting it for a course in order to ensure that it appropriately augments the class instruction and course learning objectives.

The creation of a college-level textbook involves an considerable investment of time in three stages: (1) The pre-production stage, when the publisher surveys the needs of the market and competing textbooks and looks for authors; (2) a developmental stage involving a team that includes author(s), a subject matter specialist, content and copy editors, a photo researcher, an art director, a production manager, senior editor, and

production manager; and (3) the post-production stage involving the marketing of textbook and training in the use of the book and any ancillary supplements (Young, 1990; Watt, 2007.) According to Michele Cadden, a senior acquisition editor at Pearson Education, this entire process can take up to four years to complete (personal communication. September 16, 2014). During these three stages, the textbook publisher is absorbing the expense of employing all of the individuals associated with these stages. Thus, the creation of a textbook is a labor intensive, costly endeavor. Textbook publishers are motivated to create a product that the consumer wants.

Even though a great deal of time and labor are invested in creating each textbook, there has been a growing trend for students to not complete the textbook reading assignments (Baier, Hendricks, Gordan, Hendricks, and Cochran, 2011; Berry, Cook, Hill, and Stevens, 2011; Sadaghiani, 2012). Berry, Cook, Hill, and Stevens (2011) stated that “students spend significantly less time reading and studying than they did even twenty years ago” (p. 31). Studies of college students have found that only approximately 25 percent of the students complete the assigned readings before each class and as many as approximately 53 percent never or rarely complete the textbook assigned readings before class (Baier, Gordan, Hendricks, and Cochran 2011; Berry, Cook, Hill, and Stevens, 2011). With the use of technology, such as PowerPoint™ in the classroom becoming more popular, many students rely solely on the lectures and accompanying electronic presentations or recorded video presentations to gain the information needed to meet the course assignments and pass the class examinations.

Possible reasons for the decline in reading the course assigned textbook could

include the lack of personalization of the textbook content, the format of the textbook, and the cost of the textbook. Each of these potential reasons will be discussed.

Personalized Learning

The lack of personalization could be playing a role in the decline of college students reading the course assigned textbook. The students currently enrolled in college have grown up in a digital world and are learning differently than those from past generations (Federal Communications Commission and the U.S. Department of Education, 2012). Researchers for Project Tomorrow (2012) surveyed over 330,000 K–12 students. The majority of the students stated that they defined school success by the achievement of their own personal learning goals and were using technology, specifically the Internet outside the classroom, to meet those goals. Currently, if students do not understand the basic concepts of the subject matter obtained from either a lecture or an assigned reading, or want to explore the topic to a greater extent, the Internet becomes their virtual tutor (Project Tomorrow, 2012). The students can turn on a digital device and “Google it” or go online to Wikipedia to read more about it. They can also log on to YouTube to view more about the topic in order to gain a deeper understanding (Project Tomorrow, 2012).

Other research supports this digital trend (Martell, 2008; Rose-Wiles, 2013). The physical use of reference books, journals, and other scholarly collections at campus libraries by students has declined since 1995 (Martell, 2008; Rose-Wiles, 2013). Simultaneously, the use of electronic references that can be obtained at another site on campus without entering the library building, or even off campus, has skyrocketed

(Martell, 2008; Rose-Wiles, 2013). In other words, students are digitally personalizing their education using technology on demand to meet their needs outside the classroom (Project Tomorrow, 2012).

Textbook Format

The static format of the textbook may also be playing a role in the decline among college students to read the course assigned textbook. Current students have grown up in a digital world where they are accustomed to the immediacy and personalization of information on demand. A Kaiser Family Foundation Study that 8 to 18-year-olds spend approximately 7½ hours daily using technology, which includes smartphones and computers (Rideout, Foehr, and Roberts, 2010).

A report by Grajek (2013) revealed that 47 percent of college and graduate students “wished their instructors used eTextbooks more” (p. 32). A pilot study of over 1,700 undergraduates at Indiana University who were given access to an eTextbook for their courses found that about 60 percent of the students surveyed preferred the electronic version compared to the paper textbook (Dennis, 2011). Similarly, a survey conducted of close to 300,000 students in grades K through 12 found that 25 to 35 percent of the students were already using online textbooks or other online curriculum (Project Tomorrow, 2011). In another survey of over 330,000 K–12 students, about 50 percent of middle school students welcomed the use of digitally-rich textbooks in the future (Project Tomorrow, 2012). In a few years, these students will be college freshmen who could be looking for digital options for their coursework. It appears that technology-savvy students may be ready to embrace the format of a digital textbook.

Researchers also suggest that technology can be used to motivate learner engagement and interest (National Education Technology Plan, 2010). “Digital learning resources enable engaging individual learners’ personal interests by connecting Web-learning resources to learning standards, providing options for adjusting the challenge level of learning tasks to avoid boredom or frustration, and bridging informal and formal learning in and out of school” (U.S. Department of Education and Office of Educational Technology, 2010, p.17). Thus, an interactive digital textbook format may also increase the student’s motivation to read the assigned textbook.

Textbook Costs

Economics could also be playing a role in the decline in the reading of course assigned textbooks. In a survey of 2,039 college students from 156 university campuses, 65 percent of students stated that they did not buy a course-assigned textbook in the semester due to its high price, even though they were concerned that this would negatively impact their grade in the class (Senack and The Student PIRGs, 2014). The need to create cost-effective digital resources, such as textbooks, for students is also one of the many pressing recommendations urged by the Federal Communications Commission and the U.S. Department of Education (2010).

Textbook prices have increased at an average rate of six percent annually from 2002 to 2012, which is currently twice the annual inflation rate (GAO, 2013; Miller, Nutting, and Baker-Eveleth, 2012). It is estimated that students spend \$1,200 in books and supplies annually (Senack and The Student PIRGs, 2014). The average college textbook costs \$125 (Miller, Nutting and Baker-Eveleth, 2012). While college tuition

has also increased significantly during the same time period, students have to pay tuition in order to attend classes. In contrast, they can opt not to pay for textbooks, especially for books required in courses outside of their major, such as a nutrition course designed for students not pursuing a career in dietetics.

There are costs associated with printing and delivering textbooks to the student that are often unknown to the consumer and are eliminated in the production of a digital textbook. Researchers at the online consumer textbook search engine, Textbook Spyder (2014), which compares vendor textbook prices, has analyzed the costs associated with the distribution of a college textbook that costs \$100:

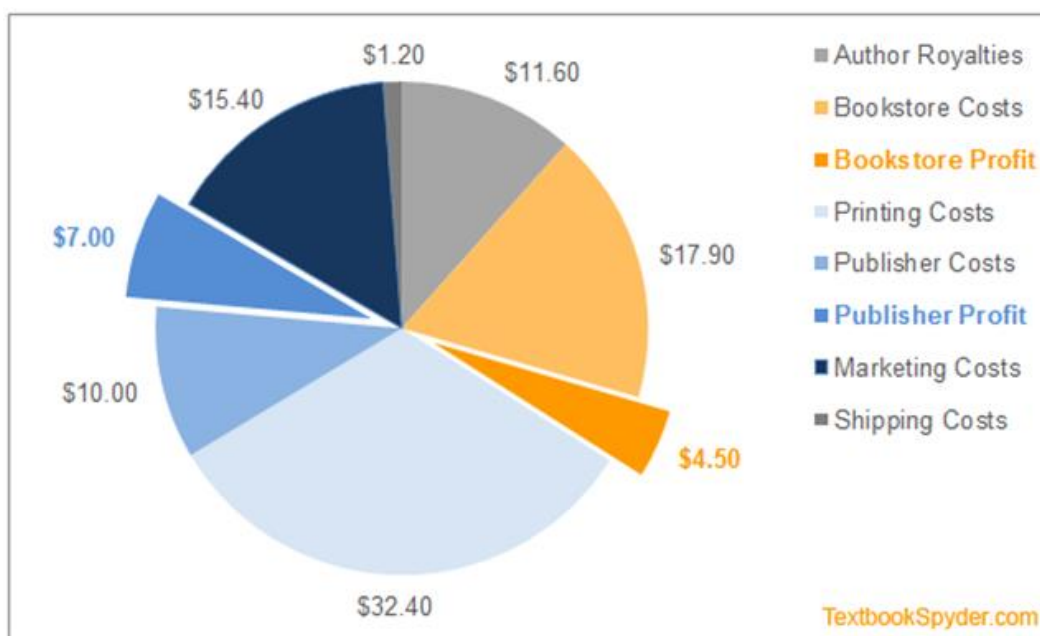
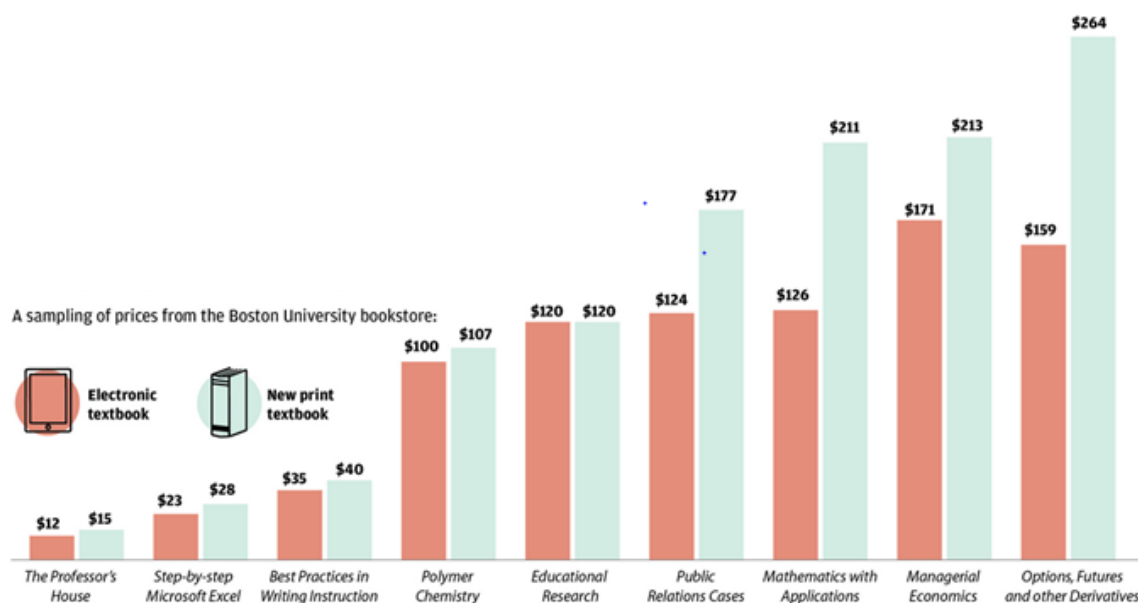


Figure 1: Costs associated with the distribution of a college textbook costing \$100.

Based upon the above analysis by Textbook Spyder, the highest cost associated with producing a \$100 textbook is the printing (\$32.40). Shipping the textbook to the college bookstore will also create an added expense (\$1.20), albeit smaller in comparison

to the printing costs. Therefore, by switching to a paperless, digital textbook, which can be read from the Internet, the cost of the textbook could be reduced by over 33 percent by eliminating both the printing and shipping as compared to a traditional paper textbook. These potential savings by eliminating the costs associated with the printing, transportation, and warehouse storage of a print textbook were a benefit stated by in the Digital Textbook Playbook, albeit the short-time savings may not be realized as schools may have to invest in technology upgrades to accommodate the demands of digital textbooks (Federal Communications Commission and the U.S. Department of Education, 2012).

According to a Boston Globe report (Hall, 2014), electronic versions of print textbooks could save the student as much 60 percent of the price of a new edition of print textbook:

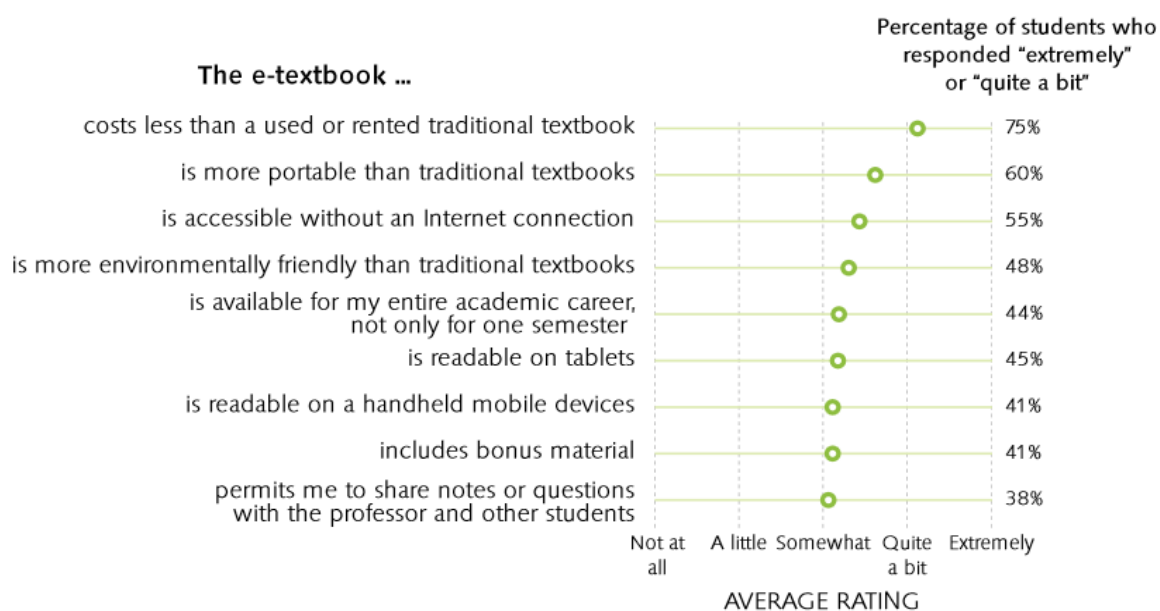


Source: Hall, 2014.

Figure 2: Sample cost savings of electronic textbook compared to a print textbook.

According to the Boston University bookstore, while new and used books can be possibly returned to the bookstore for cash, the resale may be as low as 10 percent of the original purchased price (personal communication. June 8, 2016).

The results from a study conducted by the EDUCAUSE Center for Analysis and Research (Grajek, 2013) involving 23 colleges and universities support the premise that students want lower costs for course materials, and eTextbooks are very appealing to them. In this study, 5,383 students were asked to rate the importance of specific features offered in an eTextbook when persuading them to switch from a print textbook to an eTextbook. Cost was the most important decision-making factor (Figure 3).



Source: Grajek, 2013.

Figure 3: Persuasive factors in purchasing an eTextbook.

Because electronic versions of a textbook are less expensive compared to the print copy, digital textbooks can be a viable component in helping reduce the cost of higher education (Dwyer and Davidson, 2013).

This is especially pertinent for assigned textbooks in courses that students take outside of their major. Because these courses are not required within their major, there is typically not a need to keep the textbook for future reference. These students typically sell the book back to the bookstore or online at the end of the semester to offset the original cost of the textbook. A less expensive version of a textbook in non-major courses could be appealing to these students.

Digital textbooks are less expensive than print textbooks and are becoming more popular, but the pertinent question is whether or not they are more effective in the acquisition, comprehension, and application of the subject matter as compared to print textbooks.

Effectiveness of Digital Textbooks

Research on the effectiveness of learning and comprehension using a digital textbook in the classroom is limited, as the field is still emerging (Porter, 2010). A study of 60 children, ages 11 to 12 years old, found that those who used a history eTextbook with interactive activities, assignments, quizzes, and Internet links achieved higher, but not statistically significant, test scores than those using the traditional print textbook (Maynard and Cheyne, 2005). However, there was a trend among those who used the eTextbook to score higher on the test ($p=0.1$) (Maynard and Cheyne, 2005). One limitation of the Maynard study was that the textbooks that were used were not identical.

Rather, the researchers used two different textbooks about the same topic but written by two different authors. The lack of statistical significance could have been attributed to the inferior readability, illustrations, and figures of the eTextbook compared to the traditional print textbook. Thus, the results of the study may have been different if the researchers had compared the exact same textbook written by the same author in both a printed and electronic format.

Research conducted at Capella University of 90 allied health students found no significant difference in content retention among students reading the same chapter from a textbook presented in different formats (Porter, 2010). In this study, the students were divided into three equal groups and were assigned one of the following three formats: a print chapter of the textbook along with a separate CD-ROM problem-based learning activity; the same chapter but scanned in an electronic form with the CD-ROM problem-based activity; or the scanned chapter in electronic form but with the separate CD-ROM problem-based learning activity embedded in the chapter. Johnson (2013) found no significant difference in comprehension among 233 college students reading a textbook chapter on organizational behavior in print compared to reading the text in a digital format with the interactivity limited to note taking capabilities. Taylor (2011) found no significant difference in comprehension among 72 college undergraduates reading a microeconomics textbook chapter in print as compared to an eTextbook, which enabled them to make electronic study notations in the margin and highlight the text. Cheng, Zheny, Li, and Chen (2014) found no significant difference in reading comprehension and summarization of content among 24 college students reading language arts exam

passages either in print, on a computer, and on a tablet. The passages were presented as a PDF on the computer and in a similar format on the tablet. No interactivity capabilities were mentioned for the electronic formats. Daniel and Woody (2013) studied 298 college students and found no significant difference in the exam scores between a social psychology chapter in a print and electronic textbook. There was no mention of interactivity capabilities in the electronic textbook. Similarly, Connell, Bayliss, and Farmer (2012) found no significant difference in comprehension in 201 college students reading instructional text about the human heart in a print, tablet, or eBook reader (Kindle™) formats with similar font sizes. There was no mention of interactivity capabilities in the tablet or eBook reader formats.

A major limitation of the majority of these studies is that the format of the digital textbook used was just a digital copy of the print version with no interactivity or activity limited to highlighting the text and note taking. Thus, in these studies, adding interactivity in the digital textbook and changing the design of the content might have improved the reader's comprehension of the chapter and changed the outcome of the study.

Digital textbooks need to go beyond the mere duplication of the written text and should be designed to include interactivity that allows for the building of knowledge, known as knowledge construction, by the student in order to be effective (Berg, Hoffman, and Dawson, 2010; Bransford, Brown, and Cocking, 2000; Clark and Mayer, 2008, Davidson and Carliner 2014). Interactive, multimedia instruction, which uses multiple methods of instruction, such as text, graphs, videos, and animations, has been shown to

aid in active learning and improve problem solving skills (Clark and Mayer, 2008; Sadaghiani, 2012).

According to Clark and Mayer (2008), “People are more likely to understand material when they can engage in active learning—that is, when they engage in relevant cognitive processing such as attending to the relevant material in the lesson, mentally organizing the material into a coherent cognitive repetition, and mentally integrating the material with their existing knowledge” (p. 57). This type of active learning not only integrates both the visual and auditory presentation of concepts but also engages the student in relevant cognitive processing (Clark and Mayer, 2008; Sadaghiani, 2012). Sadaghiani states that “multimedia-based instruction is more likely to trigger the cognitive processes associated with active learning than listening to a verbal explanation or reading the text” (2012, p. 2).

However, Clark and Mayer (2008) advocate that a special instructional design is needed when designing digital learning in order to improve the reader’s comprehension and cognitive processing (p.39). For example, in a digital textbook, the supporting graphics and figures need to be next to the corresponding content on the same screen rather than forcing the reader to hunt for the information on another screen. Clark and Mayer (2008) explain that the advantage of integrating the text with the graphics or figures reduces the mental burden to search for the augmenting visual, “which allows the user to devote limited cognitive resources to understanding the material” (p. 78).

A PDF eTextbook version of a print textbook would not necessarily allow for this close proximity of text with supporting graphics and figures on the screen. Depending on

the page layout of the print textbook, the supporting graphics and figures could be on another page of the textbook or located at the top or bottom of the same page but not visible on a computer or tablet screen near the accompanying text. This would force the reader to scroll up or down on the screen to view this supporting pedagogy, which would drain upon the reader's limited cognitive resources and increase the reader's mental burden to search for the supporting visuals.

During this current digital publishing movement, textbook publishers have an opportunity to go beyond just converting a current print textbook into an electronic PDF reader. While a digital reader may reduce costs, it is unlikely to enhance active student engagement (National Survey of Student Engagement, 2013). Future digital textbooks need to contain the same high quality content of a print textbook but be instructionally designed with enhanced electronic features such as links to embedded video tutorials, problem-based activities, personalized interactive self-assessments, and testing with tailored feedback that engages the student. The digital textbook should be created with the capabilities of using reflective and integrative learning that enables the students to interact with the material. Researchers suggest that this will allow students to hone their critical thinking skills by applying the information learned, and thus, potentially increase comprehension (Bransford, Brown, and Cocking, 2007, pages 206–213; National Survey of Student Engagement, 2013).

The future paperless textbook should go beyond an eTextbook PDF and should contain activities that allow for enhancement of knowledge acquisition and application. The digital textbook needs to engage the student with its content to allow both for

interactive learning and application of the information learned (Bransford, Brown, and Cocking, 2000). The next generation of digital textbooks will be interactive, personalized, instructionally designed, cost effective textbooks (iTextbooks).

iTextbooks

Publishers are currently developing interactive textbooks (iTextbooks) that add video, interactive maps, adaptive learning aids, and quizzes that are designed to engage students more deeply in their personalized learning (Zalaznick, 2014). “What we traditionally know as the best learning strategy is the multi-modal approach—you can hear it, you can see it, you can manipulate and interact with [the] scientific concepts” (Zalaznick, 2014, p 3). Discovery Education, Houghton Mifflin Harcourt, McGraw-Hill Education, and Pearson Education are all creating iTextbooks that meet the needs of auditory learners, visual learners, and text-based learners (Zalaznick, 2014).

The iTextbook version of the nutrition textbook used in this study contains numerous forms of multimedia and interactivity to engage the student. The following are examples from Chapter 5, Lipids in the iTextbook:

Embedded Definitions of Key Terms

If students are unclear about a key term, such as “lipids,” they are able to click on the term and a pop-up box with an explanation of the term will appear on the screen:

When you see the word *fat*, you may think of butter, mayonnaise, the cholesterol in meats and eggs, and even the fatty tissues in your own body. But technically speaking, these aren't all fats. Instead, they're examples of a broader category of substances known as **lipids**—compounds that contain carbon, oxygen, and hydrogen

A category of carbon, hydrogen, and oxygen compounds that are insoluble in water.

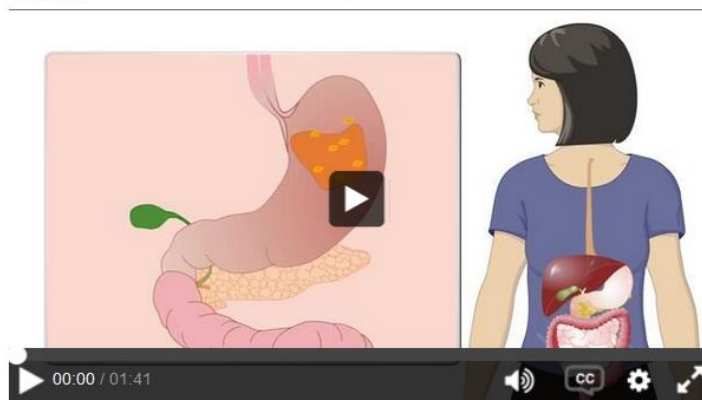
(*hydro* = water, *phobic* = fearing), water. If you were to drop lipids, a glass of water, you would see them

rise to the top and sit on the water's surface. This repelling of water

Animated Physiology Concepts

Students can view animations that help them visually understand challenging nutrition concepts such as fat digestion:

Watch Nutrition Animation: Fat Digestion



Interactivities That Test Student Knowledge

Following the viewing of the animation, an interactive drag and drop activity allows the students to interact with material to test their understanding of the material:

Activity Following the Breakdown of Fats through the Digestive Tract

The goal of digestion is to break food into smaller pieces so that it can be absorbed by the body through the intestines and distributed to cells through the bloodstream.

The digestion of food follows a sequence of steps that breaks down fats, carbohydrates, and proteins into smaller food segments for absorption. In this activity, we follow the breakdown of fat in the body to illustrate how it is used to fuel cells and body activities.

Evaluate the following steps of the digestive process and correctly order them, from left to right, to reflect the process by which food is digested in the body.

Gastric lipase creates diglycerides from fats	Liver produces bile for fat breakdown	Bile emulsifies fat	Fat packaged into micelles for transport	Chewing to create smaller particles	Lingual lipase begins fat breakdown
1	2	3	4	5	6

Submit **3** Remaining Attempts | Reset

End of Chapter Self Study Questions

Each chapter also contains several interactive test questions to help the students assess their knowledge:

3) Which statement is FALSE regarding lipoproteins?

- LDL is considered the "bad cholesterol" because it deposits fat into tissues.
- HDL is considered the "good cholesterol" because it takes fat away from tissues so it can be excreted.
- VLDLs are eventually converted to mimic the action of LDLs.
- The cholesterol removed by VLDLs can be used to make bile for fat breakdown.

Submit **2** Attempts Used

Correct.

While the research involving iTextbooks is still emerging, Discovery Education has created a K–8 Science Techbook that is being used in the Collier County Schools in Florida. Anecdotally, the school district has reported an increase in their science assessment scores among students using the iTextbook (Zalaznick, 2014).

This type of iTextbook has also recently shown promise in the field of math. In a study sponsored by Houghton Mifflin Harcourt (2011) at the Amelia Earhart Middle School in Riverside, California, two math teachers each had one of their classes randomly assigned to use an instructionally designed, interactive digital algebra application (app) on the iPad® (intervention group), while their other algebra classes used the textbook version of the same program (control group) over the course of the school year. Thus, both the control and intervention groups were taught by the same teacher using the same textbook material. The digital algebra app contained interactive tools such as real time quizzes, graphing features, and help with homework embedded in the program, as well as 400 lesson videos by the author, a prominent mathematician (Houghton Mifflin Harcourt, 2011). The app allowed the students to personalize their learning, and both teachers remarked that the students using the app were more motivated, attentive in class, and engaged in the subject matter. They read the chapters repeatedly and watched the videos to understand the content more thoroughly (Houghton Mifflin Harcourt, 2011). When the students took the year-end state standardized math test, over 78 percent of the students using the digital algebra app scored higher than those using the standard textbook. Unfortunately, the study's authors did not report if the higher test scores were statistically

significant. The higher test scores could have also been attributed to the novelty of the device as a potential motivator for the students to practice and engage with the content.

In summary, textbooks have been used as pedagogical tools in the classroom for centuries. While required readings in textbooks are still an important college course resource, there has been a decline in the reading textbooks among some college students. The lack of personalization, digital interactivity, and the high costs of printed textbooks may all play a role in the decline of the use of this course tool among students.

While eTextbooks have been developed and are lower in costs, they typically are PDF versions of the same printed text and lack personalization, proper instructional design, and interactivity. The next generation of digital textbooks needs to be iTextbooks that are not only lower in cost but also instructionally designed to allow personalization and active learning. The pertinent question is if such an iTextbook will improve knowledge acquisition and comprehension and if it would be favorably received by college students.

There are four research questions that drive this study:

(1) Do college students who use an instructionally designed, interactive college nutrition textbook (iTextbook) with embedded links to digitally-rich supporting multimedia, enhanced graphics, videos, figures, self-assessments and problem-based activities, score higher on multiple choice exams designed to measure knowledge acquisition and application of the nutrition content when compared to college students who use a print nutrition textbook or eTextbook written by the same author with the same information?

(2) Do college students who use an instructionally designed, interactive college nutrition textbook (iTextbook) with embedded links to digitally-rich supporting multimedia, enhanced graphics, videos, figures, self-assessments and problem-based activities, spend more time-on-task interacting with the nutrition content compared to those college students who use a print textbook or eTextbook written by the same author with the same information?

(3) Do the college students who spend more time-on-task score higher on multiple choice exams designed to measure knowledge acquisition and application of the nutrition content?

(4) Do college students who use an instructionally designed, interactive college nutrition textbook (iTextbook) with embedded links to digitally-rich supporting multimedia, enhanced graphics, videos, figures, self-assessments and problem-based activities, rate the learning experience higher in quality as compared to reading the content in a print textbook or eTextbook format written by the same author with the same information?

CHAPTER THREE

Research Method

This section will provide information about the purpose of the study, operational definitions, research questions, choice of methods, hypotheses, null hypotheses, independent and dependent variables, subjects, threats to validity, procedures, and extenuating circumstances that occurred, and the data collection.

Purpose of the Study

This quantitative study was conducted to ascertain if the use of an iTextbook improves college students' knowledge acquisition and application of the content as compared to the use of an identical print textbook or eTextbook written by the same author and containing the same information. This study also assessed if students spend more time-on-task reading the iTextbook and rate this format higher in quality compared to a print or eTextbook format.

Operational Definitions

Control groups: Print textbook (CPT) and eTextbook PDF (CET)

Treatment group: iTextbook (XIT)

Knowledge acquisition and application of content: Measured by student grades on two multiple choice exams taken by each subject in the CPT, CET, and XIT groups after reading two chapters. The two chapters were read at two different times within a three-week period.

Time-on-task: The amount of total time each subject interacts with the content in the CPT, CET, and XIT groups. The beginning and ending time of each subject's interaction

with the textbook content was recorded by a teaching assistant (TA). The time-on-task is the difference between the beginning and ending times.

Independent and Dependent Variables

Independent Variables: The independent variables are the formats of the textbook: print textbook (CPT), eTextbook (CET), and iTextbook (XIT).

Dependent Variables: The dependent variables are the test scores of the multiple-choice exams designed to measure knowledge acquisition and application.

Moderating Variable: Time-on-task is a moderating variable used to explain the relationship between the textbook format and its potential effect on knowledge acquisition and application. In others words, if the student is more engaged, the better the outcome on the exam instrument.

Research Questions

(1) Do college students who use an instructionally designed, interactive college nutrition textbook (iTextbook) with embedded links to digitally-rich supporting multimedia, enhanced graphics, videos, figures, self-assessments and problem-based activities score higher on multiple choice exams designed to measure knowledge acquisition and application of the nutrition content compared to using a print nutrition textbook or eTextbook written by the same author with the same information?

(2) Do college students who use an instructionally designed, interactive college nutrition textbook (iTextbook) with embedded links to digitally-rich supporting multimedia, enhanced graphics, videos, figures, self-assessments and problem-based activities, spend more time-on-task interacting with the nutrition content compared to using a print

textbook or eTextbook written by the same author with the same information?

(3) Do college students who spend more time-on-task score higher on multiple choice exams designed to measure knowledge acquisition and application of the nutrition content?

(4) Do college students who use an instructionally designed, interactive college nutrition textbook (iTextbook) with embedded links to digitally-rich supporting multimedia, enhanced graphics, videos, figures, self-assessments and problem-based activities, rate the learning experience higher in quality as compared to reading the content in a print textbook or eTextbook format written by the same author with the same information?

Choice of Method

A mixed method research design was used to identify a potential causal relationship and moderating effect of the use of an iTextbook (XIT) to improve the knowledge acquisition and application and the quality of the learning experience, as compared to the use of a print nutrition textbook (CPT) or eTextbook (CET). The iTextbook (XIT) contained the exact same content as the printed textbook and eTextbook (XIT), but was instructionally designed and digitally formatted to allow the reader to engage with links to embedded digitally-rich supporting graphics, videos, figures, and self-assessments on the screen.

Previous studies have tested textbooks in different formats. Unfortunately, the previous studies either involved textbooks in different format but by different authors and/or used static eTextbooks that were not instructionally designed for reading on a computer screen. The advantage of this study is that this was the first experimental

design that utilizes a textbook in three different formats containing the same information written by the same author and instructionally designed.

The quantitative measure of time-on-task when reading the three different textbook formats provides additional insight regarding the moderating effect of time-on-task and exam scores. This study will also provide insight on the perceptions of the learning experience using an iTextbook compared to reading the same information in a print or eTextbook format.

Hypotheses

- Hypothesis No. 1: The subjects using the iTextbook (XIT) will score higher on multiple choice exams that test for knowledge acquisition and application of the material as compared to the subjects using a traditional print textbook (CPT) or eTextbook (CET).
- Hypothesis No. 2: The subjects interacting with the iTextbook (XIT) will spend more time-on-task as compared to subjects reading the traditional print textbook (CPT) or eTextbook (CET).
- Hypothesis No. 3: The subjects spending more time-on-task will score higher on multiple choice exams designed to measure knowledge acquisition and application of the nutrition content.
- Hypothesis No. 4: The subjects using the iTextbook (XIT) will rate the overall quality of the learning experience higher than using either the print or eTextbook format.

Null Hypotheses

1. There is no difference in exam scores designed to measure knowledge acquisition and application of the nutrition content in college students using the iTextbook (XIT) as compared to using a print (CPT) or eTextbook format (CET).
2. There is no difference in time-on-task in college students using the iTextbook (XIT) as compared to using a print (CPT) or eTextbook (CET) format.
3. There is no effect of time-on-task on exam scores.
4. There is no difference in the rating of the learning experience using the iTextbook (XIT) as compared to a print (CPT) or eTextbook (CET) format.

Subjects

The students were recruited from a Boston University undergraduate course, HS201 *Introduction to Nutrition* taught by Joan Salge Blake (Appendix A). The study was conducted in the spring 2016 semester. HS201 *Introduction to Nutrition* is designed for non-majors, and therefore does not enroll any students majoring in the field of nutrition who may be more motivated to read a nutrition textbook in any format, print or digital. The textbook required for the course, *Nutrition & You*, 3rd edition, 2015, was written by Joan Salge Blake and published by Pearson Education. Earlier versions of this textbook have been used in this course since 2007. The chapters used in the experiment were from *Nutrition & You*, 4th edition, with a copyright date 2017.

This experiment coincided with the normal class assignments of reading Chapter 4, Carbohydrates and Chapter 5, Lipids. This ensured that the subjects in the experiment were familiar with the information in Chapters 1 through 3, which laid the nutrition and

science foundation for Chapters 4 and 5. The subjects were asked to not read the chapters prior to the experiment nor was there a lecture on the contents of the chapter prior to the experiment. As remuneration for their participation in this study, all of the subjects were entered into a raffle to win one of three \$75 Visa gift cards after the completion of the entire experiment.

The subjects were randomly assigned into one of three groups and each group was asked to read Chapter 4, Carbohydrates, in a specific form (print, PDF, or interactive) and then immediately take a multiple choice exam to assess their knowledge acquisition and application (Appendix B). Approximately two weeks later, the subjects were asked to read Chapter 5, Lipids, and then immediately take a multiple-choice exam to assess knowledge acquisition and application (Appendix C). The multiple choice exam questions for each chapter were derived from a combination of test questions used in Boston University's HS201 *Introduction to Nutrition* class in previous years as well as from the Pearson Educational instructors' test bank that accompanies the textbook. The exam questions were critiqued by two nutrition professors at Boston University's Sargent College of Health and Rehabilitation College who were teaching college-level nutrition courses at the time. The exam contained 20 multiple-choice questions. Ten questions were designed to measure knowledge acquisition, and ten questions were designed to measure knowledge application (Appendices B and C).

The students were given up to three hours to complete the interaction with the chapter and exam. An Information Services & Technology Answer Sheet Form No. 2780 (Scantron) was used by the students to record their test answers (Appendix D). The

exams were graded by the Boston University Information Services and Technology department, using an answer sheet provided by the TA. After completion of the Chapter 5 exam, all of the subjects completed a short questionnaire to ascertain the overall quality of the learning experience using the textbook formats (Appendix E).

All of these activities took place prior to the assigned classroom lectures of carbohydrates and lipids to avoid the impact of the professor's instruction on the students' knowledge acquisition and application.

Threats to Validity

To ensure that each group had a similar grade distribution prior to reading both Chapter 4 and Chapter 5, a class exam was given prior to the experiment covering the content in Chapters 1 through 3. Each subject's exam score was recorded and matched with their identifying number. To ensure that there would be no statistical significant differences in the groups' mean exam performance which could affect the groups' mean exam performance, a deliberate randomization using the Microsoft Excel program's random number generator (RAND()) occurred until each group had a similar mean exam score. The test scores from Chapters 1 through 3 also served as a weak proxy measure to identify higher motivated students (those who scored higher on the test) versus less motivated students (those who scored lower on the test). This data was used to address the concern that the subjects recruited are only highly motivated, higher caliber students. The experiment took place prior to the class lecture on Chapter 4 and Chapter 5. This prevented the subjects from having a prior exposure to the information derived from the lecture before reading each chapter beyond that which they may have encountered from

past experience.

Each subject was provided with an unique identifying number. A TA was the only person who had access to the names of the subjects and identifying corresponding number. The subject's name and identifying numbers were locked in a filing cabinet in Allen G. Harbaugh's (doctoral advisor) office.

A TA proctored each of the three groups to ensure that the researcher was not present during the experiment, which could potentially influence the subjects' exam scores and time-on-task. Only the subjects' identifying numbers were used in the experiment. A TA recorded all the time-on-task scores for each subject based on their identifying numbers. The researcher had access only to the identifying numbers of the subjects in each group and their corresponding time-on-task and exams scores.

Procedures

The students were recruited from 200 students who were enrolled in the HS201 *Introduction to Nutrition* class in the spring 2016 semester, which starts in January. Recruitment occurred via an e-mail message (Appendix A), and the students had the option of participating in the study during the day or in the evening. After the initial recruitment email, only six students committed to participating in the experiment. An additional two email recruitment requests were sent to the class in the following days, which generated an additional seven participants for a total of 13 subjects. In this first experiment, Chapter 4, Carbohydrates, seven subjects committed to reading the chapter in the morning with the remaining six subjects reading it in the evening.

The subjects were randomly assigned to one of three groups (CPT, CET, XIT)

using the Microsoft Excel program's random number generator (RAND ()). The randomization was deliberate and based on the subjects' multiple choice exam score for chapters 1 through 3 previously covered in class.

The 13 subjects were randomly assigned to one of three groups:

Group 1 (CPT): These subjects read a print copy of the chapter from the textbook, which included stagnant problem-based activities, graphs, figures, and self-assessments. Each subject was provided a print copy of the chapter.

Group 2 (CET): These subjects read a digital PDF, eTextbook copy of the chapter from the textbook, which included static problem-based activities, graphs, figures, and self-assessments. The subjects had access to the eTextbook on the Internet using a password protected log-in provided by the publisher and read the chapter on their laptops.

Group 3 (XIT): These subjects read the chapter from the instructionally designed, iTextbook, which included a digitally-enhanced, interactive problem-based activities as well as links to interactive graphs, figures, and self-assessments. The subjects in this group were trained to use the iTextbook on their laptops by the TA and had access to the iTextbook on the Internet using a password protected log-in provided by the publisher.

A TA texted each student the day before as well as the morning of the experiment to remind them of the time and classroom location of their assigned experiment group. Each group was assigned to a separate classroom at Boston University. The classroom contained desks with attached seats, WiFi access, and adequate electrical outlets and electrical cords to accommodate the subjects' laptops as needed. A different TA proctored each of the three groups to avoid bias by the researcher (who is also the

instructor for the course). The TAs recorded each of the subjects beginning and ending reading time of the chapter to determine each subject's time-on-task.

The distribution of the randomly assigned subjects for Chapter 4, Carbohydrates is found in Table 2.

Carbohydrate Chapter	Exam 1 Mean Test Scores based on 100%*	Morning Experiment	Evening Experiment	Total
Classroom No. 1 Group 1: CPT	92	n= 1	n=1	n=2
Classroom No. 2 Group 2: CET	90	n=3	n=1	n=4
Classroom No. 3 Group 3: XIT	83	n=3	n=4	n=7
Total				n=13

*Test scores randomly assigned using Microsoft Excel program's random number generator.

Table 2: *Distribution of randomly assigned students reading Chapter 4, Carbohydrates.*

Upon completing the assigned reading, each subject was given a multiple-choice exam (Appendix B).

Extenuating Circumstances

On the morning of the first experiment, Chapter 4, Carbohydrate, two subjects dropped out of the study, reducing the total number of potential participants from 13 to 11. Unfortunately, only four subjects of the seven subjects showed up for the morning experiment. The TA texted the morning "no-shows" and asked them to come to the evening experiment. None replied.

As the day progressed, inclement weather caused Boston University to cancel

evening campus classes so the evening experiment was also cancelled. The carbohydrate experiment could not be moved to the next day as the subjects in the experiment would have been exposed to the HS201 *Introduction to Nutrition* class lecture on carbohydrates. Thus, the subjects would have been tainted by the classroom presentation of the carbohydrate content prior to a second attempt to conduct the experiment.

After this failed attempt with the first experiment, two additional recruitment emails were sent to the entire HS201 *Introduction to Nutrition* class. These emails encouraged those who initially agreed to participate in the study but did not show up, as well as new subjects, to commit to the second experiment, the reading of Chapter 5, Lipids. A total of 21 students agreed to participate in this second experiment.

Unfortunately, of these 21 students, only 14 subjects showed up for the Chapter 5, Lipids experiment. The TA randomly assigned these 14 subjects based on their initial exam score to the three groups found in Table 2.

Lipids Chapter	Exam 1 Mean Test Scores based on 100%*	Morning Experiment	Evening Experiment	Total
Classroom No. 1 Group 1: CPT	88	n= 1	n=4	n=5
Classroom No. 2 Group 2: CET	84	n=0	n=4	n=4
Classroom No. 3 Group 3: XIT	87	n=3	n=2	n=5
Grand Total				n=14

*Subjects randomly assigned using based on Exam 1 mean test score using Microsoft Excel program's random number generator.

Table 3: *Distribution of randomly assigned students reading Chapter 5, Lipids.*

Data Collection

A TA recorded the beginning and ending time of each subject's time-on-task for interacting with Chapter 5, Lipids. Each subject's identifying number was used as identification on the exam and time-on-task data collection. Immediately after interacting with the chapter, each subject completed a multiple choice exam containing 20 questions, which was designed to assess knowledge acquisition and application of content relating to lipids (Appendix C).

After completion of the Chapter 5, Lipids exam, subjects completed a short questionnaire to measure the quality of the learning experience using the iTextbook and the print or eTextbook formats (Appendix E). The comments on the questionnaire were summarized by a TA (Appendix F).

CHAPTER FOUR

Results

This chapter provides the research results to determine if the use of an instructionally designed, interactive college nutrition textbook (iTextbook) with embedded links to digitally-rich supporting multimedia, enhanced graphics, videos, figures, self-assessments and problem-based activities, improved college students' knowledge acquisition and application of the nutrition content compared to reading the same content in a static print or PDF format. Quantitative research findings are also provided to determine if those college students using a college-level nutrition iTextbook spend more time-on-task interacting with the nutrition content compared to those using a print textbook or eTextbook and if time-on-task affected exam scores. Lastly, a final questionnaire was provided to determine if college students who use a college-level nutrition iTextbook rated the learning experience higher in quality compared to reading the nutrition content in a print or PDF format.

Extenuating Circumstances

Due to the inability for the majority of the subjects to complete Chapter 4, Carbohydrates, this research contains only the data and statistical analysis based on the 14 subjects who read Chapter 5, Lipids. The data for the exam scores and time-on-task are listed in Table 4.

Lipids Chapter, Subjects' Exam Scores Matched and Time-on-Task	Exam Score (100%)	Time-On-Task (minutes)
Group 1: CPT: n=5		
Subject 1	90	48
Subject 2	65	44
Subject 3	90	81
Subject 4	70	57
Subject 5	70	17
Group 2: CET: n=4		
Subject 1	75	72
Subject 2	65	63
Subject 3	75	70
Subject 4	80	65
Group 3: XIT: n=5		
Subject 1	85	61
Subject 2	75	52
Subject 3	70	41
Subject 4	85	55
Subject 5	75	54

Table 4: Exam scores and time-on-time for reading Chapter 5, Lipids.

The quantitative data collected was analyzed using an analysis of variance (ANOVA), a T-Test, and an analysis of covariance (ANCOVA).

Knowledge Acquisition and Application

The first research question examine if college students who use an instructionally designed, interactive college nutrition textbook (iTextbook) with embedded links to digitally-rich supporting multimedia, enhanced graphics, videos, figures, self-assessments and problem-based activities, scored higher on multiple choice exams designed to measure knowledge acquisition and application of the nutrition content compared to using a print nutrition textbook or eTextbook written by the same author with the same information. Figure 4 shows the mean exam scores for the three groups, print, eTextbook

and iTextbook. While the students using the iTextbook format scored higher on the exam compared to either the print or eTextbook groups, statistical analysis using an ANOVA found that there was no significant difference, $F(2,11) = 0.267$, $p = .77$, among the three textbook formats in the students' multiple choice exam scores, which tested for knowledge acquisition and application of the chapter content.

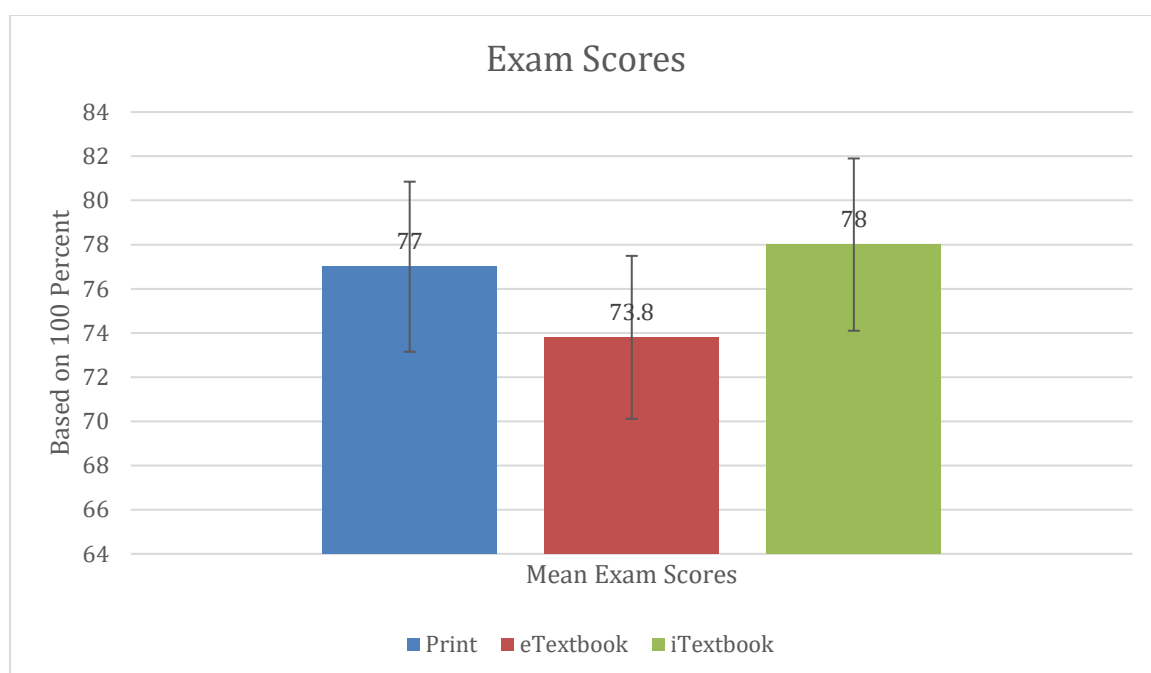


Figure 4: Mean exam scores for Chapter 5, Lipids.

A T-Test was also conducted to compare the mean test score in the iTextbook group with the print group and eTextbook group. While a T-Test is not traditionally performed between pairs when using an ANOVA, it was used in this study in an attempt to explore a possible difference between the groups. Since this study is considered exploratory in nature, the findings could be used to build the groundwork for similar studies in the future. There was no significant difference ($p = .88$) between the iTextbook and the print textbook groups, and there was no significant difference ($p = .36$) between

the iTextbook and the eTextbook groups.

Therefore, the null hypothesis that there is no difference in exam scores designed to measure knowledge acquisition and application of the nutrition content in college students using the iTextbook compared to college students using a print or eTextbook format was not rejected.

However, an analysis of the effect size between the iTextbook and eTextbook was investigated. The effect size is a way of quantifying the difference between these two groups of test scores. This is particularly helpful when the sample size is small. The effect size is calculated by as follows:

$$\frac{[\text{Mean of Experimental Group}] - [\text{Mean of Control Group}]}{\text{Standard Deviation of the Experimental Group}} = \text{Effect Size}$$

Using the above formula based on the mean test scores of the iTextbook and the eTextbook, the effect score is 3.23 ($p = 3.6$, $d = 3.23$):

$$\frac{78 - 73.8}{1.3} = 3.23$$

An effect size of 0.8 or higher is consider large. Thus, this suggests that the effect of the iTextbook was large but the lack of statistical significance between the mean test scores of the iTextbook and eTextbook could have been attributed to the small sample size.

Time-on-Task

The second research question examined if college students who use an instructionally designed, interactive college nutrition textbook (iTextbook) with embedded links to digitally-rich supporting multimedia, enhanced graphics, videos, figures, self-assessments and problem-based activities, spend more time-on-task interacting with the nutrition content compared to those college students who use a print

textbook or eTextbook written by the same author with the same information.

The mean time spent by each group reading the chapter are shown in Figure 5. When an ANOVA was used to analyze the time-on-task, there was no significant difference $F(2,11) = 1.838$, $p = .20$ among the three groups in time spent reading the chapter.

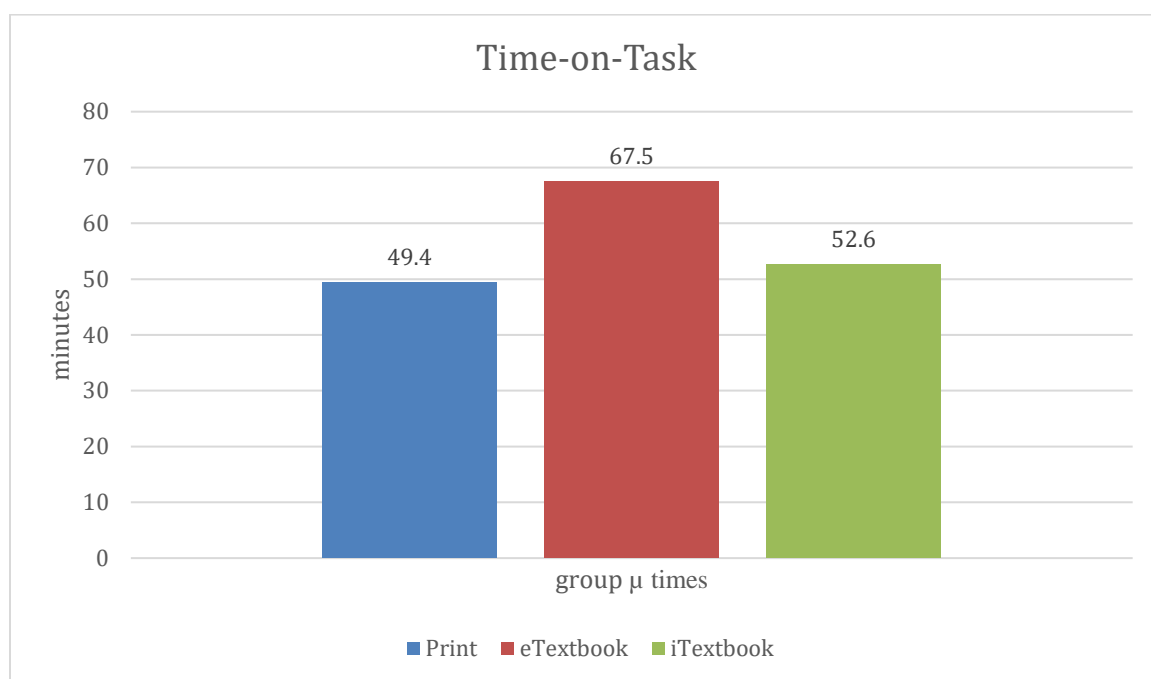


Figure 5: Time-on-task for the three groups reading Chapter 5, Lipids using ANOVA.

While the ANOVA did not show any difference among the three groups, the potential differences between pairs of textbook formats were explored. A T-Test was conducted to compare the mean time-on-task for the iTextbook group compared with the print and eTextbook groups. As mentioned previously, a T-Test is not traditionally performed between pairs when using an ANOVA, but was used in this study in an attempt to explore a possible difference between the groups. There was no significant

difference ($p=.77$) between the iTextbook and the print textbook, but there was a significant difference ($p=.008$) between the iTextbook and the eTextbook groups. The eTextbook group spent significantly more time reading the chapter than the iTextbook group (Figure 6).

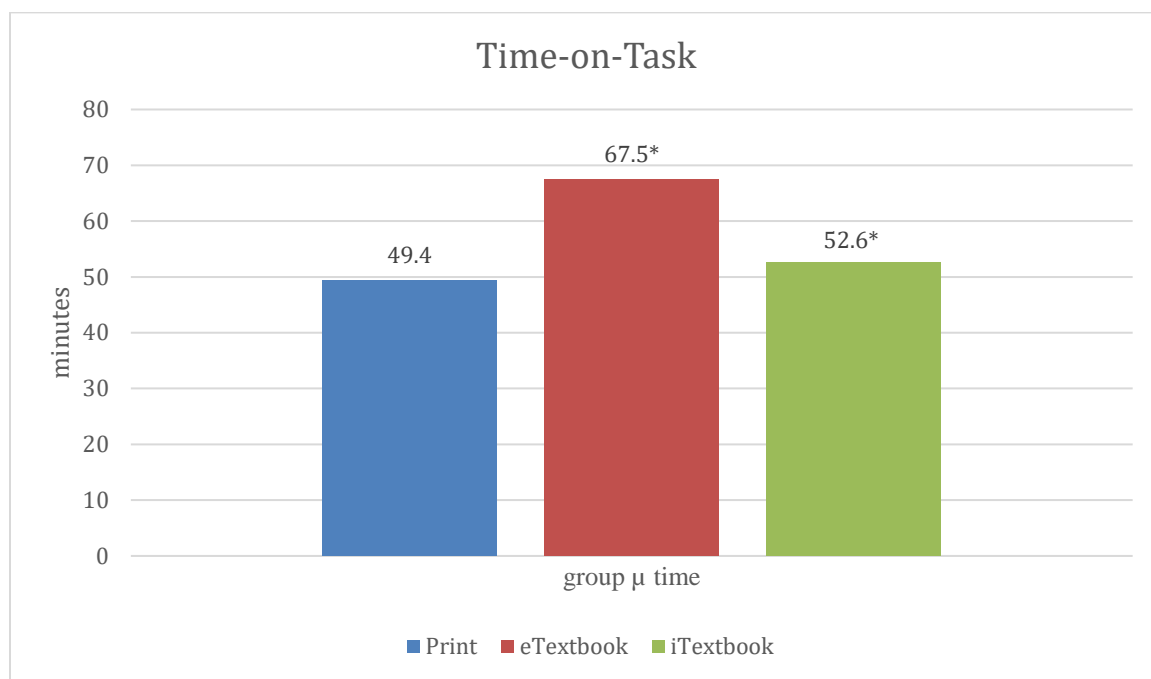


Figure 6: Time-on-task was significantly ($*p=.008$) longer in eTextbook users compared to iTextbook users using a T-Test.

Therefore, the null hypothesis that there is no difference in time-on-task in college students using the iTextbook compared to using a print or eTextbook format was rejected based on the T-Test results. However, the significant difference findings between the eTextbook users and iTextbook users on the T-Test could be attributed to a type 1 error in the T-Test, which means that the null hypothesis is true but it is rejected.

Time-On-Task and Exam Scores

The third research question examined if college students who spend more time-on-task score higher on multiple choice exams designed to measure knowledge

acquisition and application of the textbook content. To compare the potential relationship between time-on-task and the exam scores, an ANCOVA was used to determine if the dependent variable was influenced by the independent variable if the covariant was removed. An ANCOVA test was conducted to determine whether the textbook format (independent variable) influenced the exam score (dependent variable) after the influence of the time-on-task (covariant) has been removed. The task-on-time had no significant effect on the exam scores $F(2,8) = 0.362, p = .70$ (Figure 7).

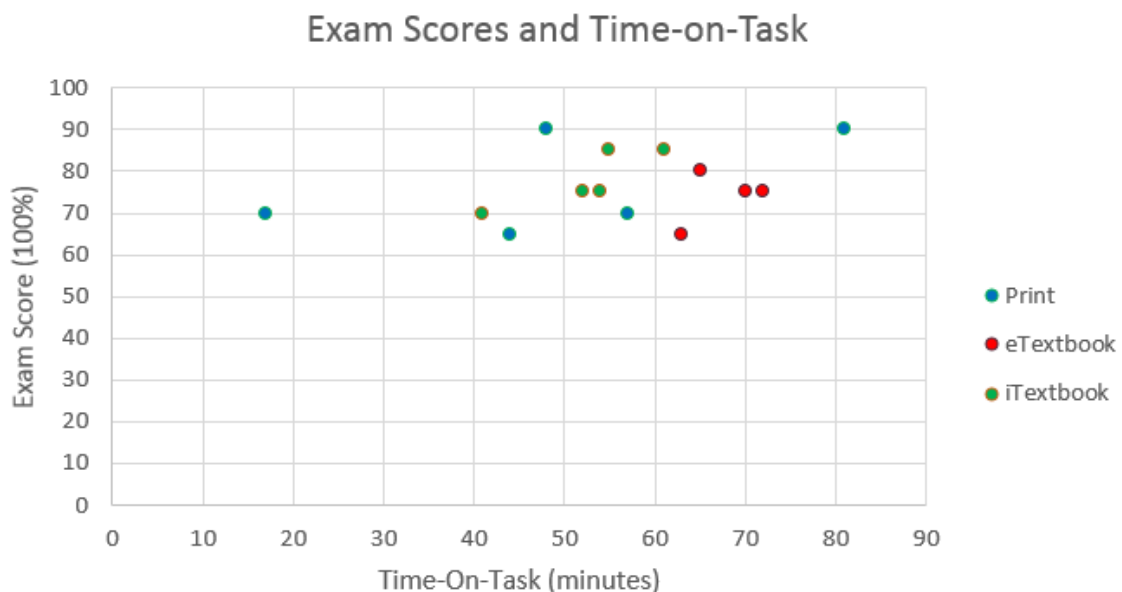


Figure 7: Exams scores and time-on-task for reading Chapter 5, Lipids.

While the ANCOVA did not show any difference among the three groups, the potential differences between pairs of formats were explored. An ANCOVA was conducted to compare the mean time-on-task on the exams scores between the iTextbook and the print and eTextbook. There was no difference between the iTextbook and print textbook $F(1,6) = 0.615, p = .46$ and no difference between the iTextbook and the eTextbook

$F(1,5) = 0.038, p = 0.85.$

To ensure that that any of these above results could have been due to an uneven distribution of academically, higher caliber students among the three groups, a Mann-Whitney-Wilcoxon Test was conducted to determine the ranking of the subjects in the experiment as compared to all the students in the HS201 *Introduction to Nutrition* class. Using the five exams scores and final grades for all the students in the HS201 *Introduction to Nutrition* class, there was no significant difference among the ranking of the subjects in three groups.

iTextbook Rating as a Learning Experience

The last research question examined if college students who use an instructionally designed, interactive college nutrition textbook (iTextbook) with embedded links to digitally-rich supporting multimedia, enhanced graphics, videos, figures, self-assessments and problem-based activities, rate the learning experience higher in quality as compared to reading the content in a print textbook or eTextbook format written by the same author with the same information. This qualitative question examined each student's learning experience after using the iTextbook as compared to the print textbook or eTextbook (Appendix E).

The questionnaire was completed by six subjects. The six subjects included the five subjects who were assigned to the Chapter 5, Lipids, in the iTextbook format and one subject who completed both Chapter 4, Carbohydrates, and Chapter 5, Lipids. This subject read Chapter 4, Carbohydrates, in the iTextbook format and Chapter 5, Lipids, in the print or eTextbook format. A 5-point Likert scale was used for most of the questions

with a section that allowed the subjects to respond with open-ended comments (Appendix E).

All of the six subjects did not complete all of the questions. The TA summarizes the questionnaire (Appendix F). Table 5 contains the TA's summary as well as the number (n) of subjects answering each question and the mean (μ) Likert score for each question as appropriate.

Question	Subjects	Likert Score					Comments
		Poor 1	Neutral 2	3	4	Superior 5	
1. How would you rate the overall quality of your learning experience of the iTextbook?	n=6	$\mu = 4.5$					<ul style="list-style-type: none"> I liked the quizzes throughout and links back.
2. How would you rate the overall quality of your learning experience using the Print or eTextbook formats?	n=5	$\mu=3.0$					<ul style="list-style-type: none"> Easy to lose focus.
3. Please rate the quality of the following features in the iTextbook as compared to the print or eTextbook format:							
a. Overall Features	n=6	$\mu=4.7$					<ul style="list-style-type: none"> Videos and questions throughout the interactive textbook helped a lot. The videos, demonstrations, etc., made everything easier to understand. Kept my attention. Liked pop-up boxes.
b. Self-Assessments	n=5	$\mu=5$					<ul style="list-style-type: none"> Good way for me to make sure I was absorbing info.
c. End of the Chapter Check Your Knowledge Questions	n=5	$\mu=5$					<ul style="list-style-type: none"> Helpful for understanding main points Good way for me to make sure I was absorbing info. Liked that it linked back to pages where answers are found.
d. Focus Figures	n=4	$\mu=4.8$					
4. Please circle the textbook format you would prefer to use for the remainder of the nutrition course.	n=6	Print/PDF or iTextbook: Print/PDF: n=0 iTextbook: n=6					<ul style="list-style-type: none"> I like the questions and self-assessment, but it takes way longer to go through the interactive textbook (because the videos are long) than the print/PDF versions. Extremely helpful. Videos are very helpful.

Table 5: Summary of ratings of textbooks formats as a learning experience.

While the number of subjects who completed the survey was small (6 subjects), the overall trend of the results was that the iTextbook was received more favorably as a

learning experience than the print or eTextbook. With a score of “1” being considered as poor, “3” being considered as neutral, and a “5” being considered as superior, the quality of the learning experience with the iTextbook received an average score of 4.5. In comparison, the subjects scored the learning experience with either the print or eTextbook only a 3, on average. Note: None of the subjects rated the print or eTextbook higher than a 3.

The iTextbook’s overall features, which included self-assessments, end of chapter test questions, and focus figures were rated 4.7 to 5.0, on average. The open-ended comments further expanded on these features with thoughts and opinions on the iTextbook’s interactive quizzes, videos, self-assessments, pop-up boxes, and links back to important content for answers to the questions. While there was one comment that the interactivity made the interaction with the iTextbook chapter longer to read than the print or eTextbook, all of the six subjects stated that they would prefer to use the iTextbook format for the remainder of the course. No one preferred use the print or eTextbook for the remainder of the course.

Due to this unanimous, albeit small, response, the null hypothesis that there is no difference in the rating of the learning experience using the iTextbook compared to a print or eTextbook format was not accepted. Based on the results of this questionnaire, the iTextbook was reported to have provided a higher quality learning experience among these subjects as compared to using the print or eTextbook.

CHAPTER 5

Discussion, Summary, Limitations, Future Research, and Conclusions

Discussion

The results of this study alluded that there was a trend towards an increasing group mean exam score with the lowest score (73.8 out of 100) occurring in the static eTextbook group and highest group mean exam score (78 out of 100) occurring in the digitally-enhanced, iTextbook group. However, even though this study alluded this upward trend for group mean exam scores, there was no statistically significant difference in the scores ($p = .77$) among the three textbook formats. However, this lack of significance could have been attributed to the sample size. According to Amato and Satake (2009), sample sizes should be equal to or greater than 30 subjects when using an ANOVA. This effect size is needed in order to satisfy the assumption that the samples drawn from a population are normally distributed and that these samples are independent of each other (Amato and Satake, 2009). Ideally, having each group contain at least 30 subjects would have provided a minimum effect size to potentially detect a difference in this study.

It is noteworthy that the eTextbook exam score was lower than both the print and iTextbook exam scores. This preliminary finding could possibly indicate that while a textbook in PDF affords the reader “anytime, anywhere” Internet access and a potential cost savings, it may actually hinder knowledge acquisition and application as compared to a traditional print or iTextbook format.

While this study alluded that the time-on-task among the groups increased from the shortest time ($\mu = 49.4$ minutes) spent in the print group to the longest time ($\mu = 67.5$

minutes) spent reading the chapter in the eTextbook group, there was no significant difference in time among the three textbook formats ($p = .21$). However, there was a significant difference ($p = .008$) between in the amount of time that the students spent reading the chapter in the eTextbook format compared to the iTextbook format.

However, this significance was determined using a T-Test, which traditionally is not conducted between pairs when using an ANOVA. With that stated, those reading the eTextbook format spent significantly more time, as measured using a T-Test, reading the chapter in the eTextbook format compared to the iTextbook format yet this group scored the lowest mean score on the exam. As mentioned previously, this study is considered exploratory in nature and can be used to build the groundwork for similar studies in the future.

Thus, this study alluded that reading the textbook in the eTextbook format took longer and produced poorer exam results than reading the content in the iTextbook format. Thus, compared to the eTextbook, the iTextbook format produced better exam score results with less time-on-task.

The results from the final questionnaire also adds insight to this interesting finding of a longer time-on-task yet poorer exam scores in the group using the eTextbook. The rating for the overall quality of the learning experience using the print or eTextbook was lower than the iTextbook. With a score of “1” being considered poor, “3” being neutral, and a “5” considered superior, the quality of the learning experience with the print or eTextbook was only a “3.” One subject in this study responded that the format of the print or eTextbook made it “easy to lose focus.” This lack of focus could

explain why the eTextbook format group spent more time reading the content yet scored lower on the exam designed to measure knowledge acquisition and application.

Rockinson-Szapkiw, Courduff, Carter, and Bennett (2012) found that the difficulty of reading the text from the screen was cited as one of the reasons college students did not prefer an electronic textbook compared to a print textbook. These results mirror the findings of Shepperd, Grace, and Koch (2008), which found that college students were neutral in their liking of electronic textbook, less likely to use an electronic textbook in future classes, and less likely to recommend it to a colleague. Sheppard, Grace, and Koch (2008) also found when given the option of using an electronic textbook at a savings of over 60 percent of the cost of the print textbook, 90 percent of the college students purchased the print version. Thus, the convenience and costs savings of an eTextbook may not be enough to entice students to embrace it if it is perceived as being more difficult to read.

In contrast, the results from the final questionnaire showed that the students rated the learning experience using the iTextbook an average score of “4.5,” higher than the print or eTextbook. In addition, all of the iTextbooks’ overall features, self-assessments, the end of the chapter test questions, and focus figures were rated favorably, with a score of 4.7 to 5.0, on average. Although one subject mentioned that the interactive features in the iTextbook caused him/her to spend more time reading the chapter in this format, all of the subjects stated that they preferred to use the iTextbook compared to the print or eTextbook. Interestingly, the increased time-on-task did not deter this person from rating the iTextbook learning experience as a higher quality than the print or eTextbook.

Summary

There has been a paradigm shift in post-secondary education from an instructional paradigm to a learning paradigm. This shift from the instructional paradigm of merely delivering knowledge from the professor to the student predominately via lectures is being modified with a new learning environment and paradigm that is student-centered. This new learning paradigm encourages students to personalize the course content by allowing them to analyze, synthesize, and apply the information learned both in and outside the classroom. Current students have grown up in a digital world where they are accustomed to the immediacy and personalization of information on demand inside and outside the classroom.

While the textbook is a resource tool in a college course, there has been a decline in completing the assigned textbook readings by some students as part of their course requirements. The lack of personalization and the format of a static textbook content as well as the high costs of the textbooks could be contributing to the decline in the use of the textbook by college-age students. An instructionally designed, interactive textbook is one of the tools that can be used in this new learning paradigm to improve the quality of the learning experience at a lower price than a print textbook and potentially increase its usage by college-age students.

This study investigated if an instructionally designed, interactive college nutrition textbook (iTextbook) with embedded links to digitally-rich supporting multimedia, enhanced graphics, videos, figures, self-assessments and problem-based activities, improved students' knowledge acquisition and application of the nutrition content, and

the quality of the learning experiences, as compared to reading the content written by the same author in a static print or eTextbook format. Students were randomly assigned to three groups and were asked to read a nutrition chapter in either a print, eTextbook, or iT textbook format. Immediately after completing the chapter, they were given a multiple-choice exam designed to measure knowledge acquisition and application of the nutrition content. Time-on-task, which is the time spend reading the chapter, was recorded for each individual in each group. The quality of the learning experience was also ascertained.

Limitations

The inability to complete experiment No. 1, the reading of Chapter 4, Carbohydrates, due to inclement weather limits the findings of the study. The original study was designed to enable all subjects to be randomly assigned to the iT textbook (XIT) format or either the print (CPT) or eTextbook (CET) format in experiment No. 1. In experiment No. 2 in this study, the reading of Chapter 5, Lipids, the subjects who were not in the iT textbook (XIT) group in the first experiment would have been assigned to this format group based on this experimental design:

- 1/4 CPT @ t1 & XIT @ t2
- 1/4 CET @ t1 & XIT @ t2
- 1/4 XIT @ t1 & CPT @ t2
- 1/4 XIT @ t1 & CET @ t2

This experimental design would have allowed each subject to be his/her own control. It would have also enabled data to be collected and analyzed not only for each groups' mean exam score and time-on-task, but also each subject's exam score and time-on-task when interacting with the iT textbook as compared to the print or eTextbook. The data

analysis would have been able to look at both group mean differences as well as individual differences in regards to exam scores and time-on-task among the three textbook formats.

Another limitation was the low number of subjects recruited for the study. While there was a pool of 200 subjects enrolled in HS201 *Introduction to Nutrition* in which to recruit subjects, multiple email recruitment messages had to be sent in order to obtain 13 volunteers for experiment No. 1 and for the 21 volunteers who committed to experiment No. 2. With such a small number of subjects in this study, it was challenging to obtain a statistical significance in exam scores designed to measure knowledge acquisition and application as well as time-on-task among the three groups. Ideally, a minimum of 90 subjects would have allowed an even distribution of 30 subjects in each group and the potential for statistical significance in the data analysis.

The low number of recruitments may have been due to several reasons. Firstly, the incentive to volunteer for the study may have been inadequate. While there was a financial incentive of the potential to win one of three \$75 Visa gift cards to participate in the study, this monetary incentive did not appear to be adequate for motivating enough students to volunteer. Another potential barrier to obtaining a larger number of volunteers in this study could have been that the students in HS201 *Introduction to Nutrition* were non-nutrition majors. These students may not be motivated to be part of a nutrition education study in which the findings would have little benefit on their careers outside of the field of nutrition. Lastly, another reason for the low recruitment rate could have been a conflict of the timing of the experiment with the students' availability.

The high dropout rate in the study was another limitation. While 21 subjects were recruited for experiment No. 2, only 14 subjects completed the experiment. Because these 14 subjects were randomly assigned to one of the three textbook formats, only six of these 14 subjects had exposure to the iTextbook. This limited the findings of the qualitative questionnaire to the responses of only these six subjects.

Another limitation was that while the covariant, time-on-task, did not significantly influence the exam scores in a positive way among the three formats, this could have been attributed to the fact that the subjects using the iTextbook did not interact with all of the interactive features. All of these limitations will be discussed in the next section.

Future Research

Future research should attempt to repeat the original study design, which was a crossover design that allowed each subject to also be their own control. This experimental design would enable data analysis of both group means and individual exam scores and time-on-task.

In order to successfully implement the original study design as well as to obtain additional useful data, future research should include the following recommended changes: 1) an increased in the number of recruitments, 2) an assessment of the use of the interactive tools by the subjects when reading the iTextbook format, 3) a separation of the rating of the print textbook from the eTextbook in the final questionnaire, 4) an assessment of the importance that price plays in each subject's decision regarding purchasing a course-assigned textbook, and 5) conducting a focus group after the completion of the experiment to obtain qualitative data regarding the overall features and

use of the iTextbook. All of these recommended changes will be discussed below.

To maximize a higher recruitment rate, there should be an investigation of each of the potential subjects' availability prior to scheduling the days and times of the experiment. At Boston University, there is a Class Schedule Matrix scheduling tool that allows instructors to assess the unscheduled class times for all the students in their enrolled courses. Checking the schedules of the students enrolled in HS201 *Introduction to Nutrition* and coordinating the days and times of the experiment when the most students were potentially available to volunteer may have encouraged a higher recruitment rate.

Another incentive to enhance recruitment numbers in the study should be to provide a larger financial incentive to volunteer for the experiment. Because these subjects were not nutrition majors, they may have lacked the incentive to further science in a field that is not pertinent to their career. To correct for this, the subjects should be financially compensated for their time for reading and taking the accompanying exam for each of the chapters with a bonus compensation for reading and completing the accompanying exam for both chapters. For example, subjects would be given \$20 to read and complete the exam for one chapter but \$50 for reading and completing the exam for both chapters. This additional compensation will potentially safeguard against the low initial recruitment rate as well as the high dropout rate, which was seen in this current study.

Importantly, the study needs to ascertain if the interactive tools were used when reading the iTextbook format. This could have changed not only the time-on-task but

also the exam scores. In this study, there was no way of knowing if the subjects utilized the interactive tools when reading the iTextbook. The findings in this study suggested that the eTextbook had a longer time-on-task, potentially due to its difficulty for the reader to stay focused when reading this format on a computer screen. However, this longer time-on-task among the eTextbook group could have been attributed to the lack of the iTextbook subjects to thoroughly utilize the interactivity in the iTextbook format. If the subjects in the iTextbook did not thoroughly utilize the interactivity, this could have reduced their time-on-task as well as their exam scores. The final questionnaire should assess if all of the interactivity was utilized in the iTextbook.

Additionally, the final questionnaire should allow the students to separate their ratings of the print textbook from the eTextbook rather than combining the two formats. This separate ranking would have not only provided information regarding each subject's preferred textbook format but also allowed for additional comments in regards to their preferences.

The final questionnaire should also ascertain the typical textbook reading habits of the subjects. While this study showed that all of the subjects preferred the iTextbook compared to the print or eTextbook, it would be advantageous to assess if those who do not typically read the course assigned textbook would be more motivated to read the textbook in an iTextbook format compared to a print or eTextbook format.

The final questionnaire should assess the role that price plays in each subjects' decision when purchasing a course-assigned textbook, especially for courses outside of the student's major. An updated final questionnaire addressing the above changes can be

found in Appendix G.

Lastly, a focus of five to seven of the subjects should be conducted at the end of experiment to ascertain qualitative data regarding the overall features and use of the iTextbook by the students. This would provide rich insight into the features that were useful, those that were not, and feedback on overall use of an iTextbook by the students. This qualitative data would be insightful for the future design and development of instructionally designed textbook by other authors.

Conclusion

While there was no significant difference in exam scores and time-on-task among college students using a print, eTextbook, or iTextbook format, the eTextbook format group scored the lowest on an exam designed to measure knowledge acquisition and application of the content and took significantly longer to read than the iTextbook.

This study also provides support that college students favor an instructionally designed, digitally-enhanced, interactive college iTextbook over a static print textbook or eTextbook, which may help motivate students to complete the course assigned readings. The textbook industry is moving towards producing textbooks in a digital format. While eTextbooks provide anytime, anywhere access at a reduced cost, their effectiveness and preferred use by the student may not be optimal. Future digital textbooks need to be instructionally design that supports student-centered learning. More research needs to be conducted to ascertain the optimal instructional design and features that meet the learning needs and desires of the student.

APPENDIX A: RECRUITMENT MESSAGE

Dear Student:

As a student enrolled in HS201 Introduction to Nutrition at the Boston University, you are eligible to participate in a research study involving the class required textbook, *Nutrition & You*, authored by Joan Salge Blake and published by Pearson Education. This study is being conducted as part of a dissertation project by Joan Salge Blake, a student in the Boston University School of Education, under the doctoral advisement of Allen G. Harbaugh, PhD.

Participation in this study is voluntary and will take approximately six hours to complete and occur in two 3-hour study visits. Your participation or lack of participation will not affect your final grade in the course.

As a participant of the study, you will be asked to read two chapters of this textbook in either a print or electronic format. After reading the chapter, you will be asked to answer 20 multiple choice test questions regarding the information in the chapter. Depending upon the textbook format that you read, you may also be asked to complete additional open-ended questions. After completion of the above tasks, you will be entered to win one of three \$75 Visa gift cards for volunteering for this study.

All of your responses will be kept confidential. If you have any questions regarding this research, please contact Joan Salge Blake, MS, RD, LDN, Clinical Associate Professor, Boston University Sargent College at: salge@bu.edu and Allen Gregg Harbaugh, Assistant Professor, Boston University School of Education at: harbaugh@bu.edu. If you are interested in participating in this study, there will be an introductory meeting on February 4 immediately after the first exam in Room 101 at Sargent College, 635 Commonwealth Avenue, Boston, Massachusetts.

You may also obtain further information about your rights as a research subject by calling the **BU IRB Office at (617) 358-6115**.

APPENDIX B: CHAPTER 4, CARBOHYDRATES EXAM**Multiple-Choice Test Questions for Carbohydrates (Chapter 4)**

1. Carbohydrate digestion begins in the mouth with the help of:
 - a) chewing and peptic amylase
 - b) salivary amylase and peptic amylase
 - c) chewing and salivary amylase
 - d) salivary amylase and peptic amylase

2. After monosaccharides are absorption in the body, they travel to the:
 - a) pancreas
 - b) gallbladder
 - c) liver
 - d) large intestine

3. During the process of photosynthesis which of the following are created?
 - a) glucose and oxygen
 - b) fructose and glucose
 - c) glycogen and sunlight
 - d) water and glycogen

4. What is the function of glycogen?
 - a) to provide energy storage in plants
 - b) to store glucose in humans and animals
 - c) to lower blood glucose levels when they rise after a meal
 - d) to create membrane structures in plants

5. Which statement is false about whole wheat bread?
 - a) It is missing phytochemicals that are found in white bread.
 - b) It is missing the thiamin, niacin, and folate that are found in white bread.
 - c) It is missing the fiber that is found in wheat bread.
 - d) It is made from only the endosperm of the wheat kernel.

6. Janelle never has time to eat between work and her evening nutrition class. It has been 7 hours since lunch and she is feeling hungry and weak. Where is she getting glucose from to meet her energy needs?
 - a) from stored fat
 - b) from muscle protein
 - c) from liver glycogen
 - d) from the brain

7. When would glycogenesis occur?
 - a) when your blood glucose level dips too low.
 - b) when there is excess glucose in the blood.
 - c) when a person is fasting and glucose is created from noncarbohydrate sources.
 - d) during an emergency, when glycogen can be broken down to release glucose.

8. You want to reduce the amount of added sugars that you are consuming in your diet. Which of following would be the healthiest beverage to drink with your lunch?
 - a) energy drinks.
 - b) chocolate milk
 - c) soda
 - d) low fat milk

9. You got up late for your 8 am nutrition class so you did not have time to eat breakfast. What is likely happening in your body?
 - a) You are feeling tired so your liver will release insulin.
 - b) Your blood glucose levels are increasing so your pancreas will release glycogen.
 - c) Your blood glycogen levels are decreasing so your pancreas will release glucagon.
 - d) Your insulin levels are rising so your blood glucose is decreasing.

10. Which of the following is/are monosaccharaides?
 - a) glucose
 - b) sucrose
 - c) fructose
 - d) a and c only

11. You are constipated. You need to increase the fiber in your diet. Which of the following breakfast options are high in fiber and may help “keep you regular”?
 - a) bran flakes cereal with skim milk and blueberries
 - b) toasted white bread with jelly
 - c) cheese omelet
 - d) steak and eggs

12. Your aunt has had poorly controlled diabetes and chronic high blood glucose levels for years. In the long term, she may experience:

- a) baldness
- b) blindness
- c) dental issues
- d) b and c only

13. Insulin resistance is:

- a) a person's inability to digest carbohydrates
- b) the inability of the body cells to respond to insulin
- c) the resistant to consuming carbohydrates in the diet
- d) having an allergy to insulin

14. Your 50-year old, sedentary, and overweight uncle has just been told by his doctor That he has a high blood glucose level. His father also has diabetes. How many risk factors does he have for diabetes?

- a) 2
- b) 3
- c) 4
- d) 5

15. Your best friend is coming for dinner, and she has lactose intolerance. What dinner would be the best to serve in order to make sure that she doesn't experience gastrointestinal discomfort?

- a) hamburger and a milkshake.
- b) cheese pizza and a tossed salad.
- c) grilled chicken, baked potato, and green beans.
- d) lasagna and garlic bread.

16. You are looking for a whole grain snack to munch on while studying for your first nutrition exam. You could choose:

- a) potato chips
- b) pita chips
- c) pretzels
- d) popcorn

17. You are trying to reduce your risk of getting a dental cavity. In addition to eating a healthy diet, which other dietary habit(s) can also help you reduce your risk of getting a cavity?

- a) chew on a sugarless gum after a meal.
- b) eat a piece of low fat cheese after meals and snacks.
- c) eating crackers as a snack.
- d) a and b only

18. Your sister has Type 1 diabetes. Which of the following issues is NOT associated with Type 1 diabetes?
- The cells are resistant to insulin.
 - Ketoacidosis may occur.
 - It is a rarer type of diabetes.
 - It begins in childhood.
19. Added sugar in a food can come in many forms, such as:
- high fructose corn syrup
 - brown sugar
 - honey
 - all of the above
 -
20. You are trying to reduce the amount of added sugars in your diet. How many sources of added sugars are found in the ingredient listing for this energy bar?

Nutrition Facts	Amount/Serving	% DV*	Amount/Serving	% DV*
	Serv. Size 1.4oz (40g) Serv. Per Cont. 1	Total Fat 11g	16%	Total Carb 20g
Calories 190 Fat Cal 90	Sat Fat 2g	10%	Dietary Fiber 3g	13%
	Trans Fat 0g		Sugars 10g	
	Cholest 0mg	0%	Protein 5g	
	Sodium 60mg	3%		
*Percent Daily Values (DV) are based on a 2,000 calorie diet.	Vitamin A 0%	Vitamin C 0%	Calcium 4%	Iron 10%
	Vitamin E 35%	Niacin 10%	Vitamin B ₆ 6%	Folate 6%

BumbleBars Contain These Quality Ingredients: Organic Sesame Seeds, Organic Brown Rice Syrup, Organic Crisp Brown Rice (Organic Brown Rice, Organic Brown Rice Syrup, Sea Salt), Organic Evaporated Cane Juice, Organic Dairy Free Chocolate (Organic Cocoa Liquor, Organic Cocoa Butter, Organic Sugar, Soy Lecithin {GMO FREE}), Organic Flax Seeds, Organic Peanuts, Organic Cocoa Powder, Organic Extract of Vanilla, Sea Salt, Natural Mixed Tocopherols, A Natural Source of Vitamin E Used to Protect Freshness

Contains the following allergens: Peanuts.

- 2
- 3
- 4
- 5

APPENDIX C: CHAPTER 5, LIPIDS EXAM**Multiple Choice Test For Lipids Chapter 5**

- 1) A fatty acid that has one double bond is called a:
 - a) nonessential fatty acid.
 - b) polyunsaturated fatty acid.
 - c) monounsaturated fatty acid.
 - d) saturated fatty acid.

- 2) Which of the following terms encompasses all the other terms listed?
 - a) LDL
 - b) HDL
 - c) lipoprotein
 - d) VLDL

- 3) Which is NOT a benefit associated with omega-3 fatty acids:
 - a) prevention of irregular heartbeats
 - b) reduces atherosclerosis
 - c) lower blood pressure
 - d) increase the clustering of platelets

- 4) The following are the steps, in the correct order, for digesting fat in the body:
 - a) Chewing begins the mechanical digestion, the gallbladder releases bile into the small intestine, the pancreas secretes pancreatic lipase in the small intestine, the stomach releases gastric lipase to break down the fat.
 - b) Chewing begins the mechanical digestion, the stomach releases gastric lipase to break down the fat, the gallbladder releases bile into the small intestine, the pancreas secretes pancreatic lipase in the small intestine.
 - c) The gallbladder releases bile into the small intestine, chewing begins the mechanical digestion, the pancreas secretes pancreatic lipase in the small intestine, the stomach releases gastric lipase to break down the fat.
 - d) The pancreas secretes pancreatic lipase in the small intestine, chewing begins the mechanical digestion, the stomach releases gastric lipase to break down the fat, the gallbladder releases bile into the small intestine.

- 5) The development of atherosclerosis in the heart begins with:
- a) the deposit of cholesterol in the wall of the artery.
 - b) an injury to the lining of the wall of the artery.
 - c) the formation of a fatty streak in the wall of the artery.
 - d) the formation of plaque in the artery
- 6) Which of the following lipid is used to make both vitamin D and the hormone, testosterone?
- a) cholesterol
 - b) alpha-linolenic acid
 - c) eicosanoid
 - d) saturated fat
- 7) Which statement is correct regarding *trans* fats?
- a) They raise LDL and HDL.
 - b) They raise triglycerides and lower LDL.
 - c) They raise LDL and lower HDL.
 - d) They raise blood pressure.
- 8) You want to order a heart-healthy soup in the dining hall. Which of the following would be the best choice:
- a) cream of potato soup
 - b) beef and barley soup
 - c) onion soup topped with melted cheese
 - d) vegetable and bean soup
- 9) You are in the dining hall and want to choose a pizza that is the lowest in fat and heart unhealthy saturated fat. You should choose:
- a) a slice of pizza topped with pepperoni
 - b) a slice of pizza topped with meatballs
 - c) a slice of pizza topped with chicken
 - d) a slice of pizza with roasted vegetables
- 10) Martin is 45 years old and has a family history of heart disease. He watches his diet carefully. Which of the following foods has the highest amount of fat and saturated fat per serving, and thus should Martin find an alternative for in his diet?
- a) fresh fruit salad
 - b) peach pie
 - c) whole-milk ice cream
 - d) home-baked muffins

- 11) Anna wants to increase the soluble fiber in her diet to help her lower her blood cholesterol level. At breakfast, she should eat:
- a) white toast topped with peanut butter.
 - b) an egg white omelet with vegetables.
 - c) vanilla yogurt topped with a wholegrain cereal.
 - d) oatmeal made with skim milk and topped with berries.
- 12) John wants to increase his HDL cholesterol levels. Which of the following should he do?
- a) lower his saturated fat intake
 - b) lowering his polyunsaturated fat intake
 - c) engage in routine exercise
 - d) drink green tea daily
- 13) You want to add more heart-healthy omega-3 fatty acids in his diet. You can do this by eating:
- a) a vegetarian soy burger at lunch.
 - b) a very lean hamburger at lunch.
 - c) a salmon burger at lunch.
 - d) a cup of vegetable chili at lunch.
- 14) Your overweight uncle has high blood pressure and does not like to exercise. His doctor just told him that he has type 2 diabetes. How many risk factors does he have for heart disease:
- a) 2
 - b) 3
 - c) 4
 - d) 5
- 15) You decided to cook a Mediterranean-style dinner. Which of the following dinners would be a typical Mediterranean-style dinner:
- a) A plate of cooked pasta tossed with olives, beans, and vegetables and fresh berries for dessert.
 - b) A grilled hamburger topped with cheese, a tossed salad, and cookies for dessert.
 - c) Crispy breaded fried shrimp, a baked potato, a glass of red wine, and a sliced banana for dessert.
 - d) Baked, skinless chicken, green beans sautéed in olive oil, and frozen yogurt for dessert.

- 16) Your pregnant sister is coming for dinner. Which of the following should you NOT serve?
- a) scallops
 - b) cod
 - c) flatfish
 - d) swordfish
- 17) Another term for fat is:
- a) cholesterol
 - b) triglyceride
 - c) sterol
 - d) phospholipid
- 18) Which of the following delivers fat made in the liver to your tissues?
- a) chylomicron
 - b) VLDL
 - c) LDL
 - d) HDL
- 19) HDLs remove cholesterol from the cells and deliver it to the
- a) liver.
 - b) pancreas.
 - c) gall bladder.
 - d) heart.
- 20) You are hungry for a snack. Which of the following would be a snack that would provide antioxidants and also help lower your blood cholesterol level:
- a) low fat cheese
 - b) almonds
 - c) low fat yogurt
 - d) peanut butter on crackers

APPENDIX D: SCANTRON

Slide 1

Information Services & Technology
Answer Sheet Form No. 2780
See Important Marking Instructions on Slide 2



1	A	B	C	D	E	21	A	B	C	D	E	41	A	B	C	D	E	61	A	B	C	D	E	81	A	B	C	D	E
2	A	B	C	D	E	22	A	B	C	D	E	42	A	B	C	D	E	62	A	B	C	D	E	82	A	B	C	D	E
3	A	B	C	D	E	23	A	B	C	D	E	43	A	B	C	D	E	63	A	B	C	D	E	83	A	B	C	D	E
4	A	B	C	D	E	24	A	B	C	D	E	44	A	B	C	D	E	64	A	B	C	D	E	84	A	B	C	D	E
5	A	B	C	D	E	25	A	B	C	D	E	45	A	B	C	D	E	65	A	B	C	D	E	85	A	B	C	D	E
6	A	B	C	D	E	26	A	B	C	D	E	46	A	B	C	D	E	66	A	B	C	D	E	86	A	B	C	D	E
7	A	B	C	D	E	27	A	B	C	D	E	47	A	B	C	D	E	67	A	B	C	D	E	87	A	B	C	D	E
8	A	B	C	D	E	28	A	B	C	D	E	48	A	B	C	D	E	68	A	B	C	D	E	88	A	B	C	D	E
9	A	B	C	D	E	29	A	B	C	D	E	49	A	B	C	D	E	69	A	B	C	D	E	89	A	B	C	D	E
10	A	B	C	D	E	30	A	B	C	D	E	50	A	B	C	D	E	70	A	B	C	D	E	90	A	B	C	D	E
11	A	B	C	D	E	31	A	B	C	D	E	51	A	B	C	D	E	71	A	B	C	D	E	91	A	B	C	D	E
12	A	B	C	D	E	32	A	B	C	D	E	52	A	B	C	D	E	72	A	B	C	D	E	92	A	B	C	D	E
13	A	B	C	D	E	33	A	B	C	D	E	53	A	B	C	D	E	73	A	B	C	D	E	93	A	B	C	D	E
14	A	B	C	D	E	34	A	B	C	D	E	54	A	B	C	D	E	74	A	B	C	D	E	94	A	B	C	D	E
15	A	B	C	D	E	35	A	B	C	D	E	55	A	B	C	D	E	75	A	B	C	D	E	95	A	B	C	D	E
16	A	B	C	D	E	36	A	B	C	D	E	56	A	B	C	D	E	76	A	B	C	D	E	96	A	B	C	D	E
17	A	B	C	D	E	37	A	B	C	D	E	57	A	B	C	D	E	77	A	B	C	D	E	97	A	B	C	D	E
18	A	B	C	D	E	38	A	B	C	D	E	58	A	B	C	D	E	78	A	B	C	D	E	98	A	B	C	D	E
19	A	B	C	D	E	39	A	B	C	D	E	59	A	B	C	D	E	79	A	B	C	D	E	99	A	B	C	D	E
20	A	B	C	D	E	40	A	B	C	D	E	60	A	B	C	D	E	80	A	B	C	D	E	100	A	B	C	D	E

COURSE NO. _____ DATE: / /

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GRADE OR EDUC. _____

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CORRECT MARK

INCORRECT MARKS
 X

APPENDIX E: FINAL QUESTIONNAIRE

Thank you for taking time to complete this final survey.

	Rating					Comments
	Poor	Neutral			Superior	
1. How would you rate the overall quality of your learning experience of the Interactive Textbook ?	1	2	3	4	5	
2. How would you rate the overall quality of your learning experience using the Print or PDF formats?	1	2	3	4	5	
3. Please rate the quality of the following features in the Interactive Textbook as compared to the Print or PDF formats: Overall Features	Poor 1	Neutral 2 3 4			Superior 5	
Self-Assessments	Poor 1	Neutral 2 3 4			Superior 5	
End of the Chapter Check Your Knowledge Questions	Poor 1	Neutral 2 3 4			Superior 5	
Focus Figures	Poor 1	Neutral 2 3 4			Superior 5	
4. Please circle the textbook format you would prefer to use for the remainder of the nutrition course:	Print/PDF OR Interactive Textbook					

APPENDIX F: SUMMARY OF QUESTIONNAIRE BY TA

Student	Question 1	Question 2	Question 3 - Overall	Question 3 - Self Assessments	Question 3 - End of Chapter	Question 3 - Focus Figures	Question 4
A	4	N/A	5 "VIDEOS AND QUESTIONS THROUGHOUT THE INTERACTIVE TEXTBOOK HELPED A LOT"	N/A	N/A	N/A	INTERACTIVE TEXTBOOK
B	4	3	4	5	5	4	"I LIKE THE QUESTIONS AND SELF-ASSESSMENT, BUT IT TAKES WAY LONGER TO THROUGH THE INTERACTIVE TEXTBOOK (BECAUSE
C	5	3	DEMONSTRATIONS ETC MADE EVERYTHING EASIER TO UNDERSTAND"	5	5 "HELPFUL FOR UNDERSTANDING MAIN POINTS"		INTERACTIVE TEXTBOOK "EXTREMELY HELPFUL"
D	5	3 "EASY TO LOSE FOCUS"	5	WAY FOR ME TO MAKE SURE I WAS ABSORBING	WAY FOR ME TO MAKE SURE I WAS ABSORBING	5	INTERACTIVE TEXTBOOK
E	4	TO LOSE FOCUS"	4	WAY FOR ME TO MAKE SURE I WAS	5	5	INTERACTIVE TEXTBOOK "VIDEOS ARE VERY HELPFUL :)"
F	LIKE THE QUIZZES THROUGHOUT &	3 "EASY TO LOSE FOCUS"	5 "KEPT MY ATTENTION. LIKED POP UP WINDOWS"	5 "GOOD WAY FOR ME TO MAKE SURE I WAS ABSORBING INFO"	5 "LIKED THAT IT LINKED BACK TO PAGES WHERE ANSWERS ARE FOUND"	5	INTERACTIVE TEXTBOOK

APPENDIX G: UPDATED FINAL QUESTIONNAIRE

Thank you for taking time to complete this final survey. Please circle N/A if you did not experience a particular textbook format and/or if you did not experience any of the specific features in the Interactive Textbook that are listed below:

	Rating						Comments
1. How would you rate the overall quality (ease of use, visual appeal, richness of content, motivation to read) of your learning experience when using the Interactive Textbook ?	Poor	Neutral			Superior		
	1	2	3	4	5		
2. How would you rate the overall quality (ease of use, visual appeal, richness of content, motivation to read) of your learning experience using the Print format?	Poor	Neutral			Superior	N/A	
	1	2	3	4	5	0	
3. How would you rate the overall quality (ease of use, visual appeal, richness of content, motivation to read) of your learning experience using the PDF format?	Poor	Neutral			Superior	N/A	
	1	2	3	4	5	0	
4. Please rate the quality (ease of use, visual appeal, richness of content, motivation to read) of the following features in the Interactive Textbook as compared to the Print or PDF formats:	Poor	Neutral			Superior	N/A	
Overall Features	1	2	3	4	5	0	
Self-Assessments	Poor	Neutral			Superior	N/A	
	1	2	3	4	5	0	
End of the Chapter Check Your Knowledge Questions	Poor	Neutral			Superior	N/A	
	1	2	3	4	5	0	

Focus Figures	Poor Neutral Superior N/A 1 2 3 4 5 0	
Videos	Poor Neutral Superior N/A 1 2 3 4 5 0	
5. How often do you read the assigned textbook? Circle all that apply.	Before each class After each class Before Exams Rarely Never	
6. Please circle the textbook format you would prefer to use for the remainder of the nutrition course.	Print PDF Interactive Textbook	
7. Would you be more likely to read the course assigned textbook readings if you had the option of using the Interactive Textbook?	Yes No	
8. Does the price of a course assigned textbook determine which textbook format you purchase?	Yes No	
9. Have you ever not purchased a course assigned textbook because of the price?	Yes No	

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CURRICULUM VITAE

Education

Ed.D., Educational Media & Technology – Boston University
 M.S., Clinical Nutrition – Boston University
 Dietetic Internship – New England Deaconess Hospital
 B.S., Food and Nutrition – Montclair State University, graduated *summa cum laude*.

Academic Appointments

2008–present Boston University – Clinical Associate Professor, Sargent College of Health and Rehabilitation Sciences
 1994–2008 Boston University – Clinical Assistant Professor, Sargent College of Health and Rehabilitation Sciences
 1994–present Boston University – Dietetic Internship Director, Graduate Level
 1992–1994 Boston University – Adjunct Clinical Instructor, Sargent College of Allied Health Professions

Academic Teaching Experience

2009 Summer Boston University – MET 691 Nutrition and Diet
 2007 Summer Boston University – MET 691 Nutrition and Diet
 2002–present Boston University – SAR HS 366 Community Nutrition
 2001–present Boston University – SAR HS 811 Practicum in Clinical Nutrition
 1997–present Boston University – SAR HS 201 Introduction to Nutrition
 1994–present Boston University – SAR HS 703 Dietetic Internship Director
 1992–present Boston University – SAR HS 789 Theory and Practice in Nutrition Counseling

Professional Experience

2002, 2007 Consultant, **Papa Gino's & D'Angelo's Company**.
 Helped design, analyze, and create nutrition educational materials for the healthy menu items.

1996–2002 Nutrition Expert, **Oxygen Media/Thriveonline.com**.
 Created nutrition programs, provided nutrition text including weekly “Ask Joan” nutrition advice column, and conducted online chats for website consisting of online community of over a million strong. Thriveonline received the Tufts Nutrition Navigator’s website rating of “Among The Best”. Personally named as the best feature at Thriveonline in the Diet and Nutrition category by Forbes Magazine in their “Best of The Web 2001” issue. Archived “Ask Joan” nutrition column can currently be found at: <http://people.bu.edu/salge/>.

1989–present Registered Dietitian, Private Practice, **Longfellow Health Center**, Wayland, MA

- 1997 – 1998 Nutrition Expert/Consultant, **Sudbury Schools**, Sudbury, MA. Co-created “Mission Nutrition – A Three-Prong Approach To Nutrition Education in the Cafeteria, Classroom, and The Home”. Worked with effective nutrition education in the cafeteria and in targeted classrooms, along with supporting monthly nutrition newsletters to the parents to encourage healthy, positive lifestyle changes. Focused on different nutrition topic monthly.
- 1995–1996 Nutrition and Food Consultant, **Fidelity Investments**, Boston, MA. Created a “Conscious Cuisine”, healthy cycle menu for their employee’s cafeteria. Modified recipes, conducted demonstrations, and developed a monthly nutrition newsletter, entitled, “Healthy Investments” focusing on nutrition and lifestyle topics.
- 1984 – 1989 Director, Nutrition Services. **Medical Care Affiliates, Health Promotion Affiliates**, Boston, MA. Created, managed, and implemented the nutrition component of a medical organization, providing health care and education to individuals and corporations throughout New England. Created and delivered nutrition lectures, seminars, and workshops to the public.

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Published Articles/Poster Sessions

Salge Blake, Joan, Judd, L., Lenders, C., Ireland, K., Milch, H., Decker, A., Harvey, N., Stanfield, L, Lim-Miller, A., Levine, S. 2014. *Dietetic Interns Educating Future Physicians about the Role of Registered Dietitians and Nutritionists and Medical Nutrition Therapy in Patient Care*. Abstract. John McCahan Medical Campus Education Day, Boston University School of Medicine, May 2015

Salge Blake, Joan, Judd, L., Lenders, C., Ireland, K., Milch, H., Decker, A., Harvey, N., Stanfield, L, Lim-Miller, A., Levine, S. 2014. *Dietetic Interns Educating Future Physicians about the Role of Registered Dietitians and Nutritionists and Medical Nutrition Therapy in Patient Care*. Abstract. Food and Nutrition Conference and Expo, Atlanta, GA.

Lenders, C., Gorman, K., Milch, H., Decker, A., Harvey, N., Stanfield, L., Lim-Miller, A., Salge-Blake, J., Judd, L., Levine, S. 2013. *A Novel Nutrition Medicine Education Model: the Boston University Experience*. *Advances in Nutrition*; 4: 1 to 7.

Ahneman, W, and Salge Blake, J. Spring 2010. *Yogurt in the Clinic*. ADA Times, American Dietetic Association.

Salge Blake, J. 2004. *Great Ideas in Teaching Nutrition*. 2004. Benjamin Cummings Publications for Nutrition Professors.

Salge Blake, J. 2004. *Vegetarian Diets*. The Food Network.

Salge Blake, J. 2004. *Low Calorie Diets*. The Food Network.

Salge Blake, J. 2004. *Low Fat Diets*. The Food Network.

Salge Blake, J. 2004. *Low Cholesterol Diets*. The Food Network.

Creative Works

DVDs:

Salge Blake, Joan. 2010 *Nutrition Tips for You*. San Francisco: Pearson Education, Inc./Benjamin Cummings.

Salge Blake, Joan. 2008 *Lecture Teaching Tips*, DVD, San Francisco: Pearson Education, Inc./Benjamin Cummings.

Web-Based Teaching Tools:

Salge Blake, Joan, 2008. *Get Real and Nutrition Sleuth: Numerous Online, Interactive Internet Tools to augment Nutrition & You*. Available at:

http://wps.aw.com/bc_blake_nutrition_1/75/19278/4935269.cw/index.html

Audio Continuing Education:

Salge Blake, Joan. 1985. *Nutrition At The Worksite*, continuing education audio cassette for registered dietitians, Chicago: The American Dietetic Association.

Presentations

Salge Blake, J. “*Eat More Weigh Less.*” Psychiatric Rehabilitation Association, Boston, MA, April 25, 2016

Salge Blake, J. “*Nutrition and You.*” Sargent College Open House, April 16, 2016

Salge Blake, J. *A Career in Nutrition*. UPHA Career Panel. Sargent College, April 12, 2016.

Salge Blake, J. “*Nutrition and You.*” Sargent College Open House, April 9, 2016

Salge, Blake, J. *Dietary Guidelines 2015*. Webinar. Pearson Education, February, 2016

Salge Blake, J. *Weight Management*. Penn State University, University Park, Pennsylvania, November 2015.

Salge Blake, J. *Eat More, Weigh Less*. Wine, Women and Wall Street, North Easton, MA, October 2015.

Salge Blake, J. “*Eating for Longevity.*” Boston University Alumni Luncheon, October 2015.

Salge Blake, J. and Robarts, J. *Creating a Dynamic Application.*, Massachusetts Dietetic Association, Boston, MA, October 2015.

Salge Blake, J. “*What’s In the Scientific Report of the 2015 Dietary Guidelines Advisory Committee?*” Beth Israel Deaconess Medical Center, Alumni Event, June 2015.

Salge Blake, J. “*Eating for Longevity.*” Boston University Claflin Society Luncheon, April 2015.

Salge Blake, J. *What’s In the Scientific Report of the 2015 Dietary Guidelines Advisory Committee?*” Online Webinar, Pearson Education, April 2015.

- Salge Blake, J. *Eat More, Weigh Less* Boston University, Goldman School of Dental Medicine, Boston, MA, April 2015.
- Salge Blake, J. *Eat to Compete*. Pearson National Sales Meeting, Orlando, FL, January 2015.
- Salge Blake, J. and Robarts, J. *Creating a Dynamic Application.*, Massachusetts Dietetic Association, Boston, MA, October 2014.
- Salge Blake, J. *Nutrition and You*. Residential Life, Boston University, August 2014.
- Salge Blake, J. “*Winning the Weight Loss Battle: Science-Based Strategies that Work!*” Boston University School of Medicine, August 2014
- Salge Blake, J. *The Freshmen 15*. Boston University Orientation, Boston, MA, July 2014.
- Salge Blake, J. “*The Future of Nutrition.*” Boston University Alumni, Boston, MA, May 2014.
- Salge Blake, J. “*Nutrition and You.*” Sargent College Open House, April 2014
- Salge Blake, J. “*Working with the Media.*” Nashville Dietetic Association. March 2014.
- Salge Blake, J. “*Eating for Longevity.*” Boston University Alumni, Boca Raton, FL, March 2014.
- Salge Blake, J. “*Eating for Longevity.*” Boston University Alumni, Miami, FL, March 2014.
- Salge Blake, J. *Nutrition and You*. Residential Life, Boston University, January 2014.
- Salge Blake, J. *Professionalism*. Interdisciplinary Orientation, Boston University, January 2014.
- Salge Blake, J. and Robarts, J. *Creating a Dynamic Application.*, Massachusetts Dietetic Association, Boston, MA, October 4, 2013.
- Salge Blake, J. *Eating 101*. Residential Life, Boston University, October 2013.
- Salge Blake, J. *Rhett Talks: The Freshmen 15 is a Myth*. Boston University, September 10, 2013.
- Salge Blake, J. “*Dietary Guidelines for Americans*” Boston University School of Medicine, September 26, 2013.
- Salge Blake, J. “*Winning the Weight Loss Battle: Science-Based Strategies that Work!*” Boston University School of Medicine, August 26, 2013.
- Salge Blake, J. “*Eat More, Weigh Less.*” Seabourn Cruise Line, Barbados, Bridgetown April 19, 2013.
- Salge Blake, J. “*Eating for Longevity.*” Seabourn Cruise Line, Barbados, Bridgetown April 20, 2013.
- Salge Blake, J. “*Fighting Heart Disease with a Knife and Fork.*” Seabourn Cruise Line, Barbados, Bridgetown April 21, 2013.
- Salge Blake, J. “*The Mediterranean Diet.*” Seabourn Cruise Line, Barbados, Bridgetown April 21, 2013.
- Salge Blake, J. “*Eat More, Weigh Less.*” Crystal Cruises, Caribbean, January 5, 2013.
- Salge Blake, J. “*Eating for Longevity.*” Crystal Cruises, Caribbean, January 7, 2013.
- Salge Blake, J. “*Fighting Heart Disease with a Knife and Fork.*” Crystal Cruises, Caribbean, January 9, 2013.

- Salge Blake, J. *“Winning the Weight Loss Battle: Science-Based Strategies that Work!”* Boston University School of Medicine, August 31, 2012.
- Salge Blake, J. *“Nutrition and Oral Health.”* Boston University, Goldman School of Dental Medicine, Boston, MA, June 2012.
- Salge Blake, J. *“Working with the Media.”* Massachusetts Dietetic Association Annual Meeting, Framingham, MA. March 23, 2012.
- Salge Blake, J. *“Working with the Media.”* Massachusetts Dietetic Association Media Workshop. Boston University, Boston, MA. November 4, 2011.
- Salge Blake, J. *“Your Diet and Longevity: Food for Thought,”* Boston Globe sponsored Boomers and Seniors Seminar, World Trade Center, Boston, MA, October 30, 2011.
- Salge Blake, J. and Robarts, J. *“Creating a Dynamic Application.”* Massachusetts Dietetic Association, Student Chapter, Boston, MA, October 2011.
- Salge Blake, J. *“Winning the Weight Loss Battle: Science-Based Strategies that Work!”* Boston University School of Medicine, September 1, 2011.
- Salge Blake, J. *“Eating 101.”* Boston University, RYSOP, Boston, MA. August 31, 2011.
- Salge Blake, J. *“When Food Becomes Your Medicine: Functional Foods.”* New York Dietetic Association, Buffalo, NY. January 15, 2011.
- Salge Blake, J. *“Nutrition & Your Patients.”* Boston University School of Medicine, Boston, MA. January 7, 2011.
- Salge Blake, J. and Robarts, J. *“Creating a Dynamic Application.”* Massachusetts Dietetic Association, Student Chapter, Boston, MA, November 2010.
- Salge Blake, J. *“Winning the Weight Loss Battle: Science-Based Strategies that Work!”* Boston University Alumni Association, New York, NY., October 2, 2010.
- Salge Blake, J. *“Fast Food Finales.”* Boston University, RYSOP, Boston, MA. August 24, 2010.
- Salge Blake, J. *“When Food Becomes Your Medicine: Functional Foods.”* Boston University School of Medicine, Boston, MA. April 14, 2010.
- Salge Blake, J. *“Functional Foods.”* Southeastern Massachusetts Dietetic Association, Norwood, MA. April 5, 2010.
- Salge Blake, J. *“Working with the Media.”* Massachusetts Dietetic Association Media Workshop. Quincy Medical Center, Quincy, MA. February 27, 2010.
- Salge Blake, J. *“Holiday Eating Tips.”* Boston University Women’s Guild. December 1, 2009.
- Salge Blake, J. and Robarts, J. *“Creating a Dynamic Application.”* Massachusetts Dietetic Association, Student Chapter, Boston, MA, November 2009.
- Salge Blake, J. *“When Food Becomes Your Medicine: Functional Foods.”* Sodexo Health Care, Clinical Update, Bentley College, June 3, 2009.
- Salge Blake, J. *“Eating Healthy in an Unhealthy Economy.”* Boston University Winterfest, February 28, 2009.
- Salge Blake, J. *“Lights, Camera, Action: Creating Memorable Nutrition Lectures.”* Strategies for Success Conference, George Mason University, Fairfax, VA, November 8, 2008.

- Salge Blake, J. and Robarts, J. “*Creating a Dynamic Application.*” Massachusetts Dietetic Association, Student Chapter, Boston, MA., October 2008.
- Salge Blake, J. “*When Food Becomes Your Medicine: Functional Foods.*” Sargent College Alumni Seminar, April 5, 2008.
- Salge Blake, J. “*Nutrition & You.*” Sargent College, Undergraduate Open House, April 2008.
- Salge Blake, J. “*Nutrition & You and Your Patients.*” DPT students, Sargent College, March, 2008.
- Salge Blake, J. and Robarts, J. “*Creating a Dynamic Application.*” Massachusetts Dietetic Association, Student Chapter, Boston, MA, November 2007.
- Salge Blake, J. “*Nutrition & You.*” Sargent College, Undergraduate Open House, April 2007.
- Salge Blake, J. “*Nutrition & Your Patients.*” DPT students, Sargent College, March, 2007.
- Salge Blake, J. “*Nutrition and Oral Health.*” Boston University, Goldman School of Dental Medicine, Boston, MA, March 2007.
- Salge Blake, J. Keynote Speaker, “*Nutrition and You.*” New Hampshire Oral Hygienists Annual Meeting, Nashua, NH, October, 2006
- Salge Blake, J. “*Nutrition and Oral Health.*” Boston University, Goldman School of Dental Medicine, Boston, MA, March 2006
- Salge Blake, J. “*Nutrition & You.*” Sargent College Undergraduate Open House, April 2006.
- Salge Blake, J. “*Creating a Dynamic Application.*” Massachusetts Dietetic Association, Student Chapter, Boston, MA. November 2005.
- Salge Blake, J. Presiding Officer. American Dietetic Association’s Annual Meeting, St. Louis, MO, October 2005.
- Salge Blake, J. Presiding Officer. Massachusetts Dietetic Association Annual Meeting, Randolph, MA, May 2005.
- Salge Blake, J. “*Nutrition and Oral Health.*” Boston University, Goldman School of Dental Medicine, Boston, MA, March 2005.
- Salge Blake, J. “*Eating 101.*” Sargent College, Undergraduate Open House, April 2005.
- Salge Blake, J. “*Eating 101.*” Sargent College, Undergraduate Open House, April 2004.
- Salge Blake, J. “*Marketing 101: How To Market Your Course to Students.*” Sargent College Faculty Lecture, 2004.
- Salge Blake, J. “*Eating 101.*” Sargent College, Undergraduate Open House, April 2003.
- Salge Blake, J. “*Eating 101.*” Sargent College, Undergraduate Open House, April 2002.
- Salge Blake, J. “*Be Innovative.*” Sargent College Faculty Innovation Day, 2004.
- Salge Blake, J. “*Creating a Dynamic Application.*” Massachusetts Dietetic Association, Student Chapter, Boston, MA. November 2004.
- Salge Blake, J. “*Eating 101.*” Sargent College, Undergraduate Open House, April 2002.
- Salge Blake, J. and Meerchaert, C. “*Speak To The Point: Delivering Dynamic Presentations.*” Massachusetts Dietetic Association Annual Convention, Randolph, MA, May 2002.

- Salge Blake, J. “*Navigating Nutrition on the Web: Jobs on the Internet.*” Massachusetts Dietetic Association Annual Convention, Randolph, MA, May 2001
- Salge Blake, J. “*Eating 101.*” Sargent College, Undergraduate Open House, April 2001.
- Salge Blake, J. “*Food For Thought.*” Sargent College Alumni Association, 1998.
- Salge Blake, J. “*Sudbury Schools Mission Nutrition: A Three Pronged Approach of Nutrition Education in the Cafeteria, Classroom, and The Home,*” poster session, the American Dietetic Assoc. Annual Convention, Boston, MA, October 1997.
- Salge Blake, J. and Durschlag, R. “*Effect Of High Fiber Diets On Serum Cholesterol in Males.*” Poster session, the American Dietetic Association Annual Convention, San Francisco, CA. October 1988

Media

- 2016–present Nutrition Blogger for Huffington Post.
- 2015–present The Boston.Com Radio Show, WRKO, weekly nutrition segment
- 2015–present Nutrition Blogger for the U.S. News & World Report website
- 2011–2015 Nutrition Blogger for the Boston Globe’s Boston.com website
- 2007–2016 Academy of Nutrition and Dietetics, National Media Spokesperson.
Selected by the Academy to represent and promote the association in the national media.
- 1998–present Nutrition Expert/Media Spokesperson for Boston University Press Office.

Media Interviews (partial listing):

2016

1. WRKO, Top 10 Dining Trends in 2016, January
2. Yahoo, Dietary Guidelines for Americans, January
3. Washington Post, Fiber Weight Loss App, January
4. US News & World Report, Dietary Guidelines for Americans, January
5. The Daily Basics, The Year of the Bean. January
6. Huffington Post, Dietary Guidelines, January
7. WRKO, Dietary Guidelines, January
8. Yahoo, Chobani Yogurt, January
9. BU Today, New Dietary Guidelines, January
10. New York Times, Whole 30 Diet, January
11. Livestrong, Wheat Germ, January
12. WRKO, Dole Salad Recall, January
13. BCBS, Weight Loss Tips, January
14. Woman’s Health, Dark Chocolate, January
15. WRKO, Pulses, February
16. US News & World Report, Processed Foods, February
17. Real Simple, Alcoholic Beverages, February
18. WRKO, Processed Foods, February
19. News Max, American Diet, February
20. The Economist, GRE Prep and Diet, February
21. WRKO, Restaurant Meals and Calories, February

22. Today's Dietitian, Diet for Belly Fat, March
23. US News & World Report, Sleeping Your Way Trim, March
24. Channel 5 Boston, Sleeping Your Way Trim, March
25. WRKO, Sleeping Your Way Trim, March
26. Huffington Post, Anti-Aging Diet, March
27. WCBV, Why You Need An RD In Your Life, March
28. WRKO, Why You Need An RD In Your Life, March
29. Consumer Reports, Labeling Terms, March
30. Health Radio Music Mix, Salt, March
31. Dr. Oz Magazine, Healthy Hacks, April
32. WRKO, Anti-Aging Secrets, April
33. Today's Dietitian, Clean Eating, April
34. WRKO, MD & Nutrition, April

2015

1. Boston.com, Wholegrains for Longevity, January
2. WRKO, Wholegrains for Longevity, January
3. Boston Globe, Nutrition Myths, January
4. NowU.com, Sarcopenia, January
5. Alaskan Airlines, MyPlate, January
6. WRKO, Water for Weight Loss, January
7. Boston.com, Water for Weight Loss, January
8. Energy Times, Health Benefits of Soup, January
9. Boston.com, Slim Down with Soup, January
10. WRKO, Slim Down with Soup, January
11. US News & World Report, Best Diets for Men and Women, January
12. SiriusX MDoctor Radio, Comfort Foods, January
13. Boston.com, Hack Your Pizza Habit, January
14. WRKO, Healthy Pizza, January
15. Boston.com, Superfood for Men, February
16. WRKO, Superfood for Men, February
17. Boston.com, What's in your Herbal Supplement?, February
18. WRKO, What's in your Herbal Supplement?, February
19. HealthDay, Fiber in your Diet, February
20. Today's Dietitian, Food Trends 2015, February
21. Boston.com, Is Your Chicken Making You Sick?, February
22. Boston.com, Bellying Up to the Bar, February
23. Boston.com, What are Natural Sugars?, February
24. Boston.com, How can I stop at one dessert?, February
25. Vitacost.com, Gluten Free Diets, February
26. WRKO, Bellying Up to the Bar, February
27. Boston Globe, Pizzeria Uno, February
28. Boston.com, My Daughter is a Vegan, March
29. Boston.com, Good News about Peanut Butter, March
30. WRKO, Peanut Butter, March

31. Boston.com, Stress Eating, March
32. Boston.com, Hack Sugar Out of the Diet, March
33. WRKO, Hack Sugar Out of the Diet, March
34. Boston.com, Are Megablenders Worth It?, March
35. Boston.com, How Often Should I Weigh Myself?, March
36. Everyday Health, Health Talk Twitter Chat, March
37. Healthline, Vitamins and Herbs, March
38. Everyday Health, Detox Diets, March
39. WRKO, How Often Should I Weigh Myself?, March
40. Nutrition Jobs, AND Media Spokesperson Program, March
41. Dr. Oz Magazine, Beef Jerky, March
42. Boston.co., Coconut Oil, March
43. Daily Free Press, Fastfood, March
44. NBC.com, Listeria, March
45. WRKO, Coconut Oil, March
46. WRKO, Supplements, March
47. Boston.com, Healthy Kid Snacks, March
48. WRKO, Eggs, April
49. Boston.com, When Do Easter Eggs Go Bad?, April
50. Boston.com, Can Models Ever Be Too Thin?, April
51. Boston.com, Hey, Dude. Can You Cook?, April
52. CBS Boston, The Hormone Reset Diet?, April
53. Today's Dietitian, Nutrition in Medical School, April
54. WRKO, Hey, Dude. Can You Cook?, April
55. Boston.com, Health Benefits of Beans, April
56. Energy Times, Sugar and Health, April
57. Boston.com, Anti-aging Diet, April
58. WRKO, Anti-aging Diet, April
59. Prevention Magazine, Binge Eating, April
60. USA Today, Health Aspects of Potatoes, April
61. Hopes and Fears, Bathing in Energy Drinks, April
62. Boston.com, Kindle Diet, April
63. USA Today, Mother's Day Health Gifts, April
64. Dr. Oz Magazine, Calories in Dried Fruit, May
65. Next Avenue, Calcium and Osteoporosis, May
66. Boston.com, 5 Foods Your Mom Should Eat, May
67. Chronicle of Higher, Dangers of Hunger Strikes, May
68. WRKO, 5 Foods Your Mom Should Eat, May
69. Everyday Health, Best Diet for Weight Loss, May
70. Grandparents.com, Toxins in Food, May
71. AND, Review of the Food Babe, May
72. Martin Marietta, Healthy Sandwiches, May
73. Prevention, Eliminating Meat from the Diet, June
74. US World News & Report, Foods Men Should be Eating, June

75. US World News & Report, Eating Your Way Thin, June
76. CNN.com, Timing of Eating and Weight, June
77. Today's Dietitian, Lentils, June
78. Men's Health, Nitrates in the Diet, June
79. SafeBee.com, Zinc in the Diet, June
80. US News & World Report, Are You a Sodium Sleuth?, July
81. Dr. Oz Magazine, Foods the Fight the Cold, July
82. WebMD, Fiber and Your Health, July
83. WebMD, Fiber at Breakfast, July
84. Breastfeeding, How to get Vitamin D and Calcium During Pregnancy, July
85. US News and World Report, Is Your Restaurant Making You Fat?, July
86. Shape Magazine, Halo Foods, July
87. Doctor Radio, Being a Sodium Sleuth, July
88. WebMD, COPD, August
89. Dr. Oz Magazine, Chicken Skin, August
90. US World News & Report, Eat to Compete, August
91. Boston.com Radio, Is your Restaurant Making you Fat?, August
92. Feinman, Inc., Benefits of cooking at home, August
93. US World News & Report, Savvy Snacking, August
94. Boston.com Radio, The Secret Weapon in Kids Sports, August
95. Fox25 TV, Boston School Lunches, August
96. WRKO, Snacks, September
97. Dr. Oz Magazine, Pasta, September
98. Radio MD, Food Safety, September
99. AARP, Brain Foods, September
100. US World News & Report, Is your coffee giving you a sugar jolt?, September
101. Eliza Zied.com, Fat Shaming, September
102. AARP, Why Big Meals Make You Tired, September
103. WRKO, Freshman 15, September
104. Weight Watchers, Easy Healthy Breakfast, September
105. US World News & Report, Summer Produce, September
106. Dr. Oz Magazine, Carob and Almond Butter, September
107. The Buzz, Halo Foods, September
108. WRKO, Coffee Drinks, September
109. CNN.com, The History of Dietary Carbohydrates, September
110. US World News & Report, Foods Dieticians always have on hand, September
111. Spoon University, Greek Yogurt, September
112. US World News & Report, Food Safety during Hurricane, October
113. Men's Journal, 10 Foods You Should Never Feed Your Kids, October
114. Whole Foods Blog, Portion Control, October
115. WRKO 0680 Morning Show, The Health Effects of CHO's, October
116. US World News & Report, An Apple a Day can keep the Doctor and Dentist Away, October

117. WRKO 0680 Morning Show, An Apple a Day can keep the Doctor and Dentist Away. October
118. Boston Globe, WHO Latest on Processed Meats, October
119. MensJournal.com, WHO Latest on Processed Meats, October
120. WRKO 0680 Morning Show, WHO Latest on Processed Meats, October
121. Elisa Zied, Halloween Hangovers, November
122. WRKO 680, Eating a Bigger Breakfast, November
123. US World News & Report, I have a Salt Tooth, November
124. US World News & Report, Nutrition Education of MDs, November
125. WalletHub, Worksite Wellness, November
126. Trip Advisor, Travel Health, November
127. US World News & Report, Diabetes, November
128. WRKO 680, Diabetes, November
129. Eatright.org, Healthy Weight Loss, November
130. SafeBee.com, Foods to lower HTN, November
131. WERS, Processed Foods, November
132. WebMD, Weighing Yourself, November
133. Reebok, Headaches, November
134. WRKO 680, Obesity in America, November
135. Science for Nutrition Students, WHO Processed Meats Study, November
136. WRKO 680, Shopping as Exercise, November
137. AARP, Eating Healthy on a Budget, November
138. US News & World Report, Holiday Wish List, December
139. Food, Fitness, and Fiction, Healthy Gift Ideas, December
140. US News & World Report, Shopping as Exercise, December
141. WRKO, Shop to Drop Holiday Pounds, December
142. WRKO, 3 Tips to Lose Weight During the Holidays, December
143. US News & World Report, Healthy Holiday Gifts, December
144. Natcom, Healthy College Eating, December
145. US News & World Report, 5 Tips to Stop Food Poisoning at Holiday Buffets, December
146. WRKO, 5 Tips to Stop Food Poisoning at Holiday Buffets, December
147. Monthly Prescribing Reference, Weight Loss Apps, December
148. Anthem, Mediterranean Diet, December
149. WRKO, Men's Cooking, December
150. Woman's World, Noro Virus, December

Professional Honors and Distinctions

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|------|---|
| 2014 | Boston University Residence Life Award |
| 2013 | Named a Fellow of the Academy of Nutrition and Dietetics |
| 2012 | Named by Good Housekeeping Magazine as the expert to follow on Twitter for healthy eating |
| 2012 | Nominated for US Professor of the Year by Boston University |
| 2009 | Outstanding Dietitian, Massachusetts Dietetic Association |

- 2009 Who's Who in Health Science Education
 2007 Outstanding Dietetic Educator, Massachusetts Dietetic Association
 2001 Recipient of the 2001 Whitney Powers Excellence in Teaching Award, Sargent College of Health and Rehabilitation Sciences.
 2000 Nominated for 2000 Whitney Powers Excellence in Teaching Award, Sargent College of Health and Rehabilitation Sciences.
 1985 Recognized Young Dietitian of The Year, Massachusetts Dietetics Association.
 1983 Hazel M. Hauck Graduate Fellowship in Human Nutrition, American Dietetic Association.
 1983 Who's Who Among Students in America

Professional Memberships and Affiliations

- 2010–2011 Nominating Committee, Chair, Massachusetts Dietetic Association Board
 2009–2010 Nominating Committee, Massachusetts Dietetic Association Board
 2007–present ADA Media Spokesperson
 2006–2007 Liaison to COP and Areas, Massachusetts Dietetic Association Board
 2005–2006 Liaison to COP and Areas-Elect, Massachusetts Dietetic Association Board
 2004–2005 Chairperson, Nominating Committee, Massachusetts Dietetic Association Board
 2003–2004 Nominating Committee, Massachusetts Dietetic Association Board
 2002–2003 Nominating Committee, Chairperson, Massachusetts Dietetic Association Board
 2001– 2002 Elected, Nominating Committee, Massachusetts Dietetic Association Board
 1999–2001 Elected, Director of Education, Massachusetts Dietetic Association Board
 1984–present Member of the American Dietetic Association and Massachusetts Dietetic Association.

Pro Bono Work

- Salge Blake, J. Lecture: "*Nutrition & You.*" Senior Center, Regis College, 2012.
 Salge Blake, J. Lecture: "*Careers in Nutrition.*" Natick High School, Natick, MA, 2007.
 Salge Blake, J. Lecture: "*Nutrition & Your Family.*" Grace Baptist Church, Hudson, MA, 2000.
 Salge Blake, J. Lecture: "*Nutrition & Health.*" Baptist Church Women's Group, Marlboro, MA, 1997
 Salge Blake, J. Lecture: "*Nutrition & Health.*" Sudbury Methodist Church Women's Group, Sudbury, MA, 1996.
 Salge Blake, J. Lecture: "*Nutrition & Health.*" Temple Shir Tikva, Wayland, MA, 1996.
 Salge Blake, J. Lecture: "*Nutrition & Health.*" Jewish Women's Group, Wayland, MA, 1996.