Unit 8 Action Research Project Proposal

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Printed Versus Digital Learning Materials:

Action Research Project Proposal

This study will determine if students who complete their courses online using printed reading materials in contrast to students reading from a screen (digital format) experience the same comprehension and memory recall levels. Comprehension is important when reading because it adds meaning to what is read, creates new thoughts and ideas, and couples with memory recall to help build constructivism. The ability to assimilate new learning is also essential for students to reach higher levels of Bloom's Taxonomy, which offers a hierarchy of leveled (lower to higher) thinking skills in a learning environment.

The directional hypothesis of this deductive research study is that online undergraduate students who use printed reading materials will experience improved comprehension and memory recall than comparable students who access reading materials in digital format. The purpose of this study would be to recognize the need to provide online undergraduate students with the option and resources for printed learning materials.

The author of this study underwent eight years of online undergraduate and graduate programs and has directly experienced a better understanding when using printed learning materials. This empirical research has informally indicated that comprehension and memory recall in online learning can be optimized or reduced depending on whether course reading is performed using printed material or viewing a digital screen. Three major points support this theory: the cognitive effects, environmental impacts, and academic discipline and study habits of a learner's situation, all explored in the subsequent literature review comprised of scholarly articles.

Problem Statement

It can be a debatable misconception that learning from digital resources is adequately equivalent to paper learning materials. Do learners understand and retain information as well in digital format versus reading from a printed book? Online students are defined for this problem statement as undergraduate students who complete all of their studies over the Internet.

An essential element to examine is whether the proliferation of continuous onscreen content affects the memory recall of online students because, according to analysis, "reading complex stories or interconnected facts in a printed book leads to better recall of the story, of details, and of the connection between facts than reading the same text onscreen" (Korte, 2020, para. 5). As an example, according to a 2006 study of 237 online Canadian undergraduate and graduate students (Hamer & McGrath, 2011), more students (60.8%) claim to recall a long assignment (more than five pages) when reading it on paper versus digitally (5.9%). Moreover, these same students say they actually prefer learning on paper (72.6%) than on a screen (7.2%), and, correspondingly, reading assignments in digital format causes more distractions and mind wandering (71.3%) than reading on paper (8.4%). Other concerns and aspects must be included in the research to support the problem statement, including students' technical and digital skills and experience, preferred learning styles, ergonomic comfort, and digital device screen sizes.

This problem statement seeks to answer: "Are printed learning materials more effective for comprehension and memory recall than digital resources?"

Summary of Literature Review

The literature related to this action research study came from various sources, although mainly stemming from the Education Resources Information Center (ERIC), an online library sponsored by the Institute of Education Sciences (IES) of the U.S. Department of Education.

A review of the following literature from previous related studies on this topic found many factors that have proven to impede a learner's ability to stay focused while learning from digital text, especially with long or complex content. Across studies, online reading appeared to prosper better in situations that require browsing, skimming, or searching for data, as compared to deep learning. Distractions and mind-wandering are more prevalent when reading online, requiring increased self-discipline and keen metacognitive and study habit skills to stay focused. Physical and digital ergonomics are also consistent research findings regarding comfort, fatigue, eyestrain, the level of reading ease per the onscreen textual design, and how these contribute to the effects of learners' comprehension and memory recall.

These findings were not surprising to the author of this study as they mirrored the aforementioned empirical research. However, one notable observation during this literature review is that there was no mention of students attempting to find or purchase textbooks on their own or any reference to students being given a choice of printed versus digital reading materials in an actual course outside of research studies. However, this may have been out of scope to mention.

This literature examination found that the benefits and advantages of digital resources in online learning are more regularly lauded and heavily examined than the pre-internet, traditional process of learning from printed materials, such as books or paper printouts. In other words, during the window given to perform this literature review, only some prior studies were found that explored the concept of 'printed' materials affording better comprehension and memory recall to students of any age. Locating previous research studies that focused mainly on the benefits of printed learning materials in today's digital age, with few exceptions, was not fruitful. Additional time and probing were required to locate adjacent studies baked into other studies, where they were used as comparable data. A suggested next step for a future research project

would be to chase down the original referenced studies to find and analyze the writings of initial research projects on this topic.

It is important to consider that perhaps comprehension, akin to achievement, does not rely solely on intelligence but on a learner's metacognitive ability to examine their learning style, ergonomic environment, and study habits preferences to refine it better. In other words, should not a learner be able and expected to monitor their comprehension of a reading assignment? By understanding the nuances and nature of one's strengths, competencies, and limitations, efforts can be made to calibrate better to the unique ecosystem of an online learning situation.

Methodology

The methodology that will be used for this research project is a mixed methods approach: Undergraduate online students across five different courses within the Communication and Media Studies program at Post University will be asked simultaneously to consent to a voluntary research study involving quantitative quizzes and grades and qualitative surveys to assess student comprehension and memory recall throughout one eight-week online module. This approach is expected to be successful as the aspects of the study (population, setting, associated activities, testing mechanisms) are relevant in answering the following problem statement.

Problem Statement

This project will seek to answer the following research question: "Are printed learning materials more effective for comprehension and memory recall than digital resources?"

Cognitive Effects

Online learning can challenge cognitive abilities by the demands placed on a learner's mental mindset, such as their working memory, metacognition, the ability to deal with distractions, and the perception of credibility. This study aims to show that comprehension can be improved or mitigated in these areas by accessing printed materials to study and learn.

Comprehension and Memory Recall

Cognitive scientific theories on children's mental and sociocultural development and self-efficacy were not based on the repetitive reading of long passages of online content. For example, Jean Piaget's concepts on how patterns of thought (schemas) are organized and assimilated to create understanding were explored using pre-Internet research. Piaget's study would arguably be different and include other, more modern-day variables if he had performed his studies in the advanced digital environment of current times.

For example, several contemporary studies found during this literature review reported that printed materials were the best choice over digital resources for improved comprehension or reading long text passages. One study (Park & Lee, 2021) found that inferential learning (ideas not explicitly stated) and memory recall were greater for learners who used printed books than those who read from a digital tablet. In contrast, the comprehension of the tablet group fared better with literal level learning (direct statements in the text) compared to the book readers. Similarly, students from another study reported a preference for print when reading complex texts (Pierard et al., 2021). These findings imply that "print medium was superior for deep reading, and digital texts were better for quick and shallow learning" (para. 1).

It has been demonstrated that students engage with ebooks in a shallow manner and tend to skim the text rather than read for understanding (Pierard et al., 2020) or use them for quick references only rather than for serious academic reading, or browse rather than engage (Chen et al., 2019), which can also lead to lack of comprehension. In one study, students tended to print their textbooks and read offline (Nelson, 2008, as cited in Chen et al., 2019). In another, students typically used ebooks for searching for information rather than reading (Pierard et al., 2020).

However, some studies demonstrated that printed texts do not always guarantee better comprehension than digital texts. For example, one investigation found no significant differences in reading times and comprehension among undergraduate students who used various reading methods, such as paper, computers, and tablets (Sage et al., 2019, as cited by Park & Lee, 2021). Park & Lee (2021) surmise this may be caused by a handful of reasons, such as acquired reading habits, the shallowness of digital media compared to print media, and the familiarity and frequency of digital use. In other words, "if readers continue to use digital devices for a long time, they may find it challenging to maintain attention in complex tasks, such as reading comprehension" (Delgado et al., 2018, as cited in Park & Lee, 2021).

Lastly, digital reading materials in online learning environments can overload one's working memory and prevent information processing. For instance, the "noise" of digital distractions (multimedia, open browser tabs, and other computer assets) can affect the encoding of a message when reading course lessons online. Mind-wandering can cause cognitive overload and prevent information from being processed (Zeglen, 2018).

Metacognition

Metacognition in education is a mental construct where one is keen enough and able to evaluate and make changes to their learning behaviors. It has been a strong predictor of student performance (Abdelrahman, 2020). Specifically, metacognition is understanding one's strengths and limitations enough to create mitigating solutions and proactive plans to ensure successful learning.

For example, one study found that students in an online course "often reported printing out their readings in order to process the information deeply" (Rasmussen & Stewart, 2018), suggesting their metacognitive awareness made them "better able to monitor their learning effectiveness." Another research finding showed that when students were presented with more

than one page of text to read, their comprehension was better when reading from printed material than in digital format (Singer & Alexander, 2017b, as cited in Rasmussen & Stewart, 2018). Further, when asked to recall "key details and other relevant information," a study of different students performed better when reading print, although reading digital materials caused no problems identifying the main idea. This implication ties back to the importance of comprehension and the idea that prolonged reading may fare better in print form.

The perception of credibility should also be mentioned in the realm of metacognition because the belief one has in the content's validity may affect their student motivation, which, in turn, can enhance or diminish comprehension and memory recall. For example, one study reported that when presented with learning materials, students generally felt that printed formats had more credibility than digital ones, which was more pronounced for books (Chen et al., 2019). Also, anecdotal evidence suggests that people tend to trust print more than digital content (Chen et al., 2019). Even more, when these same students read their learning materials online, many did not take notes. Many studies support the benefits of taking notes, such as helping one better to understand main concepts (Learning Center, 2022), engaging in a higher cognitive function, and aiding in recall (Dibben, 2022). Therefore, if students are not taking notes while reading online course lessons, this may signal a warning for lowered comprehension.

Environmental Impacts

There are additional limitations when reading course assignments online that can indirectly influence a learner's ability to grasp and understand learning content, such as the physical learning environment required by sitting for long periods in front of a digital screen and how well the course content is designed.

Physical Environment

Many studies show the benefits of digital learning materials, particularly ebooks. Some of these advantages include portability (printed books are heavier to carry), lower costs, more accessibility (MOOCs and open-source LMSs), and interactivity on many platforms that allow readers to search for text easily (Chen et al., 2019). However, there are also limitations. For starters, because online coursework tends to be reading and writing intensive (GVSU, 2021), learners are seated in front of a computer for the duration of the course or even an entire academic year. Here, there are many aspects to consider related to the ergonomic use of digital learning materials. Without options for printed materials (the use of a textbook or a printer), prolonged immobility may cause students to lose focus and not work to their full potential if they are unable to do their assigned reading and stay engaged in a more comfortable location. Multiple studies show that students avoid reading long text passages in digital format to avoid eyestrain (Pierard et al., 2020; Alsadoon, 2020) or experiencing headaches from low screen resolutions (Alsadoon, 2020). Further, according to one study conducted on children aged 10-17 during the 2019 COVID-19 pandemic, "online classes longer than four hours were more detrimental to abnormal binocular vergence and accommodation parameters than online classes shorter than four hours" (Mohan et al., 2021). These findings add to the theory that comprehension and memory recall may benefit from using printed learning materials versus reading digital texts online.

Course Design

One study found that when learners were given a task that required a deeper level of processing, digital text appeared to hamper their learning (Singer & Alexander, 207b, as cited in Rasmussen & Stewart, 2018). A suggested reason for this is that webpages with long texts require the act of scrolling, and this may increase the "cognitive demand on the reader and thus

negatively impact comprehension of digital versus print mediums" (Kerr & Symons, 2006; Wastland et al., 2005, as cited in Rasmussen & Stewart, 2018, p. 26).

There is also the impediment of ancillary issues, such as the negative impact of digital texts on readers' concentration because ebooks take longer to read (Richter & Courage, 2017, as cited in Park & Lee, 2021) and the assumption and expectation that digital learning will include reliable internet access, fully functional hyperlinks, and responsive web designs (to make web pages render well on all digital devices) and will not require paid subscriptions to access learning. Fatigue from reading onscreen has been shown to undermine comprehension (Jeong, 2012, as cited in Pierard et al., 2020). Screen size is another concern that restricts students; one study showed that when 1,200 students at the University of Texas were offered Kindle e-readers to replace their traditional textbooks, they were "unsuitable for most textbooks because the screens were too small and were particularly problematic with science texts" (Alsadoon, 2020). While printed textbooks may be heavier and more costly than most digital reading materials, their design simplicity and physical reliability are arguably more consistent than technology can be.

Text Readability

In one analysis, participants "read digital medium more quickly than print, which led to the decreased depth of processing of the text" (Lenhard et al., 2017, as cited in Rasmussen & Stewart, 2018, p. 27). One potential cause may be the quality level of text on the screen. In other words, "the readability of text on screens is necessary to ensure effective engagement in order to enhance the level of students' readability," which aids in recalling information and comprehension (Hojjati & Muniandy, 2014). Studies show that reading onscreen text is 30% slower than reading printed materials (Ferrari & Short, 2002, as cited in Hojjati & Muniandy, 2014). Also, factors such as font size, blank space, text line spacing, paragraph styles, length of

the line and word length, whitespace, placement of words, and screen resolution all affect the readability of digital reading on a computer screen or digital device. Further, studies conducted by Sanchez and Wiley (2009, as cited in Hamer & McGrath, 2011, p. 26) suggest that comprehension suffers when text is presented in a scrolling format, does not fit on a single screen, and requires the reader to manipulate the screen or navigate elsewhere to view the remaining content. Comfortable font presentation is also essential, as it contributes to readers' "spatial representation and provides specific spatial clues that support memorization and recall of necessary details" (Mangen et al., 2013, as cited in Park & Lee, 2021). There is also screen glare, incompatibility of file formats, battery and electrical power reliance, hardware problems, and technical glitches to consider (Chen et al., 2019). Since learning materials come in many different formats, it is probable that online learning materials will not meet the digital ergonomic needs of all learners, thus inhibiting their full potential for comprehension that might otherwise have been met with a textbook or other printed material.

Technical Challenges

Technical challenges should also be examined. While it may be assumed that learners who enroll in an online course or program have the basic ability to use a computer for general use, it should not be presumed that all are technically inclined or have the complex skills required to be proficient in twenty-first-century technology. For example, "constantly shifting between skimming a deep reading requires great flexibility and is a skill that must be practiced" (Coiro, 2015, as cited in Brun-Mercer, 2019). Brun-Mercer (2019) also warns that online readers may not be adept at evaluating the credibility of online materials or know how to discern bias. Additionally, the non-linear, unpredictable, multi-layered format of online reading can become confusing and distracting with multiple browser tabs, hyperlinks, advertisements, and scroll bars to navigate, and this can put a strain on cognitive resources (Spiro et al., 2015, as cited in Brun-

Mercer, 2019). One can argue that the fixedness of printed reading provides a more stable experience.

Academic Discipline/Study Habits

In the last decade (from 2011 to 2021), students who took massive open online courses (MOOCs) increased from 300,00 to 220 million, and hybrid-only and distance-only students at traditional universities increased by 36%, while the COVID-19 pandemic in 2020 accelerated this grown an additional 92% (Diaz-Infante et al., 2022). With an influx of students doing their learning in a digital world, there are increased opportunities to lose focus and experience distractions when studying online. This section will examine if learners' academic discipline, study habits, and preferences related to reading comprehension make a difference when comparing printed and digital resources.

Self-Discipline

Many studies prove that self-discipline is a necessary quality for all online learners, regardless of whether they use printed or digital learning materials. One study tested learners' recall using ebooks versus print conditions and found that when students were stopped earlier than expected during a task, they were able to plan self-regulation strategies better when working with print more effectively but not when working with ebooks materials (Ackerman & Lauterman, 2012, as cited in Pierard et al., 2020). Also, "off-task behavior" is a common occurrence associated with poor learning (Baker et al., 2004; Cocea et al., 2009, as cited in Ma et al., 2021) that online students encounter as digital devices make it easy to drift attention to distracting activities, such as online games, browsing the internet, or using other applications. In other words, because the structured environment of a physical classroom is missing, online learners must be diligent in creating this setting for themselves.

Distractions

Further, eye-tracking research revealed that online advertisements and other unrelated digital activities pose added threats for potential distraction (Nielson and Pernice, 2010, as cited in Brun-Mercer, 2019). Another challenge for online readers is remembering where information was found because of the rapid activity of bouncing back and forth between screens, browsers, documents, and applications. Online readers must be skilled at synthesizing data to help construct meaningful ideas and understanding, leading to comprehension and memory recall. Related to this notion, research has shown that combining text, visuals, and audio increases cognitive load (Clark & Mayer, 2011, as cited in Zeglen & Rosendale, 2018).

Preferences

From a preferential viewpoint, some research has shown that students learning English as a foreign language (EFL) prefer paper reading materials over viewing texts on a computer because their reading comprehension improved (Park & Lee, 2021). However, there also exists conflicting evidence from several studies on the general perception of ebooks to printed ones. For instance, while one study found that science and engineering students, along with faculty, preferred ebooks over printed learning materials (Anuradha & Usha, 2006, as cited in Chen et al., 2019), a contradicting study revealed that master's and research students "preferred the feel of printed books and disliked reading on the desktop computer screen" (Abdullah & Gibb, 2008, as cited in Chen et al., 2019). Ebooks are consistently noted as less expensive than printed versions, but one study revealed that "many students reportedly prefer – and would pay more – for paper versions" (Terpend et al., 2014, as cited in Pierard et al., 2020) and another reported readers' "sense of progress" associated with turning with pages, something a scroll bar cannot fulfill (Keller, 2012, as cited in Pierard et al., 2020). Learners who consider themselves bibliophiles are likely to fall into this population.

Also, while digital natives and technophiles may prefer using ebooks because they are accustomed to existing in a digital world, many studies mention the desire to perform traditional reading tasks, such as highlighting, bookmarking, and note-taking right within the printed book. Some digital reading devices offer these features, but results suggest that issues exist with the note-taking function of ebooks, and perhaps students are not aware of ebook features or find them cumbersome to use, which is a serious concern as note-taking strengthens learning (Kiewra, 1989, as cited in Chen et al., 2021). On the other hand, ebooks offer the highly valued ability to perform data searches, a feature that print books do not provide.

Lastly, according to analysis, "reading complex stories or interconnected facts in a printed book leads to better recall of the story, of details, and of the connection between facts than reading the same text onscreen" (Korte, 2020, para. 5). As an example, according to a 2006 study of 237 online Canadian undergraduate and graduate students (Hamer & McGrath, 2011), more students (60.8%) claim to recall a long assignment (more than five pages) when reading it on paper versus digitally (5.9%). Moreover, these same students say they actually prefer learning on paper (72.6%) than on a screen (7.2%), and, correspondingly, reading assignments in digital format causes more distractions and mind wandering (71.3%) than reading on paper (8.4%). These findings neatly synthesize the three themes mentioned above: improved comprehension of deeper reading with printed learning materials, environmental impacts of digital reading that provoke a lack of focus, and learning styles and preferences.

Literature Review Conclusion

The conclusion of this literature review need not be a mutually exclusive dichotomous result of yes or no. In other words, there is enough evidence to warrant further examination into providing undergraduate students with the opportunity and option of using printed reading materials during their academic journey.

The examined data herein shows evidence of a positive outcome to the originating problem statement: "Are printed learning materials more effective for comprehension and memory recall than digital learning resources?" The sources from previous analyses highlighted in this literature review support the need for further investigating the comprehension levels and memory recall undergraduate students experience using digital reading materials. These academic sources were collated and presented to provide a less challenging and more beneficial learning experience for undergraduate students taking advantage of the convenience of online education. This proposed study will contribute to the literature of this field in the sense that it can offer additional insightful information about possible comprehension enhancements used by online students based on the format of their reading materials.

While studies have been conducted that cite similar findings, a strength of this experiment is that the author of this research has experiential knowledge from which to draw. Although this is a benefit, it can also be considered a weakness because one might assume that the author is too intimate with the problem statement to be subjective or lack bias. Other limitations may depend on whether learners hold jobs, have families, or encounter learning disabilities not identified within the parameters of the research. To alleviate these issues, this study's sample population would need further classification and refinement, although this is not recommended as this would not represent a real-world evaluation. Another flaw in the study may be the inability to find prior research in areas the author has experienced as an online learner, such as faulty digital materials or broken web links within an online course. However, this can also be an opportunity to add new research to this field. Additional future studies might focus on different academic topics rather than the suggested Communications and Media Studies curriculum.

Action Research Project Proposal

Description

The purpose of this inquiry is to determine if students who complete their courses online using printed reading materials, in contrast to students reading from a screen (digital format), experience the same comprehension and memory recall levels. Therefore, an action plan involving a mixed method of quantitative and qualitative research should be the next step to gather empirical data from and about undergraduate students participating in an eight-week academic online course.

The following outline illustrates a methodology aimed at recognizing if there is a substantive need for offering online undergraduate students the option and resources for printed learning materials. These components craft an action plan that will generate data to answer the following research question (Alber, 2011). Subsequently, proposed solutions will be presented.

Research Question

This project will seek to answer the following research question: "Are printed learning materials more effective for comprehension and memory recall than digital resources?"

Setting

The setting for this action research project will comprise undergraduate students across three concurrent courses within the Communication and Media Studies online degree program at Post University. This audience was selected due to its large class size and ample reading requirements, as experienced by the author of this study. There will be no age parameters or geographical restrictions. Several conditions will apply. Students must

- engage in the entire eight weeks of the assigned course;
- agree to abide by the rules of their given group (those who can use printed materials versus those who cannot);

- participate in all research activities at designated times throughout the course;
- sign consent forms, by which they will be informed that their participation is voluntary and not required for a passing grade, and they may withdraw at any time and are encouraged to do so if they feel uncomfortable or their grades are at risk by participating in the study.

Participants

Participants in the study would be voluntary and consist of two groups: Post University undergraduate students enrolled in the Communication and Media Studies online degree program across three concurrent courses and the instructors who administer the three courses. Neither participant group will be pre-selected, and the age and gender of each will vary. A limitation will exist if an instructor is unwilling to participate, whereby the study will be unable to proceed for that course. However, not all students within a single course need to participate; if the instructor is willing to partake in the study, the action research will proceed, but with at least 10 voluntary students per course.

Methods

The initial step in the implementation process is identifying which courses within the Communication and Media Studies curriculum at Post University are most eligible due to voluminous reading assignments. After determining a module where the top three eligible courses are running concurrently, it would be necessary to contact the registered students and assigned instructors to contact, obtain consent, and provide instruction.

Each of the three courses will be divided into two groups throughout the study. In the first half of the course (Weeks 1-4), half of the students must view assignments using only a digital device, such as a computer, tablet, or smartphone. In contrast, the other half of the class will be provided with printed materials (either a textbook where publishing is available or printed

web pages) that they must use dedicatedly. The groups will switch reading platforms for the remaining half of the course (Weeks 4-8). In other words, the digital readers will begin to use only printed materials provided to them, and the printer readers will then use only digital resources for the reading assignments.

Four assessment events will occur to estimate students' comprehension and memory throughout the three eight-week course studies, as defined below. The scores of the first three activities listed are exclusive to this action research study and will not affect the students' actual grade or GPA. The last activity, grade assessments, are a natural component to the course but will be used in the research data analysis.

1. **"Retell" activities** will occur per student weekly throughout the study. This activity will be in the format of an untimed quiz that must be completed in one sitting (requiring students' integrity to complete both reading and testing activities concurrently and not refer back to their original reading materials). Each learner will read an assignment (from either a digital device or printed paper) and immediately following will answer no more than 10 questions online to test their comprehension. Subsequent weeks will include an additional five questions that will test memory recall from previous course weeks, for a total of no more than 15 questions each week.
2. **"Perception" surveys** will occur per student at the end of each week to self-assess (a) the students' comfort zone using their assigned reading method for the week and (b) how well they thought they did with comprehension, memory recall, and avoiding distractions for that week.
3. **A final "Self-Reflection" activity** will occur per student at the end of the courses. This will include quantitative inquiries (such as a four-point Likert scale to avoid ambiguity

and closed polar questions, e.g., Yes or No) and open-ended qualitative questions of self-judgment, perception, and observation.

4. **Grade assessments** after the courses conclude will be collected and analyzed per student (individually) and from a perspective of mean deviation (collectively) while taking care to note the digital reading weeks versus the printed reading weeks of learning.

Throughout the eight-week course study, instructors will administer, collect, collate, and track the progress of the research activities, such as the online comprehension quizzes, surveys, self-reflection entries, and grade assessments. These procedures and activities are deemed to yield the most valuable data to support this action research project.

Timeframe

The live study will be conducted over one eight-week module session using participants from three different online courses pre-determined to have substantial reading assignments. However, an additional two weeks before the course starts will be needed to notify, provide instructions, and obtain consent from students and instructors. An added two-week post-study timeframe is also required to give instructors time to organize and calibrate the hand-off of collected data. Therefore, the overall timeframe of this study would require a minimum of at least 12 weeks.

Data Collection

The data for this action research project will be collected from the aforementioned methods: Retell activities, Perception surveys, a final Self-Reflection survey, and grade assessments. The timing of these data collection intervals is to be scheduled as described by milestone dates of “weekly throughout the study,” “at the end of each week,” and “at the end of the course.”

A mixed method approach will be taken when collecting data. To assess comprehension and memory recall during the live study, quantitative data will be captured using online surveys and (non-graded) quizzes, and qualitative data will be obtained using surveys and open-ended questions. To supplement the experiment, pre- and post-course informal interviews will also occur to gauge students' before-and-after perceptions, thoughts, and learning styles to identify any changes after the experiment. These 1:1 conversations will be conducted by the researcher and will offer further insightfulness and interpretation for the text commentary and quantitative measures culled from the courses' surveys and activities. Feedback from the verbal interview will be captured either by hand in writing or typed into a Word document. The researcher will retain all newly created materials and original data collected in a designated and secure SharePoint library.

Data Analysis

Examining and evaluating data received are essential to discover patterns or common themes throughout the three-course experiment. It also allows one to compare and contrast alongside previous literature review findings if data is applicable.

Students' online activities and surveys will be administered using the Microsoft Forms tool; therefore, all data will be exportable to Excel spreadsheets. Data can be manipulated using filters, formulas, and pivot tables to provide various summaries, trends, and patterns relevant to the problem statement. Interview commentary feedback will be transferred to a master Excel spreadsheet where data will be organized using color categories, color coding, and column and row labels.

The examination of data collected from completed course grades will require a more careful approach with the understanding that students used different reading formats (printed or digital) in each half of the course. For example, it will be necessary to know that Student A

performed their reading lessons from a textbook during Weeks 1-4 while analyzing their grades for those weeks. An aggregate of students' grades per course will be used to (a) determine the class average grade (mean) and (b) how each student scored on a standard deviation chart (how far ahead or behind they veered from the mean).

Proposed Solutions

Since the hypothesized problem is that online undergraduate students comprehend better and remember more of what they read when learning from printed materials, the following are proposed solutions that can be executed at any time at nominal to no cost in the interim of conducting this action research study. The solutions are easy to implement and assumed to bring about the desired positive outcome at nominal to no cost.

Proposed Solution 1: Allow students the option to purchase course books by providing them with the ISBN.	This can be done in several ways: a) Post University can establish auto-generated emails one week before the course begins with "welcome and preparation" information that includes the ISBNs of textbooks that will be used in the upcoming course. This would allow time for students to find and order the associated books if they know their learning style prefers printed reading materials. b) Ensure the textbooks are listed in Post University's Bookstore for each course, so students can take ownership of checking themselves for textbooks before their class begins. c) Ensure course books and ISBNs are listed in the Syllabus.
Proposed Solution 2: Post University can create, administer, and promote a "Recycled Book Share/Swap."	Post University can create, administer, and promote a "Recycled Book Share/Swap" for its students by creating a social forum, such as a collaborative space within Blackboard or a private Facebook group where students can share their used books with one another. Supplementing this solution option will be forming partnerships with local libraries where students can borrow textbooks as they would typically be lent other books.

Discussion And Reflection

As I conclude this capstone course and am asked to present key elements of how my action research project meets the outcomes of this M. Ed. program, I am reminded that learning is an integrative process, a complete synergy of systems, tools, and methodology that are interchangeable and available when needed to call upon. For example, while I had never conducted an action research proposal before this capstone study, the comprising components were not new to me; they had been presented and practiced in prior courses throughout the overall trajectory of this master's program. From a SWOT analysis to a fishbone diagram, SMART goals to a VMOSA (Vision, Mission, Objectives, Strategies, and Action Plan) document, to problem statements, literature reviews, and brainstorming solutions, I have learned that these, along with others, are methodologies that intersect in different ways across many ventures.

As for how I can apply my action research process knowledge in my personal life, I have begun to see tactical day-to-day issues all around me – work, home, and play; and many of them can benefit from strategic future-focused solutions. The mindful work around an action research project can be applied to almost anything. For example, identifying a problem, doing the preface work (researching what has already been done), doing research via careful methodology (who, what, where, when, how), and the data collection and analysis process are relative to many things. For instance, early on in this course, I realized that the disciplines and processes I learned throughout the action research project are ones I will need to write a book over the next few years. I had never considered the value of adding a "research" element to my book, but now I recognize the credibility that scholarly resources lend to any writing. I have yet to know precisely how these tools and knowledge will benefit my corporate professional success, but I trust they will support me well.

Program Outcome 1

One of my biggest takeaways from this program culminating in this EDU690 course is learning how to examine and interpret educational data to support and inform data-driven decision-making (DDDM) to determine issues and propose solutions. I was familiar with searching and using scholarly resources for my undergraduate thesis. Still, I had not discovered the Education Resources Information Center (ERIC), an invaluable online library sponsored by the Institute of Education Sciences (IES) of the U.S. Department of Education, until this capstone course. Designing my capstone action research project allowed me to level up my researching, synthesizing, and critical thinking skills experientially like never before. I learned the value and importance of conducting literature reviews and how they prevent duplicative research, provide context, identify gaps in previous studies, and emphasize and justify the need for new research.

Program Outcome 2

As a non-teacher, I was unsure how the "application" of learning aspects within this program and capstone course would benefit my personal and professional worlds. While I may never need to conduct a full-on action research project in my corporate communications role, identifying problems and crafting practical solutions will improve my future endeavors. Interestingly, I felt the most creative during a discussion board exercise. We were encouraged to help classmates propose solutions by presenting "wildly interesting ideas" in "as many solutions as you can think of." With this permission and knowledge that "no idea is a bad idea," I surprised myself with stretched ideas and out-of-the-box thinking that otherwise may not have surfaced. This enlightens me to release my rigid thinking and accept that "wishful thinking" could become a reality if presented as well-researched and organized as an action research project.

Program Outcome 3

In two earlier M. Ed. courses (Measurements and Metrics and The Future of Education), I enjoyed learning about trends and how they help us understand and prepare for anticipated changes. The literature review portion of my capstone project allowed me to engage in this satisfying task again—by looking for and analyzing patterns and trends in previous literature relative to my problem statement.

Conclusion

The implications of this study could be used confidently to advocate for providing students the option to use printed reading materials when learning in an online environment. Personal potential is an elusive result to predict or measure. However, the two research methods described in this action research proposal offer excellent measures for comparing students' comprehension of printed versus digital learning materials: qualitative student surveys and reflection activities and quantitative grade tracking.

In the interim, the proposed solutions herein are conceivable resolutions that are easy to implement and assumed to bring about the desired positive outcome at nominal to no cost. This is needed to ensure students reach their highest proficiency, understanding, and memory recall when participating in online education. Examining this problem statement can raise the quality of online learning for a new generation of remote learners by providing a solution to students who may fare better reading from printed materials rather than digital text.

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