

THESIS

STUDENT AND INSTRUCTOR USE AND PERSPECTIVES ON THE ENGAGE E-READER  
AND ASSOCIATED E-BOOKS

Submitted by

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## ABSTRACT

### STUDENT AND INSTRUCTOR USE AND PERSPECTIVES ON THE ENGAGE E-READER AND ASSOCIATED E-BOOKS

Many universities are increasingly considering use of digital learning platforms and e-books, replacing print textbooks and course materials. This study aimed to explore student and instructor use and perspectives of the Engage e-reader and associated e-books, including students who used assistive technology (AT) to access course materials (AT-user). This mixed-method pilot study was conducted at a four-year public grant university in an introductory composition course, using a cross-sectional survey design with close-ended and open-ended questions. Twenty-one instructors and 51 students, including four AT-users, met inclusion criteria and participated. Results showed instructors did not receive training on the Engage e-reader and associated e-books but would have preferred training before instructional use. The majority (n=17) felt “somewhat comfortable” using the Engage e-reader and associated e-books, but 61.9% (n=13) also indicated preference for print materials. While instructors reported answering all students concerns, these concerns were topical in nature. Although students reported overall positive experiences using the Engage e-reader and associated e-books, they had mixed opinions on preference between e-book over print textbooks and whether digital learning materials were effective for learning. AT-users reported more positive experiences using the Engage e-reader and associated e-books than non-AT users. Students reported concerns of screen fatigue, difficulty using tools, and infrequent use with the Engage e-reader and associated e-books due to the nature of the course. From these results, instructors and students may benefit from training

before initial use and changes and modifications are made in subsequent semesters. Other implications for practice and research are provided.

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## INTRODUCTION

Universities have traditionally utilized physical textbooks as the primary instructional material across most university courses (Stone & Baker-Evelteh, 2013). However, Colorado State University (CSU) and other universities nationwide are increasingly transitioning from traditional textbooks to digital learning platforms and e-textbooks (Falc, 2013; Hollins & Foley, 2013; Stone & Baker-Evelteh, 2013). For example, CSU is currently piloting use of the Engage e-reader and associated e-books in some courses. Common advantages associated with the use of digital learning materials include decreased student cost, a decreased carbon footprint, and a decreased shipping and storage costs (Chapman, Seeley, Wright, Glen, & Adams, 2016). However, multiple studies have shown that a large amount of digital materials are inaccessible, meaning that students with disabilities are unable to use assistive technology to interact with the materials (e.g. Lewis, Yoder, Roiley, So, & Yusufali, 2007; Smith & Lind, 2010). Assistive technology (AT) is defined as “any item, piece of equipment, or product system, whether acquired commercially, modified, or customized, that is used to increase, maintain, or improve functional capabilities of individuals with disabilities” (29 United States Code § 3002). For example, a student who is blind may use screen reading software to hear PDF documents read aloud. If the PDF is not in an interactive format, the student cannot use the screen reading software with the PDF, and they will not be able to hear the PDF read aloud. The PDF is therefore inaccessible for the student. Beyond lacking legal compliance, this lack of digital accessibility for students with disabilities raises ethical and moral concerns for universities.

When utilized correctly, technology has the potential to be a great equalizer for students with disabilities; however, research has shown that technology can act as both a barrier and a support for students with disabilities in higher education (The Florida College System, 2009;

Getzel, 2008; Hong, 2015). Students with disabilities now constitute more than 11% of students in universities, yet they continue to face significant barriers to academic success compared to their peers with disabilities, including a lack of accessible course materials (Hong, 2015; National Council of Disability, 2015). Additionally, it is not known whether the increased prevalence of technology in higher education improves accessibility or creates greater accessibility issues for students with disabilities. It is therefore imperative that universities consider the needs of students with disabilities when considering new and/or emerging technologies and digital learning platforms, lest they face legal consequences, increased financial burdens, and the ethical burden upon realizing they have further alienated an already marginalized population. As of this writing, there have been no studies conducted on the accessibility of the Engage e-reader and associated e-books specifically. Therefore, more research that investigates the accessibility of the Engage e-reader and associated e-books is needed as universities consider a broader use of digital course content. Moreover, general findings from this investigation of the Engage e-reader and associated e-books may then be applicable to other digital learning platforms and e-books as well.



## LITERATURE REVIEW

### **Introduction**

Five key areas of literature that are pertinent to and informed this study will be reviewed. First, I will review the role of occupational therapy within this research area. Next, I will review the literature concerning the increased prevalence of technology within postsecondary education, as well as the supports and barriers students with disabilities face while pursuing their postsecondary education. Then I will review the use of assistive technology by students with disabilities, and the accessibility of digital materials in postsecondary education. The literature review will end with a synthesis of how these topics informed and provided the rationale for the study.

### **Occupational Therapy Perspective**

As a therapy discipline, occupational therapy practitioners work with people of all ages with a disability, injury, or illness to help them participate in meaningful and/or needed everyday activities (AOTA, 2014). Clients range from babies in the neonatal intensive care unit (NICU) and their parents who need assistance in feeding, from older adults who would like to continue living at home but need modifications made to their house, to college-aged students who need assistance while pursuing university studies. Across all settings, occupational therapists consider client factors (e.g. body functions and structures, values, beliefs, and spirituality), the client's performance skills (e.g. motor skills, process skills, and social interaction skills), performance patterns (habits, routines, rituals, and roles), and contexts and environments (cultural, personal, social, physical, temporal, virtual) when creating intervention strategies for each client seen (AOTA, 2014). Because occupational therapists consider such a variety of factors, they are well-suited to understand the many factors that influence any given client's needs, including a college

student's ability to participate in their everyday school activities, like reading, writing, note-taking, and test-taking (Malcolm & Roll, 2017).

When implementing intervention strategies, occupational therapists often focus on adapting the environment or modifying the task to meet the abilities of the individual (AOTA, 2014). For example, consider a student with dyslexia. Other medical disciplines may focus on “fixing” the student's body functions and structures by providing medication or other medical treatments. Occupational therapy will instead focus on modifying and adapting the environment and/or task to enable the student to continue participating in their studies. One such powerful way to modify and adapt the environment and/or task is through assistive technology (AT) (AOTA, 2014). AT has relevance across multiple treatment settings, and occupational therapists that are versed in AT are skilled at enabling a person to continue interacting with their environment and participating in everyday activities, including in postsecondary institutions (AOTA, 2014). As Malcolm and Roll (2017) highlight, completing academic tasks such as writing, reading, and note-taking are the primary activities of college students, so it is role of occupational therapists to assist these clients in finding suitable AT to enable them to participate in these activities.

One model frequently used by occupational therapists to guide theoretical thinking and best practice of AT is the Human Activity-Assistive Technology (HAAT) model, seen in Figure 1 (Cook & Pulgar, 2015). The HAAT model has four components: the human, the activity, the AT, and the context. All four components act in a transactional nature and influence the other components. Therefore, all four components must be considered when working with an individual to determine the most suitable AT for their specific needs and context. The practitioner must understand the activity (i.e. note-taking or reading electronic texts) to ensure

AT will support the person in completing the activity. The practitioner must understand the person to know about their abilities, skills, and knowledge, and how it will influence their use of AT. The practitioner must also understand the specific context to understand what supports and barriers are in place that will influence how a person uses their AT to participate in an activity. Overall, the HAAT model provides a theoretical foundation and practice model that reinforces the transactional nature between all components, and when practitioners keep these principles in mind, they are most likely to be successful in helping their client use AT to achieve their goals.

Take again the example of a college student with dyslexia. Using the HAAT model, the occupational therapist considers the “human” component, including the student’s age, personal preferences (e.g. Have they used AT previously? Do they use technology frequently?), and classes they are taking, etc. The occupational therapist also looks at the activity demands, (e.g. Is the activity note-taking, reading, writing papers, taking tests? How long does the activity take and how often does it happen?). Next, the occupational therapist determines how the student is interacting with the activity demands. Do they struggle to take notes quickly and effectively? Are they able to read and comprehend course materials? Do they struggle to write papers without making frequent typos? After determining the discrepancies present, AT is introduced to mitigate any disconnects between the student and their activities. For instance, if the student struggles to read and comprehend their course materials, the occupational therapist might recommend text-to-speech software so the student listens to the material while reading the materials. The student’s personal factors and activity demands will also determine AT use. The process of pairing AT to the student is done while keeping the context in mind. For instance, this interaction of student, AT, and student activities might look different in an elementary context than a university context. These interactions may also look different depending on whether the university context

uses primarily print-based learning materials versus digitally based learning materials. Until now, the context has been a university environment that relies on print textbooks, which has influenced the use of AT. However, through the lens of the HAAT model, it is clear this scenario would look different if it took place in a different context, such as a university environment that relies on electronic textbooks. Therefore, it is important to consider how changing the university factor will influence the other factors. As such, the perspective provided by the occupational therapy perspective and HAAT model guided the review of the literature and the foundations of the study.

### **Increased Prevalence of Technology in Postsecondary Education**

Providing content electronically is a rapidly growing trend within higher education, and technology use in higher education has expanded from specialized academic programs (e.g. computer science, graphic design) to use within most educational and administrative operations (Dillon, 2008; Hill, 2010; Hollins & Foley, 2013; Laketa & Draculic, 2015; Oblinger & Katz, 2000; Stone & Baker-Evelteh, 2013). As Oblinger and Katz (2000) describe, most colleges and universities have a web-based presence that includes a variety of online learning resources, such as an online library database and websites with supplemental class materials. In addition, students now register for classes, buy textbooks, check grades online, and more. Furthermore, many students own personal laptops and/or tablets, which play a leading role in the educational process (Laketa & Draculic, 2015). The increased use of technology has become so pervasive to the university environment that some researchers now refer to it as a “virtual campus” (e.g. Hollins & Foley, 2013).

One area of change in technology that has the potential to significantly impact how students engage in their role of learning is the increased use of electronic textbooks, known as e-

textbooks. Traditional textbooks are now displayed digitally and accessed within an e-reader, which is then opened through an electronic device, such as a laptop or iPad, resulting in the emergence of e-textbooks (Stone & Baker-Evelte, 2013). As Laketa and Draculic (2015) state, e-materials and e-texts are now forming the basis of electronic education in most affluent nations. Advantages frequently stated or associated with moving to e-textbooks address pragmatic decisions, such as decreased costs of printing, storing, and shipping print books, and the ability for book editors to more easily distribute updated book editions (Chapman, Seeley, Wright, Glenn, & Adams, 2016). As such, many universities are transitioning from print textbooks to e-textbooks in response to concerns of high textbook and tuition costs, compared to either using cheaper past editions of print textbooks or not using textbooks at all (Falc, 2013). Unfortunately, decisions to move to e-textbooks often occur without taking the student perspective into account (Daniel & Woody, 2013; Falc, 2013). Indeed, numerous studies have found that the increased use of digitally based learning materials, including e-textbooks, is currently driven by political pressures and external factors (e.g. the need to decrease tuition and textbook costs), instead of pedagogical decisions or the needs of the students (Daniel & Woody, 2013; Ji, Michaels, & Waterman, 2014; Seaton, Kortemeyer, Bergner, Rayyan, & Pritchard, 2014). While these advantages may be well-intentioned, these factors do not create the most informed decision on whether digitally based learning materials is effective for student learning.

Other advantages frequently stated or associated with moving to e-textbooks are more functional in nature, such as the digitally based functions like copy-paste and keyword searches that are not possible in print textbooks. Proponents of e-textbooks state that these functions create a greater overall opportunity for interaction between user and medium, which may lead to improved learner performance (Chapman, Seeley, Wright, Glenn, & Adams, 2016). However,

few researchers have explored or studied the student experience of using e-textbooks, and whether students feel these purported advantages for themselves.

The student perspective brings forth a few points to consider. Students have been initially hesitant to accept the use of e-textbooks over print textbooks due to the novel nature of e-textbooks (Weisburg, 2011). In addition, students have been more inclined to buy e-textbooks if they are perceived as easier and more flexible to use and understand than print textbooks (Daniel & Woody, 2013; Stone & Baker-Eveleth, 2013). Students are also more likely to try e-textbooks if they have previous computer experience, or if there is a decreased cost of e-textbooks over print textbooks (Daniel & Woody, 2013; Stone & Baker-Eveleth, 2013). Overall, these studies primarily look at what factors motivate a student to initially try an e-textbook. They do not investigate the actual student experience of using e-textbooks. Therefore, research needs to be done to investigate the student experience of using e-textbooks and the tools within e-textbooks to determine whether students consider e-textbooks more advantageous than print textbooks.

The issue of student perspective and suitability for e-textbooks becomes even more significant when considering students with disabilities. To date, there have been limited studies that explore the experience of using e-textbooks for students with disabilities, even though students with disabilities now constitute more than 11% of the university population (National Center for Statistics, 2016). In addition, technology use in general (e.g. university websites to register for classes and check grades) is cited as both a support and barrier for students with disabilities in higher education, so one cannot assume the use of e-textbooks will be beneficial for these students (Getzel, 2008; Hong, 2015; Mullins & Preyde, 2013). Applying the HAAT model to this dilemma, the increased use of technology changes the context for postsecondary

education, which will in turn change how the human (i.e. the student with a disability) and activity (university coursework) interact. Until now, assistive technology has been shown to be an effective modification to improve the student's ability to complete their needed activities, but it is unclear whether an increasing prevalence of e-textbooks (i.e. the changing context) will hinder or support the student. Therefore, more research needs to investigate the experience of students' disabilities when using e-textbooks.

### **Supports and Barriers for Students with Disabilities in Postsecondary Education**

Over the past 30 years, the number of students with disabilities pursuing post-secondary education has more than tripled (Eckes & Ochoa, 2005; Lee, Oakland, Jackson, & Glutting, 2008; National Council of Disability, 2003). This increase can be partially attributed to the passage of the Americans with Disabilities Act (ADA), section 504 of the Rehabilitation Act, the ADA Amendments Act (2008), and the 2008 Higher Education Opportunity Act. Despite such legislation, students with disabilities still face many barriers while pursuing their postsecondary education. (e.g. Conner & Beard, 2015; The Florida College System, 2009; Hong, 2015; Mullins & Preyde, 2008). Subsequently, students with disabilities have historically graduated at a much lower rate than students without disabilities, and those who do graduate often take twice the amount of time to graduate than students without disabilities (Dowrick, Anderson, Heyer, & Acosta, 2005; Stodden, 2005).

Numerous studies have researched the barriers students with disabilities face while pursuing postsecondary education. Firstly, students with disabilities have stated that having to provide documentation of their disability can be a barrier itself, because it is both timely and emotionally difficult (Borland & James, 1999; Burgstahler & Doe, 2004; Holloway, 2001; Getzel, 2008; Mullins & Preyde, 2013). Other barriers include inaccessible course information,

such as lack of access to textbooks in alternative formats (The Florida College System, 2009). Still other studies point to the lack of quality support services and course advisors for students with disabilities as a major barrier (Fuller, Healey, Bradley, & Hall, 2004; Goode, 2007; Holloway, 2001; Hong, 2015). Lastly, faculty's negative perceptions and lack of knowledge regarding the accommodation rights and needs of students with disabilities are some of the most frequently cited barriers across the literature (Conner & Beard, 2015; DaDeppo, 2009; Hong, 2015; Mamiseishvili & Koch, 2011; Mullins & Preyde, 2013; Murray, Wren, & Keys, 2008; Yuen & Shaughnessy, 2001).

In order to navigate these barriers, more than 90% of students who identify as having a disability utilize some type of assistance or support services to succeed while pursuing their postsecondary education (National Center for Education Statistics, 2011). Such support services for students with disabilities include disability support offices that provide accommodations, as well as service departments that teach students with disabilities to develop self-determination skills and self-management skills (Getzel, 2008). In addition, Mamiseishvili and Koch (2011) found that graduation rates for students with disabilities were influenced by students' involvement in academic and social life on campus, as these activities increased their likelihood to persist. DaDeppo (2009) cited freshmen year seminar classes and cohorts and student learning communities as supports for student integration. Other supports include AT departments (Getzel, 2008; Mullins & Preyde, 2013). Lastly Yssel, Pak, and Beilke (2016) found that students in their study cited faculty as a support, because they were willing to provide accommodations, showing that faculty can become a support when faculty perceptions change. Indeed, educating faculty on the rights and needs of students with disabilities, to in turn create positive faculty attitudes and create a supportive university environment is one of the biggest implications cited throughout the



literature (e.g. DaDeppo, 2009; Getzel, 2008; Hong, 2015; Mullins & Preyde, 2013). As students with disabilities become more prevalent in postsecondary education, it is important to expand and strengthen the supports services for these students to foster a more supportive environment.

### **Use of Assistive Technology (AT) in Higher Education**

One support frequently cited for students with disabilities is the use assistive technology (AT) (Getzel, 2008; Mullins & Preyde, 2013). Approximately 70% of students with disabilities use AT to access digital course materials, such as university websites, online learning materials, and e-textbooks (National Center for Education Statistics, 2011). AT provides students with adaptive ways to compensate for their disability and allows them to access previously inaccessible materials and information for reading, writing, planning, organization, memory skills, and math deficiencies (MacArthur, 2009; Ofiesh, 2007). There are many different forms of AT based on user need, such as speech-to-text software, text-to-speech software, closed captioning, and special text formats to compensate for dyslexia, etc. (Coleman & Berge, 2018). For example, people with visual deficits often use AT designed to access printed materials in alternative formats, such as screen readers, braille displays, screen magnification, and text-to-speech technology (Coleman & Berge, 2018). Students with reading disabilities, like dyslexia, may also use text-to-speech or reading pens, which will read words aloud and provide dictionary definitions, to improve reading comprehension accuracy and rate (Schmitt, McCallum, Hennessey, Lovelace, & Hawkins, 2012). Meanwhile, students with hearing impairments benefit from videos that use closed captioning (Coleman & Berge, 2018).

There are limited quantitative studies exploring the effect of AT on academic success for students with disabilities using objective measures, such as increase in GPA, decrease in time spent studying, and increase in graduation rate (Malcolm & Roll, 2017). Malcolm and Roll

(2017) found that students with less apparent disabilities (e.g. dyslexia, ADHD, etc.) reported significant improvement in academic performance and satisfaction after receiving AT services. While the study provides preliminary results exploring the effect of AT use, these results were found using self-report measures, which may not be as reliable as objective measures. Schmitt et al. (2012) studied the impact of using a reading pen for three students with reading disabilities. The student with the lowest initial reading accuracy and rate scores showed significant improvements in reading comprehension and rate while using the reading pen, but the other two students showed little clinically significant differences. Heiman and Shemesh (2012) studied the extent and usage patterns of web courses for 964 undergraduate students with and without a disability. They found students with disabilities who use AT reported higher scores on the *Hope Scale and Subjective Well-being Scale*, than students without disabilities. Students with disabilities who use AT also reported an increased drive to find different pathways to attain their goals, as well as being motivated to pursue said goals. However, it is unclear how strong the correlation between AT use and the outcomes are, as opposed to the influence of other confounding variables.

Although the depth of quantitative research is limited, it is important to remember that qualitative studies show that students with disabilities cite their use of AT as a major support to their academic success (Getzel, 2008; Mullins & Preyde, 2013). For instance, students with disabilities in the study by Mullins and Preyde (2013) stated AT services as not only a major theme when reporting supports, these students also listed more funding dedicated to AT services as their main implication for university providers and future research. Therefore, students with disabilities value the ability to use AT and find their AT meaningful for their academic success. When considering the HAAT model, AT use has been an effective means to improve the

interaction between a student with a disability and their ability to complete student occupations within the previous context of postsecondary education. However, the context of postsecondary education is changing as technology use becomes more prevalent, and it is unclear how AT use will fit into this new paradigm. As learning materials change, it is imperative to understand the impact this has on students' with disabilities ability to access materials.

### **Accessibility of Digital Materials**

In order for students to use their AT, the digital content must be accessible.

“Accessibility” refers to the characteristics of a digital or electronic content that allows individuals with disabilities to access information and services (Hollins & Foley, 2013). For instance, a student may use text-to-speech software, but if the digital content (e.g. a website, e-textbook, PDF) is not in an accessible format, then the student will not be able to use their AT when interacting with the digital materials. Examples of methods to make digital content accessible include: 1. using Alt Tags for images (this adds a text description to an image and is accessed by screen readers to provide a text equivalent of images), 2. using identified header rows in Word and PDF documents, 3. providing transcripts for all audio and video files, and 4. converting PDF documents to an electronically readable format (Huss & Eastep, 2016).

Research consistently show that accessibility of digital materials is low (e.g. Lewis, Yoder, Roiley, So, & Yusufali, 2007; Smith & Lend, 2010). Smith and Lind (2010) found that only 5% of home pages within educational departments at institutions accredited by the National Council for Accreditation of Teacher Education were accessible and were in full compliance with Section 508. Another study completed at the University of Texas at Austin found that only 12% of university websites they evaluated were accessible and met all standards of Section 508 (Lewis et al., 2007). Lastly, Huss and Eastep (2016) surveyed 92 faculty members and asked

questions concerning the accessibility of the web content for their courses. Their results showed that the accessibility of course content ranged considerably by category, from 49% of professors reporting that all Word and PDF files have identified headers, to only 4% reported having transcripts for all video files.

Research also shows that faculty members are often not trained on accessibility concepts and lack the knowledge to troubleshoot problems regarding electronic accessibility (Conner & Beard, 2015; Huss & Eastep, 2016; Smith, Spiegel, & Cox, 2016). Furthermore, it is often unclear who is responsible for ensuring the accessibility of course content (Connor & Beard, 2015). The research highlights that many universities are reactive rather than proactive when it comes to ensuring electronic accessibility and usability, and instructors know they should make online materials accessible, but they do not know how (Lewis et al., 2007; Huss & Eastep, 2016; Smith, Spiegel, & Cox, 2016). Lewis et al. (2007) and Huss and Eastep (2016) both emphasize that their findings show a need for more training on accessibility by faculty, administrators, designers, and others. One reason that accessibility may not be a high priority is due to insufficient budgets, yet in the study by Huss and Eastep (2016), only 26% of respondents in their study reported financial constraints as a barrier to accessibility. Instead, most professors reported they had little experience with ADA compliance and their response to accessibility was reactive. Overall, the training of instructors in accessible design is often an afterthought, and faculty members are considered the “missing piece” for electronic accessibility (Huss & Eastep, 2016; Smith, Spiegel & Cox, 2016).

There are multiple reasons why inaccessible digital content is problematic. Firstly, there are ethical dilemmas to consider, namely that all students deserve equal access and opportunities for academic success. Secondly, inaccessible digital content is illegal, as it does not meet the

standards of section 504 of the Rehabilitation Act, which requires all federally funded agencies and contractors, including federally funded public universities, to make electronic and information technology accessible (section 504 of the Rehabilitation Act). In addition, the Web Content Accessibility Guidelines (WCAG) is considered the gold standard accessibility guidelines to which universities should adhere. As such, universities could face legal ramifications if their digital materials are inaccessible. For instance, in 2009, two national organizations representing the blind brought suits against Arizona State University over its use of the Kindle e-reader, because it was inaccessible for blind students (Campus Clarity, 2013). UC-Berkeley was sued and reached a settlement with Disability Rights Advocates to ensure that students with print-related disabilities had accessible materials (Campus Clarity, 2013). In addition, Harvard and Massachusetts Institute of Technology (MIT) both faced civil lawsuits from advocates for the deaf due to lack of captions for online lectures (Lewin, 2015). Overall, there have been over 240 online-accessibility lawsuits since 2015 (Youngblood, Tirumala, & Galvez, 2018), highlighting the importance of postsecondary educations meeting accessibility standards, lest they find themselves in a courtroom.

There are additional matters for universities to consider beyond ethical and legal matters. Numerous studies have shown it is cheaper, less time intensive, and many even negate the need for further accommodations when universities ensure accessibility when first creating web material rather than trying to solve problems after they have arose (Case & Davidson, 2011; Hollins & Foley, 2011; McGuire, Scott, & Shaw, 2006). Furthermore, accessible course content often benefits all students and instructors involved, not just students with disabilities (Higbee, 2009). Overall, the research clearly shows that accessibility of web content is low, and it cannot be assumed that any given digital content meets full accessibility standards.

## **Rationale**

When viewing the results of the literature reviewed through the HAAT model (Cook & Pulgar, 2015), it is apparent the postsecondary education context is changing in a variety of ways. On the one hand, students with disabilities are enrolling in postsecondary education at increasing rates, making the needs of students with disabilities more pronounced within the university context (National Center for Education Statistics, 2016). At the same time, technology is becoming more prevalent, changing both the activity demands of academic coursework and the postsecondary education context overall (Hollins & Foley, 2016). Of note, the increased enrollment of students with disabilities in postsecondary education and the increased prevalence of technology in postsecondary education have occurred at the same time, but the two phenomena have occurred independently. As these two phenomena continue to occur, universities must take into consideration the impact one has on the other. In previous postsecondary educational contexts, AT has been shown to be an effective support for students with disabilities to complete the activity demands of their academic coursework (e.g. Malcolm & Roll, 2017). But, it is unclear how effective AT will be as technology becomes more prevalent. Previous research on this topic shows that much of the digital learning materials within postsecondary education are not fully accessible, which hinders AT use for students to complete their necessary academic activities (e.g. Lewis et al, 2007; Smith & Lend, 2010). Therefore, one cannot assume that any digital course content is automatically accessible. Each system needs to be researched and assessed individually.

As CSU pilots the use of the Engage e-reader and associated e-books, the university must assure this platform does not put any group of students at a disadvantage. Research shows that students are becoming more receptive to increased technology use in the classroom for

postsecondary education, but students still have mixed opinions regarding the increased use of technology (e.g. Weisburg, 2011). However, few studies have investigated the student experience of actually using e-textbooks. Therefore, it is important to ensure students' perspectives are heard, because they are the people using the e-textbooks whose lives and academic success are most influenced by how course materials are presented. In addition, none of the studies reviewed looked at the perspective of students with disabilities and their experience using e-textbooks. As such, both the perspective of all students and the perspective of students who use AT will be studied in order to better inform our study.

Another aspect to consider is the instructor perspective and knowledge regarding the Engage e-reader and associated e-books. Applying the HAAT model (Cook & Pulgar, 2015), instructors are included in the context, which influences a student's ability to complete their student roles and overall academic success. Furthermore, other research has shown digital materials themselves may be accessible, but it is the lack of faculty knowledge concerning accessible design that makes the information inaccessible (Conner & Beard, 2015; Huss & Eastep, 2016; Smith, Spiegel, & Cox, 2016). Therefore, it is important to understand the instructor perspective and knowledge concerning the Engage e-reader and associated e-books to better understand how they are using the Engage e-reader and associated e-books as an instructional tool.

To date, there are no studies found that investigate the accessibility and usability of the Engage e-reader and associated e-books specifically. As such, this study will investigate the use with and perspective on Engage e-reader and associated e-books from the student perspective. This study will also explore whether the Engage e-reader and associated e-books is equally accessible for students who use AT as students who do not use AT. Lastly, we are interested in

learning more about the instructor's experience teaching with the Engage e-reader and associated e-books to provide greater context to the study.



# STUDENT AND INSTRUCTOR USE AND PERSPECTIVES OF THE ENGAGE E-READER AND ASSOCIATED E-BOOKS

## Introduction

### Background

Universities nationwide are increasingly transitioning from traditional textbooks to digital learning materials and e-books (Falc, 2013; Hollins & Foley, 2013; Stone & Baker-Evelteh, 2013). Common advantages associated with the use of digital learning materials include decreased student cost, a decreased carbon footprint, and a decreased shipping and storage costs (Chapman, Seeley, Wright, Glen, & Adams, 2016). Other proposed advantages of e-books include the digitally based functions, like copy-paste and keyword searches, that are not possible in print textbooks. Overall, proponents of digital learning materials and e-books state that these functions create a greater overall opportunity for interaction between user and medium, which may lead to improved learner performance (e.g. whether students read, write, or study better when using e-textbooks) (Chapman et al., 2016; Daniel & Woody, 2013; Falc, 2013). However, there is a paucity of research showing improvements in learner performance when actually using digital learning platforms and e-books.

In addition to this lack of research regarding learning advantages of digital learning platforms and e-books, decisions to move to an increased use of technology in the classroom often occur without taking the student perspective into account (Daniel & Woody, 2013; Falc, 2013). Moreover, students have been slow to accept the use of e-books in the classroom due to its novel nature (Weisburg, 2011). As such, student perceptions of these purported advantages for digital learning platforms and e-books are less clear. Although some studies have investigated the personal characteristics of students who were more inclined to try digitally based

learning materials and e-books (e.g. Daniel & Woody, 2013; Stone & Baker-Eveleth, 2013), fewer studies have explored the overall student perspective of actually using these materials (e.g. Weisburg, 2011). Therefore, more research needs to be done to investigate the student experience of using digital learning platforms and e-books to determine whether students consider these technologies more advantageous for themselves.

One subset of students to consider when transitioning to an increased use of technology should be students who use assistive technology (AT) to access course materials. Assistive technology (AT) is defined as “any item, piece of equipment, or product system, whether acquired commercially, modified, or customized, that is used to increase, maintain, or improve functional capabilities of individuals with disabilities” (29 United States Code § 3002). For example, a student who is blind may use text-to-speech software to hear PDF documents read aloud. Multiple studies have shown that a large amount of digital materials are inaccessible, meaning that students who use AT (also referred to as “AT-users”) are unable to use their AT to interact with the materials (e.g. Lewis, Yoder, Roiley, So, and Yusufali, 2007; Smith & Lind, 2010). This lack of accessibility of digital course content has resulted in over 200 lawsuits since 2015 (Youngblood, Tirumala, & Galvez, 2018). With these points in mind, universities must consider the accessibility of digital learning platforms and e-books to avoid both costly lawsuits and alienating an already marginalized subset of students.

In addition to the accessibility of course content, the usability of course content is also important to consider. Usability is defined as “the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use” (International Organization for Standardization, 2018). Examples of usability concerns include the navigability of the digital materials, the clarity of tools and

functions, and general page formatting and visual organization of information. For example, if there are no pages in an e-book, it could be difficult to locate needed information, and the usability of such content is low. While the accessibility of course content primarily affects students with disabilities who use assistive technology (AT-users), the usability of course content affects all users, including all students (both AT-user and non-AT users) and instructors alike.

Research shows it has been cheaper, less time intensive, and many even negate the need for further accommodations when universities ensured accessibility when first creating electronic material rather than trying to solve problems after they have arose (Case & Davidson, 2011; Foley, 2011; McGuire, Scott, & Shaw, 2006). Furthermore, research also indicates that when publishers ensure digital materials meet accessibility and usability standards, there are positive benefits for all users (Higbee, 2009). For example, closed captioning was originally implemented to make audio files accessible for people who are deaf or hard of hearing. Now many people, including those who do not have hearing problems, benefit from closed captioning (Coleman & Burge, 2018). It is therefore imperative that universities consider both the accessibility and usability of digital course content when increasing the use of digital learning platforms and e-books.

With these points in mind, it is clear there are multiple aspects of digital learning platforms and e-books, universities should consider when implementing an increased use of such technology. While decisions to increase the use of such technology in university courses has largely stemmed from pragmatic advantages, universities need to also investigate whether students find this increased use of technology beneficial to their academic success. Furthermore, more research needs to be done to ensure the digital learning materials are accessible for students

who use AT. Lastly, more research needs to be conducted to investigate the usability of digital learning materials as well.

### **Theoretical Framework**

Researchers of this study used the person-environment-occupation (PEO) model as the theoretical framework of this study (Law, Cooper, Strong, Stewart, Ring, & Lett, 1996). As suggested in its name, the PEO model has three components: the person, the environment, and the occupation (see Figure 2). All three components act in a transactional nature and influence the quality of occupational performance, which is the primary outcome of these components. For college students, the primary occupational outcome of interest is their academic performance.

Take the example of a college freshman student majoring in psychology. Using the PEO model, the student is the “person” component with their own set of personal characteristics, such as age, major, gender, study habits, previous exposure to technology, and classes they are taking. The person’s occupation is being a student, which may include multiple activities and tasks, including reading, writing, note-taking, studying, and test-taking (Malcolm & Roll, 2017). The student’s personal characteristics will influence their ability to fulfill their student activities, and in turn the student occupation and activities will shape the person as a student. The environment consists of the university environment, including both the physical environment (e.g. the physical buildings) and social environment (e.g. legal policies and cultural values of the institution). Just as the student and student role influence each other, the university environment also plays a role in a student’s academic performance. Until recently, the university environment has relied primarily on print textbooks. However, the transaction between these components, and ultimately a student’s academic performance, may look different in a different context, such as a university environment that relies on digital learning platforms and e-books.

Faculty comprise another aspect of the environmental component that merits consideration. Research on the accessibility of digital course content in higher education suggests faculty's lack of knowledge on accessibility standards and how to make digital course materials accessible is a primary underlying cause of most inaccessible materials (Huss & Eastep, 2016; Smith, Spiegel & Cox, 2016). The training of instructors in accessible design is often an afterthought, and faculty members are considered the "missing piece" for web accessibility (Huss & Eastep, 2016; Smith, Spiegel & Cox, 2016). Furthermore, it is unclear what training instructors are or are not receiving on these digital learning materials before instructional use, or how instructors feel about this change in transmission of course content. These points suggest it is particularly important to consider the faculty perspective as part of the university environment as universities increase use of digital learning materials to prevent a negative effect on student's academic performance.

### **Research Questions**

A few universities are currently piloting the use of the Engage e-reader and associated e-books. The Engage e-reader and associated e-books is a digital learning platform that consists of both an e-reader and e-book, accessed through a digital learning management system (i.e. Canvas). When considering the implementation of the Engage e-reader and associated e-books through the lens of the PEO model (Law et al., 1996), it is not clear how the change from standard print materials to this new form of digital course materials will influence student's academic performance. Furthermore, it is not clear whether instructors have received training on use of the Engage e-reader and associated e-books before instructional use, nor is it clear what faculty perspectives are regarding the Engage e-reader and associated e-books. Our research team was unable to find any published studies that investigate the student experience of using the

Engage e-reader and associated e-books, nor studies that investigate the accessibility and usability of the Engage e-reader and associated e-books for AT-users. However, it is important to research the Engage e-reader and associated e-books, or any other electronic reading platforms other universities may use, such as Vital Source, Red Shelf, etc., to determine how this change in the university environment might influence students' ability to fulfill their student role and the instructors' ability to fulfill their instructor role as well. Therefore, the purpose of this study was to better understand the student use with and perspective on the Engage e-reader and associated e-book for all students, including those who use AT. In order to better understand the context under which students are using the Engage system, a secondary aim of this study was to better understand the instructor use with and perspective on the Engage system as well. Our research questions were as follows:

1. What is the student use with and perspective on the Engage e-reader and associated e-books?
2. Is the Engage E-reader and associated e-books platform equally accessible and usable for students who use assistive technology as students who do not use assistive technology?
3. What is the instructor use with and perspective on the Engage e-reader and associated e-books?

## **Methods**

### **Research and Survey Design**

Our study took place at a western university with approximately 30,000 students. The research team was comprised of an occupational therapist with expertise in AT use, a professor of education with expertise in learning analytics, a professor of occupational therapy, and a

graduate research student. The team employed a cross-sectional survey design with close-ended and open-ended questions. Both student and instructor surveys were created by the research team using best practice for survey writing, including clear, short, concise questions, no double barrel questions, and all questions were written for a middle school reading level (Vaske, 2008). The research team employed an iterative review process, gathering feedback from researchers, students, and the Assistive Technology Resource Center (ATRC, the support service of campus for students who use AT) staff three times prior to use. The finalized student survey consisted of 40 potential questions regarding the usability of the Engage e-reader and associated e-books. Some questions branched and students only answered subsequent questions if criteria were met (e.g. “Did you utilize services from the ATRC?”), so most students saw less than the 40 total questions. The survey consisted of both close-ended and open-ended questions. The close-ended questions pertained to the usability and accessibility of the Engage e-reader and associated e-books. The goal of these questions was to better understand the student’s use with the e-reader and e-book. The open-ended questions pertained to what students liked and disliked about both the e-reader and e-book. The goal of these questions was to better understand the student perspective of using the e-reader and e-book. The student survey took approximately 10-25 minutes to complete, based on what criteria the student met. The finalized instructor survey consisted of 18 close-ended and open-ended questions regarding instructors’ training, familiarity with, and use of the Engage e-reader and associated e-book. The instructor survey took approximately 10-15 minutes to complete.

### **Recruitment**

Both instructors and students were recruited through convenience sampling. The university primarily piloted the Engage e-reader and associated e-books in “gateway courses,”

which are primarily freshmen level courses. Therefore, this study focused on the introductory composition course, as this class had the greatest numbers of students enrolled and the e-book was text based (as opposed to a mathematics course where the e-book might be figures based). Instructors were invited to participate in the study during the departmental Fall Colloquium, held every semester for instructors of the course to come together and discuss topics pertinent to the class. Approximately 25 of out 33 total faculty members attended the colloquium, of which 21 agreed to participate in the study. Inclusion criteria stipulated the instructor directly taught a section of the introductory composition course that used the Engage e-reader and associated e-books (e.g. could not be a faculty member that oversees the course). There were no exclusion criteria.

Recruitment of students occurred using two different methods: through instructors of the course, and through the ATRC. For students recruited through the course, inclusion criteria stipulated the student must be enrolled in a section of the course that used the Engage e-reader and associated e-book. Students were excluded if they did not use the Engage e-reader. Students enrolled in a section of the course where the instructor agreed to participate were contacted through their university e-mail with a link to the survey and invited to participate in the study. Students who received ATRC services, who identified taking the composition course on their intake form, were first notified of the opportunity to participate through verbal communication with their service provider when completing their intake form. They were formally invited to participate in the study through an email sent by the student's ATRC service provider at the end of the semester. For AT-users, their instructor did not have to participate in the study. Therefore, inclusion criteria for AT-users stipulated that they must be in a section of the course that used the Engage e-reader and e-books. Students were excluded if they did not use the Engage e-reader.



## **Procedures**

Following IRB approval, instructors were invited to participate in the study during the Fall Colloquium in September 2018. Next, instructors were contacted via their provided email during weeks 8 to 10 of the semester to provide student recruitment materials for class use. Recruitment materials included a video introducing the study to students and a script for describing the study for instructors to use during class if desired. Researchers opted to use a video introduction rather than introducing the study via a research team member in person because the video allowed instructors to introduce the study at a time that was convenient for them. The video allowed for consistency in how the project was described. At the same time, instructors provided students' university emails to the research team. After an instructor verified with the research team that they had introduced the study to their class, each student was sent an invitation to participate in the study through their university email. In the email, there was a link to the survey which led students to a web link via an internet or Local Area Network enabled computer of his or her choice. Once students clicked on the link, they were directed to the informed consent and indicated his or her understanding and consent by clicking a radio button. Once informed consent was given, students proceeded to the questionnaire, administered through Qualtrics and associated with students' individual emails. Students provided demographic information and completed the questionnaire that asked questions about their use and experiences with the Engage e-reader and associated e-book. All students who completed the survey were enrolled in a lottery to win a basic iPad.

Data collection occurred at week four of the semester for instructors. Student data collection began between week 10 and continued until the end of the semester. Initials emails were sent out week 10-14 of the semester. It was intended that one reminder email would be sent

one week after the initial email. However, due to a glitch in Qualtrics where some reminders were not sent, some reminders were sent later than one week. Students who participated through ATRC recruitment took the survey the last week of the semester or two to three weeks following. The survey closed before the beginning of the next semester (Spring 2018).

### **Statistical Analysis**

All close-ended questions were analyzed using descriptive statistics. All open-ended questions were examined using content analysis and themes were developed (Savin-Baden & Major, 2013). First, all responses were read by two researchers to become acquainted with the data. Next, inductive codes emerged from the responses. Finally, inductive codes emerged into themes. Analyst triangulation occurred to ensure rigor. The original survey questions differentiated between the Engage e-reader and the e-book (i.e. “What did you like about the Engage e-reader?” and “What was the main advantage of the e-book?”) However, there was little difference in the resulting codes. Therefore, results for both the e-reader and e-book were merged together. In addition, some students reported issues with the content of the book, which are not reported.

## **Results**

### **Instructor Data**

Twenty-one out of approximately 25 instructors who learned about the study at their departmental Fall Colloquium responded to the survey. Fourteen instructors (66.7%) reported they had not previously taught using the Engage e-reader, and 12 of these instructors (80.9%) reported they did not receive any training on the Engage e-reader before teaching a section of the course that uses Engage. Of these 12 instructors who did not receive any training, 10 of these instructors (88.3%) reported they would have preferred training. Instructors cited departmental

training as their most preferred method of training (see Figure 2). When all instructors were asked if they felt comfortable teaching with the Engage e-reader and associated e-books, 17 instructors (81.0%) reported feeling “somewhat” comfortable using the Engage e-reader, and only one instructor (5.8%) reported feeling “very” comfortable using the Engage system. When asked whether they preferred the Engage e-reader and associated e-books versus standard print textbooks, 61.9% of respondents reported they “somewhat disagree(d)” or “strongly disagree(d)” (n=13, see Figure 3).

When asked whether students ever came to the instructor with problems/concerns using the Engage e-reader and/or e-book, 8 instructors reported students came “occasionally” (38.1%.) One additional instructor reported that students “never” came to them with problems about the e-reader, but “occasionally” had problems/concerns with the e-book. Instructors cited student concerns regarding: where to buy the Engage e-reader, the cost of the e-reader, how to access the e-reader and/or readings for the first time, and how to initially navigate the interface of the e-reader and/or e-book. As one instructor said, students came with a “general struggle to use it - not more than their struggle to use the rest of Canvas.” (The university’s online learning management system.) Instructors cited modeling through either 1:1 instruction or an in-class demonstration on how to use the Engage system, as well as providing information on how to opt out of using the Engage system, as the most frequently used methods to help these students. No instructors reported being unable to help the students.

## **Student Data: Survey Results**

Of the 21 instructors who consented to the study and completed the instructor survey, 13 instructors provided student emails for student recruitment. A total of approximately 330 students (unknown whether some AT-users were recruited through both their course section and their ATRC provider) were invited to participate in the study, and 59 students completed the survey. Of these 59 students, 8 students responded that they did not use the Engage e-reader or did not know if they used the Engage e-reader, so their responses were discarded, leaving 51 survey responses. Of the 51 respondents, 4 students reported using AT. The sample consisted of 23 male students and 28 female students (45.1% and 54.9% respectively, n=51.) The majority of students reported they were college freshman (78.4%, n=40). See Table 1 for demographic information regarding college major (n.b. one student reported two majors, hence the total of 52 responses for 51 students).

Table 2 displays the means and standard deviations for the entire sample, non-AT users, and AT users. For every question, AT-user response scores had a higher mean than non-AT users responses. Answers regarding preference of e-books over standard print textbooks and number of tools used showed the largest score differences between AT-users and non-AT users.

Because of the large difference between group sizes, subsequent survey results report AT users and non-AT users together. In general, 51% (n=26) of students “somewhat agree(d)” or “strongly agree(d)” that e-books are effective for their learning, but when asked whether they preferred an e-book over a standard print textbook, only 35.1% (n=18) stated they “somewhat agree(d)” or “strongly agree(d)” (see Figure 4). Concerning use of the Engage e-reader and e-book, 90.2% of students “somewhat agree(d)” or “strongly agree(d)” that it was easy to read materials, and 76% of students “somewhat agree(d)” or “strongly agree(d)” that it was easy to

navigate the e-book (see Figure 4). Students identified highlighting and searching as the most frequently used tools within the Engage e-reader (see Figure 5). Of those who used each type of tool, most students found each tool either “somewhat helpful” or “very helpful” (see Figure 5).

### **Student Data: Open-ended Survey Questions**

In addition to close-ended questions, students responded to open-ended questions regarding the positive and negative attributes of both the e-reader and the e-book, as well as what features they would like to see added to the e-reader and e-book. There were no differences between responses for AT users and non-AT users.

#### **Positive attributes associated with the Engage e-reader and associated e-book.**

Responses fell into four major themes: 1. Easy to access via screen device, 2. Easy to use tools, 3. Other positive attributes associated with lack of a physical textbook, and 4. Less cost. Two students also commented on the sustainability/eco-friendly nature of the Engage e-reader, while two other students stated they liked “nothing” about the Engage e-reader.

#### ***Easy to access via screen device***

Many students spoke of the ability to access the Engage system via a screen device as one of the main advantages, as reflected by one student stating, “I like that the (e)-(r)eaders are available online...it wasn’t hard to find or access the (e)-(r)eaders.” Other students wrote comments such as, “it’s accessible on any device,” and they could “read anywhere” and “use whenever.” Some students specifically spoke to the ability to access the Engage e-reader from multiple devices, stating, “I liked the simplicity and how accessible it was on the computer as well as mobile devices.”

### ***Easy to use tools***

Students cited the ease of use due to the features and tools of the Engage e-reader and e-book as another primary advantage. One student commented they were “able to use (the Engage system) quickly and easily.” Many students stated the e-book was easily searchable and easy to navigate. Still other students referenced the use of tools, such as the highlighting and search tools, which made the system easy to use for coursework, reflected in answers such as, “I could type in words I was looking for and find it right away,” and, “All the resources and tools it has to annotate make the text more understandable.”

### ***Other positive attributes associated with lack of a physical textbook***

Students also commented on various other positive attributes associated with lack of a physical textbook, namely portability and less need for storage. For instance, students reported liking that they did not have to carry an extra textbook, due to the e-book being on their computer/screen device. Students wrote comments such as, “It’s all in the same place and easy to carry around. If I had an actual book, I wouldn’t take it with me.” Another student stated, “The Engage e-reader allows for one less item to be carried around or lost on campus. As a disabled veteran, this means a lot to me as mobility is somewhat limited and largely related to how much I’m carrying.” Other students spoke about the need for less storage room in their dorms and/or book bags, as reflected by the quote, “I live off campus and don’t have places to keep my extra things,” and, “Having an electronic book makes more room in my bag.” Still other students stated they liked that they could not lose or damage the textbook due to it being digital, such as, “...it was online, can’t lose or damage it,” and, “There’s no big textbook you have to worry about damaging or carrying around.”

### *Less cost*

The last major theme students reported as a positive attribute was the cheaper cost of the Engage e-reader and associated e-book compared to a standard print textbook. As one student said, “I don’t have to pay for the physical copy of the textbook, and it’s a lot cheaper.” Other students reported, “It’s cheaper and easier than a regular textbook,” and “It is cheaper than buying or renting a book.” Of note, students reported this theme less frequently than the other themes.

### **Negative attributes associated with the Engage e-reader and associated e-books.**

Comments regarding disadvantages of the Engage e-reader and e-book fell into seven major themes: 1. Need for screen device with internet, 2. Need for system updates 3. Complicated to use and navigate tools, 4. Screen fatigue, 4. Preference for physical textbooks, 6. Used very little, and 7. No dislikes/complaints. Three students commented on the expensive cost of the e-textbook, although these comments appeared to be linked more to the cost of the book in relation to the content value (e.g. “I don’t like paying for an online textbook I barely use. The information in the reader is basic information that is common knowledge.”)

### *Need for screen device with internet*

One of the most commonly cited disadvantages of the Engage e-reader and/or e-book was the need for a screen device with internet. Many students focused on the need for internet, reflected in the quote, “If you do not have service or Wi-Fi then I am unable to use the site.” Other students stated, “Sometimes I don’t have a strong network connection,” and, “Disadvantage is you need a connection to the internet.” Of note, other students also commented on the need for a screen device as well. For instance, one student stated, “It’s hard for students who don’t have laptops to take to class to access the book in class.”

### *Need for system updates*

Students also reported that the Engage e-reader and associated e-books needed system upgrades in a variety of ways. Some students reported that the Engage e-reader and associated e-books would occasionally malfunction or have “some glitches,” while other students reported, “The overall site needs to be updated for easy access,” and “I felt like it was clunky, or unoptimized. Many (e)-(r)eaders are alike in this way but it felt odd and sometimes spazzes out when using it.” One student reported disliking “not being able to open (Engage) up in any browser,” and others commented they disliked having to access the Engage e-reader through Canvas (the university’s learning management system). Additionally, a few students commented that the system was “not interactive.” On a different note, other students commented on the scaling of the pages, stating, “It was hard to make both pages fit on the screen and to read the text when I tried this technique,” and, “Sometimes the pages are oddly scaled to the computer screen.” Overall, students reported several different issues that were included within this theme.

### *Complicated to use and navigate tools*

Difficulty in navigating the system and understanding how to use the features was also reported as a negative attribute. For instance, students reported the Engage e-reader was at times “complicated to use” and “hard to get used to.” As one student put it, “It was hard to get used to, I didn’t know that there were so many tools...it’s also hard to reference back to and navigate. The highlighting function messes up and is hard to use, it is not clear how to make notes...” Another student perhaps captured this sentiment best, stating, “I dislike the complication of all the tools. I feel like I would have used them if they were easier to navigate.”



### *Screen fatigue*

In addition to difficulty using the tools, other students stated they found it harder to read an e-book, commenting, “I find it hard to look at a screen and read for a long period of time” and, “Working on a computer for long periods of time can make your eyes tired and reading more on a screen after doesn’t help focus.” Other students reported similar sentiments as well, such as “I can’t read it as effectively as I would a printed textbook,” and “Not having a physical copy of the text makes it hard on my eyes and I can’t spend a lot of time reading the online screens.”

### *Preference for physical textbooks*

Multiple students expressed preference for physical textbooks over e-textbooks. Some students did not indicate any specific concern or disadvantage for using the e-reader or e-book, just that they simply prefer physical textbooks, writing statements such as, “I prefer a normal book so I am not really a fan in general” and, “I don’t think there is a disadvantage I just prefer to have a physical copy of a book.” However, other students explicitly reported preferring a standard print textbook, writing statements such as, “I enjoy reading paper books more, just feels better” and “A paper book is easier to navigate and use, in my opinion.” Other students reported they study better with physical textbooks, writing statements such as, “I like to physically mark and annotate my textbooks, and it’s difficult for me to do that online,” and, “I can’t physically touch it and mark up pages easily. It’s bothersome because it’s how I study.” Other students commented, “It is much harder to write notes to myself or marking up my pages by hand.”

### *Used very little*

Some students reported using the Engage e-reader and e-book very little, or not at all. Indeed, these students reported they “haven’t used it enough to have a problem with it” or, “I’m

not sure, I don't use it very much." While some students did not indicate why they had not used the e-reader and e-book, others indicated they did not use the e-book due to the nature of the content of the course. For instance, some students wrote statements such as the e-book "wasn't interesting," and "There wasn't a lot of motivation to actually read it (the e-book)" and "It's not that useful personally, a lot of it is mostly review of things I learned in high school."

### ***No dislikes/complaints***

Lastly, several students stated they had no dislikes or complaints with the Engage e-reader and e-book, reflected in the statement, "There were not any dislikes that stuck out to me with the Engage E-reader as I feel it's a very reliable source when provided Wi-Fi or cellular service." Other students stated, "I can't make any real complaints" and, "I didn't find anything I disliked about the Engage e-reader."

### **What feature would you like to see added to the Engage e-reader?**

Three main themes captured what students wanted added into the Engage e-reader: 1. No changes, 2. Ability to download materials, and 3. Content added into the readings. In addition, two students reported wanting a mobile-friendly version of the e-book, two students wanted a text-to-speech option, and one student wanted demonstration videos on how to use the tools within the Engage system.

### ***No changes***

The majority of students did not report any features they would like to see added, reflected in statements such as, "I think it's good," and "The features are fine." Some students specified the Engage system had all features they needed, reflected in the statement, "No. I appreciate everything in the book." Of note, other students, wrote comments suggesting they

may simply not know of other features that could be added, reflected in statements such as, “Not that I know of,” and, “None at the moment that I can think about.”

### ***Ability to download materials***

Students most frequently cited the ability to download materials to use without Wi-Fi as the feature they would like to see added. This sentiment is reflected in the comment, “I would like to be able to download my study questions, highlights, and notes to my device straight from the site.” Some students stated they would like to be able to download materials in general, while other students specified, they would like to be able to download annotated notes. These students indicated they could download basic readings, but they could not download readings with their highlights and notes included.

### ***Content added into readings***

Students also reported they would like to see various content-related features added into the e-book. Examples of type of content included summary sections at the top of each page/chapter, summary sections at the end of each reading, and tips/examples/videos that correlate within the readings.

## **Discussion**

The aim of this study was to better understand the student use with and perspective on the Engage e-reader and associated e-books. A secondary aim of this study was to better understand the instructor perspective and experience teaching with the Engage e-reader and e-book, which may influence student use and perspective. The findings for instructor data will be discussed prior to discussion on student data.

## Instructors

Our instructor results align with other studies that indicate faculty training is often an afterthought and not included before implementation of new digital materials in higher education (Conner and Beard, 2015; Huss & Eastep, 2016; Smith, Spiegel, & Cox, 2016). Previous research has further shown faculty attitudes and knowledge of students' needs was either a major support or barrier to students' academic success (Conner and Beard, 2015; DaDeppo, 2009; Hong, 2015; Mamiseishvili & Koch, 2011; Mullins & Preyde, 2013; Murray, Wren, & Keys, 2008; Yuen & Shaughnessy, 2001). Applying the PEO model (Law et al., 1996), it is therefore important to ensure faculty are both trained and feel comfortable using course materials to ensure a positive environment for students' academic success. Regarding our results, not all instructors received training before instructional use, nor did they feel completely comfortable using the Engage e-reader and associated e-books. Furthermore, despite instructors' ability to answer all students' questions and concerns, these questions and concerns were largely topical in nature. While these findings did not appear to hinder student success during this semester, it is not a guarantee this lack of instructor training and comfort using the Engage e-reader and associated e-books will not have negative consequences in the future. Furthermore, there are plans to continue modifying and updating the Engage e-reader and associated e-books in subsequent semesters, and there could be more substantial questions or concerns if there are issues with these modifications and updates. Given the instructors lack of training of the Engage e-reader and associated e-books, it is not clear whether instructors would be prepared to address these concerns, which could in turn impact students' use with the Engage system and their overall learning. Therefore, our findings indicate universities should consider training for all instructors before implementing the Engage e-reader and associated e-books, or other digital learning

platforms, in a course to ensure instructors are knowledgeable and feel comfortable using the platform. In addition to initial training, universities should also provide ongoing training as modifications and changes are made to the Engage e-reader and associated e-books, or other digital learning platforms, to ensure instructors continue to understand how to best utilize the platform. Otherwise, this lack of training and instructor comfort and knowledge may impact students' ability to interact with course materials and effect student learning.

## **Students**

Students reported largely positive experiences overall with both the Engage e-reader and the e-book, potentially providing preliminary positive findings for the use of the Engage e-reader and associated e-books. However, despite students' positive feedback with the Engage e-reader and associated e-books, students remained mixed on whether they found e-books effective for their learning and whether they preferred e-books to standard print textbooks. These results align with other studies that have shown students have mixed opinions regarding the increased use of digital learning materials in higher education, and students have been slow to accept e-books over standard print textbooks (e.g. Weisburg, 2011.) Moreover, multiple students explicitly stated a preference for standard print textbooks and indicated print textbooks were more effective for their learning. In addition, eight students who completed the survey were excluded from data analysis because they did not use the Engage e-reader. Unfortunately, our survey was not designed to assess why students opted out of the Engage e-reader. However, the combined number of students who did not use the Engage e-reader and students who reported a preference for physical textbooks suggests there remain several students who did not prefer the Engage system. As universities consider an increased use of the Engage e-reader and associated e-books, or another digital learning platform, they must take this student perspective into account. As

such, students should be able to choose between the Engage e-reader and associated e-books and standard print textbooks. Applying the PEO model (Law et al., 1996), the change in environment through made by administration through the use of the Engage system when students do not feel comfortable using it or find digital learning materials effective for their learning may impact the student's academic success.

If universities want to change the university environment through the use of the digital learning platforms, such as the Engage e-reader and associated e-books, universities must then support students in this new technological paradigm. One such way to provide student support would be through formal training on the Engage e-reader and associated e-books before class use. In our study, multiple results indicate students would indeed benefit from formal training on the Engage e-reader and associated e-books before class use. Firstly, there were multiple contradictions within students' open-ended responses. For instance, some students reported they could use the Engage e-reader and associated e-books on any screen device, while others stated they could only access the Engage e-reader and associated e-books on their laptop. Other students reported they did not know about the tools with the Engage e-reader, while other students reported they found the tools very helpful, suggesting not all students know how to use the Engage system to the same extent. Moreover, AT-users reported they found e-books more effective for their learning than non-AT users, and they also reported a higher preference for e-books. While the AT-user sample size was significantly smaller than the non-AT user sample size, the differences in scores may be attributed to the extensive and individualized training AT-users receive through the ATRC, which are not available to non-AT users. Therefore, this combination of inconsistent answers from non-AT users and more positive scores from AT-users suggests all students may benefit from training on the Engage system to best understand how to

use the platform. If universities were to provide such training, all students could develop skills to more effectively use the Engage e-reader and associated e-books to fulfill their student roll in the new university environment and continue to achieve academic success.

One area of surprise findings for our study were the positive results for AT-users. Previous studies had shown technology and inaccessible course materials had been a barrier to academic success for AT-users (The Florida College System, 2009). However, our results indicated AT-users were not only able to access the Engage system with their AT, they actually had more a more positive experience with the Engage system. Like stated above, these findings may relate to the extensive training AT-users receive through the ATRC. Perhaps these students may have previously developed more advanced skills on how to use digital learning materials in the classroom, which enabled them to fulfill their student role within a technological environment better than students who have not had as much exposure to such digital learning materials. Therefore, our findings suggest that when utilized correctly, technology can become a support for students who use AT.

As another point of consideration, some non-AT users reported a desire for AT features within the Engage system, such as text-to-speech software. These findings support previous research that has shown the inclusion of AT features can ultimately benefit all users (Higbee, 2009.) Additionally, previous research has shown that ensuring digital materials are both accessible and include AT features is less costly up front than when software developers add these features retroactively (Case and Davidson, 2011; Hollins & Foley, 2011; McGuire, Scott, and Shaw, 2006.) Therefore, Engage software and e-book publishers and other e-technology platforms should consider incorporating AT features and accessibility within the Engage system

now instead of retroactively, both to meet the needs of all students, and to reduce cost in the long run.

Lastly, multiple students indicated they did not use the Engage system, or used it very little, due to the nature of the course. Even with students reporting limited use of the Engage system, some students still reported screen fatigue and difficulty taking notes. These issues may only be compounded in more intensive courses, where students are spending longer times reading the e-book on a screen or need to take more detailed study notes. With these points in mind, universities must be cautious generalizing these results. They should also consider what type of course is the most appropriate course in which to pilot the Engage e-reader and associated e-books as a means to determine its usability on a broader scale.

### **Limitations**

While the study produced valuable findings, there were limitations to the study as well. Firstly, there was a large dropout rate for instructors, reducing the recruitment pool for students. Instructors cited time constraints and difficulty locating their list of student emails as their primary reasons for dropping out of the study. Secondly, there was less than a 20% response for the student survey, which may not be representative of the entire population. In addition, the AT-user sample size was small, which limited the researchers' ability to draw strong conclusions from these results. Regarding demographics, there was an unequal distribution of college majors and year in college. Thirdly, changes could be made to the surveys for future use to gather more information. For instance, the current instructor survey did not include a short answer for preference between e-book or print textbook, which could have added rich data. On the student survey, there were no questions concerning why students opted out of using the Engage e-reader, which could be an area for future research. Lastly, students provided short answers for open-



ended survey questions at times (e.g. “convivence!”), so the qualitative data was not as rich as it could have been.

### **Implications for practice**

While this study investigated the Engage e-reader and associated e-books specifically, these findings can be applicable to other digital learning platforms as well. For instance, other universities are using other digital learning platforms to Engage, such as Red Shelf and Vital Source, which are similar in nature to the Engage e-reader and associated e-books. As such, the implications listed below are general points for use of any digital learning platforms.

1. Universities should provide training on digital learning platforms and e-books, for both students and instructors before use in a course and as changes and modifications are made in subsequent semesters.
2. Universities should continue to provide students the choice between digital learning platform and a standard print textbook and course materials.
3. Universities should continue to consider the student perspective as they implement use of digital learning platforms on a broader scale.
4. Universities should implement a broader use of digital learning platforms cautiously, as multiple students indicated they did not actually use the Engage e-reader and associated e-books due to the nature of the course, decreasing generalizability of the results.
5. When implemented in an accessible format, the Engage e-reader and associated e-books or other digital learning platforms can be a support for students who use AT.

## **Implications for research**

1. Continue to research the student experience with the Engage e-reader and associated e-books and other digital learning platform as updates and changes are made in subsequent semesters.
2. Research why students opted out of using the Engage e-reader.
3. Research student and instructor use with and perspective on the Engage e-reader and associated e-books across multiple courses.
4. Restructure procedures of study design to include focus groups.

## **Conclusion**

Universities are increasing using digital learning materials within university courses, such as the use of the Engage e-reader and associated e-books (Falc, 2013; Hollins & Foley, 2013; Stone & Baker-Evelteh, 2013.) While there are advantages associated with increased e-technology, there are disadvantages to consider as well. Additionally, the student perspective must be considered as well. Therefore, our study aimed to better understand the student use and perspective on the Engage e-reader and associated e-books. Instructor use and perspectives were also gathered to better understand one factor of the university environment, as it may affect students' academic success. Overall, our findings support previous research on the student perspective and use of e-technology. Our findings add to the literature concerning the AT-user experience with e-technology, as our findings differed from previous studies where e-technology had been a barrier to academic success. Therefore, our findings suggest e-technology can be a support for AT-users if implemented correctly. Lastly, our findings support previous studies that found instructors do not always receive training on e-technology or accessibility and usability concepts before instructional use. Overall, our findings suggest that training is critical when

implementing e-technology, but training does not always occur. Because there is limited, if any, research on the Engage e-reader and associated e-books and other digital learning platforms, implications for both future practice and research were also provided. While our study investigated the Engage e-reader and associated e-books specifically, the findings may be applicable to other digital learning platforms as well.

## REFLECTIONS

One of the primary reasons I chose to attend Colorado State was for the option to complete a thesis. I came into graduate school with my own research interests, which did not align with any thesis topic options. However, I knew I wanted to gain research experience and I chose to work with Karen Atler on this thesis topic by sheer luck. I had very little idea what to expect of the process, and I learned a great deal about research, completing a thesis, and myself along the way.

### **Reflections on Research Project**

I have learned multiple key lessons from partaking in this particular research project. First and perhaps most importantly, I have learned a great deal about accessibility and usability concepts. Before this project, I had no idea what these terms meant in a digital context, and I certainly did not know how to implement these concepts. After researching for this study, however, I am much more well-versed on accessibility and usability. For instance, I was able to recognize the “alt text” section on Instagram, and I now attempt to create an alt text for all my posts. With that said, I know this is just a small step in the right direction. I still have a great deal to learn on accessibility and usability, and I look forward to better understanding how to incorporate accessibility and usability standards into my practice and everyday life.

I have also learned a great deal about the research process. For instance, I now more fully recognize the importance of creating a detailed and comprehensive survey initially to capture as much potential variance in data as possible. While our survey captured a great amount of information, there are findings from this past round of data collection that show where improvements could be made. I plan to carry that lesson forward into any future survey research I might complete.

Lastly, I have gained a new appreciation for the inclusion of qualitative data in a mixed methods study. I had exposure to other types of qualitative research through my undergraduate studies, but I had never worked on any mixed methods studies. For this research project, however, I fully saw the potential value in focus groups and rich open-ended questions. While our qualitative data provided some meaningful information, there were several gaps in the data that could have been answered had we been able to hold focus groups.

### **Reflections on Thesis Process**

Throughout the process of completing a thesis, I have seen time and time again the importance of a strong, supportive thesis advisor. Karen has been an exemplary in this regard, and she has provided much appreciated guidance throughout this process. In addition, I have been very grateful for the amount of input I have been able to have on the project. For instance, the intervention portion of some research projects had already been completed by the time the thesis student started. However, I was able to start my thesis at the start of the research study, and I enjoyed being able to help guide and shape the research design.

### **Reflections on Myself as a Future Practitioner**

I have also learned aspects about myself through this thesis. For one, I knew I had room to grow in my writing abilities, but this thesis has highlighted the weak areas of my writing process. While I feel like my writing abilities has been strengthened through this writing process and Karen's suggestions, I know I still have large room for improvement. With that in mind, I may take a writing course in the future to focus on developing my writing skills.

Throughout my graduate studies, I have been interested in potentially going on to complete a PhD. However, I learned through this thesis I am not ready to fully dedicate myself to academia at this point. And I have learned that is ok. I have been able to have many different

experiences that have helped shape me as a future OT, and while I have thoroughly enjoyed this thesis, I have also enjoyed the other opportunities equally. Therefore, I now feel comfortable entering this next phase of my life post-graduation as a practitioner instead of a PhD student. Through my thesis, I have been able to examine where my priorities lie, and I feel more confident in my decisions than I would have without completing a thesis.

While I feel confident entering the workforce, I still greatly value research and my ability to participate in conducting research. Therefore, I hope to find opportunities to still conduct research while practicing. Furthermore, I still plan to study at the doctoral level eventually, and I know the experience gained through my thesis will aid me in those studies greatly. Overall, I will use the experience from the thesis to find a program that best fits my research interests, and I can only hope my next thesis advisor is just as great a fit as Karen.

## FIGURES

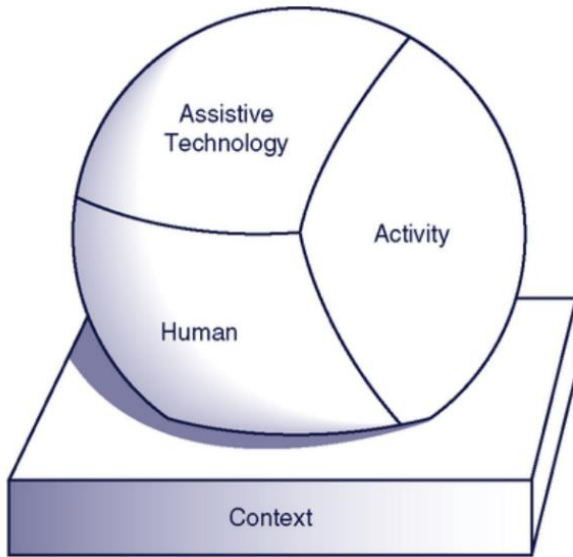


Figure 1: Human Activity-Assistive Technology Model (Cook & Pulgar, 2015, p. 2)

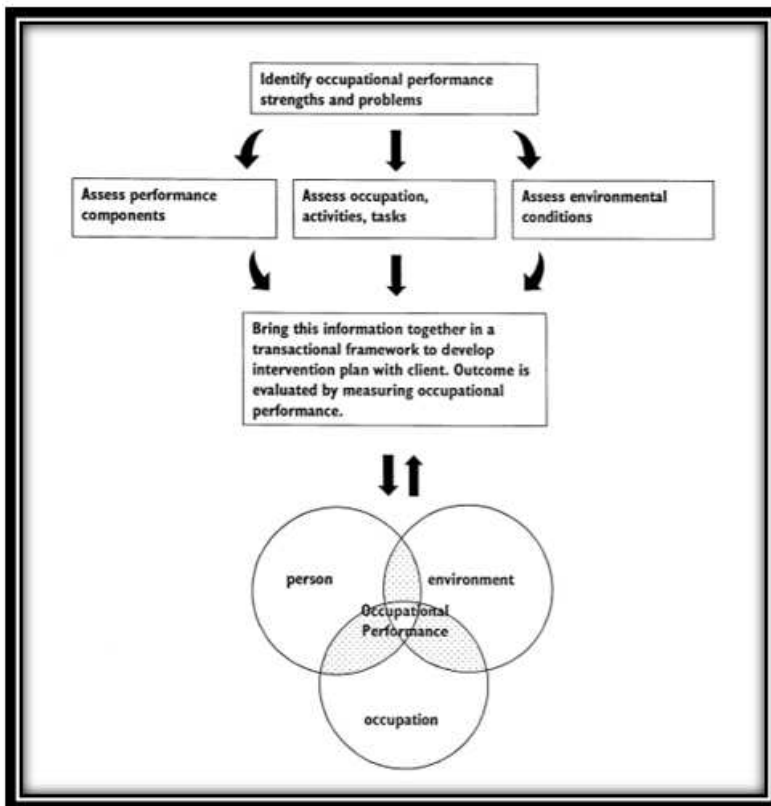


Figure 2: The Person-Environment-Occupation Model's Application Framework (Law et al., 1996, P. 10)

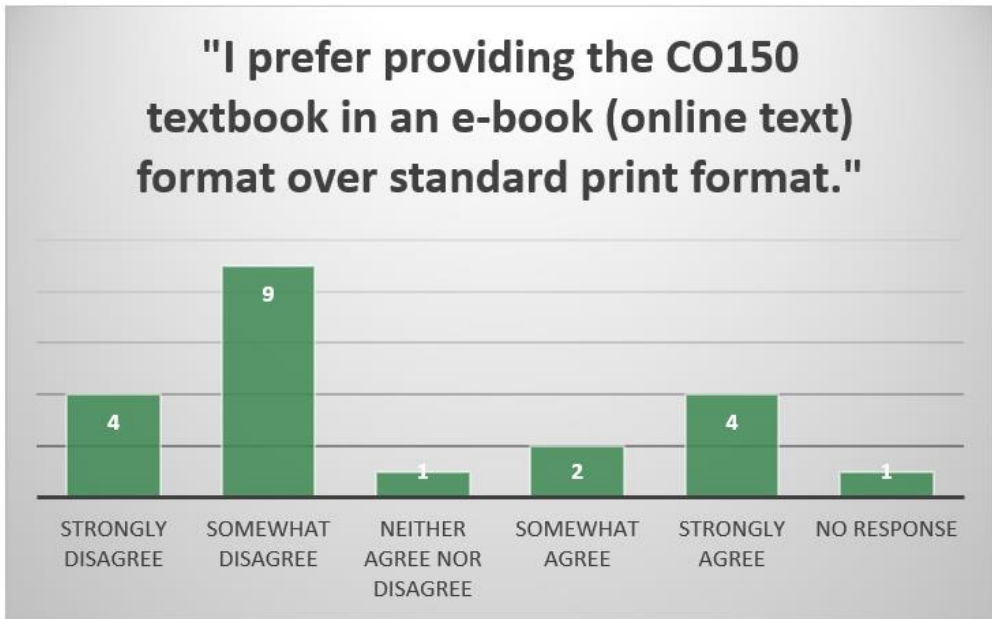


Figure 3: Responses to preference for type of training and preference between e-book and print textbook.



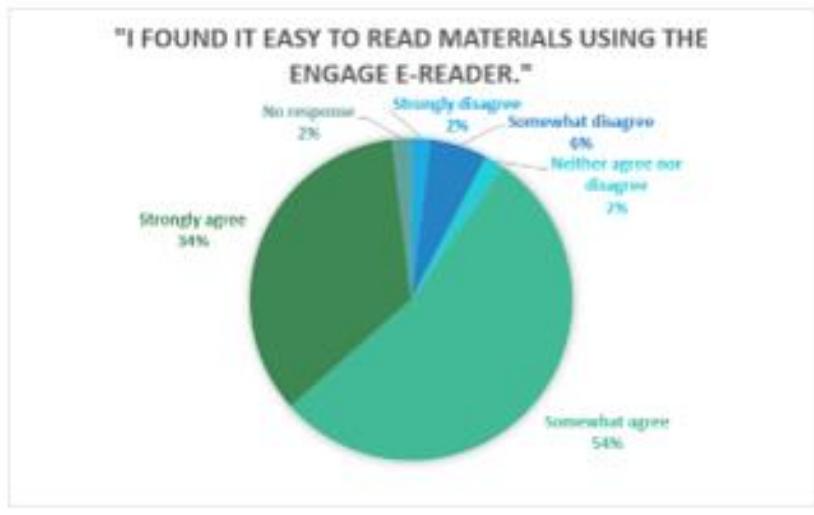
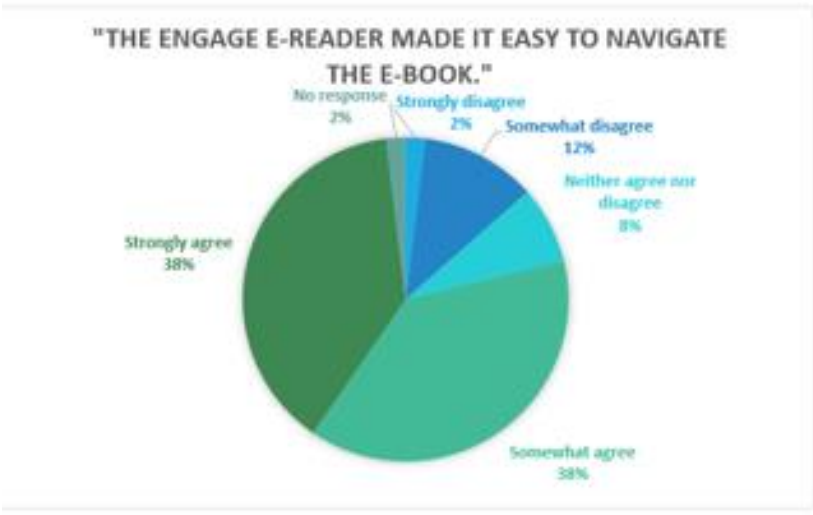
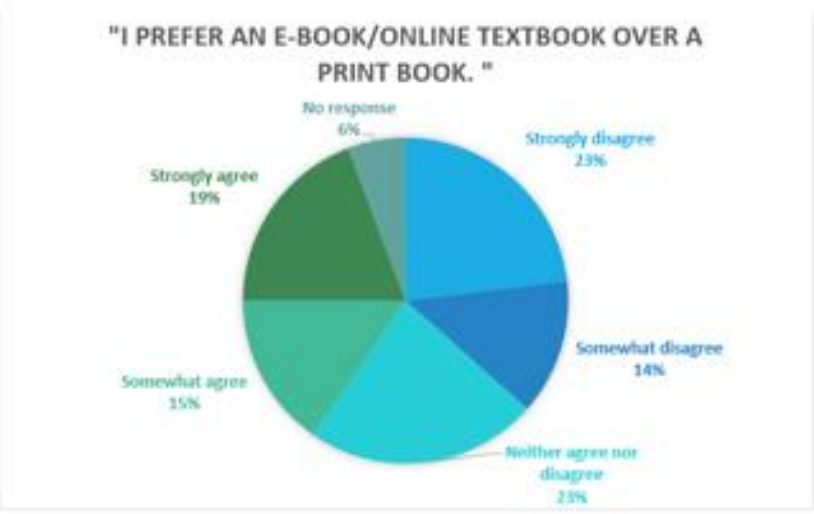
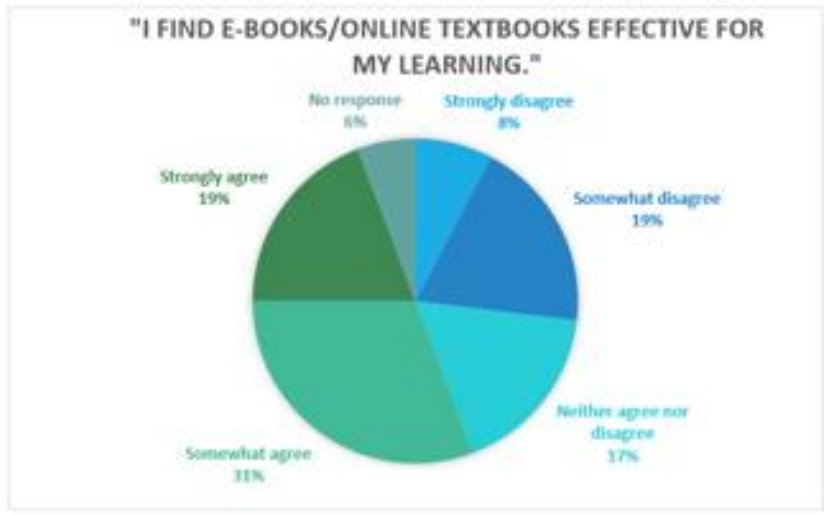


Figure 4: Student responses to close-ended questions

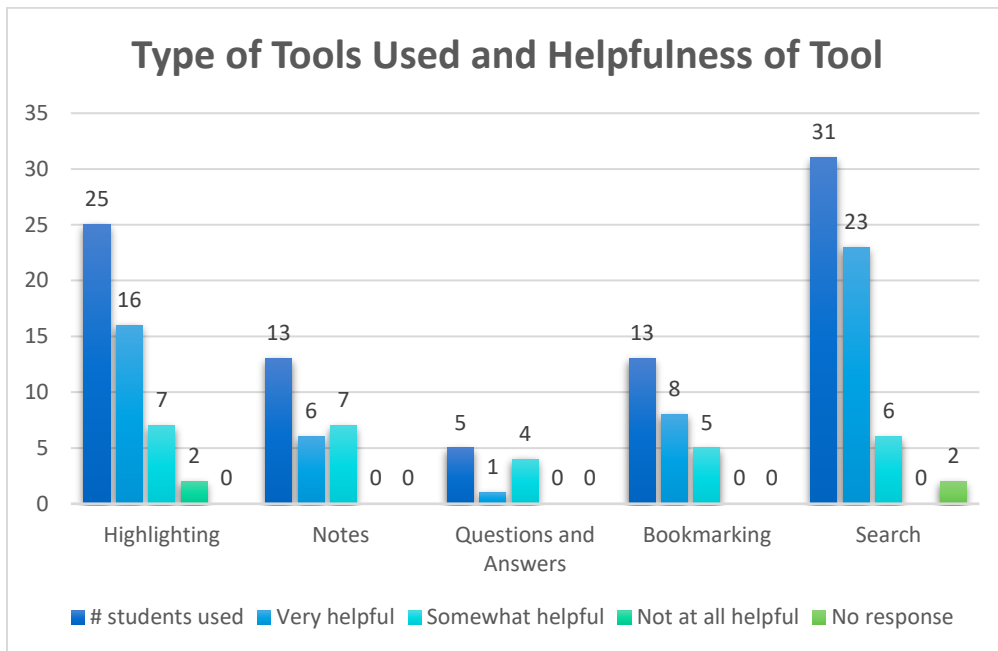


Figure 5: Students responses for type of tools used and helpfulness of each tool

## TABLES

Table 1: Student college majors

| College                            | Total     | Percentage |
|------------------------------------|-----------|------------|
| Agricultural Sciences              | 3         | 5.88       |
| Business                           | 10        | 19.61      |
| Engineering                        | 4         | 7.84       |
| Health and Human Sciences          | 6         | 11.76      |
| Liberal Arts                       | 3         | 5.88       |
| Natural Resources                  | 3         | 5.88       |
| Natural Sciences                   | 10        | 19.61      |
| Veterinary and Biomedical Sciences | 2         | 3.92       |
| Undecided                          | 10        | 19.61      |
| Missing                            | 1         | 1.96       |
| <b>Total</b>                       | <b>52</b> | <b>100</b> |

Table 2: Responses to close-ended questions of student survey

\*1 = Strongly disagree, 2 = Somewhat disagree, 3 = Neither agree nor disagree, 4=Somewhat agree, 5 = Strongly agree

| Question   | Whole group                            | non-AT user response                   | AT-user response                      |
|--|--|--|---------------------------------------|
| Comfort using tech in general                            | mean=4.62*; SD=.68 (n=51)<br>mode=5    | mean=4.6*; SD=.70 (n=47)<br>mode=5     | mean=5* (n=4) SD=0.0<br>mode=5        |
| "I enjoy reading books in e-book format."                | mean=3.29*; SD=1.17 (n=49)<br>mode=4   | mean=3.2*; SD=1.39 (n=45)<br>mode=4    | mean = 4.25* (n=4) SD=.43<br>mode = 4 |
| "I find online books effective for learning."            | mean=3.36*; SD=1.25 (n=49)<br>mode=4   | mean=3.29*; SD=1.26 (n=45)<br>mode=4   | mean = 4.25* (n=4) SD=.43<br>mode = 4 |
| "I find it easy to navigate the Engage e-reader."        | mean=4.02*; SD=1.07 (n=51)<br>mode=4,5 | mean=3.96*; SD=1.07 (n=47)<br>mode = 4 | mean = 4.75* (n=4) SD=.43<br>mode = 5 |
| "I find it easy to read materials in the Engage e-book." | mean=4.16*; SD=.88 (n=51)<br>mode=4    | mean=4.15*; SD=.90 (n=47)<br>mode=4    | mean=4.25* (n=4) SD=.30<br>mode = 4   |
| "I prefer an e-book over standard print textbooks."      | mean=2.94*; SD=1.43 (n=49)<br>mode=3,1 | mean=2.82*; SD=1.43 (n=45)<br>mode=1   | mean = 4.25* (n=4) SD=.83<br>mode = 5 |
| Number of tools used                                     | mean=1.71*; SD=1.18 (n=51)<br>mode=1   | mean=1.6*; SD=1.10 (n=47)<br>mode=1    | mean = 2.75* (n=4) SD=1.25<br>mode =4 |

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