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Reducing Library Anxiety in the Information Seeking Behavior Of First Year College Students

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REDUCING LIBRARY ANXIETY IN THE INFORMATION SEEKING BEHAVIOR
OF FIRST YEAR COLLEGE STUDENTS

A Dissertation

by

ELIZABETH JEAN BRUMFIELD

Submitted to the Graduate School
Prairie View A&M University
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

May 2023

Major Subject: Educational Leadership

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ABSTRACT

Reducing Library Anxiety in the Information Seeking Behavior of First Year College Students

(May 2023)

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This study explored the use of interactive technology to reduce library anxiety in the information seeking behavior of first year students enrolled in a historically Black college or university. Based on the research focus, the following questions were formulated: What are the determinants for reducing library anxiety in first year college students' information seeking behavior? Related questions were formatted to test the hypotheses and for data collection:

(1) Can interactive applications included as part of the information retrieval process decrease library anxiety?

(2) Can familiarity, as measured by a pre and post survey, decrease library anxiety?

Interactive applications may include virtual and augmented reality, online chat, games and artificial intelligence technology. These are relatively new forms of technology used in education, and research indicates that these technologies promote immersive experiences that can contribute to learning. The research hypothesized that these technologies may also increase familiarity of the library and the related resources, which may reduce library anxiety. This research may provide vital information to higher education administrators and librarians to

ensure that all students receive adequate resources to find information needed for their classes and that barriers that prevent progress in student's education are removed.

Keywords: information seeking behavior, library anxiety, virtual reality, augmented reality

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CHAPTER 1

INTRODUCTION

As a psychological and emotional condition, anxiety is characteristic of human behavior. Most humans will, to some extent, experience anxiety at some point in their lives. The characteristics of anxiety differ for everyone. The accepted definition of anxiety is a feeling of worry, nervousness, unease, or concern about an uncertain outcome. Many people deal with anxiety and phobias of various kinds: aerophobia-fear of flying, agoraphobia-fear of crowds; PTSD-post traumatic stress disorder; fear of public speaking; and fear of driving (Manera et al., 2016; Morina et al., 2015; Zinzow, 2017). During their studies, students may experience academic fears, test anxiety, math anxiety and library anxiety (Van Scoyoc, 2003).

Anxiety can be long-term (trait) or (state) short-term-incident-related anxiety. Long-term anxiety falls into a category of mental disorders associated with compulsive behaviors, whereas short-term or state anxiety is specific to a situation or an event. Library anxiety, as state or short-term anxiety, is associated with a person having uncomfortable feelings in a library setting or performing library activities, such as searching for information, either online or within a physical library setting (Gardijan, 2021; Jiao, et al., 2006; Jiao, et al., 1996; Mellon, 1986; Popoola, et al., 2021; Van Scoyoc, 2003).

Library educators have observed that some students are more comfortable in a library environment than others. Some students feel at home in a library, while others may feel overwhelmed. Researchers began studying library anxiety in 1986 and continue looking at this phenomenon. Studies have shown that first-year students exhibited the highest fear of the library and the process of finding information within a library or library website. This documented

anxiety is one of the main barriers to academic success. The idea of fearing the library and librarians was first coined "library anxiety" in 1986 by Constance Mellon (1986). According to Mellon, 75 to 85% of undergraduate students described their initial library research experiences as anxiety. The anxiety stemmed from either the relative size of the library, a need for knowledge about the location of materials, equipment, and resources, and how to initiate and proceed with library research. Library anxiety is also characterized by feelings that one's library skills are inadequate compared to one's peers. Students may feel that this inadequacy is shameful and should be hidden and that one's inadequacy is revealed by asking librarians questions.

Librarians could be seen as contributing to library anxiety because students feared they would be considered stupid for asking questions. Mellon (1998) concluded that "Students become so anxious about having to gather information in a library for their research papers that they are unable to approach the problem logically or effectively" (p. 163).

Library anxiety can severely impact college students' ability to complete their assignments. Information searching in online library databases is impacted by search strategies. The relevancy and accuracy of critical words, authors, titles, call numbers, and subject classifications determine the likelihood of finding appropriate information. Students can spend their spare time searching if they need to be more knowledgeable of library terms and search techniques. It can be frustrating and anxiety-producing. Students' uncomfortable feelings about the library can lead to cognitive, physiological, and behavioral problems that interfere with their abilities to accomplish library tasks (Jiao & Onwuegbuzie, 1996; Van Scoyoc, 2003) or complete a program of study. Students may avoid or procrastinate going to the library or researching (Onwuegbuzie et al., 2004). Millennial students' information-seeking behaviors may be

especially problematic because they tend to rely on digital tools such as Google or Yahoo instead of library databases (Holman, 2011; Lacovic, 2015).

Regarding appropriate and legitimate information resources instead of fake or inaccurate information, Google and Yahoo as search engines are not necessarily considered for the quality or accuracy of the documents posted online. Students can be misled into believing the information they retrieve from these sites is scholarly research. Students must create quality searches using appropriate resources to succeed in the research process. It can be a complex and overwhelming process. Students sometimes need to realize that searching on Google differs from using an article database. Search syntax, titles, and search strings are required for relevant information retrieval in database searches as opposed to typing a sentence in Google and retrieving popular information, not necessarily relevant.

Library directors spend thousands of dollars for access to publisher's databases. As a budget item, justification is usually required, which often includes an analysis of library resources. Database vendors provide the ability to analyze search strategies, including the terms used in each search. Accordingly, an overview of search data indicates that 80% of student search syntax used one or two keywords as a strategy (Holman, 2011). This strategy often leads to a broad range of titles and documents, many irrelevant. Within the information-seeking process, the inability to find relevant information quickly can lead to anxiety and frustration. Search patterns provide a window into lost information-seeking behaviors (Dorn, et al., 2013). The feeling of not knowing where to look or what terms to use to find information is evident in the repetitive use of search terms, the broadness of the subject terms used and the tendency to continually use only the most familiar resources. Lost search patterns can lead to frustration and

anxiety, which can cause students to procrastinate with assignments or withdraw entirely from a class. The expense of retaking a class or withdrawing because assignments are incomplete or poorly completed might result from library anxiety.

Students who rely on library machinery can feel anxiety because of library resources and equipment's physical size and location. Printers and computer labs can cause a sense of frustration. Students rely on mechanical library equipment, scanners, computers and printers. Recently, libraries have begun to loan out laptops and other devices. Students must learn where to pick up items, pay for them, and use them. Usually, identification and authentication are required, such as remembering passwords and updating software applications. Many libraries have student departments within the building, financial aid, writing centers, tutoring, and technology centers which may be located on various floors along with books and other physical library items. Thus, the physical environment of a library can contribute to anxiety.

The complexity of today's information retrieval systems dictates an increasing need for students to rely on the expertise of librarians. However, the appearance and demeanor of a librarian can also cause library anxiety in some students. Students may need answers but are reluctant to ask questions. Swope and Katzner (1972) determined that only 35% of the students in the library who had questions indicated they would ask a librarian for help.

There are various reasons why a student may feel uncomfortable approaching librarians with questions. Some theorize that students perceive the librarian as an institution instead of an individual. Thus, they approach communication with the norms they would for approaching an institution. For example, a student who expects the librarian to be friendly and helpful may approach the librarian very differently than a student who expects the librarian to be there to help

if they are still looking for the information. Also, students from underrepresented populations may feel uncomfortable approaching a librarian dissimilar to their culture (Stewart et al., 2019). Approximately only five percent of African Americans are currently in the library field. As such, Black students may interact with a librarian, not of their race or culture. Most librarians are American White women; thus, the reality is that many students may find themselves having to ask questions from a librarian not of their culture, gender, race or ethnicity.

In the library and information science field, library anxiety remains a significant concern and is the basis for research studies for administrators and librarians. Library professionals aim to reduce or eliminate conditions that impact access to information. Library anxiety can affect decision-making in locating, identifying appropriate data, and using relevant information. These are the three stages in the information-seeking process. It is beneficial to discuss library anxiety as it relates to information-seeking behavior and as intrinsic to learning. Libraries are information resources, especially for college students. As such, it is helpful to examine students' perceptions of libraries and provide ways to reduce barriers that may hinder their academic performance.

Background of the Study

Information-seeking behavior arises from a determination that one needs information and the realization that they do not have the knowledge to address that need. An information need is, therefore, a gap in knowledge and information seeking is the process one goes through to fill that gap (Case, 2006; Dervin, 1998; Kulthau, 1993; Kulthau, 2004; Wilson, 1999). Psychology and neuroscience research suggest that people have affective and emotional motivations for their

choice and behaviors when dealing with an information need (Kalbach, 2006). Anxiety would, therefore, be an affective condition experienced during the information-seeking process.

Information-seeking behavior is studied in psychology, management, communications, and information science. There are more than 10,000 publications and other disciplines related to this essential human activity (Case, 2012). The literature shows that information seeking has been accepted as dynamic and linear (Kulthau, 2004), following stages from a lack of knowledge to knowledge. People experience the information-seeking process as an interplay of emotions, thoughts, and actions (Kulthau, 2004). Various theories and models have been used to explain information-seeking behavior, including Ellis' (1989) behavioral model of information-searching strategies, Kulthau's (1993) information-search process, Dervin's (1998) sense-making model and Wilson's (1999) problem-solving model. Many others contribute to a general understanding of information seeking. Collectively, these studies suggest information seeking exists within a context and is a linear process consisting of stages and iterative activities. These theories form the foundation of what is accepted as a definition of information-seeking behavior (Wilson et al., 2002).

Conceptual Framework

As anxiety is an affective condition of human behavior, the conceptual framework most relevant focuses on appraisal theories of emotion and how affective obstacles impact information seeking. The premise of appraisal theories is that human emotions are elicited when an individual appraises a situation, object or circumstance, and that appraisal results in the feeling of intrinsic pleasantness or unpleasantness (Ellsworth & Scherer, 2003). Appraisal theorists take a functional approach to emotions and barriers in information seeking. Emotions cause individuals to act in

specific ways based on their appraisal; in libraries, this could be the environment or situational experience. The individuals' feelings have a motivational effect that produces action. "Positive actions can include approaching the library or librarian and using the appraised resource.

Adverse actions can include rejection, avoidance and non-use of an appraised object, event, or environment" (Mulligan & Scherer, 2012, p. 352). The objects that would be affective barriers to information seeking in this study are information sources, for example, websites, library staff and library environments, or information systems, for example, library databases and search engines, and physical locations of items. In this study, there is a deliberate attempt to observe negative appraisals and actions before introducing a controlled variable to produce positive appraisals and actions.

Participants were given a pre and post-survey that required them to appraise how they felt before and after they viewed and used an interactive application added to a survey question. The digital information included in the question was designed to familiarize them with library resources, staff, search engines, and the overall library environment. The survey data of their experience provided the means for analysis of library anxiety, both pre and post-introduction of the use of the controlled variable.

Libraries are information resources and are essential in the research-seeking behavior of students. A study by De Rosa (2006) showed that 87% of college students physically visited their library, 61% used a library website, and 89% of college students typically began their information search using a library search engine.

As the Covid-19 pandemic forced many libraries to close, there are new studies that look at library usage before, during and after the pandemic (Anderson, et al., 2021; Scoulas, et al.,

2021; Walsh & Rana, 2020). Responses revealed that the COVID-19 pandemic significantly influenced library visits. There was a negative correlation between students' GPA and lack of physical library use and a positive correlation between online library use and GPA (Scoulas & De Groote, 2021). While it is evident that students use the library, research indicated a dissonance between the environments and materials that libraries provide and the environment and resources that students wanted and used. Self-service, satisfaction, and seamlessness, such as ease of use, comfort, convenience and availability, knowledge of the library and barriers with staff contribute to the information-seeking process as well as feelings of anxiety (DeRosa, 2006; Malvasi, 2009).

The concept of library anxiety was introduced in 1986 by Constance Mellon's research on academic libraries. Mellon (1986) noted that students felt overwhelmed and inadequate when first approaching a library. Students perceived their library skills as insufficient, while they overestimated the skills of their peers. They were embarrassed to ask librarians for assistance because of this feeling of inadequacy. She suggested several causes of library anxiety: the size of the library, not knowing where things were located, how and where to begin research, and the library's role in the research process (Malvasi, 2009; Mellon, 1986).

Jiao and Onwuegbuzie (1999) indicated that knowledge of the library played a part in students' perceptions. Students unfamiliar with the library and the resources were more frustrated and anxious. They noted that the anxiety student's felt included frustration with the library's mechanical devices, including copy machines and printers.

Several studies have examined library anxiety. These are discussed in the literature review. The studies include information on how self-efficacy and uncertainty relate to library anxiety. Uncertainty is customary when students navigate new environments. First-year students

arriving on campus have to orient themselves to an unfamiliar environment. Thus, the library becomes a place of uncertainty, which can cause anxiety.

Self-efficacy refers to individuals' confidence that they have the ability and resources to succeed at specific goals. One's self-efficacy beliefs contribute to effective performance by increasing motivation, task focus, effort, and decreasing anxiety. Self-efficacy is more than just confidence. It considers the perceived outcome of the action and whether that action is within its range of capabilities. Thus, self-efficacy is a person's belief in their ability to achieve (or otherwise) an outcome through their behavior.

Students with low self-efficacy may doubt their ability to interpret the information they find accurately. Low self-efficacy can lead students to seek information consistent with their views of themselves and interpret information like what they already believe, even if it needs to be more accurate or correct (Swann, 1985). Low self-efficacy students may become distracted by perceived inadequacies and failures, which consume the time and cognitive resources needed to attend to task demands and interpret information effectively (Bandura, 1993).

One important conclusion drawn from many studies on library anxiety is that affective perceptions of anxiety are not related to academic ability. Exceptional students with high test scores and academic rank may experience library anxiety (Jiao & Onwuegbuzie, 1999; Mech & Brooks, 1995, 1997). As the research indicates, library anxiety is specific to the environment or activity. This suggests that researchers should focus on treating and reducing library anxiety within the context of the library environment or activity (Mech & Brooks, 1995, 1997). While exceptional students may experience library anxiety, the research shows that students with higher library participation have higher grades, better research papers, overall satisfaction in their

academic studies, and more significant retention records (Allison, 2015; Malvasi, 2009; Mezick, 2007).

This study hypothesized that by increasing the amount of information via an interactive application, including virtual or augmented resources, students would become more familiar with the library and thus, anxiety would be reduced. Interactive applications, such as virtual and augmented scenes, were used to treat many trait anxiety disorders, including post-traumatic stress, anorexia, dementia and social phobias (Beach & Wendt, 2016; Gorini & Riva, 2008; Harris et al., 2002; Lindner et al., 2017; Manera et al., 2016; Morina et al., 2015). This study embedded digital applications that use designs that facilitate interactions between users and the app or website. Thus, the user interacts with the screen through clicking, swiping, tapping or some sort of action. The webpage is designed to elicit some action connecting the user with the screen. The screen can include designs incorporating artificial intelligence, virtual or augmented reality and other types of immersive design elements. Interactive applications contrast with static web pages characterized by static text and pictures. (Nysveen et al., 2004). Corporations use interactive applications in designing websites to encourage consumer decision-making and purchasing. Examples of such applications are customer communities, personalized services, and push-based notifications. An example of a push-based notification is clickable pop-up messages on browsers. They are interactive communication tools that enable companies to convey messages, offers, or other information to their customers. Personalized service applications allow users to set their preferences by inputting information related to their likes and dislikes. The application uses that information to make recommendations and provide access to those items for purchases. The application can use artificial intelligence to select personalized resources or

human interaction. A more detailed definition and description of the way interactive applications used in this study are included in the literature review.

This study did not intend to diagnosis and serve as a treatment for any anxieties. The study aimed to generalize and describe the affective conditions of library anxiety as perceived by first-year college students and to analyze whether students perceived less discomfort after receiving more information through a controlled application added during the information-seeking process.

Definitions

Augmented Reality: the definition of augmented reality is an enhanced depiction of reality where the physical real-world is augmented with superimposed computer-generated images (Aggarwal, 2019).

Community interactive applications: are Internet-based forums for group communication. Examples of interactive community applications are online chat services, discussion boards, polls and surveys (Nysveen et al., 2004).

Informatics: is the study and use of information technology and its purpose in society. Information professionals, including librarians, who focus on the study of technology fall into the informatics category. Librarians who study informatics seek to observe how people interact with information technology and how it shapes relationships, organizations, and the world (Sawyer, 2002)

Interactive Application(s): there are many definitions for interactive applications, it is a term that may be applied to a wide range of software applications. It is an application that allows users to interact with audiovisual information via gamification, visualization, and even virtual and

augmented reality. Most apps include some interactivity, usually, with visual or auditory elements (Nysveen et al., 2004).

Virtual Reality: there are two different kinds of virtual reality applications: non-immersive and immersive. Non-immersive virtual reality is a computer-based environment that can simulate places in the real or imagined worlds. Immersive takes the idea further by perceiving being present in a non-physical environment. While non-immersive virtual reality can be loaded on a standard computer, immersive virtual reality needs devices for the total experience (Freina & Ott, 2015).

Web application personalization: is defined as any action that customizes the information or services provided by a website to an individual (Ameen et al., 2012).

Emerging Technology in Libraries

With the advent of new systems of searching and retrieving information, there is a growing body of theory and research on emerging technology, such as virtual reality and augmented reality applications for library use. Virtual reality has undergone many definitions over the years since its first introduction in science fiction books in 1935 (Norman, 2017). Depending on the field of study, virtual reality is viewed as an artistic expression, interactive application, medical and clinical therapy device, or gamification application for entertainment. A simplistic definition of virtual reality as seen from an informatics perspective would be a computer simulation of a 3D or 360-degree environment that can be interacted with by a person using special electronic equipment. Virtual reality is based on three principles: immersion, interaction, and user involvement with the environment. This technology has potential in education and library science by making learning more motivating and engaging. Figure 1

(Brumfield, 2021) is a depiction of a virtual scene that is augmented with interactive applications.

Figure 1

Example of an Augmented Virtual Interactive Scene



Augmented reality is described as an enhanced depiction of reality where the physical real-world is augmented with superimposed computer-generated images, thus enhancing reality (Carmigniani, 2011). Whereas virtual reality immerses one in a virtual environment, augmented reality uses the existing natural environment and information is laid on top. Augmented reality applications can be as simple as a text message or as complicated as instructions on how to perform surgery (Silva et al., 2003).

There are four kinds of augmented reality applications: (1) image recognition or marker based, which uses a camera and either QR codes or some visual recognition markers; (2) GPS or location-mapping applications, (3) projection-based or hologram applications; and (4) superimposition as found in commercial apps such as IKEA and automobile company

advertisements (Carmigniani, et al., 2011). Figure 2 is an illustration of augmented reality with image recognition (Brumfield, 2021).

Figure 2

Example of Augmented Reality with Image Recognition



For this study the researcher used augmented reality as an interactive application. Virtual library scenes were created and augmented with overlaid library information related to the survey questions asked of the participants. The users experience with the interactive application may have affected their responses to a post survey and were used as data for the study. The researcher used previous experience creating augmented and virtual reality projects to develop a virtual library test scene specifically to address the questions presented in the study.

Problem Statement

Librarians and other information professionals' function under the auspice that users want, need, and use information. With the desire for information comes the need for search strategies. Students use various information resources, including the physical library and online library resources. However, many studies show that library anxiety is a problem for many students and affects their ability to use library resources. Online or digital information seeking is influenced by multiple factors, including the user's knowledge of the information retrieval system, user goals, search patterns, expectations, understandings, and navigational strategies. It also includes unintended or passive behaviors such as glimpsing and serendipitous browsing, which is often described as stumbling upon useful information (Toms, 2000).

The study sought to explore the use of interactive applications, including augmented reality, to reduce anxiety in the information-seeking behavior of first-year college students. First-year students were selected as the target population because their level of formal knowledge might predispose them to feel anxiety when finding information on an advanced scholarly topic. Mech and Brooks (1995, 1997) determined that first-year students had significantly higher library anxiety scores than other students. Also, many first-year students currently, represent a demographic considered Generation Z. These students have computer skills and feel comfortable using emerging technologies, specifically mobile devices, smartphones, and virtual and augmented reality applications. As such, these students might be more familiar with using interactive applications.

Research indicates that information seeking is more than just a goal driven task performing activity. People have emotions and affective and cognitive behaviors that influence

their search strategies. Library anxiety affecting the information-seeking process can directly affect a student's academic progress. Jiao and Onwuegbuzie (1999, 2000) noted that library anxiety and the avoidance behaviors and procrastination associated with it could lead to weak quality research papers, incomplete theses or dissertations, missed deadlines for assignments, failing grades, lack of satisfaction with the academic programs, and lower retention rates.

Research Objectives

The objective of this study, Reducing Library Anxiety in Information Seeking Behavior of First Year College Students, was to collect data on the perceived characteristics of library anxiety pre and post-interactive application ~~is~~ included in the information retrieval process. Following the digital interaction, the student was re-surveyed to determine whether the addition of the controlled variable significantly changed their perceived anxiety level. As a prelude, this initial work may help prepare a framework for further research on library anxiety and virtual and augmented reality applications.

Research Questions

Based on the research focus, the following question was formulated: What are the determinants for reducing library anxiety in first-year college students' information-seeking behavior? Related questions are as follows:

- (1) Can interactive applications decrease library anxiety in the information retrieval process?
- (2) Can familiarity with the library decrease library anxiety?

Familiarity is a word not often used with libraries. However, it conveys a sense of identification in which a situation, event, place, or person, provokes an unconscious feeling of remembrance

and recognition. Familiarity reduces uncertainty which is a negative factor in information seeking. It is believed that people, in general, tend to gravitate to things they are familiar with. Soleimani and Shahreki (2017) evaluated the effect of teaching scientific search methods and increasing familiarity with databases to reduce library anxiety in dental students. Their study showed that anxiety decreased when students became more familiar with computers and databases through a training program.

The information-seeking behavior of students has long been a focus of researchers. The generation born around 2000 is often referred to as Generation Z. They are prime subjects because they have grown up with more electronic resources than any previous generation (Weiler, 2005). These students have never been without a smartphone or tablet, and many have used them since infancy. This generation is also losing patience and expects information to be readily available.

However, this generation is also exposed to more fake news and unreliable information they must decipher. According to the research, the ability to distinguish relevant information from irrelevant is a cause of anxiety (Mellon, 1986; Van Scoyoc, 2003). Thus, it is appropriate that the research questions focus on first-year students.

Libraries play a crucial role in the education of students and are in an ideal position to introduce new technologies. Libraries evaluate and purchase electronic databases, create catalogs and metadata, apply emerging technologies to information literacy instruction and invent and patent software. The use of technology in libraries is significant, however, overlooked. The use of digital and virtual technology to reduce anxiety has been used in other research areas, so it is reasonable to assume there is potential to use it in library studies. The research questions posed

will assist libraries in future research and may assist in developing content, services, and environments conducive to the next generation of students.

Limitations and Delimitations

The limitation of this study is that it did not seek to identify a correlation between the use of interactive applications such as augmented reality and students' levels of anxiety throughout the information-seeking process. Nor did it attempt to identify causal relationships to barriers, such as library staff, size of the library and students' academic ability in predicting library anxiety levels. However, the recommendations from the findings will be helpful to librarians and administrators interested in furthering the research on the use of technology to enhance familiarity with library resources. Additionally, the results will not provide remedies for the psychological aspects of library anxiety. The goal is to explore, understand, clarify, and elucidate the importance of library anxiety so that subsequent discussions may lead to better practices and informed decisions that assist students experiencing library anxiety.

Significance of the Study

Ways of discovering and assessing students' needs is an ongoing effort. Library anxiety can be debilitating to students. If students feel uncomfortable or unfamiliar with the library, they may avoid participating in library activities and will not get the best out of the resources available. Students' uncomfortable perceptions about libraries can lead to cognitive, physiological, and behavioral problems and diminish their ability to complete assignments and even their courses.

University administrators and librarians want to ensure that students succeed. Access to information, unfortunately, for library-anxious students does not necessarily translate into user-

friendly library environments, receptive and understanding librarians, and relevant and responsive retrieval systems. For some students, because of anxiety, the library is a barrier to their success and completion of their education. The study determined whether the use of interactive applications as a manipulation of an information retrieval system could reduce the affective conditions of anxiety among first-year students during the information-seeking process. This study is needed to continue investigating the barriers to student success and to assist librarians and information professionals on the potential of emerging technologies, virtual and augmented reality, in education.

CHAPTER II

LITERATURE REVIEW

This literature review is arranged topically based partly on the questions posed for the study. The researcher examined first-year students and their information-seeking behaviors, followed by a discussion on self-efficacy and studies focusing on library anxiety. The review continues with a review on technology in education followed by a discussion on interactive applications, and virtual and augmented reality, as an emerging technology researched in recent studies in education and library and information science. The final section of the review discusses how valuable libraries are and their role in the persistence and success of college students. This review is necessary for this study, which determined whether the use of interactive applications as part of an information retrieval system could reduce the affective conditions of library anxiety among students during the stages of the information-seeking process.

First-Year Students Information Seeking Behavior

This study sought to examine the information-seeking behavior of first-year students. The study took place at a historically Black university. However, the distinction of HBCUs is not a focus of this study. The information-seeking behavior of first-year students at HBCUs might be affected by their identity as first-generation students. At historically Black colleges and universities (HBCUs), many first-year students are also first-generation students whose parents did not go to college or only attended college briefly.

There are approximately 101 Historically Black Colleges and Universities (HBCUs). HBCUs disproportionately enroll low-income, first-generation college students. It is estimated that over 50% of the first-year students attending HBCUs are first-generation students (Thurgood

Marshall College Fund, 2019). Black first-generation college students have unique identities and social, cultural, and academic needs that should be communicated to college and university faculty, staff, and administrators (Wiggins, 2011). Parents' prior education experiences often influence knowledge about what to expect in college, so students whose parents have limited or no experience with higher education face additional challenges in navigating college life (Mitchall & Jaeger, 2018).

First-year students start their college experience with unique contextual and social perceptions that may influence their integration into a higher education institution. Contextual factors may include students' family histories, academic skills and abilities, and prior schooling experiences. Students have intentions of what they expect to gain from their higher education experiences, a promising career, independence from parents, and meeting new friends are some motivations. Their academic goals and desire to graduate from a particular institution can contribute to how they view college life. Some students come to the university with external commitments such as family obligations or outside employment, which may further impact students' academic and social integration into a university-(Croxton, 2016).

Savolainen's (1995) theory of everyday life information seeking (ELIS) provides a framework for analyzing how first-year students engage in information seeking. Savolainen suggested that people have an internal "order of things" structured according to choices one makes in terms of people, time, resources, and networks. People resort to various problem-solving or information-seeking activities when things are out of order. These activities are rooted in one's culture, social class, and past experiences.

A study by Nicholas et al. (2009) showed a distinctive form of information-seeking behavior associated with students and differences between them and faculty or staff. Many first-year students need more information literacy skills, critical thinking, and database searching proficiency, which are needed for research, academic success, and a satisfying college experience (Jacobson & Mark, 2000). High school and entering college students believe they are familiar with the Internet and use it as their first source of information. Zhang (1998) suggests that while students think they are adept at Internet searching when finding information for class projects, they lacked Internet search knowledge and skills. First-year students are generally impatient in their search strategies, and often prefer to browse quickly. Thus, they are only sometimes accurate. Research on students' information-seeking behavior suggests that students prefer online searching and indicate Google is the preferred search engine (Fast, 2004; Zhang, 1998). Urquhart and Rowley (2007) concurred in their study that Google was the most widely used information retrieval system, and the most popular electronic information services were mobile phones and texting.

A Pew study found that when teachers were asked about the overall impact of the Internet and digital technologies on students' research habits, 77% of those teachers said it was mostly positive. Also, 99% said the Internet enabled students to access a broader range of resources that would otherwise not be available, and 65% stated that the Internet makes today's students more self-sufficient researchers (Purcell et al., 2013).

Teachers asserted that students had come to expect to be able to find information quickly and easily. Teachers commenting on the negatives of online searching said that the amount of information available today was overwhelming. It was also not always credible and discouraged

students from using various sources when conducting research (Purcell et al., 2013). The credibility of sources was evaluated in a study conducted on university students searching for information on prescription medication. Students indicated that the sources they chose were ones they perceived to be credible (Alkhalaf, 2013). However, a further examination found many of those resources to be unreliable.

In a study by Presnell et al. (2015), first-year students reported feelings of library anxiety and were less likely to use libraries, except for online reference services. The researchers found that students often needed to be made aware of the resources available to them to assist in their studies. Students also found the library atmosphere overwhelming and the resources hard to find (Presnell et al., 2015).

Jacobson and Mark (2000) used a pre-test and post-test to gather quantitative data on 587 first-year students' information-seeking behavior. The authors suggested that information literacy in the student's first year was optimal for student success. The authors demonstrated how library instruction could be incorporated into first-year programs because students often lacked advanced searching skills and may experience more anxiety when searching for information on class projects or using unfamiliar information retrieval systems. They suggested that there was a need to investigate how students searched for information so that librarians can improve the information retrieval systems (Soroya, et al., 2021).

Urquhart and Rowley (2007) sought to identify the type of information-seeking routines students habitually adopted when searching for information. Urquhart and Rowley (2007) found that micro and macro factors determined how students searched. Micro factors directly impact specific student information behavior, and can include their search strategies, training, academic

field, or discipline. Macro factors define the context in which information behavior occurs and may impact micro factors. These included technology infrastructure and system design. First-year undergraduates indicated that the route they chose to find information was governed by time factors, the convenience of format, and an unwillingness to try the unfamiliar.

Uncertainty in Information Seeking

Early research by Kuhlthau (1991) suggested that users having a gap in knowledge triggered the information-seeking process. That anxiety is reduced as the search process concludes. However, not all agree. Chowdhury et al. (2011) conducted a qualitative study of 16 students, eight were first-year undergraduates, and eight were graduate students in Library and Information Science. The research subjects performed searches on Google and a university OPAC. According to the study, the researchers argued that anxiety might be felt throughout the information-seeking process and fluctuated throughout the search. They concluded anxiety may be related to the information and expression of that need. Also, it may be linked to the search process, identification of relevant systems, and the assessment of and reaction to the information retrieved.

Wilson et al.'s (2002) research suggested that anxiety may be unresolved, or may even increase, as the user progresses, often iteratively, through the information-seeking and retrieval process and may remain even after its completion. The research hypothesized that the lack of knowledge that triggered the information search process may cause users to suffer from varying degrees of uncertainty at every stage of the information search retrieval process, that in turn may cause anxiety (Chowdhury et al., 2011). Uncertainty may be unavoidable in people seeking to

find information. To some, it might be more significant when the data comes from technological resources (Chowdhury et al., 2011).

Other researchers agree that information-seeking in online environments may cause more anxiety but suggest that it might be based on the information needed and the tactics used in the search (Ellis, 1993). Thus, a person's level of anxiety might be related not only to their knowledge or familiarity with the system but also to their ability to recognize helpful information. Shamo (2001) used Kuhlthau's six-stage model of the information-seeking process (Initiation, Selection, Exploration, Formulation, Collection, Search Closure) to analyze student's writing thesis papers. The study results showed that students experienced the most uncertainty during stage five, the information-gathering stage. At this stage, the student was deeply involved in their topic and committed to creating a search strategy. However, their ability to distinguish appropriate information from a vast array of resources caused the most uncertainty. Rowley and Urquhart (2007) and Chowdhury et al. (2011) also support Kuhlthau's theory and contended that uncertainty can occur throughout the information-seeking process.

Khosrowjerdi and Iranshahi (2011) showed a strong relationship between the student's confidence in the systems they were using and their familiarity with the topic. Their research identified three dimensions—familiarity, expertise, and experience as contributing factors in the search process. Familiarity is the amount of time individuals spend with the system; expertise-- an ability to perform or problem-solve successfully, past experience-- the previous use of the system. These indicators could be determinants of the levels of anxiety that a student would experience when searching in an online environment. Students' understanding of a system or device is grounded in mental models of that system (Matusiak, 2006), which encompass

experience and expectations of what the system will and can do. Also affecting their information-seeking behaviors are the goals they have for the interaction. These goals are driven by situational elements in the student's life and their understanding of the information retrieval system they access.

Technology has changed how students use libraries. Going to the library involves many activities, not just finding books in a physical location. More libraries are using e-resources, so going to the library is often going to a library webpage. Whatever the online experience might be, the physical library has much more meaning to students than online. Going to the library can be a good experience, adding value to everyday college life and giving student's a competitive edge by exposing them to a wide range of resources. Academic libraries have historically been designed as places to collect, access, and preserve print collections, but that view is shifting. Increasingly, students see the library as a social space. Library administrators create spaces that facilitate communication and interactive learning, which may require eliminating spaces used for housing print materials.

Uncertainty is a cognitive experience when deciding between two or more competing choices. Decisions faced under uncertainty can involve either risk or ambiguity, known or unknown—information seeking when uncertain is likely about weighing one choice over the other as more probable. Uncertainty is customary when one navigates new environments. First-year students arriving on campus must orient themselves to an unfamiliar environment; thus, the library becomes a place of uncertainty.

When uncertain about how to find resources in a library, not knowing which floor something is located on, which elevator or how to find the desired destination, randomly

selecting one route without additional input may not be a productive strategy. Gathering more information from the environment could differentially narrow the choices, decrease uncertainty and increase navigation efficiency. Having a virtual tour of the library with augmented reality applications added could decrease uncertainty in information seeking.

A few studies have begun to show how librarians are exploring augmented reality-based approaches to tours and scavenger hunts. One study created QR-code-based audio and video tours and beacon-based tours using videos to convey informational content. Librarians at the University of Houston Downtown used Aurasma to structure an orientation for students using pop culture-infused videos (Lemire et al., 2018). Others have used the apps Aurasma and Junaio to create video and text-based self-guided tours that are intended to improve engagement. In addition to tours of library spaces, some libraries have developed augmented reality tours of their entire campuses.

Texas A&M University Librarians conducted a project using augmented reality in a library scavenger hunt to investigate the problem students have with navigating the library. The project team considered three types of AR tools: marker-based AR, marker-less AR, and location-based AR (Wojciechowski & Cellary, 2013). Marker-based AR tools use physical markers, commonly known as QR codes. The QR codes are recognized by the augmented reality application when the participant scans the code. Scanning the code would trigger an event, which could mean tagging into an audio or video link.

Markerless augmented reality apps recognize the shape of an actual object, such as a photograph which then triggers the event. Location-based augmented reality superimposes

information directly onto the device screen after being triggered when a pre-established location is reached by the participant's mobile device (Lemire et al., 2018).

Over 900 students, over two semesters, took the Texas A&M librarians' augmented reality tour and rated it highly. The librarians suggested that reality apps should become more affordable and accessible. More opportunities for shared services like virtual tours can relieve workloads while reducing students' uncertainty and anxiety in information seeking within the library.

Self-efficacy and Information Seeking

Self-efficacy is an essential construct of Bandura's Social Cognitive Theory (SCT) (Bandura, 1986), referring to individuals' confidence that they have the ability and resources to succeed at specific goals. One's self-efficacy beliefs contribute to effective performance by increasing motivation, task focus, and effort and decreasing anxiety. Self-efficacy is more than just confidence. It considers the perceived outcome of the action and whether that action is within its range of capabilities. Thus, self-efficacy is a person's belief in their ability to achieve (or otherwise) an outcome through their behavior.

According to Bandura (1989), an individual's perceptions of their self-efficacy will influence the types of activities or situations they choose to avoid. Individuals will avoid situations they do not have confidence in succeeding but seek out situations where they believe they will excel. Self-efficacy is a motivational construct influencing choices, reactions, and how much effort and persistence is put into a task. Academic self-efficacy is the "personal judgments of one's capabilities to organize and execute courses of action to attain designated types of educational performances" (Zimmerman, 1995, p. 203).

Academic self-efficacy is considered a significant predictor of academic performance. A student's academic performance is influenced by how much effort is put into classroom tasks, student involvement, their resilience under adversity, and how much stress and anxiety they experience (Odaci et al., 2014).

Many classroom tasks require computer usage for information seeking. Most students use the library for non-entertaining Internet searching, such as searching for journal articles or finding books. Library database searching depends on the searcher's ability to use computers. Accessing and using online databases and electronic journals is necessary for students using the library to enhance students' academic performance (Tella et al., 2007).

The process of information seeking on the computer, that is, locating, comparing, and assessing information, involves examining and comparing results and reformulating queries to discover the limits for critical concepts, and thus learning occurs (Marchionini, 2006). Knowledge occurs by viewing or searching, analyzing, making comparisons, and organizing data from the search (Stokes, 2013). Often it is evident to librarians that students need help or need more self-efficacy when using library databases. For example, if a student only uses a one-word search in a subject category in a database information retrieval system and receives a list of thousands of possible hits, that would indicate their search was too broad, suggesting they need to become more familiar with the database or the search process. If this happened several times when they searched, they could begin to doubt their ability to search that database or execute the search process. The doubting of their library searching ability could lead to library anxiety.

Flavian-Blanco et al. (2011) posited that searching for information is more than mastering a set of techniques or following certain rules or principles to achieve desired outcomes. They

found that affective states or emotions experienced during the search can influence the search's nature and performance. Several studies on information-seeking behavior have examined different emotions involved in the process, such as uncertainty, and positive and negative feelings towards the search process (Flavian-Blanco et al., 2011; Tenopir et al., 2008), and perceived beliefs in one's capabilities to form thoughts to execute the courses of action required to produce successful outcomes. These beliefs refer to self-efficacy.

Self-efficacy determines people's feelings, thoughts, motivations and behaviors (Bandura, 1986). Accordingly, success in completing a task is not only based on the skills required but also on the confidence to use these skills effectively. There is a difference between having a set of skills and being able to use them optimally under diverse situations. For this reason, students with similar training and skills or the same individual in different situations may perform poorly depending on their perceptions of their ability. Self-efficacy beliefs also determine the individuals' perseverance and resilience in the face of difficulties and the amount of effort invested in accomplishing a task. Pajares (2002) argued that individuals with high self-efficacy perception expect to succeed and will persevere in activity until it is completed. Contrarily, individuals with low self-efficacy anticipate failure and will be less likely to persist in doing an activity they perceive as challenging. This function of self-beliefs can also create a self-fulfilling prophecy in which one accomplishes what one believes one can accomplish.

The study of self-efficacy is essential because one's self-perception influences one's thought patterns, emotions and actions, and total human behavior (Kurbanoglu, 2003). Pajares (2002) stated that self-efficacy is central to human behavior because it touches virtually every aspect of people's lives, providing the foundation for human motivation, well-being, and personal

accomplishment. This is the reason why self-efficacy has generated research in several areas, such as computer use (Downey & McMurtrey, 2007), business (Zhao et al., 2005), mathematics (Usher & Pajares, 2009) and web-based learning (Cheng & Tsai, 2011).

According to Bandura (1986, 1999), knowledge regarding one's self-efficacy is based on four sources of information: past performance or mastery of experiences, vicarious experiences of observing peers, verbal persuasion or social feedback, and affective or physiological states. Mastery experiences influence self-efficacy behaviors because they are based on the individual's attainments. Successful experiences raise self-efficacy appraisals, and failures lower them. The interpretation of new experiences depends on the nature and strength of existing self-efficacy percepts into which these new experiences must be incorporated. Several studies have found that the interpretation of one's performance is the most influential source of self-efficacy information (Bates & Khasawneh, 2007; Britner & Pajares, 2006; Calkin, 1994; Mills et. al., 2006).).

Peer watching or vicarious experiences can also influence self-efficacy by watching others succeed or fail in a task. These experiences are another means by which self-efficacy beliefs are created and enhanced. Students who observe others they perceive as similarly competent succeed or fail in a task can convince them that they are equally capable or incapable of performing that task. Research investigating students' self-efficacy found that vicarious experiences were among the most critical factors of self-efficacy beliefs in students who competed against each other in writing contests (Chan & Lam, 2008; Hodges & Murphy, 2009).

Verbal persuasion or social feedback can contribute to self-efficacy beliefs. It is widely used to convince people that they can achieve a particular task. People can be convinced that they have the ability or lack the necessary capabilities to perform a particular task or achieve a

particular goal. Verbal persuasion alone might have limited power to create an enduring increase in self-efficacy, but it can contribute to a successful performance (Bandura, 1986).

A study on college freshmen and their ability to make career decisions supported Bandura's hypothesis that verbal persuasion can significantly influence self-efficacy expectations. Students in the study who experienced verbal persuasion treatment from the career counselor gained confidence in their capabilities to engage successfully in career decision-making (Luzzo, 1993). In another study on self-efficacy in mathematics and technology fields, Zeldin and Pajares (2000) and Usher (2009) found that women received most of their insights about their abilities from what others believed they could accomplish.

Individuals also use physiological or affective emotions as sources of self-efficacy information. Students with low self-efficacy can interpret stress as a failure, whereas individuals with high self-efficacy can interpret anxiousness as energizing and leading to success. Pajares et al. (2007), found that students could estimate their degree of confidence by the way they felt as they contemplated an academic task. When students experience negative thoughts about their stress, arousal, and anxiety, those affective reactions can lower self-efficacy perceptions and trigger different fears and anxiety that hinder performance.

Information seeking is interwoven with learning. Students with low self-efficacy may doubt their ability to accurately interpret the information they find, not only through database or Internet searching, but also through face-to-face information seeking. General directional and reference questions that students ask librarians can challenge their self-efficacy. Low self-efficacy can lead students to seek information consistent with their views of themselves and interpret information similar to what they already believe, even if it needs to be more accurate or

correct (Swann, 1985). Low self-efficacy students may become distracted by perceived inadequacies and failures, which consume the time and cognitive resources needed to attend to task demands and interpret information effectively (Bandura, 1993). The results of a longitudinal study to examine the effects of academic self-efficacy on first-year university students' academic performance indicated that self-efficacy was strongly related to overall academic performance as well as indirectly through expectations and coping perceptions related to classroom performance, stress, health, and overall satisfaction in school (Chemers et al., 2001).

Most studies on self-efficacy in information-seeking within a library focus on electronic searching and information literacy (Ren, 2000; Shrestha, 2008; Tang & Tseng, 2017). The research methodology most often used is quantitative surveys, using a pre-test and post-test design. However, there is more to self-efficacy and information-seeking in a library than electronic searching. Often lower levels of self-efficacy are felt because of anxious feelings students develop from intimidation at the size and complexity of the library. The librarians may seem less friendly than students would like, and library resources may be challenging to find. Other common causes may be student unpreparedness, language barriers, and cultural differences.

Self-efficacy encourages and promotes academic achievement by increasing academic aspiration both directly and indirectly through perseverance. Students with high self-efficacy persist longer on a task than those who are low in self-efficacy. Additionally, students with low self-efficacy tend to use an avoidance coping strategy, such as delaying the start of a project, whereas students high in self-efficacy set attainable goals but also become resourceful in helping themselves achieve these goals (Lane et al., 2003).

Self-efficacy was included in the literature review because of its bearing on the student population being studied and its relationship to the overarching problem of library anxiety. In measuring self-efficacy, researchers suggest that the tool used to measure it should be consistent with the task being assessed and should be domain-specific (Bandura, 2006). Other researchers suggest that the most accurate predictions of self-efficacy occur when it is measured at a level specific to the prospective performance (Choi, 2005). However, determining levels of self-efficacy is not part of this study.

There are various tools used to measure self-efficacy, but they are not included in this study. While self-efficacy is an important area to investigate concerning information seeking, it is not the sole factor that contributes to a student's emotional or cognitive feelings associated with library anxiety. One of the limitations of this study is that it does not seek to analyze why students have library anxiety. The study seeks to investigate whether there are ways to decrease or eliminate library anxiety first-year students experience in library information-seeking processes.

Library Anxiety

Library anxiety is a problem for many students. Psychologically, it is a fear that creates a mental blockage a student has when entering a library environment. Research suggests that library anxiety is a serious concern for many administrators and should be investigated to help students find some relief within the library environment. The anxiety can manifest as uneasiness to extreme feelings of confusion and discomfort. It should be rightfully considered as a psychological barrier to effective library use. Reference services like providing help and support to students in accessing the resources and infrastructure of the library need to be user-friendly.

Identification and measurement of library anxiety among users, tracking demographic factors and synthesis of the results to reduce the impact of such anxiety forms an important subject matter of library research. (Carlile, 2007).

Library anxiety can manifest as an outright fear of libraries and anything associated with it. Certain negative feelings are associated with library aspects like the size of the library, locating directions and equipment, and lack of user knowledge. These negative feelings may cause an inability to function within a library. Students may feel a sense of inferiority and inadequacy and become hesitant to ask library staff for help. (Mellon, 1986)

Academic libraries are central to supporting university teaching, research and learning programs. Libraries affect students' learning and academic performance by providing access to information resources and library equipment, such as printers and computers. However, students may feel anxious and fearful while attempting to utilize library resources (Ahmad et al., 2021). This anxiety can prevent them from using the library and the resources or seeking help from a librarian (Jan et al., 2016; Mallen, 1986). Mellon (1986) was the first who introduced the term library anxiety. Mellon found that these adverse feelings frequently overwhelmed students to the stage at which they could not use the library efficiently. Her study reported that about 75% to 85% of students in different grades described their first response to using/visiting the library in terms of fear and anxiety.

Several studies have examined library anxiety and show it has been a barrier for users in many disciplines (Jan et al., 2016; Rehman et al., 2014). Most library users have diverse levels of library fear, tension, and anxiety when they come across a library building or realize they have an information need and cannot find the answer without assistance from a librarian. Their fears

may be related to the lack of library search skills or perceived difficulties with library staff. All of these can bring out unwillingness among the users to use libraries (Jiao & Onwuegbuzie, 1998).

Library anxiety is also defined as any negative emotions such as fear, worry, uncertainty, uneasiness, lack of ability and frustration regarding library use, resources, staff and environment Jan et al., (2016). When visiting a library, anxiety can make users feel uneasy and uncomfortable and leave the library before finishing their search for information or feel less interest in library use (Higgins, 2001). Cleveland (2004) found that students with high library anxiety levels have 2.5 times less library use as compared to the other students. Similarly, Kampen (2004) reported that 95% of students delay their research due to library anxiety.

Jiao and Onwuegbuzie (1998) suggested that library users may encounter anxiety at different levels and for different reasons. Researchers interested in libraries have felt the need to measure such anxieties quantitatively. Bostick (1992) developed the first tool to quantitatively analyze library anxiety, known as Bostick Library Anxiety Scale (BLAS) followed by Multidimensional Anxiety Scale (MAS) developed by Kampen in 2004, followed by Anwar et al. (2012), AQAK Scale which was developed in Kuwait. There may be a multitude of reasons behind an expression of anxious behavior when a student is face-to-face with a library professional. Bostick's scale suggested possible anxiety triggers attached to the library resources and staff. It is necessary to research library anxiety as an emotional disposition experienced in a library setting that has an impact on cognitive, affective and psycho-motor dimensions (Chutia et al., 2012).

Swope and Katzer (1972) are the earliest library anxiety researchers. They found that anxiety was a factor in the lack of communication between students and librarians. They observed student's hesitancy to interact with librarians, students would not seek help from librarians, and instead preferred to elicit assistance from their peers. The authors theorized that a fear of appearing "stupid" might have played a part in this behavior (p. 164). Kosa (1982) concurred the students surveyed in his study indicated that they were afraid of appearing ignorant or that they were intimidated by the reference librarian (p. 110). He also found that about five percent of students gave up if they did not find needed library material when they tried; they did not ask anyone, not even their friends, for help.

Constance Mellon developed the theory of library anxiety in the article *Library Anxiety: A Grounded Theory and its Development* (1986). She determined that 75% to 85% of the students studied used terms of fear or anxiety in describing the library. Students in her study described themselves as library-phobic and indicated that using the library was something they dreaded all semester. Students also described feeling lost or scared in the library, which they likened to a maze.

Mellon identified four causes for students' feelings. Two were related to the library's physical space- the building's size and its layout - which they could not navigate. Mellon also discovered that many students felt their peers were more knowledgeable and competent in searching skills which caused library-anxious students to feel shame and be unwilling to ask questions for fear of revealing their inadequacy and appearing stupid.

Mellon decided to use the term library anxiety because of the phenomenon's close relationship to both math and test anxiety. Schoonover and Kinsley (2014) explained the anxiety

students feel locating resources. Students in their study claimed that 63% of their frustration with libraries came from being unable to locate resources. Students stated, "Academic libraries can be difficult to navigate, both virtually and physically, and the amount of resources and spaces is overwhelming, particularly for new users who are unfamiliar with the facilities" (p. 175)

Sharon L. Bostick (1992) developed the Library Anxiety Scale (LAS) to quantitatively test Mellon's qualitative theory. Her study culminated in the creation of a 43-item survey to measure library anxiety in five areas: barriers with staff, feelings of inadequacy, comfort with the library, knowledge of the library, and mechanical barriers. The creation and development of a quantitative method to measure library anxiety led to an increase in its study. The ability to quantitatively measure library anxiety made it easier to conduct research studies on the topic and compare data across studies. Mech and Brooks (1995), conducted the first large-scale test using the LAS tool to compare library anxiety to general trait anxiety among 153 students and found no connections. They found, among other things, that library anxiety had an inverse relationship to a student's academic experience, existing more in first-year and sophomores than upperclassmen.

Most library anxiety research has focused on observations of different groups of students and identifying whether specific psychological, demographic, or behavioral aspects of students can be correlated to or predictive of library anxiety. Several studies researched college students in various programs of study, years, and geographical areas (Ahmed & Aziz, 2017; Anwar, Al-Kandari & Al-Ansari, 2012; Jan et al., 2016; Jiao et al., 2004). One empirical study, by Jiao et al. (2004) examined the racial differences in library anxiety among college students. Their study compared African American graduate students with Caucasian students. According to their

survey, African Americans reported statistically significantly lower levels of library anxiety associated with three library anxiety dimensions than did their Caucasian- American counterparts. However, because the two racial groups selected for the study differed in the types of institutions they attended (HBCU and PWI), the researchers could not conclude whether the differences found in the library anxiety levels were the result of race or the groups' educational experience/aptitude. A replication study (Jiao et al., 2006) with all graduate students attending the same HBCU university did not find a statistically significant difference in levels of library anxiety between the two groups. However, African American students still showed lower levels.

Anwar et al. (2012) looked at differences in culture and gender. Their results indicated that gender did not play a role in library anxiety. Ahmed et al. (2017) and Jan et al. (2016) were conducted in locations not in the United States, but in Kuwait and Dhaka in Bangladesh. These studies were done in geographical areas where women are not always given access to social environments or the ability to speak up about anxiety they may experience in social settings.

Most of the research reviewed used surveys, primarily the LAS used in 32 studies between 1986 and 2006. Several researchers commented that students find the library a physically intimidating place (Mech & Brooks, 1995; Van Scoyoc, 2003) and that an assortment of fears and problems with self-perception are contributors to library anxiety. Mellon's (1986) original study identified the propensity of library-anxious students to feel that other students had a better understanding of the library and that asking questions would create embarrassment. Later research has since supported that conclusion (Jiao & Onwuegbuzie, 1999; Mellon, 1988). Mech and Brooks (1995) found negative correlations between students' levels of library anxiety and their self-reported competence in using the library. Jiao and Onwuegbuzie (1999) found that

students with the lowest self-perception of library skills tended to have the highest level of library anxiety.

Onwuegbuzie and Jiao (2004) have conducted the most extensive research on library anxiety, published two books and over 20 articles on the topic, and co-wrote a book with Sharon Bostick, *Library Anxiety: Theory, Research, and Applications* (2004), which is a general reference book for library science students. Another book used in library schools is *Library Rx: Measuring and Treating Library Anxiety, a Research Study* (Malvasi et al., 2009). It detailed efforts to study and treat library anxiety at a small private PWI. Jiao and Onwuegbuzie found correlations between learning styles and different dimensions of library anxiety and that it could affect student study habits. They also found that library anxiety affected the quality of research proposals submitted by graduate students and that there was a link between library anxiety and academic procrastination.

Onwuegbuzie and Jiao (2000) created a predictive profile of the library-anxious student by identifying students who were most at risk for developing the symptoms. Their study identified some predictive factors, which included limited college experience, low frequency of visits to the library, and not speaking English as a native language. The last factor was supportive of other researchers, such as Ahmed et al. (2017), who found that non-U.S. students can have difficulty using libraries. These authors ~~have~~ also found connections between library anxiety and student perfectionism.

Mech and Brooks (1995) found that library anxiety decreased as students advanced in their years of study, and Jiao (1996) confirmed this. However, they acknowledged that library anxiety did exist in graduate students, including doctoral students. Ben Omran (2001) from the

University of Pittsburgh also researched library anxiety in graduate students confirming Onwuegbuzie's and Jiao's findings that even doctoral students exhibited library anxiety.

Onwuegbuzie and Jiao (2004), are the most recent researchers to present a new model of library anxiety, the Anxiety-Expectation Mediation model. The AEM model contains variables related to information search for research proposals. This AEM model suggests that library anxiety and self-perception serve as factors in correlations in the writing of a research proposal and personality, and cognitive and demographic variables. The model was tested using 225 graduate students enrolled in several sections of an introductory-level course at a mid-southern university.

They found that library anxiety correlated with the following variables: grade point average, age, cognitive learning style, procrastination, and self-perception. Their analysis also revealed a direct relationship between self-perception and research performance. Onwuegbuzie and Jiao (2004), suggested that the AEM model of library anxiety supported Wine's (1980) Cognitive-Attentional-Interference theory on test anxiety. Similarly, library anxiety hinders information search performance by impeding students' ability to receive, concentrate on, and encode information. Also, they suggested that library anxiety decreased the efficiency of memory processes that were activated when a student was conducting library searches, thus, making it difficult to undertake an adequate review of the relevant literature. Specifically, library anxiety initiates or promotes cognitive interference by causing the student to shift from doing relevant tasks to task-irrelevant thoughts (Wine, 1980), likely leading to search avoidance behaviors (Onwuegbuzie & Jiao, 2004).

Technology in Education

The use of digital technologies in education is now part of the university student experience. For many students, digital environments such as the Internet and mobile devices are part of their everyday lives. The expectations of new students are not limited to their perceived investment in technology but include how it is used in their learning. Today's students are exposed to technology at a very early stage in their education, therefore they have an expectation that it will continue in their college classes. Amidst the use of emerging technologies, it is important to recognize the difficulties that universities and students face in using the technology appropriately.

The use of digital technologies for learning and teaching has long been inconsistent – varying considerably between subject disciplines, levels of study, modes of delivery, and institutions (Selwyn, 2014). Universities provide technological resources; however, they do not often understand the reasons why students use specific forms of digital technologies during their studies. Technology in education is a source of several studies, including research on how technology affects student learning, and the potential of digital technologies to affect broader communication, interpersonal skills, and social realities. Henderson and Aston (2017) surveyed 1658 undergraduate students. They identified 11 benefits of digital technology in education – ranging from flexibilities of time and location, the ease of organizing and managing study tasks and the ability to replay and revisit teaching materials and learn in more visual forms. The data from the study confirms digital technologies as central to the ways in which students experience their education.

The potential of digital technologies to enhance student learning is well established. Benefits include equity of access and the increased efficiency and personalization of teaching tools. Technologies that contribute to the learning process are integral to the future of university education. However, differences persist between the potential of technology and the realities of technology use within university teaching and learning. Not all faculty are as tech-savvy as some students, and not all students use technology efficiently.

Today's students entering the university as undergraduates are assumed to be able to use digital technologies seamlessly. They are the first generation to have grown up with mobile devices as participatory technologies for social spaces (Wright et al., 2014). These students view their mobile phones almost as an extension of their bodies.

Most students are engaged with social media and are technology savvy. Therefore, there is an increased expectation for technology to be used in their education. Technology can be used to enhance teaching and learning and can impact a student's pedagogical experience positively or negatively. Technology can be perceived to add value to the university experience. Technology used for students' learning must be purposeful and designed to enhance their experience and improve satisfaction (Denova & Macaskill, 2013). When technology is used positively, it can help engage students. If it is used ineffectively, it can disengage the student. The issue of complexity and the advantage of technology is a concern. If the system is too complex, students are unlikely to use it, and likewise, if there is no clear advantage over the existing methods, then its use will be decreased.

As technological devices become more present in education, researchers and educators are looking into different aspects of technology-enhanced learning. Most recently, a focus on

technology-enhanced learning has been put on mobile devices. Mobile devices promote the concept of anytime, anywhere learning, which is important for students who frequently change places of learning and need access to the learning material as they move from one place to another. Most students have mobile devices which are relatively cheap, portable and compatible with many educational software applications. Mobile technologies can provide frequent and comprehensive access to systems and applications that students need to support formal and informal learning.

The popularity of mobile devices and increased use and reliance on broadband networks along with fast access to digital content are some of the direct benefits of mobile learning, as well as equal-opportunity access, ubiquitous connectivity, multigenerational users and uses, expanded services for mobile workers and enhanced access to services for mobile learners (Henderson, 2017). Mobile learning supports individual learning as well as collaborative learning which makes it applicable in different learning environments and situations (Vrana, 2015).

Libraries have an important role as providers of print and digital information necessary for research and teaching. With the emergence of technologies conducive to information retrieval, librarians are adopting new and innovative services, as well as introducing ways for users to incorporate library services into their daily lives via technology. Today, libraries offer a variety of services. Some of them include mobile library websites and MOPACs (Mobile OPACs), online collections, library instruction, databases, augmented library tours, and others.

Technology is used for searching the Internet, searching databases of scholarly information, organizing citations, accessing a course management system, and reading or

listening to books and articles. Mobile devices can support individualized learning and should not cause additional stress or anxiety to students who are familiar with their phones. The target population used in this study had access to a mobile phone, they were able to complete the survey and access the interactive applications from their phones or laptop.

Interactive Applications

New ways of searching and retrieving information are being developed that merit an examination of the functionality of emerging technologies. The qualities of interactive applications lend well to information seeking studies especially in the field of education and library and information science. *Interactive application* is a term that may be applied to a wide range of digital applications. It is used to describe the applications of design elements included in a website where one can input information and gain immediate output. Simply put, it is an application that allows users to interact with audiovisual information via graphics, images, visualization, virtual and augmented reality, audio and textual elements and gamification. The most important feature is that it requires some type of interactivity, which is common in most apps.

A study conducted by Nysveena and Pedersen (2002) looked at the use of interactive applications used in company websites to gauge consumer perceptions. Their study used the technology acceptance model (TAM) as a framework to discuss the general effects of user experience with information technology on the effectiveness of information systems. The TAM model was applied to study individual perceptions, attitudes and behavior when using information systems. “The presumption of this model is that perceived ease of use and perceived

usefulness are important determinants of the attitudes to using information systems, and consequently, the use of information systems” (p. 138).

Nysveena and Pedersen examined websites offering interactive applications in the form of personalization and customer community services. Personalized services are based on a user profile, that the user inputs. Community is a design element that allows the user to connect with other users. It could be a chat feature or some other type of communitive interactivity on the website. Adding social media buttons to websites is a form of community interactive applications that companies frequently include on websites.

Interactive applications that involve community have been researched in studies on online newspapers. Online news websites employ several interactive features for users to engage in the communication process. News organizations have been forced to adopt online versions of their print newspaper because of the shrinking print audience and the loss of credibility for traditional mass media in the United States. With the emergence of new technologies and the multidimensional flow of messages, readers can actively choose the information they want and even participate in the production of information. Readers can communicate with other readers and offer criticism and comments to news articles. The interactivity of communication elements serves as a socialization motivation feature (Chung, 2008). Deuze (2003) described interactivity used in the design of news websites as either navigational interactivity, adaptive interactivity, or functional interactivity. Navigational interactivity focuses on the technical functions of buttons, hyperlinks, scrolling and navigating the website. Functional interactivity allows users to communicate with other individuals (Chung, 2008).

The conceptualization of interactivity has recently been seen as not only human-to-human communication but also as interactions between humans and computers (Chung 2007, 2008; Deuze 2003). Technology-facilitated human interactivity involves the ability of people to engage with one another. An example of this interactivity would be an email exchange between two people. Medium interactivity refers to the ability to engage with a website in ways that change the content for a user. Clicking on a hyperlink embedded in an article is a form of medium interaction. These activities are common on websites.

Online chat is an example of an interactive community application. Many libraries offer online support and instruction through instant messaging platforms, known as ‘live chat’ systems (McLean & Wilson, 2016). These services allow users to seek information via online-based synchronous media and a human service representative who provides answers through such media (Verhagen et al., 2010). Chat services are used to help overcome problems, answer questions, and help in search and navigation of the library’s website. Previous research suggests that individuals often use live chat facilities to gather information from someone they perceive as knowledgeable and to reduce time to perform a task (McLean & Wilson, 2016). The main purpose of live chat is to provide information relevant to the query and to provide socialization and networking for librarians and library users.

Gamification is another form of an interactive application. It is the incorporation of gaming elements, such as scoring points or winning tokens for succeeding at some type of challenge. The goal of gamification is to encourage interaction with the site by giving users an incentive to engage. Incorporating quizzes and polls are also forms of interactive applications. They often resemble games and can be used as entertainment or educational tools on websites.

Sitzmann (2011) focused on the effects of virtual and augmented reality in games and simulations in enhancing work-related knowledge and skills and educational settings. According to the Sitzmann study, the digital environmental characteristics such as the presentation of materials, unlimited access to the learning materials, and presentation of resources in a supplemental format were most effective in memory retention, self-efficacy and procedural knowledge.

Augmented Reality (AR) is a software application that combines the virtual or digital with a real scene or item (Bangalore, 2015). AR is an interactive application where the physical objects are enhanced by digitally-generated information, sometimes using other sensory perception enhancing mediums including visual and auditory applications. The literature also references augmented reality as being an enhancement that is contextual and reliant on the user's personal experience.

Augmented reality has been used in fields such as the military, healthcare, architecture, robotics, and sales (Ayers, 2013; Kesim, 2012). Libraries are beginning to use augmented reality to encourage reading and promote library programs. Books are enhanced by using an image recognition device to scan the book, which brings visual interactions, sounds, graphics, or other multimedia. This is possible by installing special software on a computer, using mobile apps or a website. This technology allows any existing book to be developed into an augmented reality edition after publication. By using augmented reality in printed book pages, textbooks become dynamic sources of information. In this way, people with no computer background can still have a productive, interactive experience (Brumfield, 2013; Kesim, 2012).

Augmented reality can be embedded into mobile devices and tablets to provide interactive experiences. The technology enables print materials to be more interactive for learners in order to engage them in the experience. The applications can be included in any type of text such as books, papers, manuals, magazines, newspapers, flyers, and posters, even Adobe documents and photographs. The goal of using the technology is to turn the text into an interactive, informative experience by blending physical and digital worlds.

The addition of the digital or virtual environment to the textual document promotes immersive experiences that can contribute to learning and may reduce feelings of anxiety. Because many augmented and virtual reality applications are accessed via smartphones, students can continue the learning experience outside the classroom through interactive web pages and digital overlays. Interactivity, connectivity, and mobility of these applications are motivating factors in education and learning, and for this reason, it is essential to examine how librarians can incorporate this technology into research studies (Zak, 2014).

Augmented reality can be broadly defined based on its use and the field in which it is used. The principle of augmented reality, in which virtual content is added on top of a real environment, is not to be confused with Virtual Reality, where the environment is mostly or totally virtual” (Vogt and Shingles, (2013, p. 47). Moreover, Vogt and Shingles discussed two types of AR that differ in the way the virtual layer is associated with a given environment. The two different types of augmented reality applications include location-based AR and image-based AR. Location-based augmented reality applications rely on the spatial position and physical position of the device to select and display location-relevant information. Image-based AR uses image recognition algorithms to trigger the display of relevant content over a recognized

physical pattern (Vogt & Shingles, 2013). Tagged or linked geographical locations, images, and objects can come to life with interactive digital content such as video, audio, animations, and 3D scenes.

A lightly augmented reality refers to a situation in which users utilize a large amount of information and physical materials from the real world and have access to relatively little virtual information. On the other hand, a heavily augmented reality contains frequently accessible virtual information (Wu et al., 2013). Augmented reality applications have different unique features. Some play videos with sounds, others provide further information by going to active URLs, and some have animation. Other applications may have social communication features that link social media, email or Facebook.

Augmented reality technology is a form of interactive application where learners have a clear view of the real world, yet, it is not virtual reality, which is also an interactive technology application. For example, driving in one's car they can see the road, but they cannot see the history of the location on the road. Recreating the road and the locations in a virtual world where an individual can use a headset to imagine they are driving on the road would be virtual reality. Creating a map of the road and augmented virtually tagged historical documents about the history of the location that an individual could view on their laptop or mobile device would be augmented reality. With the augmented reality features students could also take plain text and turn into an immersive experience by tagging virtual objects.

Hew and Cheung (2010) conducted a systematic literature review on the use of virtual reality used in K-12 and higher education. Their review examined virtual worlds' literature in three areas: uses of virtual worlds by students and teachers, types of research methods applied to

study the effects of 3-D virtual worlds, and kinds of topics researched in 3-D virtual worlds. The results of their review indicated that 3-D virtual worlds were used as communication spaces, simulation spaces, and experiential spaces. A study on reducing public speaking anxiety of university students used virtual reality interactive applications as a treatment for anxiety reduction (Harris et al., 2002). They concluded that a virtual audience was able to elicit anxiety in the public speakers, and through therapy, the speakers were able to reduce their anxiety

The potential to increase self-efficacy, and reduce uncertainty and library anxiety by allowing students to visualize concepts and search for information through tagged virtual or augmented digital objects was the purpose of this study. For this study the researcher used augmented reality as an interactive application. Virtual library scenes were created and augmented with overlaid library information related to the survey questions asked of the participants. The users' experience with the interactive application affected their responses to the post-survey data reported in the study.

There is a gap in the research as to the effect of interactive applications in the field of education (Khan et al., 2019). Although the number of studies using technology in libraries has increased, there is still a lack of research grounded in theory which provides empirical evidence as to how interactive applications can improve student's library experiences. To address the gap in the literature, this study focused on the problem of library anxiety and information-seeking using the interactive application of augmented reality, as a part of the information-seeking process. The advances in technology, such as augmented reality, may be a potential tool for librarians and library administrators in curbing the decline in student's lack of library usage.

Interactive technology is changing the teaching and learning process and shows promise for libraries today and in the future.

Value of Libraries in Student Success

There is a gap between undergraduate students and academic libraries, in the perceptions of the usefulness of libraries. While academic libraries have traditionally been heralded as the heart of the university (Leupp, 1924), today's undergraduate students are opting for easy, convenient, and quick ways to satisfy their information needs, and they may not necessarily include libraries as an option (Mizrachi, 2010).

Many librarians believe that the library will always be a vital part of any academic community; however, changes in technology threaten the library's prestige in the academic environment. Previous assumptions about academic life are evolving at a time when technology and fundamental beliefs about education are challenged (Fisher, 2019).

There was a time when the library was seen as the sole provider of students' information outside of the classroom. Before the Internet, librarians were the gatekeepers of information that was not easily accessible or freely shared worldwide (American Library Association, 2018a). Academic libraries house resources students need, print and online access, and offer a variety of valuable services such as reference assistance and instruction (American Library Association, 2018a). The intent of the library's resources and services is to help students achieve their academic goals and increase student success.

With the abundance of information available online, the role of the library has been questioned. Student's doing a Google search can find thousands of results in minutes. While researchers noted that the reported usage of library websites (58%), ejournals (39%), and online

databases (39%) among the 18–24-year-old college student population in 2010 was found to be moderate at best (De Rosa et al., 2011). This turning away from the academic library students is a cause for concern as significant, positive correlational evidence suggests library utilization is closely related to both students' academic performance. When students are more engaged with library resources, they are also more likely to achieve academic success and graduate (Mezick, 2015). The concept of student engagement has largely emerged from models of student persistence frameworks such as those proposed by Tinto (1975, 1987) and Bean (1980) which posited that students' engagement in their universities plays a critical role in their commitments to persist in their studies through graduation.

The advances in technology have made possible opportunities to develop different learning and communication styles. The technology available to each generation influences not only their behaviors but also their expectations (Malvasi et al., 2009). Millennials and Generation Z have lived most of their life with computers. Generation Zs are visual learners, and possess strong visual-spatial skills, which enable them to integrate the virtual with the physical as many have done playing video games. Generations Zs are also hoarders of information with hypertext minds (Malvasi et al., 2009). While they hoard information, and are familiar with technology, this does not mean they are digitally literate. Most do not understand technology or can judge the quality of the information they seek. Their challenge is developing critical thinking skills, understanding intellectual property rights, judging the authenticity of information, and socially connecting to older generations.

Librarians have a responsibility to turn these challenges into opportunities. Librarians must help students understand the normality of their frustration with information retrieval

systems. Kuh and Gonyea (2003) studied the nature and value of students' experiences with their libraries and the unique contributions of libraries to learning and the impact of students' library use on their engagement with effective educational practices. Results indicated that libraries were important in helping colleges and universities achieve their academic goals. Library use impacted persistence and graduation. Kuh and Gonyea learned that minority students used their libraries more often than non-minorities and that academic librarians may indirectly affect student success through their interactions with students and by helping them acquire needed research and information literacy. Library instruction is important for research skills, however, if students are not comfortable with the library or librarian, they will not develop a positive attitude about their experience.

The research of Soria et al. (2014) suggested that even using the library only once during the first year of enrollment; increased the odds that students would graduate in four years or were retained after four years as opposed to withdrawing from the university. The odds of graduating were improved for first-year students who used electronic resources and books, undergraduate students who used electronic resources and who took a library instruction course, had significantly improved odds of remaining enrolled over withdrawing.

A study that examined the correlation of students who "read" more, as analyzed by the number of books borrowed and the number of searches conducted to access electronic resources, showed that student with low/or non-library visits achieve lower grades (Goodall, 2011).

A literature review conducted by Hagel et al. (2012) identified five potential means by which a university library/librarians contribute to student retention: (1) working with faculty helping students commit to and engage with their academic studies; (2) working with diverse

student groups in the conception and design of services; (3) ensuring emerging technologies were accessed and available and did not disadvantage some groups; (4) anticipating trigger points for withdrawal, such as library anxiety, that can be influenced by the library; and (5) working collaboratively with other support services to provide students with integrated support.

The academic library as a partner in improving college retention has not received much recognition in the higher education literature (Hagel, 2012). In a study looking at student retention and the use of campus facilities, Mallinckrodt and Sedlacek (2009) found that there was a correlation with hours spent in a campus library and retention. Their study further showed that "the only use of academic facilities that predicted retention for black students was studying in a campus library" (pp. 568-569). They found that students who used the library were more likely to stay in school. Four of the six significant retention predictors for students in general and one of the three significant predictors for Black students were the use of the library.

CHAPTER III

METHODOLOGY

This chapter presents the methodology used in this study. The study explored the use of online applications to reduce library anxiety in the information-seeking behavior of first-year college students. First-year students were selected as the target population because their level of formal knowledge might predispose them to feel anxiety when faced with finding information in an unfamiliar place like a library. Also, current first-year students represent a demographic considered Generation Z. These students have computer skills and feel comfortable using emerging technologies, specifically mobile devices, which are often used in interactive web applications.

This study used the Bostick Library Anxiety Scale, a five-point Likert survey, to collect information on students' perception of their anxiety when finding information in a library. Students were recruited from the list of students enrolled at Prairie View A&M University based on the records obtained from the Institutional Research Department. Approximately 1600 students were identified as first-year students. Of 1600, only 100 emails were selected randomly for the study.

Problem Statement

The goal was to explore the use of interactive digital applications, including augmented reality applications, to reduce anxiety in the information-seeking behavior of first-year students at an HBCU. Studies show that library anxiety is a problem for many students and affects their ability to use library resources. Library anxiety can affect a student's academic progress, behaviors such as procrastination, reading avoidance, and bad study habits can lead to failed

assignments and low grades, and a lack of satisfaction with their academic program leading to lower retention rates. Current first-year students were selected because their level of formal knowledge might predispose them to anxiety when searching for scholarly resources for a paper or assignment. Also, these students represent a demographic that has grown up with technology and feel comfortable using emerging technologies, specifically mobile devices, smartphones, and virtual and augmented reality applications. As such, these students might be more familiar with using online technology to find information.

Research Questions

The design of this study was descriptive and does not answer questions about how or why something occurs. It attempted to describe the characteristics of those researched. Descriptive research is concerned with patterns and observations. The data collected is not to create definitive answers. Usually, additional studies are conducted to get more accurate answers. Descriptive research methods can be used in either quantitative or qualitative research. It can involve an analysis using dependent and independent variables, which can be tabulated along a continuum in numerical form. The dependent variables are what is studied. The independent variables are those things that the researcher can manipulate. Descriptive research involves gathering data, describing occurrences, and then organizing and tabulating to form an analysis. The procedures and instruments employed are addressed in the following sections to answer the research questions.

Based on the research focus, the following question was formulated: What are the determinants for reducing library anxiety in first-year college students' information-seeking behavior?

Related questions were as follows:

- (1) Can interactive applications included as part of the information retrieval process decrease library anxiety?
- (2) Can familiarity, as measured by a pre and post-survey, decrease library anxiety?

Research Procedures

This study was designed to explore the nature of the relationship between library anxiety and familiarity with the library using interactive digital technology as a control variable. The objective of this study was to record the perceived characteristics of library anxiety before a controlled variable (interactive application) was incorporated into the information retrieval process. A pre and post-survey were used to test the differences in the survey responses. The goal was to determine whether the addition of the controlled variable made a significant change in students' perceived level of anxiety and the effectiveness of their information-seeking strategies.

The instrument used to obtain data was the Library Anxiety Scale (LAS) developed by Sharon Bostick (1992). Permission was obtained from the creators of the scale, and the proposal was submitted to the Institutional Review Board for approval. The LAS, developed by Bostick, consists of 43 statements regarding library anxiety measured on a five-point Likert scale. The final sum of the scale scores ranges from 43 to 215 points. An overall low score meant low library anxiety and vice versa. A Cronbach's alpha coefficient of 0.80 was reported by Bostick as evidence of the internal consistency of this instrument. A correlation coefficient of 0.74 between scores two to three weeks apart showed evidence of its test-retest reliability. A consensus of the experts who identified the key components and associated statements of the LAS showed its

content validity. The LAS identifies library anxiety in five subscales, namely, barriers with staff, affective barriers, comfort with the library, knowledge of the library, and mechanical barriers.

First-year students were emailed the Library Anxiety Scale (LAS) survey prior to a pre-test information-seeking activity. The information-seeking activities consisted of answering a survey question with the addition of interactive applications that the students would access using their mobile phones or laptop. Following the information-seeking activity, they answered a second set of questions from the LAS survey to determine whether there was any change following their exposure to augmented reality and other interactive applications.

Population Sample

The target population was first-year/first-year students enrolled at Prairie View A&M University. The requirements for participation were that the students were 18-24 years of age and agreed to participate in the study. As this study was a pilot, the sample size was small.

Initially, recruitment was to come from the Academic Success Center and the Summer Bridge Program, programs designed to identify academic and social roadblocks and are specifically geared toward continuing the academic success of first-year students. However, because of the Covid pandemic, the Success Center was unavailable. As a change, students were emailed a unique link to Qualtrics, a survey platform. The email contained information about the study and asked for their participation. The survey was anonymous, and no identifiable information was collected.

Recruiting took place at a historically Black university (HBCUs), as it was mentioned in the literature review that many HBCUs enroll many first-year students. Some of these students are first-generation students whose parents did not attend college or only attended college briefly

As discussed in the literature, many of these students would not have prior information about the schools they were attending, so their anxiety from uncertainty and self-efficacy might be more significant than a student with parental knowledge of college life. Parents' prior education experiences often influence knowledge about what to expect in college, so students whose parents have limited or no experience with higher education face additional challenges in navigating college life (Mitchall & Jaeger, 2018).

The students surveyed had to be 18 to 24 years old, first-year students who had never previously attended college or university. The focus on the 18–24-year age group was relevant to the study because this population is considered tech-savvy and often referred to as Generation Z. This generation of students has grown up with more access to electronic resources than any generation prior. These students use mobile devices regularly and experimenting with technology is not new to them. However, this generation is also considered information poor because of information overload and exposure to excessive fake information. It was appropriate to use this population because, according to the research, the ability to distinguish relevant information from irrelevant is a cause of anxiety (Durodolu & Ibenne, 2020).

Generation Z is also referred to as the loneliness generation (Twenge, 2019) because they have fewer social interactions outside of their online communication. There is disagreement over whether the increases in mobile devices and digital media are linked to the declines in in-person social interaction (Twenge, 2019). Librarians note that this generation appears reluctant to fully utilize library resources, as confirmed in the literature review: (Urquhart & Rowley, 2007) Thus, it is appropriate that the research questions focus on first-year students.

Survey Instrument

Using Mellon's (1986) theory of information-seeking behavior and anxiety, Bostick (1992) developed a reliable tool for quantitatively measuring library anxiety. The instrument known as the Library Anxiety Scale (LAS), consists of five factors and 43 statements. Due to its validity and reliability, the instrument is used by many researchers in their studies (Collins & Veal, 2004; Van Scoyoc, 2003). The total Cronbach's alpha coefficient for Bostick LAS is 0.80, which confirms the satisfactory internal consistency of the scale, while Pearson's correlation coefficient between the five categories is 0.74, which shows that there is a medium strong correlation. Thus, the scale is considered a valid tool.

The five factors noted in Bostick's LAS are barriers with staff, affective barriers, comfort with the library, knowledge of the library, and mechanical barriers. A few survey questions deal with library technology, and one refers to change machines, which some researchers considered outdated. As such, some researchers have tried to modernize the scale or replace it. Kampen (2004) surveyed PhD scholars to establish and confirm another library anxiety scale called the Multidimensional Library Anxiety Scale (MLAS). It was thought that due to rapid technological development in libraries, the MLAS would be an advanced version of LAS. The MLAS survey consisted of six factors with 53 statements.

Likewise, Anwar AL-Qallaf and Al-Kandari (2012) also developed an updated version of LAS. This version contained 34 statements. Unfortunately, these versions covered only some areas of recent library technology trends. The AQAK Library Anxiety Scale was developed by Anwar et al. in late 2012. The researchers used undergraduate students at Kuwait University as study participants and primarily gathered 1512 library anxiety-related statements. These

statements were discussed before a group of experts, who decided to reduce the statements to 80. Subsequent changes reduced the library anxiety instrument to 40 statements, which were divided into five factors consisting of (1) library resources, (2) library staff, (3) user knowledge, (4) library environment, and (5) user education. As the AQAK survey was conducted in Kuwait, the researchers, Anwar et al. (2004), concluded that due to cultural and economic differences between countries, creating a separate scale for different cultural groups was necessary.

Jiao et al. (2004) explored the library anxiety of Caucasian-American and Afro-American students. It was a comparative study of racial identities and their experiences with library anxiety. The study used the canonical discriminant analysis technique to understand library anxiety dimensions in two different racial groups. The study reported a high level of library anxiety among the Caucasian-American respondents in factors of library anxiety except for mechanical barriers. As reported by the researchers, the study's findings showed that library anxiety had a racial perspective. Their study indicated that race was an environmental antecedent of library anxiety.

After considering the various survey instruments developed to measure library anxiety, it was decided to use Bostick's original Library Anxiety Scale. Research done on the library scale development concluded that the original scale for measuring library anxiety, despite the evident obsolescence related to the use of technology in the library, was still the most used tool in quantitative library anxiety research (Gardijan, 2021). Further, it is suggested that there is a need to develop new, modernized national scales for measuring library anxiety regarding the development of information technology and cultural and economic differences between countries, but scales should be based on the original scale created by Sharon Bostick 1992.

Another research team, Shoham and Mizrachi (2001) also corroborated this opinion and pointed out that their research confirmed the high reliability of the original scale for measuring library anxiety. Van Kampen (2004) explicitly stated that despite its shortcomings, the multidimensional scale for measuring library anxiety (M-LAS) was based on the original Bostick (1992) library anxiety (Gardijan, 2021).

Interactive Applications and Post-survey questions

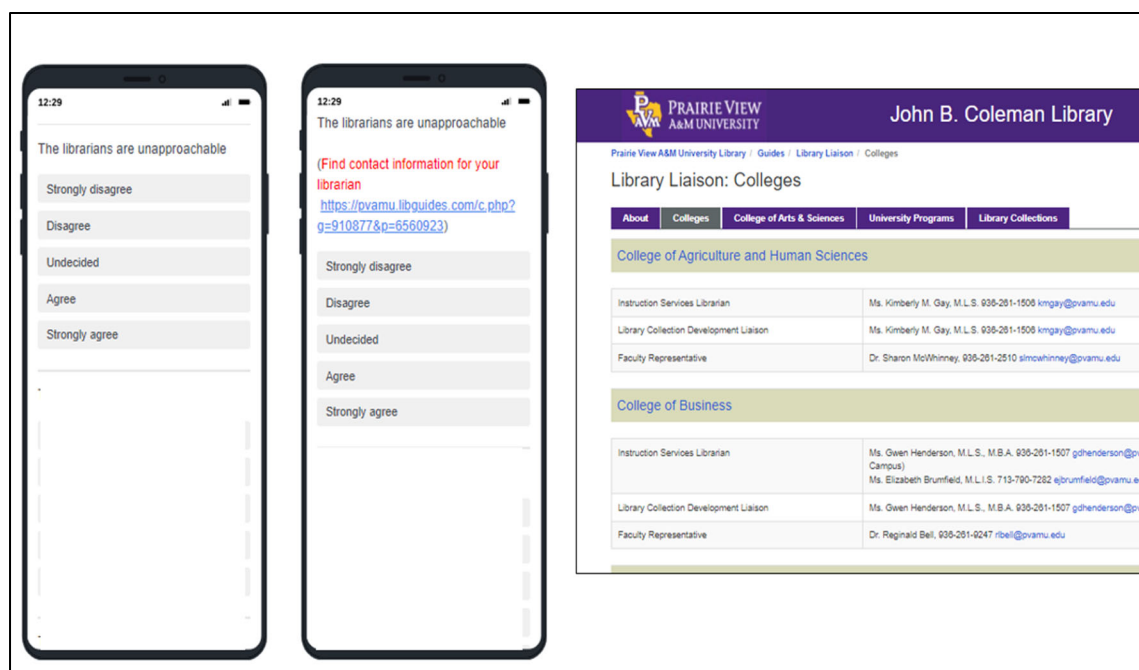
Interactive application, as discussed in the literature review, is a term that may be applied to a wide range of digital applications. It can be used to describe design elements included in a website or webpage where the user inputs information and gains immediate output. It usually refers to digital applications that allow users to interact with information via graphics, images, video, and virtual and augmented reality, it can be used in gamification websites, and include audio and textual elements. The most important feature is that it requires some type of interactivity and is not static.

This study used various types of interactive applications, including virtual tours and augmented websites and community applications such as chat links. The applications were included in the post-survey questionnaire based on the anxiety triggers that Bostick (1993) identified. As discussed in the literature review, these categories were: barriers with staff, affective barriers, comfort with the library, knowledge of the library, and mechanical barriers. Using the survey questions, six applications were included in the post-survey and required interactivity on the part of the user. Some of the applications covered multiple categories and survey questions, so it was not necessary to include interactivity on all questions. For example, there were 15 questions on the survey related to how one felt about librarian staff. There were

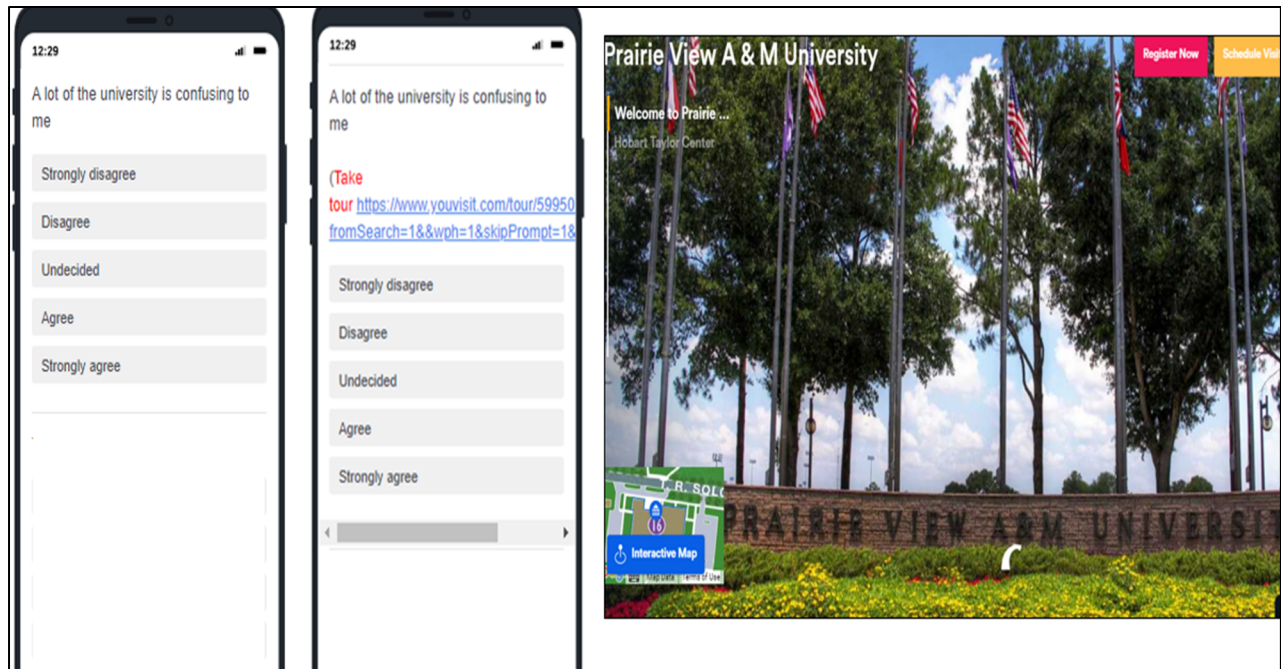
two links to the interactive application associated with this category. One link took the user to a list of librarians and contact information, and another link was included in an augmented reality library scene that the user could click on to get library staff biographies and additional information. Figure 3 (Brumfield, 2021) is a screenshot of the survey questions related to Barriers with Staff.

Figure 3

Pre and Post Survey Question Related to Barriers with Staff



The geographical location of the library falls under “knowledge of the library” and perhaps “comfort with the library” as well as “affective barriers”, as confusion is a psychological condition. For these questions, the users were directed to a virtual tour of the university campus which included the library. Figure 4 (Brumfield, 2023) is an example of the pre and post survey question related to multiple anxiety factors with interactive applications on a mobile phone.

Figure 4*Pre and Post Survey Question Screenshot*

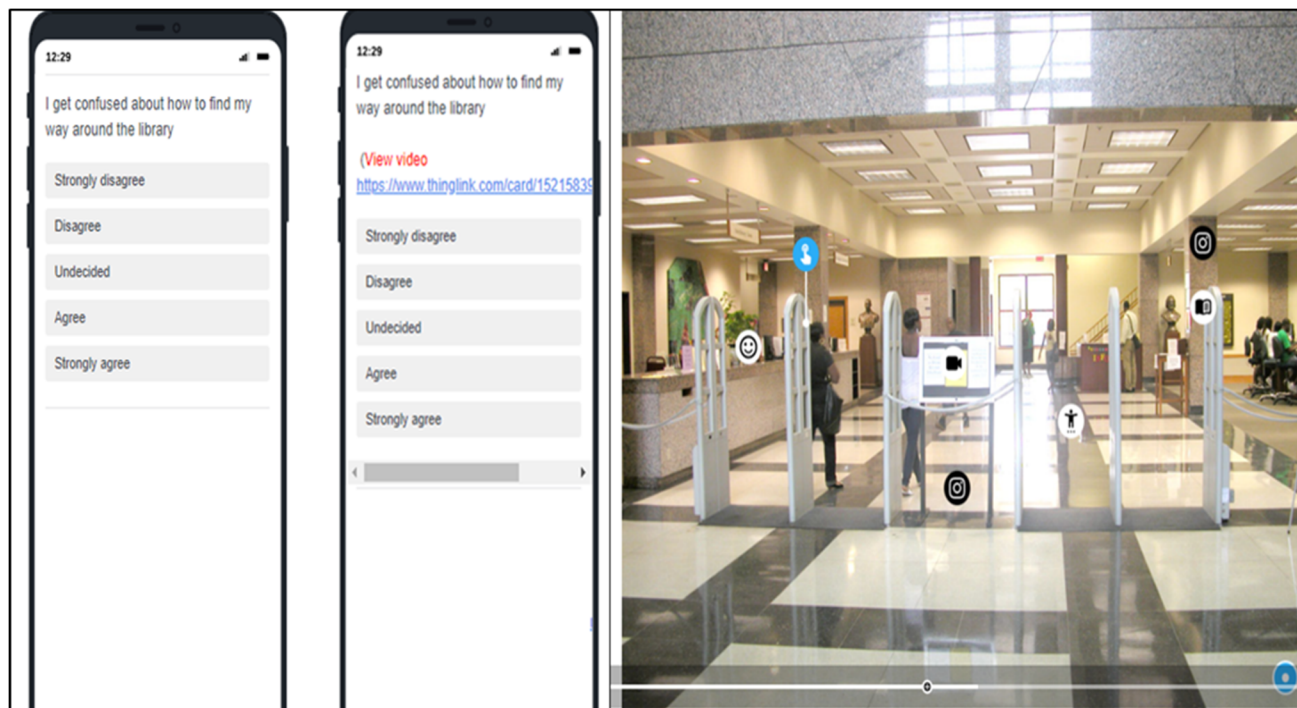
Web-based virtual tour applications constructed by 360° panoramic images are used on many college campuses to provide students with an interactive map that may reduce the anxiety of not knowing the location. Interactive virtual tours improve the visual presentation and spatial understanding of the place being visited (Bastanlar, 2007). For this study, a tour of the campus was linked to the post-survey question, "A lot of the university is confusing to me." The hypothesis was that once the tour was viewed, the student would have a better idea of where buildings were located, including the library, and thus more familiarity and less anxiety.

Knowledge of the library, comfort with the library, and affective barriers were the basis for the augmented reality image of the library lobby with access to additional interactive applications such as video and audio. The post-survey question, "I get confused about how to

find my way around the library,"⁵ was linked to a ThingLink augmented reality application of the library lobby. Figure 5 (Brumfield, 2023) is a screen shot related to multiple barriers.

Figure 5

Pre and Post Survey Question Related to Multiple Barriers



ThingLink allows users to create audio-visual and multi-media learning materials accessible in an integrated reading tool. All text descriptions in image or video hotspots can be read with immersive readers so that it is ADA compliant. ThingLink supports a modern eLearning infrastructure, ideal for building virtual environments, scenario-based learning experiences, and simulations for existing LMS or Microsoft Teams. Virtual walk-throughs and tours give students access to real-world environments, and interactive 360° images and videos help develop contextual understanding. Content creation for image, video and 360 media is fully supported inside Microsoft Teams. Interactive content sharing is supported so students can

forward information to their Teams or Google accounts. Figure 6 (Brumfield, 2023) is an example of the augmented reality scene.

Figure 6

Augmented Library Scene



The library scene is augmented with audio, and videos and has links to several textual documents. The augmented features included a student-created video showing the student walking through the library. By clicking on the icon and emojis, a student could access information about library staff, how to find books, how to navigate the library and even read newsletters. The hypothesis was that anxiety would decrease once viewed and students acquired additional information as they would have more knowledge of the library and library resources.

A question related to barriers with library staff was linked to a library libguide that encourages community interaction through a chat feature (see Figure 7). Community applications

are an interactive design element that allows human-to-human or human-to-computer communication. Community, as an interactive application design element, can allow the user to connect with other users to create a community of peers or like-minded individuals. It can also be used as a service to acquire information. As discussed in the literature review, community applications can be a chat feature or other type of social interactivity on the website. The web-based live chat platforms provide students with an online form of instantaneous web support that allows them to ask questions and clarify information sought.

The chat activity was linked in the post-survey to reduce the library anxiety triggers related to affective barriers, barriers with staff, and comfort with the library. Even if students do not use the chat service, knowing that it is available might reduce anxiety about asking librarians questions. There are several questions related to library staff. However, the link to the chat activity was connected to the question, "I cannot get help in the library at the times I need it." This question was used to analyze Barriers with Staff from the original Bostick (1993) survey. Figure 7 (Brumfield, 2023) is an example of the pre and post survey question that links to a chat feature for questions related to barriers with library staff where user will be directed to the chat service link.

Figure 7

Pre and Post Survey Question That Links to Chat Feature

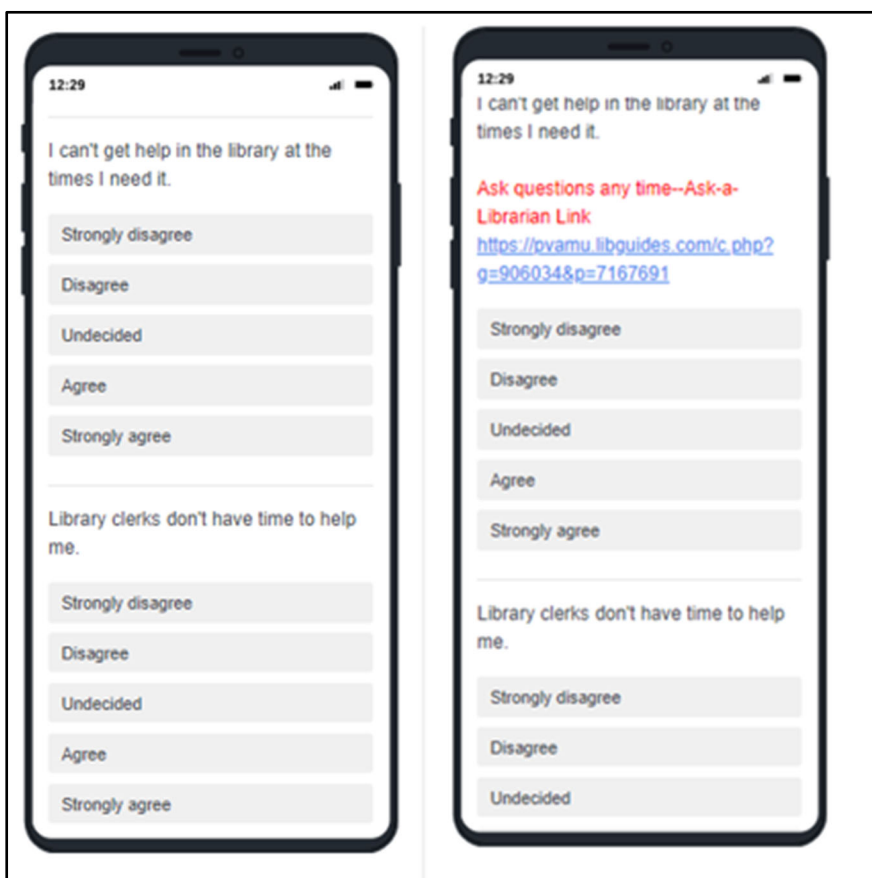
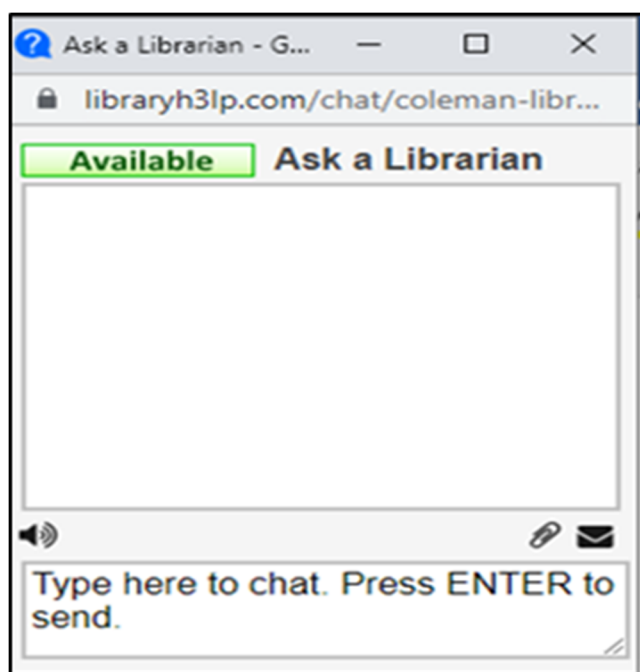


Figure 8 (Brumfield, 2023) is an example of the screen shot of the interactive application, chatbox, that a student would be directed to through the survey link. The post survey takes the student to the Ask a Librarian link and provides contact information for the library liaisons. The chat feature provides synchronous communication during the hours the library is open.

Figure 8 depicts an example of the library's chatbox. The screen shot shows that the Ask a Librarian application is available at that time.

Figure 8

Ask a Librarian Chat Interactive Link Screenshot

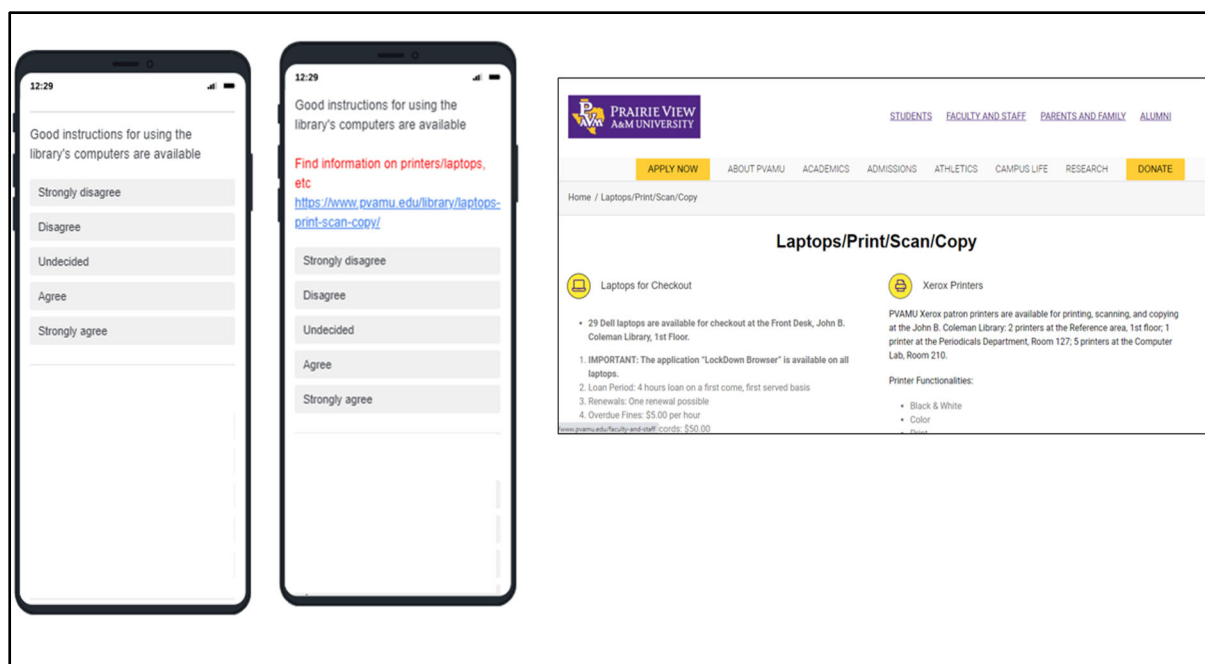


The Library Anxiety Scale (LAS) included a few questions on the mechanical barriers and anxiety triggers, including printers, change machines and computers. For the survey question, *Good instructions for using the library's computers are available*, students were directed to find information on a link to the library's website with instructions on computers and laptops.

The screen shot shown in Figure 9 (Brumfield, 2023) captures the pre and post survey question and the result of accessing the link embedded in the survey.

Figure 9

Pre and Post Survey Question Related to Mechanical Barriers



Interactive applications alter the user experience by giving them control over how much and what they want to do. A variety of applications is needed to keep the user interested and engaged. Using different kinds of software creates a rich experience and when added to interactive applications may be able to reduce library anxiety by providing familiarity and access to information.

Data Collection

Data collection consisted of statistics from the pre and post-Library Anxiety Scale survey. A paired T-Test was performed on the results of the surveys to determine whether the independent variable, the interactive application, made a difference in the survey answers.

The goal of this study was to reduce several dimensions of students' library anxiety. The interactive applications, virtual tours, and augmented websites were used to reduce anxiety related to uncertainty, lack of confidence or self-efficacy, and unfamiliarity with the library. Images and information regarding the building's library facilities and library resources were superimposed on video tours, screenshots, and textual documents. Another aim was to reduce barriers with library staff, which was addressed by providing information and images of the library staff within the augmented screens and with the chat and Ask a Librarian link. The hope was that within the information-seeking process, students could access additional information overlaid in the real world, thus reducing or eliminating anxiety. By reducing anxiety stemming from a lack of knowledge of the building and barriers with staff, students might be encouraged to use the library more often.

Pre- and post-surveys were administered to students from the 43-question, five-point Likert scale, Bostick's Library Anxiety Scale. The study consisted of two parts. The post-survey was sent with only 43 questions and an introductory letter. Approximately two weeks later, the 43-question survey was sent to the same emails along with the post-survey embedded with the interactive applications. The surveys were posted on Qualtrics, a survey database with a unique link for each participant. The surveys were anonymous and only identified by the link. The surveys and interactive applications were accessible on mobile devices, laptops, and desk computers. Although several researchers have adapted Bostick's Library Anxiety Scale, such as Onwuegbuzie and Jiao (2004), this researcher decided to use the original survey. The one question that appeared in the original survey to be outdated was question 40, which referred to change machines. Most libraries do not have change machines. Question 40 was kept because the

uncertainty of whether change machines were in the building might have a bearing on their anxiety regardless of whether the library had change machines.

At the end of the pre-survey, students were directed to an introductory screen which detailed the activities they could do to answer questions on the post-survey. The interactive applications were designed to assist students with locating and finding their way around the building and finding library resources. The applications used for the augmented reality portion of the surveys were ThingLink, HP Reveal (formerly Aurasma) and Layar. There were several different screens that participants could view. This reduced the possibility that a student had already experienced the augmented reality screen. Thus, their familiarity had already reduced some anxiety they would have experienced from prior knowledge.

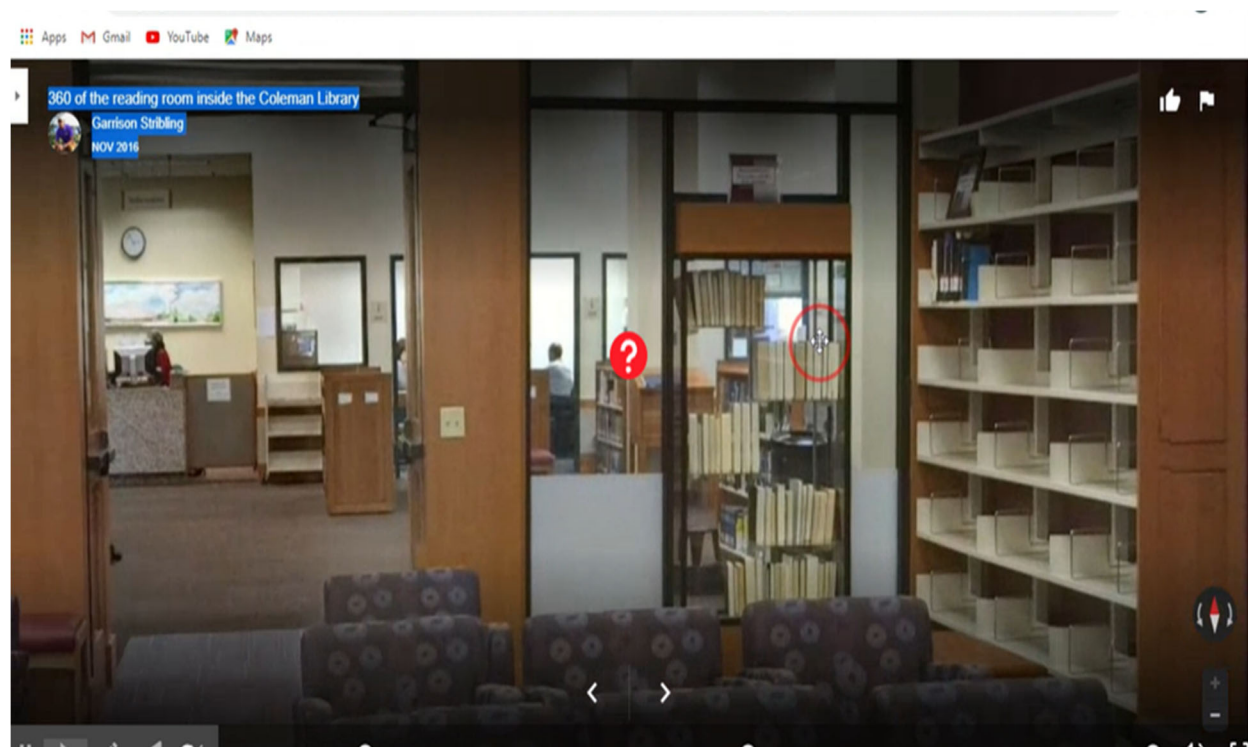
Creating an augmented experience with HP Reveal is simple. The user uploads any image (a photo, graphics, text document) which can be scanned with a smartphone or tablet (iOS or Android) and associate an action tagged when the image is scanned. An action can be a movie display, instructions, reference to another icon or object or website or link to another experience. The image can be taken by the users or uploaded from a website. If uploaded from a website or another source, request permission to upload the image. ThingLink is an application that was used in several of the interactive applications for this study. It is very similar to HP Reveal, however, it also allows for 3D movies to be augmented and headsets to be used. Thus, ThingLink applications can be made into virtual reality applications. Layar software applications can be used for augmented and virtual reality so real-world objects can be placed in the virtual 3D interactive environment with or without reality glasses or a headset. Thus, applications that feature drag-and-drop interactive digital elements, including video messages, music clips, and

interactive photo slideshows, can be embedded into textual documents or 3D environments.

Layar was used to create an augmented reality document linked to book titles. The screen shot of the interactive augmented library reading room is found in Figure 10 (Brumfield, 2021).

Figure 10

ThingLink Interactive Video of Library Reading Room



For this study, the links to the interactive application appeared only on the post-survey. The link to the post-survey was on the same page as the introductory letter, allowing participants to navigate to the post-survey when desired. The surveys asked for no identifying information; however, the unique link provided in Qualtrics allowed the researcher to link the participants' responses to both surveys. Once the results were collected, each participant's pre- and post-survey responses were recorded for analysis in statistical tools.

The researcher has a long history of library service in many capacities and the use of library technology and designed the interactive scenes that participants accessed on their smartphones or computers. The researcher attempted to maintain a constant awareness of the responsibility to avoid personal biases and observe and present accurate outcomes.

Librarians are aware of the realistic complications of library research and that confusion, uneasiness, and anxiety are natural parts of the information-seeking process. Ignoring or discounting the issues faced while doing research, especially for first-year students, is costly to the student and the institution. Students procrastinate, miss assignment deadlines, have poor academic performance, and may ultimately give up and drop out. If libraries can prevent any of these issues, it is worth investigating. Thus, this study aimed to provide data to higher education administrators and librarians to ensure that all students find libraries as user-friendly information resources and that barriers that prevent progress in students' education are removed.

CHAPTER IV

RESULTS

This chapter describes the results, sample description, data presentation, applied analytics, and a summary. This study was descriptive and did not intend to answer questions about how or why an event occurred. Descriptive research is concerned with patterns and observations. The data collected was not to create definitive answers. Additional studies are often conducted to get more accurate answers. Descriptive research involves gathering data, describing occurrences, and then organizing and tabulating it to form an analysis.

Based on the research focus, the following question was formulated: What are the determinants for reducing library anxiety in first-year college students' information-seeking behavior?

Related questions are as follows:

(1) Can interactive applications included as part of the information retrieval process decrease library anxiety?

(2) Can familiarity, as measured by a pre and post-survey, decrease library anxiety?

The study's primary purpose was to determine whether interactive applications could reduce library anxiety in first-year college students' information-seeking behavior. Digital applications allow users to interact with information via graphics, images, and video. The most important feature was that it required interactivity. Using the Bostick (1993) survey questions, six interactive applications were included in the post-survey based on the anxiety triggers Bostick (1992) identified. As discussed in the literature review, these categories or factors, as

Bostick noted, were: barriers with Staff, affective barriers, Comfort with the Library, knowledge of the Library, and mechanical barriers.

Study Sample

First-year students were selected as the target population because of their status as new students. They would have little experience with the library and might identify most with the questions concerning library anxiety. Their level of formal knowledge might predispose them to feel anxiety when seeking information in an unfamiliar place like a library. Also, current first-year students represent a demographic considered Generation Z. These students have computer skills and feel comfortable using emerging technologies, specifically mobile devices, which are often used in interactive web applications.

Initially, the researcher contacted the Academic Success Center and the Summer Bridge Program to get participants. As this was unsuccessful, the researcher obtained a list of first-year students from the Office of Institutional Research. The researcher obtained only email addresses and collected no other demographic information. The list included 1400 first-year students. However, only 100 were randomly selected for the survey and sent an email link, anticipating obtaining 50 for the pilot study. The surveys were sent by direct email. After not receiving any responses from this group, 100 other emails were selected and sent as anonymous links and no identifying information was collected. After approximately one week, this sample received a follow-up reminder to complete the survey with the link attached. After one to two weeks, surveys were re-sent to the 100 students with the post-test attached to the original pre-test. Of these 30 responses collected, 24 students completed the 43-question pre-test and 19 completed the seven-question interactive post-test. The small sample is a limitation of the study. The

surveys were sent out during the beginning of the summer term when most of the first-year students were off campus or may have decided to attend the university. The new students were unaware they had email university email accounts set up. Future research will note the timing for recruiting participants. Because of the low participation rate, formal statistical analyses yielded few results.

Methodological Approach

The researcher used Bostick's (1992) Library Anxiety Scale as the pre and post-survey instrument. The Library Anxiety Study (LAS) uses a Likert format to assess levels of library anxiety. The 43-item, five-point instrument asks participants to select from significantly disagree (1) to significantly agree (5) with the amount of anxiety they experienced in a particular situation. A higher score indicates significant anxiety.

In Bostick's study, Cronbach's alpha coefficient for Bostick's LAS is 0.80, which confirms the satisfactory internal consistency of the scale, while Pearson's correlation coefficient between the five categories is 0.74, which shows that there is a medium-strong correlation. Thus, the scale is considered a valid instrument. Bostick reported that a factor analysis accounted for 51.8% of the variance supported construct validity. Furthermore, a review of the questions by experts suggested content validity. The coefficient of 0.75 was considered adequate for establishing reliability in the test-retest with a gap of two to three weeks.

Bostick's study (1992) identified five factors related to library anxiety, on which she based the creation of the survey questions:

- Barriers with Staff,
- Affective barriers,

- Comfort with the Library,
- Knowledge of the Library, and
- Mechanical barriers.

Barriers with Staff refer to feelings that librarians and other library staff are unapproachable, uninterested, or too busy to assist students. *Affective Barriers* refer to a participant's feelings of inadequacy or incompetence using the library. *Comfort with the Library* deals with the participant's perception that the library is safe, welcoming, and non-threatening. *Knowledge of the Library* refers to how familiar participants felt with the library. *Mechanical Barriers* refer to participants' perception of the electronic equipment that libraries provide for students, including printers, photocopiers and change machines.

Fifteen questions are related to barriers with staff. Question numbers:

3. The librarians are unapproachable.
4. The reference librarians are unhelpful.
5. The librarians don't have time to help me because they're always on the telephone.
6. I can't get help in the library at the times I need it.
7. Library clerks don't have time to help me.
8. The reference librarians don't have time to help me because they're always busy doing something else.
12. The reference librarians are not approachable.
14. If I can't find a book on the shelf the library staff will help me.
15. There is often no one available in the library to help me.

- 21. I can always ask a librarian if I don't know how to work a piece of equipment in the library.
- 22. The library is a comfortable place to study.
- 27. The library staff doesn't care about students.
- 33. Librarians don't have time to help me.
- 34. The library's rules are too restrictive.
- 39. The library staff doesn't listen to students.

Twelve questions are related to affective barriers. Question numbers:

- 1. I'm embarrassed that I don't know how to use the library.
- 2. A lot of the university is confusing to me.
- 9. I am unsure about how to begin my research.
- 10. I get confused trying to find my way around the library.
- 11. I don't know what to do next when the book I need is not on the shelf
- 16. I feel comfortable using the library.
- 17. I feel like I'm bothering the reference librarian if I ask a question.
- 24. I can never find things in the library.
- 37. The directions for using the computers are not clear.
- 38. I don't know what resources are available in the library.
- 42. The library won't let me check out as many items as I need.
- 43. I can't find enough space in the library to study.

Eight questions are related to comfort with the Library. Question numbers:

- 18. I feel safe in the library.
- 19. I feel comfortable in the library.
- 20. The reference librarians are unfriendly.
- 23. The library never has the materials I need.
- 25. There is too much crime in the library.
- 26. The people who work at the circulation desk are helpful.
- 31. I don't understand the library's overdue fines.
- 32. Good instructions for using the library's computers are available.

Five questions are related to knowledge of the Library. Question numbers:

- 13. I enjoy learning new things about the library.
- 28. The library is an important part of my school.
- 29. I want to learn to do my own research
- 35. I don't feel physically safe in the library.
- 41. The library is a safe place

Three questions are related to the mechanical equipment used in the library. Question numbers:

- 30. The copy machines are usually out of order.
- 36. The computer printers are often out of paper.
- 40. The change machines are usually out of order.

The post-test survey used seven questions from the pre-test, representative of the five factors, and embedded the interactive links in the survey questions.

Face validation was used to establish the validity of the seven questions and test the five factors' hypothesis. After examining the questions, the researcher felt that the same questions could address multiple anxiety factors. For example, question 32, "Good instructions for using the library's computers are available," was used in the LAS to measure Comfort with the Library but could also be used to measure Mechanical anxiety. The researcher felt face validation was the most practical way to legitimize utilizing a portion of the survey to embed the interactive applications in the questionnaire. It would not be practical to have a different application for each of the 43 questions and it would reduce the reliability of the study.

The survey questionnaire's reliability in quantitative analysis contributes to the instrument's validity. Reliability has to do with whether the instrument will produce the same results if used by other researchers with similar circumstances. Validity in survey questionnaires refers to the extent to which the questions measure what the study intended. Content and Face validation are non-quantitative ways of establishing validity. These validity methods are based on whether the survey questions appear to measure a construct that the participants would automatically recognize in the measurement. A test in which most people agree that the test items appear to gauge what the test is intended to measure would have strong face validity. The difference between face validation and content validation is that any individual can use face validation to validate a questionnaire, whereas experts perform content validation. Researchers establishing face validation on their questionnaire would examine each question and ask themselves, "Does this question measure what it should?" Face validation is a form of common sense applied to a questionnaire's purpose (Taherdoost, 2016).

Based on face validity, the researcher established that seven questions could be used in the post-test survey to measure the five factors of library anxiety. Three of the questions from the LAS were used to measure factors from the original survey they measured in the LAS. Question 32, "Good instructions for using the library computers are found on the website", was used to measure Mechanical Anxiety instead of the original measurement for Comfort with the Library. Question 11, "I don't know what to do next when the book I need is not on the shelf," was used to measure Knowledge of the Library instead of Affective Barriers. Question 10, "I get confused trying to find my way around the library," was used to measure Comfort with the Library instead of Affective Barriers.

The questions and the related anxiety factor are listed below. Question numbers:

2. A lot of the university is confusing to me. (Affective Barriers)
3. The librarians are unapproachable. (Barriers with Staff)
6. I can't get help in the library at the times I need it. (Barriers with Staff)
9. I am unsure about how to begin my research. (Affective Barriers)
10. I get confused trying to find my way around the library. (Comfort with the Library)
11. I don't know what to do next when the book I need is not on the shelf.
(Knowledge of the Library)
32. Good instructions for using the library's computers are available. (Mechanical Barriers)

These seven survey questions were used to collect data on the five proposed hypothesis statements:

- There is no statistically significant difference in the level of barriers with staff for students before and after receiving the intervention.
- There is no statistically significant difference in the level of affective barriers for students before and after receiving the intervention.
- There is no statistically significant difference in the level of comfort with the library for students before and after receiving the intervention.
- There is no statistically significant difference in the level of knowledge of the library for students before and after receiving the intervention.
- There is no statistically significant difference in the level of anxiety to mechanical barriers for students before and after receiving the intervention.

Statistical software, SPSS was used to analyze the data and provide statistics to answer the hypothesized statements.

Presentation of Data and Results of the Analysis

The researcher used descriptive statistics to determine the significance of the data. Descriptive analysis helps describe data points in ways that identify patterns or similarities among variables. Descriptive analysis often includes data tables of means, standard deviation, and crosstabs that can be used to highlight differences among subgroups. The tables in this study include descriptive analysis from SPSS and comparative data using Excel Statistical Analysis. Inferential statistics are used to make judgments of the probability that a difference between groups can be used to make inferences from our data. This study used a Samples Paired T-Test

since the study group of participants was the same for the pre and post-intervention of the interactive application.

To perform the statistical analysis the five-point Likert system used in the LAS survey was converted into numbers to run the analyses:

- 1 for Strongly disagree
- 2 for Disagree
- 3 for Undecided
- 4 for Agree
- 5 for Strongly agree

The higher the total number represents a perception of a higher level of anxiety. The number 1, the minimum, would be the lowest level, and the number 5, the maximum, would be the highest level. A cursory look at the mean scores of the five anxiety factors indicates that Staff Barriers had the lowest scores. The categories *Comfort with the Library* and *Knowledge of the Library* had the highest mean scores, thus the highest anxiety factors. Figure 11 shows the descriptive statistics of the five factors of library anxiety as referenced in the Library Anxiety Scale.

Figure 11

Descriptive Statistics of the Five Factors of Library Anxiety

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Staff Barriers	24	1.00	5.00	2.0833	1.05981
Affective Barriers	24	1.00	4.00	2.5833	1.17646
Comfort of Library	24	1.00	5.00	3.8333	1.04950
Knowledge of Library	24	1.00	5.00	3.6250	1.01350
Mechanical	24	1.00	4.00	2.6250	1.01350
Valid N (listwise)	24				

Anxiety related to Staff Barriers included perceptions that librarians were busy and unapproachable. According to the statistics on Staff Barriers, 50% of students responded that they disagreed on questions related to the library anxiety factor, 29% strongly disagreed, and only 4.2% (1 person) agreed.

Figure 12 shows the percentage of responses to question related to the anxiety factor, Staff Barriers.

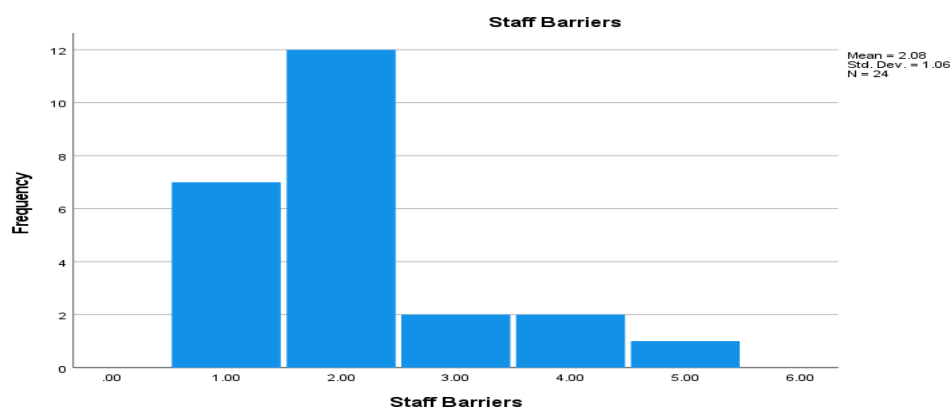
Figure 12

Percentage of Responses to Staff Barriers

Staff Barriers		
	N	%
1.00	7	29.2%
2.00	12	50.0%
3.00	2	8.3%
4.00	2	8.3%
5.00	1	4.2%

Figure 13

Histogram of the Responses to Staff Barriers



The data indicate that Staff Barriers may not be a significant factor in library anxiety for this study. As this study was conducted at an HBCU, it should be noted that the diversity of the library staff complements the diversity of the student population. Future research might investigate whether this contributes to a reduction in library anxiety.

Affective Barriers are related to the perceptions of inadequacy in using library resources. Personal inhibitions, absence of previous library experience, and lack of self-confidence or self-efficacy may play a role in a student's affective barriers.

Affective Barriers are linked to self-efficacy and students' belief that they lack the skills to complete a research assignment using library resources. Affective anxiety can hurt student learning and significantly affect a student's academic career. Some causes of affective anxiety can be students' feelings of being lost in the library, not knowing where to find things or feeling small in a large building. The anxiety may stem from the student feeling unprepared. Students who disagreed with the questions about affective anxiety may have more confidence and not feel intimidated by library resources.

Figure 14

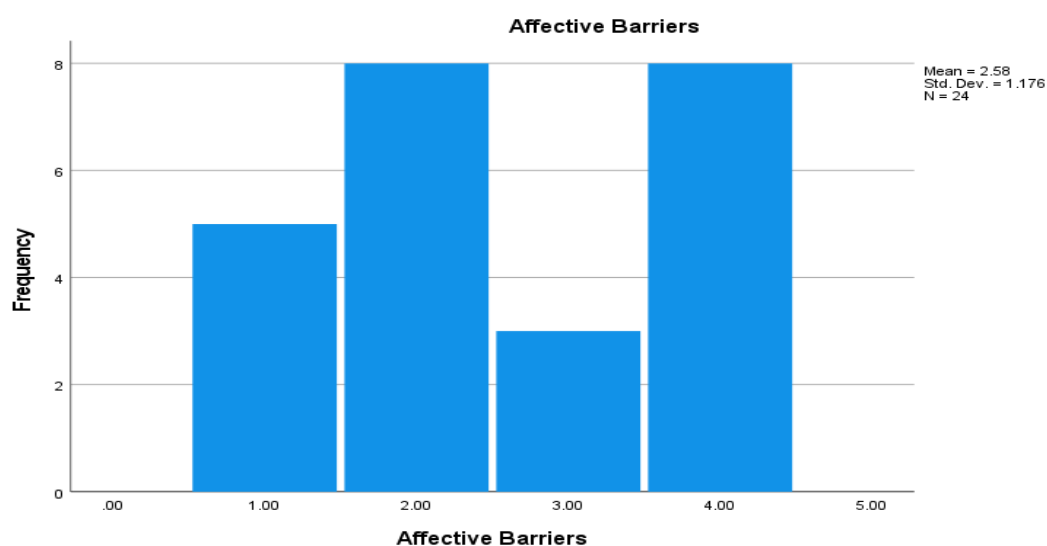
Percentage of responses to Affective Barriers

Affective Barriers		
	N	%
1.00	5	20.8%
2.00	8	33.3%
3.00	3	12.5%
4.00	8	33.3%

The histogram of Affective Barriers is shown in Figure 15. The data indicates that an equal percentage of students responded to questions related to the Affective Barriers as either, disagree (33.3%) or agree (33.3%).

Figure 15

Histogram of the Responses to Affective Barriers



The anxiety factor, Comfort with the Library, refers to the perception of how safe, welcoming, comfortable, and non-threatening students perceive the library to be. Researching can be stressful, and it can be intimidating to even walk in the door if students are unfamiliar with libraries.

The relationship between the size and layout of a library has been shown to cause anxiety. Noise, lighting, signage and even things like the location of water fountains and bathrooms can cause some students anxiety.

Figure 16

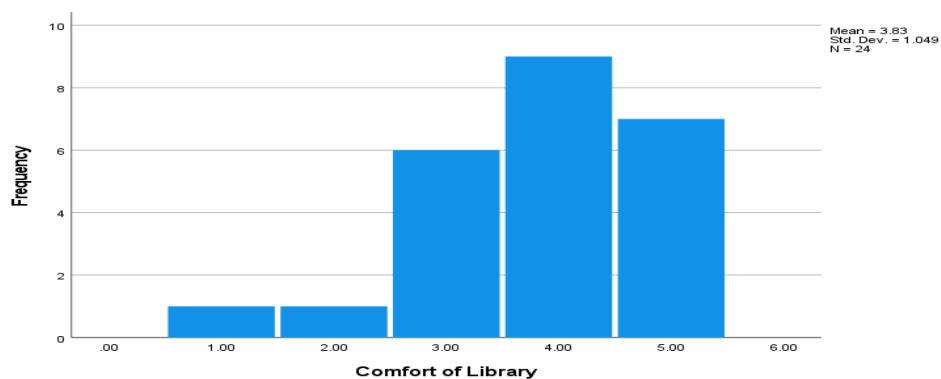
Percentage of Responses to Questions Related the Anxiety Factor Comfort of Library

Comfort of Library		
	N	%
1.00	1	4.2 %
2.00	1	4.2 %
3.00	6	25.0 %
4.00	9	37.5 %
5.00	7	29.2 %

The data indicated that around 66% of the responses indicated agreement with negative questions related to the anxiety factor, Comfort of the Library. Figure 17 shows the histogram chart of the responses.

Figure 17

Histogram of the Responses to Comfort of Library



The anxiety factor, Knowledge of the Library, refers to how much students feel they know the library and its policies and procedures. Unfamiliarity with computer databases and searching for articles or books can also cause anxiety. The computer has replaced the old card catalog, and many databases for searching require complicated strategies to find articles and

books. Also, the library is a public institution. Students share space with other students, faculty, and staff whose backgrounds or perspectives might differ. Students need to feel that there is no potential for conflict in the library.

Figure 18

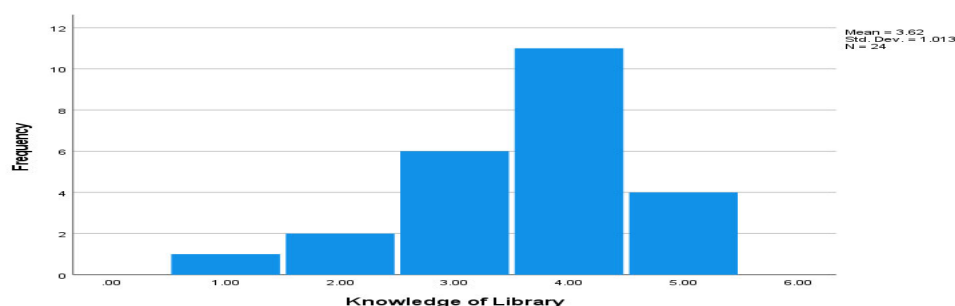
Percentage of Responses to Questions related to Knowledge of Library

Knowledge of Library		
	N	%
1.00	1	4.2%
2.00	2	8.3%
3.00	6	25.0%
4.00	11	45.8%
5.00	4	16.7%

The data showed that 45% of the responses indicated agreement to questions negatively related to the library anxiety, Knowledge of the Library. An additional 16.7% strongly agreed.

Figure 19

Histogram of the Responses to Knowledge of Library



The anxiety factor, Mechanical Barriers, relates to frustration and anxiety that can be caused when physical equipment, such as copy machines and printers, that a student needs to do their work are not working or they do not know how to use them. The data showed that 50% of

respondents rated agreed or were undecided to anxiety factors related to Mechanical, while 37% disagreed, and 12% strongly disagreed.

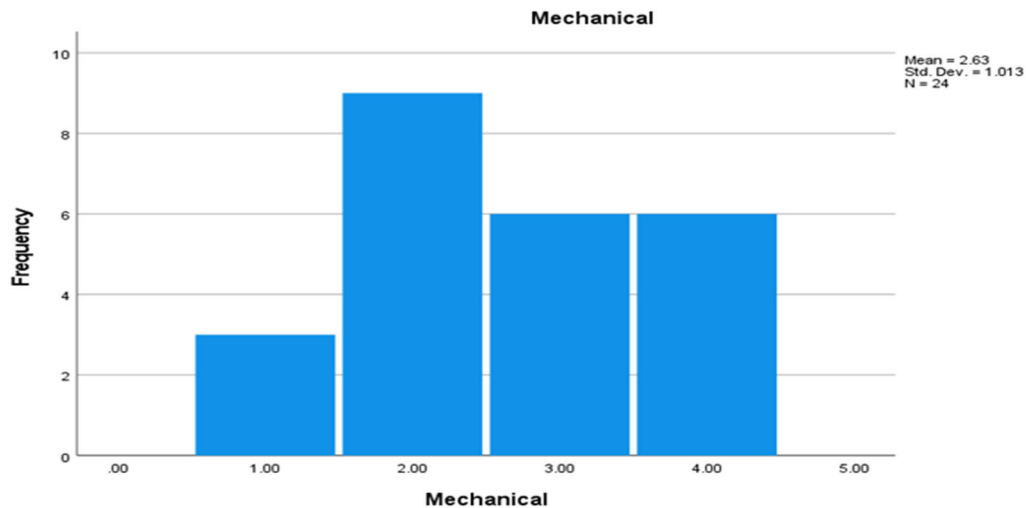
Figure 20

Percentage of Responses to Mechanical Barriers

Mechanical		
	N	%
1.00	3	12.5%
2.00	9	37.5%
3.00	6	25.0%
4.00	6	25.0%

Figure 21

Histogram of the Responses to Mechanical Barriers



Based on the data collected, the results showed that some anxiety existed in all five factors.

Thus, the research questions are appropriate for this study since the goal is to look for ways to prevent anxiety. The research questions were:

(1) Can interactive applications include as part of the information retrieval process decrease library anxiety?

(2) Can familiarity, as measured by a pre and post survey, decrease library anxiety?

To answer the research questions, the researcher proposed doing a paired t-test to compare the pre and post of the interactive application added to the survey as part of the information retrieval. The t-test calculates the probability of significant differences between two data sets, whether any or both are under the same population with the same mean.

The Paired Sample t-test compares the means of two measurements taken from the same individual at two different times (for example, pre-test and post-test score with an intervention administered between the two-time points). The formal statistical analysis using descriptive measures was used to show significant differences in the data. Because the data set was so small, there were only 19 responses for the interactive survey, so the researcher decided to do comparison data charts using Excel Statistical Analysis.

Below are the statistical analysis results with the comparisons between the pre and post-interactive applications and the Excel charts for the survey questions. T-Tests are reported like chi-squares, but only the degrees of freedom are in parentheses. The t is rounded to two decimal places and the significance level. As questions 3 and 6 were used to measure Staff Barriers, they were combined into one and labeled Pre and Post Factor 1—Staff Barriers. They were then analyzed using the Paired Samples T-Test in SPSS. The same was done for questions 2 and 9, which were labeled Factor 2--Affective Barriers.

The researcher applied the hypothesis statement for Factor 1—Staff Barriers:

HO 1: There is no statistically significant difference in the level of barriers with staff for students before and after receiving the intervention.

HO: $D=0$

A paired samples t test reveals the difference between the mean number of Factor 1 pre-survey ($M = 39.68$, $s = 1.53$) and post-survey ($M = 3.95$, $s = 1.71$) for staff barriers.

Figure 22

Factor 1 Paired Samples Statistics

Paired Samples Statistics					
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Factor1	39.68	19	6.667	1.530
	Fac1Post	3.95	19	1.715	.393

This output from the statistical software SPSS gives the descriptive statistics for each of the two samples (Factor 1 Pre and Post Survey).

Figure 23

Factor 1 Paired Samples Correlations

Paired Samples Correlations					
		N	Correlation	Significance	
				One-Sided p	Two-Sided p
Pair 1	Factor1 & Fac1Post	19	.640	.002	.003

The second part of the output gives the correlation between the pair of variable. The correlation between the two variables is given in the third column. The last column gives the p value for the correlation coefficient. If the p value is not less than the alpha level (.05) the researcher could not reject the null hypothesis. The p values are less than the alpha level so the null hypothesis is rejected.

The third part of the output gives the inferential statistics of the paired differences.

Figure 24*Factor 1 Paired Samples T-Test Pre and Post*

Paired Samples Test									
		Paired Differences				Significance			
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	
					Lower	Upper			One-Sided p Two-Sided p
Pair 1	Factor1 - Fac1Post	35.737	5.724	1.313	32.978	38.496	27.216	18	<.001 <.001

To determine whether the differences were significant, look at the results of the averages of the responses from both surveys, pre and post the interactive application intervention.

The data shows that the mean is 35,737 and the standard deviation 5.724. This represents the distance between each data point and the mean. Low standard deviation means data are clustered around the mean, and high standard deviation indicates data are more spread out. A standard deviation nearest to zero indicates that data points are close to the mean. In contrast, a high or low standard deviation indicates data points are respectively above or below the mean. If the data points are further from the mean, that signifies a higher deviation within the data set and, thus, more spread-out data. This can occur if some scores are high on either end of the mean, as if a score was exceptionally higher than most.

What the researcher was looking for in the dataset was whether these means were statistically significantly different, as was hypothesized. There are three different results from these statistics to answer that question.

First, look at the p-value, which corresponds with the t score. The objective is to see if the p-value is less than .05. The p value is .001 which is less. Next, look at the t score and Degrees of Freedom (DF). Is it greater than the critical value found on the Student's t Distribution Table? The t score is 27.216, and the degree of freedom is 18. Look this number up on the Distribution

Table. Figure 25 indicates that for the p-value of .05 and DF of 18, the t score would have to be greater than 1.734, which it is.

Figure 25

t Distribution Table

<i>t</i> Distribution						
α						
Degrees of freedom	.005 (one tail) .01 (two tails)	.01 (one tail) .02 (two tails)	.025 (one tail) .05 (two tails)	.05 (one tail) .10 (two tails)	.10 (one tail) .20 (two tails)	.25 (one tail) .50 (two tails)
1	63.657	31.821	12.706	6.314	3.078	1.000
2	9.925	6.965	4.303	2.920	1.886	.816
3	5.841	4.541	3.182	2.353	1.638	.765
4	4.604	3.747	2.776	2.132	1.533	.741
5	4.032	3.365	2.571	2.015	1.476	.727
6	3.707	3.143	2.447	1.943	1.440	.718
7	3.500	2.998	2.365	1.895	1.415	.711
8	3.355	2.896	2.306	1.860	1.397	.706
9	3.250	2.821	2.262	1.833	1.383	.703
10	3.169	2.764	2.228	1.812	1.372	.700
11	3.106	2.718	2.201	1.796	1.363	.697
12	3.054	2.681	2.179	1.782	1.356	.696
13	3.012	2.650	2.160	1.771	1.350	.694
14	2.977	2.625	2.145	1.761	1.345	.692
15	2.947	2.602	2.132	1.753	1.341	.691
16	2.921	2.584	2.120	1.746	1.337	.690
17	2.898	2.567	2.110	1.740	1.333	.689
18	2.878	2.552	2.101	1.734	1.330	.688
19	2.861	2.540	2.093	1.729	1.328	.688

Thus, it can be concluded that for the results of the pre and post survey questions for Factor 1, there was significant difference and the null hypothesis is rejected: There is no statistically significant difference in the level of barriers with staff for students before and after receiving the intervention.

HO 1: There is no statistically significant difference in the level of barriers with staff for students before and after receiving the intervention.

HO: $D \neq 0$

The same procedures can be applied to Factor 2, to accept or reject the null hypothesis for Affective Barriers. Because the same procedures were used for the other questions, only the hypothesis and output from SPSS will be shown.

HO 2: There is no statistically significant difference in the level of affective barriers for students before and after receiving the intervention.

HO: $D=0$

Figure 26

Factor 2 Paired Samples T-test Pre and Post

Paired Samples Test									
		Paired Differences						Significance	
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	
					Lower	Upper			
Pair 1	Factor2 - Fac2Post	22.105	7.578	1.739	18.453	25.758	12.714	18	<.001
									<.001

For Factor 2, related to Affective Barriers, the statistics show that the t score is 12.714, which is more than 1.734 and the p value is .001 which is less than .05. Thus, it can be concluded that for Factor 2, there is significant difference and the null hypothesis is rejected: There is no statistically significant difference in the level of affective barriers for students before and after receiving the intervention.

HO 2: There is no statistically significant difference in the level of affective barriers for students before and after receiving the intervention.

HO: $D \neq 0$

It can be concluded that the inferential data showed a difference in pre and post-interactive application. Therefore, there is a possibility that the interactive application may have contributed to a reduction in anxiety for Factor 2-Affective Barriers.

Factor 3 of the Library Anxiety Scale is Comfort of the Library. A pre and post intervention was analyzed using survey question 10. The original survey had related question 10

to Affective Barriers. Using face validation, the researcher felt that question 10, “I get confused trying to find my way around the library, “could reasonably be related to Factor 3-Comfort of the Library. A Paired Sample T-Test was done to test the hypotheses and determine if there was a significant difference in the survey results after the intervention of the interactive application.

HO 3: There is no statistically significant difference in the level of comfort of the library for students before and after receiving the intervention.

HO: $D=0$

Figure 27

Factor 3 Paired Samples t-Test Pre and Post

Paired Samples Test									
		Paired Differences				Significance			
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	
					Lower	Upper			One-Sided p Two-Sided p
Pair 1	Q10 - Q10	.389	.850	.200	-.034	.812	1.941	17	.034 .069

The statistics show that the t score is 1.941, which is greater than 1.740 on the T-Table and the p value is .034 which is less than .05. Thus, it can be concluded that for Factor 3-Comfort of the Library, the data shows there is significant difference and the null hypothesis is rejected: There is no statistically significant difference in the level of Comfort with the Library for students before and after receiving the intervention.

HO 3: There is no statistically significant difference in the level of comfort of the library for students before and after receiving the intervention.

HO: $D \neq 0$

Factor 4 of the Library Anxiety Scale is Knowledge of the Library. Question 11 of the LAS survey was used for the pre and post Paired Samples T-Test for Factor 4. The original survey related question 11 to Affective Barriers. Using face validation, the researcher felt that question 11, “I don’t know what to do next when the book I need is not on the shelf,” could reasonably be related to Factor 4--Knowledge of the Library. A Paired Sample t-Test was done to test the hypotheses and determine if there was a significant difference in the survey results after the intervention of the interactive application.

HO 4: There is no statistically significant difference in the level of Knowledge of the Library for students before and after receiving the intervention.

HO: $D=0$

Figure 28

Factor 4 Paired Samples t-Test pre and post

Paired Samples Test									
		Paired Differences				Significance			
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	
					Lower	Upper			
Pair 1	Q11 - Q11	-.444	1.199	.283	-1.041	.152	-1.572	17	
									One-Sided p Two-Sided p
									.067 .134

The statistics show that the t score is 1.572, which is less than 1.740 and the p value is .067 which is greater than .05. Thus, it can be concluded that for Factor 4 and question 11, “I don’t know what to do next when the book I need is not on the shelf,” the data shows there is no significant difference, and the null hypothesis is accepted: There is no statistically significant difference in the level of Knowledge of Library for students before and after receiving the intervention.

HO 4: There is no statistically significant difference in the level of knowledge of the library for students before and after receiving the intervention.

HO: $D=0$

Factor 5 of the LAS is related to Mechanical Barriers in the library. These barriers would include items like the printers, micro-fiche, and other electronic or mechanical devices. The researcher used question 32 for the pre and post analysis for Factor 5—Mechanical Barriers. The original LAS related the question 32 to Comfort of the Library. Using face validation, the researcher felt that the question 32, “Good instructions for using the library's computers are available,” could reasonably be related to Mechanical Barriers.

HO 5: There is no statistically significant difference in the level of mechanical barriers anxiety for students before and after receiving the intervention.

HO: $D=0$

Figure 29

Factor 5 Paired Samples T-test Pre and Post

Paired Samples Test									
		Paired Differences				Significance			
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper	t	df	One-Sided p
									Two-Sided p
Pair 1	Q32 - Q32	.333	.840	.198	-.084	.751	1.683	17	.055
									.111

For question 32, related to Mechanical Barriers, the statistics show that the t score is 1.683, which is less than 1.740 and the p value is .055 which is greater than .05. Thus, it can be concluded that for Factor 5-Mechanical Barriers and question 32, “Good instructions for using the library's computers are available,”; the data shows there is no significant difference, and the null hypothesis is accepted: There is no statistically significant difference in the level of anxiety to mechanical barriers for students before and after receiving the intervention.

HO 5: There is no statistically significant difference in the level of mechanical barriers anxiety for students before and after receiving the intervention.

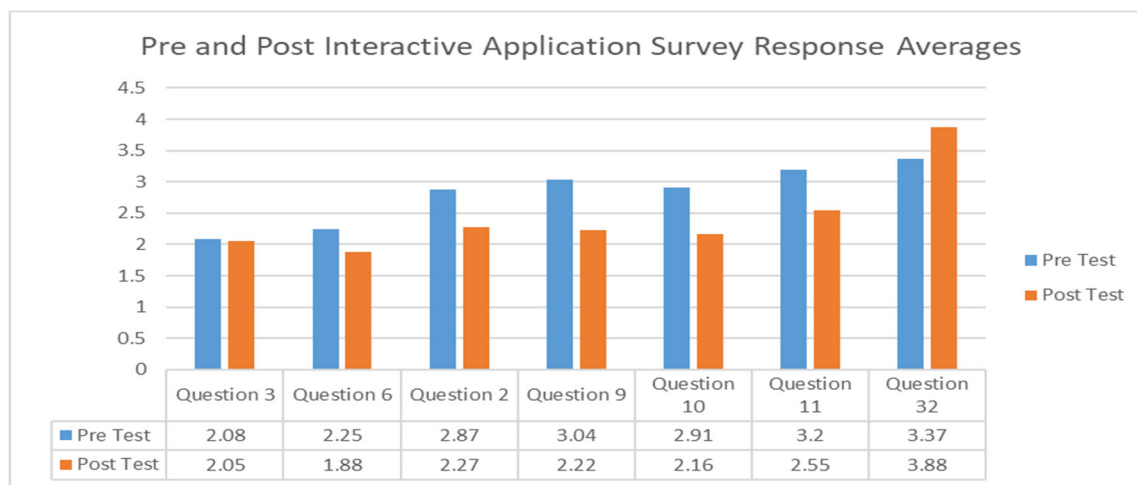
HO: $D=0$

Excel was used to allow readers to view the data in a simpler manner. Excel provides charts to communicate data graphically, to see the meaning, comparisons and trends easier.

Figure 30 presents the averages of the pre and post interactive application survey responses.

Figure 30

Pre and Post Statistics



The data shows that questions 3 and 6 related to Staff Barriers had lower scores, suggesting lower levels of anxiety before and after the intervention. Question 3, "The librarians are unapproachable," had only a three-point difference in response averages.

Question 6, "I can't get help in the library at the times I need it," ranked lowest on the survey, suggesting the lowest amount of anxiety for students. Question 2, "A lot of the university is confusing to me," was related to Affective factors of anxiety and showed a 60-point drop in scores after the interactive application. Question 9, "I am unsure about how to begin my research," showed a 79-point drop after the intervention of the interactive application. Question

10, the research related to Comfort of Library, "I get confused trying to find my way around the library," showed a 75-point drop after the intervention. Question 11, which the research related to Knowledge of Library, "I don't know what to do next when the book I need is not on the shelf," showed a 65-point drop after the intervention. Question 32 related to Mechanical Barriers, "Good instructions for using the library's computers are available," showed an increase of 51-points after the interactive application.

Face Validation Questions and Correlations

The entire survey consisted of 43 questions; however, only seven were used to test the interactive applications. Face validation was used to legitimize using a portion of the survey to embed the interactive applications in the questionnaire. Having a different application for each of the 43 questions was not practical. The Face validation method was used in selecting the seven survey questions to test the hypothesis of the five anxiety factors. Face validation is a non-quantitative way of establishing validity. The method is based on observations and perceptions of whether the survey questions appear to measure a construct that the participants would automatically recognize in the measurement.

The seven questions from the original survey that were used in the pre-posttest and the factors they measured were:

Question 3. The librarians are unapproachable. (Staff Barriers)

Question 6. I can't get help in the library at the times I need it. (Staff Barriers)

Question 2. A lot of the university is confusing to me. (Affective Barriers)

Question 9. I am unsure about how to begin my research. (Affective Barriers)

Question 10. I get confused trying to find my way around the library. (Comfort of Library)

Question 11. I don't know what to do next when the book I need is not on the shelf. (Knowledge of Library)

Question 32. Good instructions for using the library's computers are available. (Mechanical)

The bivariate Pearson Correlation was used to measure the correlations among pairs of variables representing the various factors. The bivariate Pearson correlation indicates whether a statistically significant linear relationship exists between two variables. The objective is to decipher whether the survey questions selected had a significant correlation to the factors they represented.

As questions 3 and 6 were used to measure Staff Barriers, they were combined and labeled Pre and Post Factor 1—Staff Barriers. The same was done for questions 2 and 9, which were labeled Factor 2--Affective Barriers. Questions 10 was used as the analysis for Factor 3, question 11 for Factor 4 and question 32 for Factor 5. The statistical software program SPSS was used to do the correlation analysis. Correlation shows how strongly two variables are related to each other. Questions 10, 11 and 32 were also analyzed to see the degree of association between the original questions and the face validation questions, number 10, Comfort of the Library, question 11, Knowledge of the Library and question 32, Mechanical Barriers.

The null hypothesis (H0) is used to determine the population correlation coefficient and significance, no association, positive correlation, or negative correlation.

H0: $\rho = 0$ ("the population correlation coefficient is 0; there is no association")

H1: $\rho > 0$ ("the population correlation coefficient is greater than 0; a positive correlation could exist")

H1: $\rho < 0$ ("the population correlation coefficient is less than 0; a negative correlation could exist")

Apply the hypotheses statements for Factor 1—Staff Barriers:

There is no statistically significant correlation in Factor 1 post intervention survey questions and Factor 1 original survey questions.

The hypothesis for Factor 1—Staff Barriers is detailed in the diagram of the correlations in Figure 31.

Figure 31

Factor 1 Correlations

Correlations				
		Q3	Q6	Factor 1 Pre
Q3	Pearson Correlation	1	.394	.847**
	Sig. (2-tailed)		.057	<.001
	N	24	24	24
Q6	Pearson Correlation	.394	1	.822**
	Sig. (2-tailed)	.057		<.001
	N	24	24	24
Factor 1 Pre	Pearson Correlation	.847**	.822**	1
	Sig. (2-tailed)	<.001	<.001	
	N	24	24	24

** . Correlation is significant at the 0.01 level (2-tailed).

HO: $p=0$

There is statistically significant correlation in Factor 1 post intervention survey questions and Factor 1 original survey questions.

H1: $p > 0$

The correlation coefficients can range from -1 to +1, with -1 indicating a perfect negative correlation, +1 indicating a perfect positive correlation, and 0 indicating no correlation at all. As

indicated in SPSS for the questions used for the post survey for Factor 1, they showed a positive correlation to the original survey questions used for Factor 1. Pearson Correlation showed significance at the 0.01 level and the population coefficient correlation of .003, the Factor 1 Post survey p value is .640, which is greater than and indicates a positive correlation. Thus, the alternate hypothesis statement for Factor 1 is accepted:

There is statistically significant correlation in Factor 1 post intervention survey questions and Factor 1 original survey questions.

$$H1: p > 0$$

Correlations are needed for the two questions used for Factor 1 post-test, questions 3 and 6. The data indicates that question 6 was positively correlated with Factor 1. Thus, the alternative hypothesis is accepted:

There is statistically significant correlation in Factor 1 post intervention survey questions and Factor 1 original survey questions.

$$H1: p > 0$$

Likewise the hypothesis is applied for Factor 2—Affective Barriers:

There is no statistically significant correlation in Factor 2 post intervention survey questions and Factor 2 original survey questions.

$$H0: p = 0$$

Figure 32*Factor 2 Correlations*

Correlations				
		Q2	Q9	Factor 2 Pre
Q2	Pearson Correlation	1	.525**	.893**
	Sig. (2-tailed)		.008	<.001
	N	24	24	24
Q9	Pearson Correlation	.525**	1	.852**
	Sig. (2-tailed)	.008		<.001
	N	24	24	24
Factor 2 Pre	Pearson Correlation	.893**	.852**	1
	Sig. (2-tailed)	<.001	<.001	
	N	24	24	24

** . Correlation is significant at the 0.01 level (2-tailed).

There is statistically significant correlation in Factor 2 post intervention survey questions and Factor 2 original survey questions.

H2: $p > 0$

As indicated in SPSS for the questions used for the post survey for Factor 2, a positive correlation exists to the original survey questions used for Factor 2. Pearson Correlation showed significance at the .001 level which indicated a positive correlation. Thus, the alternate hypothesis statement for Factor 2—Affective Barriers is accepted:

There is statistically significant correlation in Factor 2 post intervention survey questions and Factor 2 original survey questions.

H1: $p > 0$

Also look at the two questions used for Factor 2 post-test, questions 2 and 9, and see the correlations for each.

Figure 33*Factor 2 Questions 2 and 9 Correlations*

Correlations				
		Factor 2 Post	Q2	Q9
Factor 2 Post	Pearson Correlation	1	.511 [*]	.248
	Sig. (2-tailed)		.025	.306
	N	19	19	19
Q2	Pearson Correlation	.511 [*]	1	.525 ^{**}
	Sig. (2-tailed)	.025		.008
	N	19	24	24
Q9	Pearson Correlation	.248	.525 ^{**}	1
	Sig. (2-tailed)	.306	.008	
	N	19	24	24

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Based on the data the alternate hypothesis is accepted. There is statistically significant correlation in Factor 2 post intervention survey questions and Factor 2 original survey questions.

H1: $p > 0$

Factor 3 related to Comfort of the Library. The question used to represent this factor was question 10, "I get confused trying to find my way around the library." Apply the hypothesis statements for Factor 3—Comfort of the Library:

There is no statistically significant correlation in question 10, post intervention survey questions and Factor 3 original survey questions.

H0: $p = 0$

The alternate hypothesis is there is statistically significant correlation in question 10, post intervention survey questions and Factor 3 original survey questions.

H1: $p > 0$

Figure 34*Factor 3 Correlations*

Correlations			
		Factor 3Pre	Q10
Factor 3Pre	Pearson Correlation	1	.212
	Sig. (2-tailed)		.319
	N	24	24
Q10	Pearson Correlation	.212	1
	Sig. (2-tailed)	.319	
	N	24	24

The results show there is not a significant relationship between question 10 and Factor 3.

Thus, the null hypothesis is accepted.

There is no statistically significant correlation in question 10, post intervention survey questions and Factor 3 original survey questions.

HO: $p=0$

Factor 4 related to Knowledge of the Library. The question used to represent this factor was question 11, ""I don't know what to do next when the book I need is not on the shelf," Apply the hypothesis statements for Factor 4—Knowledge of the Library:

There is no statistically significant correlation in question 11, post intervention survey questions and Factor 4 original survey questions.

HO: $p=0$

There is statistically significant correlation in question 11, post intervention survey questions and Factor 4 original survey questions.

H1: $p > 0$

Figure 35*Factor 4 Correlations*

Correlations		Factor 4	Q11
Factor 4	Pearson Correlation	1	-.063
	Sig. (2-tailed)		.768
	N	24	24
Q11	Pearson Correlation	-.063	1
	Sig. (2-tailed)	.768	
	N	24	24

The results show there is not a significant relationship between question 11 and Factor 4.

Thus, the null hypothesis is accepted.

There is no statistically significant correlation in question 11, post intervention survey questions and Factor 4 original survey questions.

HO: $p=0$

Factor 5 related to Mechanical Barriers of the Library. The question used to represent this factor was question 32, “Good instructions for using the library's computers are available.”

Apply the hypothesis statements for Factor 5—Mechanical Barriers:

There is no statistically significant correlation in question 32, post intervention survey questions and Factor 5 original survey questions.

HO: $p=0$

There is statistically significant correlation in question 32, post intervention survey questions and Factor 5 original survey questions.

H1: $p > 0$

Figure 36*Factor 5 Correlations*

Correlations		Q32	Factor 5
Q32	Pearson Correlation	1	.331
	Sig. (2-tailed)		.114
	N	24	24
Factor 5	Pearson Correlation	.331	1
	Sig. (2-tailed)	.114	
	N	24	24

The results show there is not a significant relationship between question 32 and Factor 5.

Thus, the null hypothesis is accepted.

There is no statistically significant correlation in question 32, post intervention survey questions and Factor 5 original survey questions.

HO: $p=0$

Interactive Applications

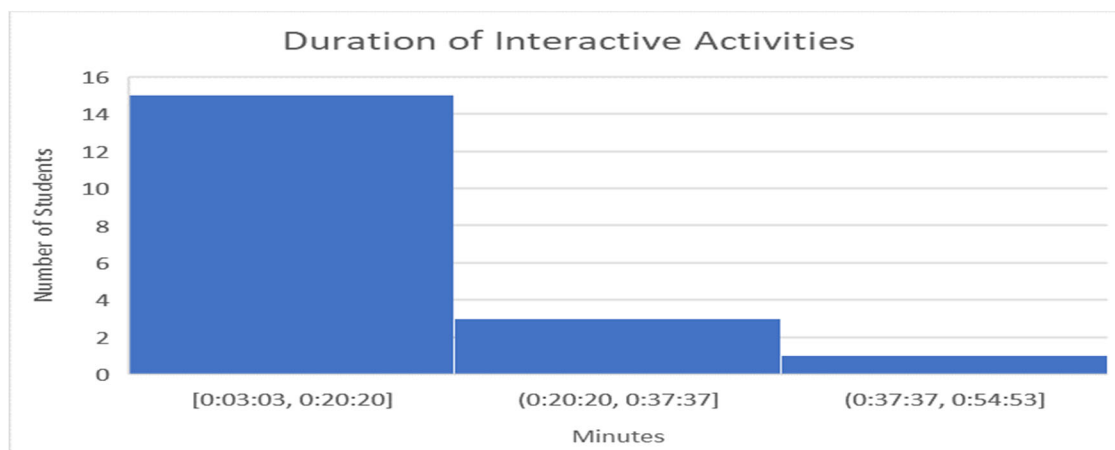
The purpose of the face validation was to select questions into which the interactive application could be embedded to provide familiarity with the library. Interactive applications may be applied to a wide range of digital applications. They can be design elements included in a website or webpage where the user inputs information and gains immediate output. The applications used in this study included maps, tours, community applications (chat), and digital media that allowed users to interact with information via graphics, images, videos, audio and textual elements. Online applications were included in the post-survey and required interactivity on the user's part. Some of the applications covered multiple categories and survey questions. For example, 15 questions on the survey related to how one felt about librarian staff. There were

two links to interactive applications associated with this category. One link took the user to a list of librarians and contact information, another link was included in an augmented reality library scene where the user can click on the icons to get library staff biographies and additional information. Applications were designed with activities that encouraged motivation, engagement, and peer-to-peer observation. Within the augmented library scene was a link to a student created video of a library tour. Another video had music and a student playing basketball while the university's history was discussed in the background.

Part of the data analysis was to determine if the interactive applications changed anxiety levels. It was essential to look at the duration of time students spent on the activities embedded in the questions. According to the survey data in Qualtrics, the average time spent on the interactive portion was 11 minutes. Of the 19 completed surveys, a majority (15 students) spent 3 to 20 minutes on the activities. Three persons spent 20 to 37 minutes, and one person spent over 50 minutes on the interactive activities (see Figure 37).

Figure 37

Histogram of Time Spent on Interactive Applications



The length of time spent on the embedded activities was not a focus of this study. However, the time spent on the interactive applications showed that serendipitous information-seeking might be a way to teach students who have anxiety. Placing learning objects within an inconspicuous augmented website might encourage discovery. The average time spent on the 43-question pre-survey was 1.5 minutes. The average time spent on the post-survey was 11 minutes. Thus, on average, almost 10 minutes were spent on interactive activities that provided information about the library. It was expected that three to five minutes would be spent on the activities, with students glancing at some of the embedded links. The time spent, at least by one student who spent almost an hour on the activities, suggests that serendipitous information-seeking may have occurred.

Serendipitous information seeking is rarely studied in library literature. In search behavior, serendipity is interpreted as accidentally finding information or information that was not initially part of the information-seeking task. (Srirahayu et al., 2019). The information-seeking task for the students in this study was to use interactive applications to answer a survey question after engaging in a brief activity. While viewing some of the links, some students found something else they were interested in that caused them to stay longer in the information-seeking process. This suggests serendipitous information seeking. A future study on serendipitous seeking is recommended as a follow-up to this unexpected result.

Design Application

The study was designed to test whether interactive applications could affect the level of anxiety a student experienced after they viewed and got additional information on library resources, staff, and services. Would anxiety decrease as students acquired more knowledge of

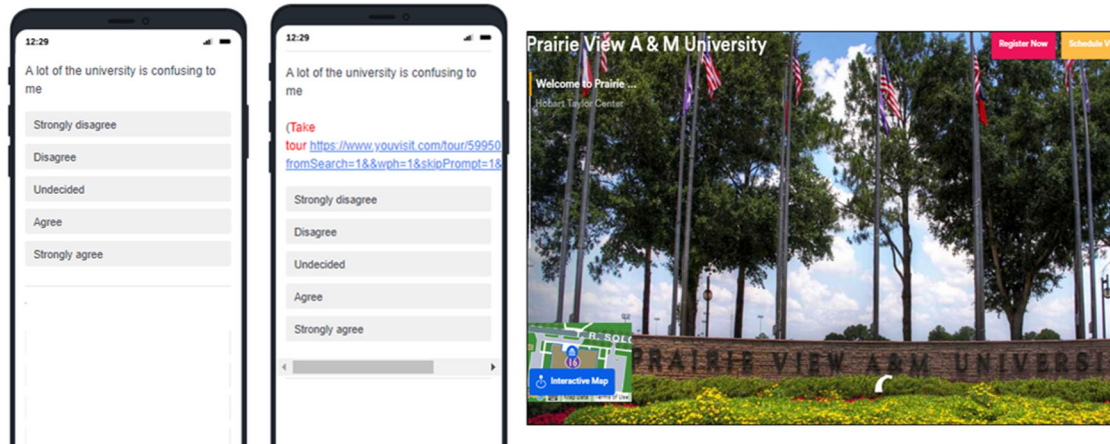
the library and library resources? The goal was to reduce anxiety related to uncertainty, lack of self-efficacy, and unfamiliarity with the library. Images and information regarding the physical building and library resources within the building were superimposed on video tours, screenshots, and textual documents. Another aim was to reduce barriers with library staff. This was addressed by providing access to chat links along with images of the library staff within the augmented library screen link.

Affective barriers are more difficult to identify and thus more challenging to create applications that reduce that factor of anxiety. Also, affective barriers are so closely related to multiple factors, comfort and knowledge of the library, and barriers with staff and mechanical barriers that it was difficult to single out one application to cover all aspects of psychological affective emotions. Thus, multiple applications could be used to test affective barriers. The applications were very different for the two questions that were used from the original survey to analyze affective barriers, the question number 2, A lot of the university is confusing to me, and question 9, I am unsure about how to begin my research. For question number 2, the interactive application was a university tour.

The library's geographic location could also relate to the factors of Knowledge of the Library and Comfort of the Library, so this tour was also used to address these factors. Web-based virtual tours on many college campuses provide students with an interactive map that may reduce the anxiety of not knowing the location. The tours improve the spatial understanding of the campus. The rationale for using the tour was that once the tour was viewed the student would have a better idea of where buildings are located, including the library and thus more familiarity and less anxiety. Figure 38 (Brumfield, 2023) presents results.

Figure 38

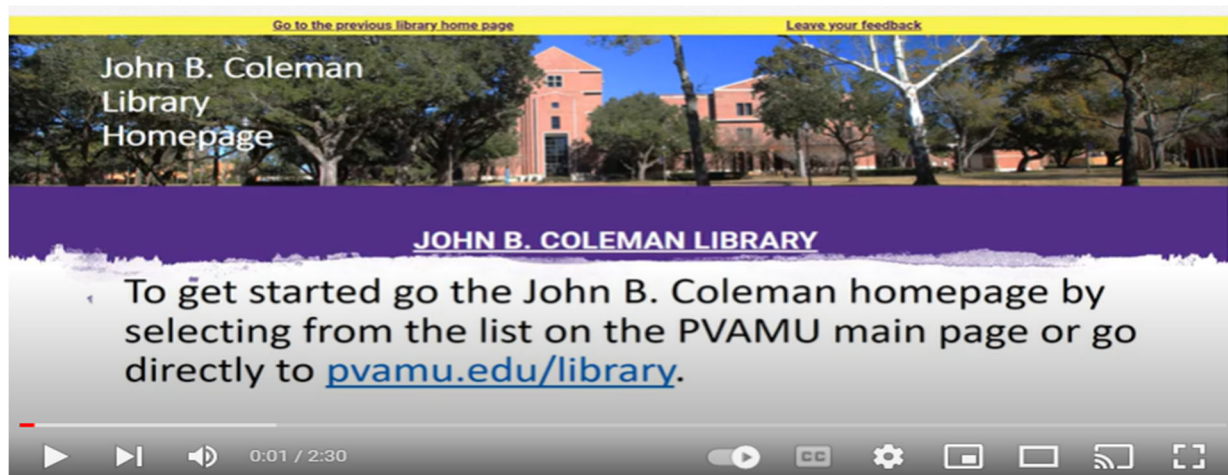
Pre and Post Question and Application for Affective Barriers



For question 9, “I am unsure about how to begin my research,” students were directed to a link to a YouTube video of a tutorial on how to search for library resources as seen Figure 39 (Brumfield, 2023).

Figure 39

Screenshot of Application for Question Related to Affective Barriers



Questions 3 and 6, were related to the anxiety barriers students have with library staff. For question 3, “The librarians are unapproachable,” the interactive application embedded into the survey was a link to the library’s website for library liaisons contact information, a chat link and Ask-a-Librarian link.

The different types of interactive applications encourage social communication and are used to reduce anxiety. Figure 40 (Brumfield, 2023) shows the list of liaisons and the link to the online chat box.

Figure 40

Interactive Application for Question 3 Related to Staff Barriers

The screenshot shows the John B. Coleman Library website. The header includes the Prairie View A&M University logo, the library name, and an "Ask A Librarian" link. The breadcrumb trail reads: "Prairie View A&M University Library / Guides / Library Liaison / Colleges". The main heading is "Library Liaison: Colleges". Below this is a navigation bar with links: "About", "Colleges", "College of Arts & Sciences", "University Programs", and "Library Collections".

Under the "Colleges" link, there are two sections:

- College of Agriculture and Human Sciences**

Instruction Services Librarian	Ms. Kimberly M. Gay, M.L.S. 936-261-1506 kimgay@pvamu.edu
Library Collection Development Liaison	Ms. Kimberly M. Gay, M.L.S. 936-261-1506 kimgay@pvamu.edu
Faculty Representative	Dr. Sharon McWhinney, 936-261-2510 simcwhinney@pvamu.edu
- College of Business**

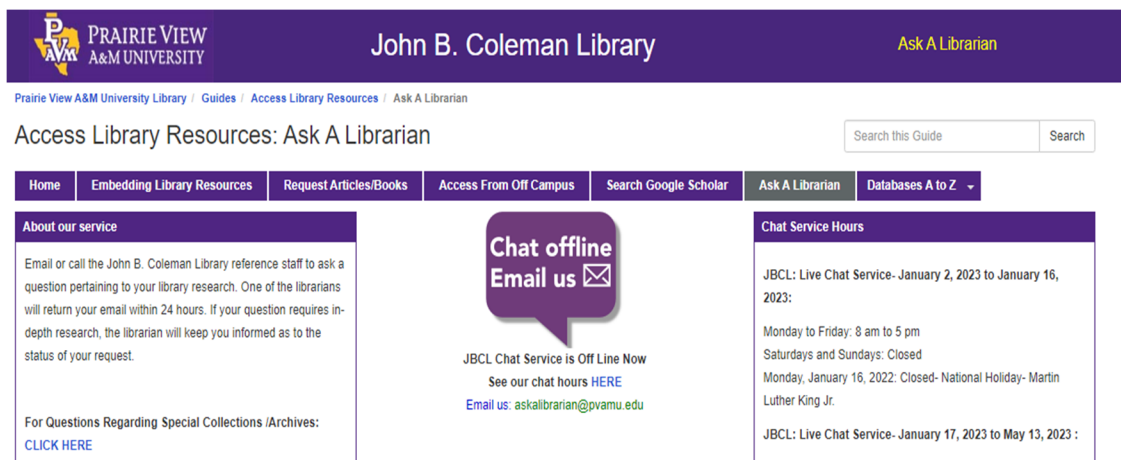
Instruction Services Librarian	TBA (Main Campus) Ms. Elizabeth Brumfield, M.L.I.S. 713-790-7282 ebrumfield@pvamu.edu (NWHC)
Library Collection Development Liaison	TBA

On the right side, there is a "Chat With Us" section. It features a purple speech bubble icon with the text "Chat offline Email us" and an envelope icon. Below this, it states: "JBCL Chat Service is Off Line Now", "See our chat hours [HERE](#)", "Email us: askalibrarian@pvamu.edu", "Ask a Librarian Services", "Send us an email askalibrarian@pvamu.edu", and "Call us: (936) 261-1535".

For question 6, “I can’t get help in the library at the times I need it,” the interactive application had a replication of the Chat feature. Figure 40 and Figure 41 (Brumfield, 2023) show the chat feature and the online reference tool entitled Ask A Librarian.

Figure 41

Interactive Application for Question 6 Related to Staff Barriers

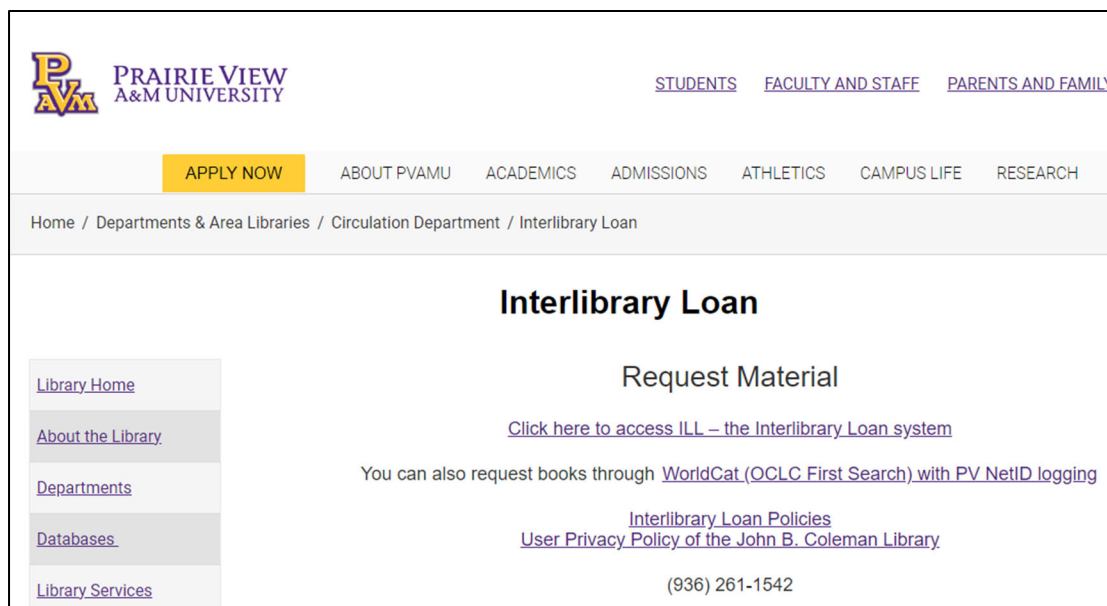


The Chat feature is considered a community application because it allows for human to human interaction. The live chat platform provides an online form of instantaneous web-support allowing the student to ask questions and to clarify information sought. The chat activity was linked in the post-survey on staff barriers but it also related to the categories of affective barriers, knowledge of library, and comfort with the library. Even if students do not use the chat service, knowing that it is available to them might reduce anxiety about asking librarians questions as well as provide valuable information and comfort with the library.

According to Bostick's (1993) definition of Knowledge of the Library as an anxiety factor, the lack of knowledge about the libraries policies and procedures was a cause of anxiety for students. Question number 11 was related to this factor, "I don't know what to do next when the book I need is not on the shelf." The interactive application used for this factor was a link to the library's website for interlibrary loan information as noted in Figure 42 (Brumfield, 2023).

Figure 42

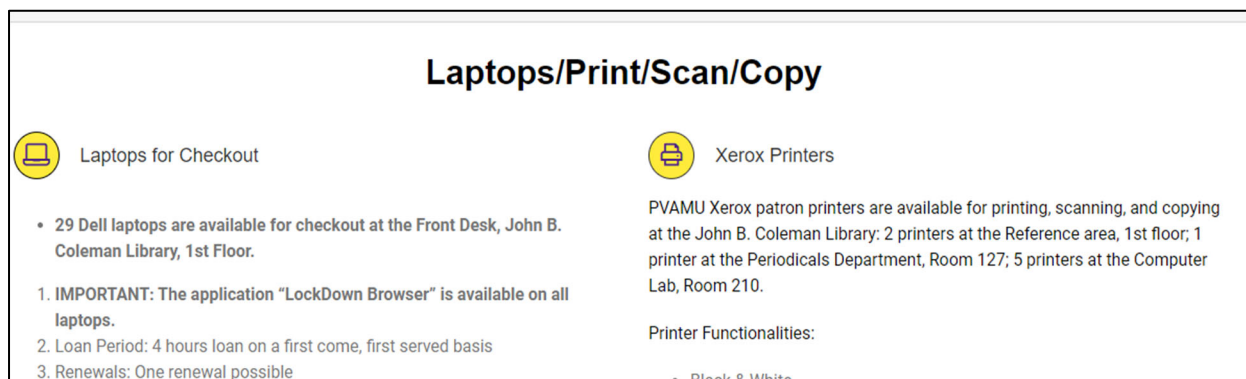
Interactive Application related to Knowledge of the Library



Question number 32, was used to address the anxiety factor, Mechanical Barriers. The question asked students to rank how they felt about using computers in the library, Good instructions for using the library's computers are available. The application associated with this factor was a link to the library's webpage with information on laptops, printers and other mechanical devices as seen in Figure 43 (Brumfield, 2023).

Figure 43

Interactive Application related to Mechanical Barriers



Interactive applications give the user control over how much or how little they want to be engaged. The variety of applications were needed to keep the engagement while providing information that might not be of interest to the student. Question 10, “I get confused trying to find my way around the library,” was originally associated with Affective Barriers in the Bostick survey. For this survey it was used for the anxiety factor, Comfort of the Library. Being lost is definitively an affective feeling of anxiety but being lost in a library can also be a sense of discomfort. Comfort with the library covers a multitude of activities, and feelings and information seeking processes. These videos were chosen to provide peer to peer observation while making the library more familiar. By clicking on the icon and emojis, student could access information about library staff, how to find books, how to navigate the library, and even read newsletters. The thought was that once viewed and new information acquired that anxiety would decrease and students would be more comfortable with the library. See Figure 44 (Brumfield, 2023).

Figure 44

Augmented Library Scene with Interactive Icons



The rationale for creating the augmented scene was to provide a link to various resources in a creative and engaging way using technology the students might want to use. Various software applications were used to create the augmented experience. It began with using a 360 camera but something as simple as cell phone camera would work as well. Using HP Reveal, which is an augmented reality software application, students uploaded the image (a photo, graphics, text document), scanned with a smartphone or tablet (iOS or Android), and associate an action that was tagged when the image was scanned. An action can be a movie display, instructions, reference another icon or object or website or link to another experience. Students could also use images from a website.

If uploaded from a website or another source, students must follow copyright restrictions and get permission before using. ThingLink is an application that was used in several of the interactive applications for this study. It is very similar to HP Reveal; however, it also allowed for 3D movies to be augmented and headsets to be used. Thus, ThingLink applications could be made into virtual reality applications.

Initially, the thought was to have virtual reality links but it was not possible to provide the technology to students not on campus. Since this study was conducted during the Covid pandemic it was not appropriate to use that type of technology that could be shared. Layar is also an augmented and virtual reality software application where real world objects can be placed in the virtual 3D interactive environment with or without reality glasses or a headset. Thus, students could drag-and-drop interactive digital elements, including video messages, music clips, and interactive photo slideshows into textual documents or 3D environments. Layar was used to create an augmented reality document linked to book titles and included in the augmented library scene.

Research Questions

At the heart of this study was the research question: What are the determinants for reducing library anxiety in first-year college students' information seeking behavior? To explore answers to that question, two related questions were formulated:

(1) Can interactive applications included as part of the information retrieval process decrease library anxiety?

(2) Can familiarity, as measured by a pre and post survey, decrease library anxiety?

This study focused on a novel approach to reducing library anxiety, adding an interactive application as part of the information retrieval process to make the library more familiar to students. Familiarity tends to convey a feeling of closeness and a deeper awareness that comes from learning or being informed about something. The interactive applications embedded in the survey included audio and visual multimedia applications that provided information but also served to engage participants. Familiarity comes from learning and getting accustomed to the knowledge. The goal was to use information to make an affective connection that would help to reduce the negative feelings associated with library anxiety.

It is difficult to measure familiarity, especially when the exposure to information is brief and not repetitive. The inability to accurately measure familiarity is one of the limitations of the study. However, the data suggested that to a minimum degree the interactive applications were able to provide a level of familiarity. Based on the results of the surveys the anxiety levels went down for all five factors after students used the interactive applications.

The researcher used descriptive and inferential statistics for the data collection on library anxiety factors: Staff Barriers, Affective Barriers, Comfort of Library, Knowledge of Library and

Mechanical Barriers. The study used descriptive statistics and tables to describe data points that identified patterns or similarities among variables. The tables in this study included descriptive analysis from SPSS and comparative data using Excel Statistical Analysis. The study used inferential statistics to make judgments of the probability of a difference between groups, which can be used to make inferences from the data. This study used a Paired Samples T-Test since the study group of participants were the same pre and post-interactive application included in the survey.

To perform the statistical analysis, the five-point Likert system used in the LAS survey was converted into numbers, with 1 being the lowest score and five the highest. When using the Bostick Library Anxiety Study, a 43-question survey, the higher the score indicated the significance of the anxiety. The totality of questions was designed so that when analyzed together, the negative and positive questions balanced out. For the interactive post-survey, which used only seven original questions, the focus was not on higher or lower scores but on significant differences as determined by inferential statistics. Thus question 32, "Good instructions for using the library's computers are available," showed an increase of 51 points after the interactive application. However, the data showed no significant difference, and the null hypothesis was accepted: There is no statistically significant difference in the level of anxiety to mechanical barriers for students before and after receiving the intervention. Conversely, question 9, related to Affective Barriers. The survey question reads, "I am unsure about how to begin my research," had a 79-point drop after the intervention of the interactive application.

The inferential statistics showed a significant difference in pre and post-interactive application. Thus, it can be concluded that for question 9, "I am unsure about how to begin my

research," the data shows a significant difference. The null hypothesis is rejected: There is no statistically significant difference in the level of affective barriers for students before and after receiving the intervention.

Anxiety related to Staff Barriers included perceptions that librarians were busy and unapproachable. According to the statistics on Staff Barriers, 50% of students responded that they disagreed on questions related to this library anxiety factor, 29% strongly disagreed, and only 4.2 (1 person) agreed.

Anxiety related to Affective Barriers concerns perceptions of inadequacy using library resources. Personal inhibitions, absence of previous library experience, and lack of self-confidence or self-efficacy may play a role in a student's affective barriers. The data indicated that an equal percentage, 33%, of students responded to questions related to the Affective Barriers as either disagree or agree. The data indicated that around 66% of the responses noted agreement with negative questions related to the anxiety factor, Comfort of the Library. The data showed that 45% of the responses indicated agreement to questions negatively associated with library anxiety, Knowledge of the Library, and an additional 16.7% strongly agreed. The data showed that 50% of respondents rated agreed or were undecided about anxiety factors related to Mechanical whereas 37% disagreed, and 12% strongly disagreed.

The data was also analyzed using a paired sample t-test to determine significant differences after the intervention of the interactive applications and to accept or reject the null hypothesis. In this study, only one question out of the seven used showed a significant difference in the t-score.

Summary

This chapter provided descriptive and inferential data to test the null hypothesis of five statements related to library anxiety, Staff Barriers, Affective Barriers, Comfort with the Library, Knowledge of the Library and Mechanical Barriers. The purpose of the study was to reduce a student's perceptions of library anxiety with the addition of an intervention, an interactive application related to the anxiety factor. There were limitations to the analysis as the sample size was small. However, overall the data showed that library anxiety existed in all five categories yet not to a significant degree in four categories.

Using the Paired Samples T-test, the data showed for at least one of the factors that there was a significant difference after viewing the interactive application. The survey question, "I am unsure about how to begin my research," related to the Affective factor of library anxiety, which included perceptions of inadequacy using library resources, showed a significant difference in the inferential statistics. Based on the overall pre-test survey responses, the data showed that all factors contributed to library anxiety, with Staff Barriers receiving the lowest ranking.

The value and significance of this research study were to provide librarians and academic leaders with valuable information to improve the experience of first-year students' library use, intending to lead to research success. Chapter 5 re-states the research questions and discuss how the study addresses the problems that prompted the research, and how well it adds to the existing literature.

CHAPTER V

DISCUSSION AND CONCLUSIONS

Reducing Library Anxiety in the Information Seeking Behavior of First-Year College Students was a quantitative study exploring the use of interactive applications embedded in post-survey questions to reduce possible library anxiety of first-year students enrolled in a historically Black college or university (HBCU). Interactive applications included virtual tours, augmented reality library scenes, online chat, and other activities requiring conscious participation. The study used these applications to promote immersive experiences that could contribute to learning and reduce affective feelings of anxiety.

Library anxiety has been a topic for librarians and researchers for years. Working in an academic library, librarians experience the frustrations students have and their looks of confusion navigating the library shelves, searching databases, traversing library equipment, including microfiche, screen readers and copy machines. Librarians watch students go from floor to floor, afraid to ask questions because they are intimidated by the size of the library collection or the layout of the building. For these students, the library could be a happier place.

Instead, for many, it can be a maze of anxiety-inducing factors. Students suffering from library anxiety tend to avoid or procrastinate or delay completing assignments that involve using the library. This study aimed to take a closer look at these anxiety-inducing factors and attempt to find ways to reduce anxiety by using interactive applications during the information retrieval process. This chapter reintroduces the purpose of the study and the literature reviewed and summarizes the study's results and how it adds to the existing literature in the field.

While conducting this study, unexpectedly, a worldwide pandemic, Covid 19, emerged and affected education and technology use. This chapter discusses the positives and negatives of the pandemic on the data collection and limitations of the study. This chapter also discusses the results of Chapter IV in greater detail and interprets how the data relates to the initial hypotheses and research questions. The discussion follows how the data results relate to previous research and the study's outcome. Following this section in Chapter V is a look at the design elements of the study, the methodology, recruitment and suggestions to improve the study. The chapter concludes with a final discussion of future research and the closure of the dissertation.

Summary of the Results

Library anxiety was first identified as a research topic in 1986. Constance A. Mellon's article, "*Library Anxiety: A Grounded Theory and Its Development*," appeared in the March 1986 College & Research Libraries issue. Mellon (1986) felt a need to research students' anxiety after she observed that students were reluctant to ask questions of librarians even when struggling to find books or use computers and printers. Mellon's study was groundbreaking for library research because of the number of students who participated and the methodology she used to analyze data. Mellon's study included 6,000 students from 20 English classes over two years. She used the qualitative method of Grounded Theory to collect and analyze personal written statements from the students. Each semester, over two years, the students were required to keep a search journal, a diary, of their library research experience. They also had to write an essay at the end of the semester.

Recurrent themes emerged from these written expressions. Some words students used to describe their library experience were scary, overpowering, lost, helpless, and confused.

Her study showed that the students lacked confidence in their library skills while they overestimated the skills of their peers. She suggested that there were several causes of library anxiety: the size of the library, not knowing where things were located, how and where to begin research, and the role the library plays in the research process (Jiao & Onwuegbuzie, 1999; Malvasi, 2009; Mellon, 1986). Mellon's research was replicated several times, resulting in additional findings. Jiao and Onwuegbuzie (1999) indicated that knowledge of the library played a part in students' perceptions. A student's unfamiliarity with the library and the resources caused frustration and anxiety. Jiao and Onwuegbuzie noted that the anxiety student felt included frustration with the library's mechanical devices, including copy machines and printers. The Mellon study led other researchers to examine different factors of library anxiety, which led to the creation of Bostick's Library Anxiety Scale.

Sharon L. Bostick (1992) developed the Library Anxiety Scale (LAS) to quantitatively test Mellon's qualitative theory. Her study created a 43-item survey to measure library anxiety in five areas: Barriers with Staff, Feelings of Inadequacy, Comfort with the Library, Knowledge of the Library, and Mechanical Barriers. The development of a quantitative method to measure library anxiety led to an increase in its study. Mech and Brooks (1995) conducted the first large-scale test using the LAS tool. They found that “library anxiety was inverse to a student's academic experience, existing more in first-year and sophomores than upperclassmen” (p. 175).

Much has changed in libraries since 1986 and 1992. However, research indicates that library anxiety is still a viable research topic. Students continue to feel anxiety when faced with having to do online or physical information-seeking activities. Research indicates that information-seeking is more than just a goal-driven task-performing activity. People have

emotions and affective and cognitive behaviors that influence their search strategies (Brumfield, 2008).

Library anxiety affecting the information-seeking process can affect a student's academic progress. Library anxiety and the avoidance behaviors and procrastination associated with it could lead to lousy research papers, incomplete theses or dissertations, missed deadlines for assignments, failing grades, lack of satisfaction with the academic programs and lower retention rates.

This study, which used Bostick's LAS survey for data collection, suggests that personal and institutional factors can contribute to the perception of library anxiety. This study occurred at a historically Black college or university (HBCU). However, the distinction of HBCUs was not a focus of this study. It was important to note that first year students were the target population. Information-seeking behavior of first-year students at HBCUs might be affected by their identity as also being first-generation students.

The data from this study was used to address the research question, related questions, and hypotheses. Based on the research focus, the following question was formulated: What are the determinants for reducing library anxiety in first-year college students' information-seeking behavior?

Related questions were:

- (1) Can interactive applications included as part of the information retrieval process decrease library anxiety?
- (2) Can familiarity, as measured by a pre and post-survey, decrease library anxiety?

The word familiarity was chosen because it conveys a sense of identification in which a situation, person or place, provokes a feeling of remembrance and recognition. It is believed that people, in general, tend to gravitate to things they are familiar. Familiarity reduces uncertainty, which studies indicate is a negative factor in information seeking. Thus, by making the library familiar, it is reasoned that it might minimize uncertainty and decrease anxiety.

Interactive digital applications were created and embedded into survey questions to familiarize students with the library. Applications included augmented reality screens, detailed research tutorials, and links to chat resources. These included providing online tours and videos of the library and buildings surrounding the university campus.

First-year students were selected as the target population because their level of formal knowledge might predispose them to feel anxiety when finding information on an advanced scholarly topic. Research shows that many first-year students have higher library anxiety scores than others. However, they have computer skills and feel comfortable using emerging technologies, specifically mobile devices, smartphones, and virtual and augmented reality applications. As such, these students might be more familiar with using online interactive applications in their information-seeking.

The significance of the study is that in the library and information science field, library anxiety is a concern for administrators and librarians because their goal is to reduce or eliminate conditions that impact access to information. Library anxiety can affect decision-making in locating, identifying appropriate data, and using relevant information. These are the three stages in the information-seeking process. Libraries are information resources, especially for college

students. As such, it is helpful to examine students' perceptions of libraries and provide ways to reduce any barriers that may hinder their academic performance.

The researcher referred to past and current literature related to the research questions throughout this study. The review began with a discussion on the information-seeking behavior of first-year students. A study by Nicholas et al. (2009) showed that first-year students had a distinctive form of information-seeking behavior, which was different from faculty. Many first-year students need more information literacy skills, critical thinking, and database searching proficiency, which are needed for research, academic success, and a satisfying college experience (Jacobson & Mark, 2000). Research on students' information-seeking behavior suggests that students prefer online searching. They are impatient and do not care about accuracy.

According to Fast (2004) and Zhang, 1998), Google is the preferred search engine because of the speed and design of the search system. Urquhart and Rowley (2007) concurred in their study that Google was the most widely used information retrieval system, and the most popular electronic information services were mobile phones and texting.

When the Covid pandemic hit, information seeking became a significant concern because of the ramifications affecting health and lifestyles. The pandemic caused changes within universities and in the lives of college students who were concerned about travel restrictions, home isolation, online learning, and social communication. The information-seeking behavior of college students was impacted by misinformation in the media and the lack of skills to seek and evaluate health information available on the Internet to cope with social, psychological and physical issues (Huang, 2022).

The immediate need for Covid related information and the lack of digital literacy skills challenged libraries leaders primarily concerned with disrupting routine library services. Administrators worried about the well-being of library users and staff, maintaining social distancing, developing new protocols, disinfecting the library, and improving online library access. The libraries were mainly affected due to the digital divide, lack of policies, issues in digitization, particularly copyright, and a lack of skillful staff (Ashiq et al. 2022). According to Asif and Singh (2020), traditional libraries had to change because of Covid and are now smart libraries because of technological advancement and developments. In today's pandemic scenario, libraries have a wide variety of e-resources and e-services that they did not have pre-Covid.

Ironically, some of the interactive applications used in Reducing Library Anxiety in the Information Seeking Behavior of First-Year College Students became part of libraries' worldwide delivery of information services. Online chat, used as an interactive application in this study, was one of the only means of communication for many libraries as they closed their doors to prevent the spread of Covid. Some of the other applications included in this study, streaming videos, maps and tours, and video tutorials, were the preferred library tools used during the pandemic.

This study suggests that modern libraries of the future could expand the use of interactive applications to distribute information in e-formats, to meet the information needs of modern library users. The overall results of this study showed that the interactive applications, when embedded into the survey questions, reduced library anxiety. Also, the applications contributed to the familiarity with the library and the resources.

The study's goal was to use the information to make an effective connection that would help reduce the negative feelings of anxiety when a student was involved in the information-seeking process. The findings indicated that, to a minimum degree, the interactive applications reduced anxiety levels in five factors. As identified in the study, these factors were Staff Barriers, Affective Barriers, Comfort of the Library, Knowledge of the Library and Mechanical Barriers.

Discussion of the Results

This study started with a discussion of the conceptual framework of anxiety. Anxiety is an affective condition of human behavior, and as such, the conceptual framework most relevant focuses on appraisal theories of emotion and how affective obstacles impact information seeking. The premise of appraisal theories is that human emotions are elicited when an individual appraises a situation, object or circumstance and that appraisal results in the feeling of intrinsic pleasantness or unpleasantness (Ellsworth & Scherer, 2003). Appraisal theorists who study anxiety in information-seeking take a functional approach to human feelings and barriers they experience that cause them to act in certain situations. Environments or situations can cause individuals to retreat or to be motivated depending on the experience. “Adverse actions can include rejection, avoidance and non-use of an appraised object, event, or environment” (Mulligan & Scherer, 2012, p. 352). The objects that would be affective barriers to information seeking in this study are information sources, e.g., websites, library staff and library environments, or information systems, e.g., library databases and search engines, and physical locations of items.

Self-efficacy and familiarity are related to emotions one can experience in environments or situations. Self-efficacy refers to individuals' confidence that they have the ability and resources to succeed at specific goals. One's self-efficacy beliefs contribute to effective performance by increasing motivation, task focused efforts, and decreasing anxiety. Self-efficacy is more than just confidence. It considers the perceived outcome of the action and whether that action is within its range of capabilities. Thus, self-efficacy is a person's belief in their ability to achieve or fail through their behavior.

Familiarity comes from learning and getting accustomed to the knowledge learned. Familiarity tends to convey a feeling of closeness and deeper awareness. Familiarity is a word not often used with libraries. However, it conveys a sense of identification in which a situation, event, place, or person, provokes an unconscious feeling of remembrance and recognition. Familiarity can reduce negative feelings, and it is believed that people tend to gravitate to things they consider familiar.

This study deliberately attempted to observe negative appraisals and actions before introducing a controlled variable to produce positive appraisals and actions. Students were given a pre and post-survey that required them to appraise how they felt before and after they viewed and used an interactive application added to a survey question. The digital information included in the questions was designed to familiarize them with library resources, staff, search engines, and the overall library environment.

The overarching research question of this study was: What are the determinants for reducing library anxiety in first-year college students' information-seeking behavior? Related questions were as follows: (1) Can interactive applications included as part of the information

retrieval process decrease library anxiety? (2) Can familiarity with the library decrease library anxiety? The data collection was limited as a pilot study and became even more so due to the Covid 19 pandemic. However, the results showed that, at a minimum, interactive applications embedded in the information retrieval process could reduce anxiety in five factors, as identified by previous research conducted by Mellon and Bostick.

Bostick's study (1992) identified five factors related to library anxiety, on which she based the creation of the survey questions:

- Barriers with staff,
- Affective barriers,
- Comfort with the library,
- Knowledge of the library, and
- Mechanical barriers.

Barriers with staff refer to a student's feelings that library staff were not interested or too busy to assist students.

Affective Barriers refer to a student's feelings of self-efficacy, inadequacy, or incompetence using the library. Comfort with the library referred to students' perception that the library was safe, welcoming, and non-threatening. Knowledge of the Library referred to how familiar participants felt with the library. Mechanical Barriers refer to students' use of electronic equipment that libraries provide, including printers, photocopiers and change machines.

Seven survey questions were used to collect data on the five proposed hypothesis statements:

- There is no statistically significant difference in the barriers with staff for students before and after receiving the intervention.
- There is no statistically significant difference in the level of affective barriers for students before and after receiving the intervention.
- There is no statistically significant difference in students' comfort level with the library before and after receiving the intervention.
- There is no statistically significant difference in the level of knowledge of the library for students before and after receiving the intervention.
- There is no statistically significant difference in students' anxiety levels of mechanical barriers before and after receiving the intervention.

Affective Barriers, statistically, showed the most significant of the five anxiety factors.

Affective Barriers are related to self-efficacy and the perceptions of inadequacy in using library resources. Personal inhibitions, absence of previous library experience, and lack of self-confidence may play a role in a student's affective barriers. Affective barriers may be linked to students' belief that they lack the skills to complete a research assignment using library resources. Affective anxiety can hurt student learning and significantly affect a student's academic career. Some causes of affective anxiety can be students' feelings of being lost in the library, not knowing where to find things or feeling small in a large building. The anxiety may stem from the student feeling unprepared.

Discussion of the Conclusion Relative to the Literature

A conclusion that can be drawn from this study is that library anxiety can be minimized.

However, because this study used a small sample, it is not appropriate to generalize the extent or suggest that the interactive applications used in this study would work for every student. The anxiety factors that have shown the most results in previous research are Affective Barriers and Barriers with Staff. Jiao and Onwuegbuzie's (1999 and 2000) studies focused on Affective Barriers. They found that students with the lowest self-perception tended to have the highest level of library anxiety. Their studies revealed that students with the lowest level of self-perception associated with perceived scholastic competence and intellectual ability tended to have the highest level of library anxiety related to Affective Barriers and comfort with the library. Van Scoyoc's (2003) study focused on Staff Barriers. She found that first-year students who took part in instruction with librarians reduced their affective feelings of library anxiety. Van Scoyoc used computer-aided and librarian-led instruction and found that students did better when they established familiarity with the librarian.

Her research suggested that technology alone did not reduce library anxiety. Other researchers agree that contact with a librarian is a way to reduce library anxiety. Carlile (2007) noted that interacting with a librarian and participating in a library tour reduced students' feelings of library anxiety. Cleveland (2004); and Guardian (2021); suggested that the demeanor of library staff could play a part in reducing library anxiety. Librarians should be friendly and approachable, empathetic and accommodating.

New research is just beginning to look at totally online library services and how it relates to library anxiety. Sledge's (2020) study focused on anxiety within a virtual library. A virtual library is an academic library of online resources, services, literary media collections, and instructions for using the resources. This study resembles the technology used in Reducing

Library Anxiety in First Year College Students. Sledge used qualitative data to develop themes associated with library anxiety in virtual spaces. Because of the emerging themes, Sledge created a virtual library anxiety as a concept-specific anxiety associated with using an online library to access virtual library resources. His research suggested that additional studies were needed that looked at online applications used by libraries and their relationship to library anxiety.

Limitations of the Study

When examining the results of this study, several limitations should be noted and considered. This study was conducted during the summer after the university had experienced several shutdowns due to the Covid-19 pandemic. Many students were getting accustomed to being back on campus. The researcher obtained a list of first-year students from the Institutional Research Department.

This list was used to select the population, 100 students. A pre-test survey was emailed twice to the first 100, once as the original email and then as a reminder. None of the first 100 students responded. Therefore, the researcher chose the second set of 100 students' emails from the list. These students received the pre-test twice before receiving a pre and post-test combined survey. Of this group, 30 responded, with 24 completing the pre-test and only 19 completing both. As such, the study sample was small, and recruiting students to complete both parts of the survey within the set time frame was challenging. Future researchers should note the timing of the surveys that use new students as the target population.

Some students may have yet to learn they had a university email and thus did not access the survey. According to the Qualtrics Survey analytics, over 100 never read the email. Perhaps emails should be one of many means of communication with potential students in the future.

This limitation may have affected the results of the study. The study used quantitative methods for data analysis, which did not allow for collecting rich details about the student's experience. As a pilot study, that was not a goal, but it might be something to explore as limitations to future studies.

Future Research and Recommendations

A qualitative study would provide richer meaning and insights not explored in the current study. Quantitative research was used in this study to provide calculations as a pilot study. However, in its exploration of thought processes, values, and lived experiences, qualitative research might make for a deeper understanding of the subtleties of user interaction with library services and collections (Cook et al., 2011). Some ideas for future studies using the qualitative design include changing the sample collection to only first-generation students. As mentioned, many first-year students at an HBCU are also first-generation.

Few studies focus on that category of students, especially concerning library service. A cursory look into the literature revealed one study by Graf (2019), that graduation and retention rates were lower for first-generation students than for other students and that anxieties with the adjustment to college life were higher for those students. It would be an interesting study to examine this population of students and their anxiety levels in the library.

Another recommendation for a future study would be to do a follow-up study on the students used in the current study to see how they fared after the initial exposure to the library resources. There could be a retest at the end of their semester, academic year or even when they become seniors.

The LAS survey was used for this study. However, it would be good to develop a more applicable survey for future studies that includes online or virtual applications. The LAS is a reliable and valid instrument explicitly designed to identify anxiety among physical library users (Bostick, 1992). A future study could focus on the differences in anxiety in a physical library versus an online library. As was noticed during the Covid pandemic, there is a difference between a physical presence in a library and using online library resources and a reliable tool is needed to explore and analyze how these differences affect anxiety.

Discussion and Conclusions

Library anxiety can severely impact college students' ability to complete their assignments. Students' uncomfortable feelings about the library can lead to cognitive, physiological, and behavioral problems that interfere with their abilities to accomplish library tasks. Many libraries have student departments within the building, financial aid, writing centers, tutoring, and technology centers which may be located on various floors along with books and other physical library items. Thus, the physical environment of a library can contribute to anxiety. The complexity of today's information retrieval systems dictates an increasing need for students to rely on the expertise of librarians. However, the appearance and demeanor of a librarian can also cause library anxiety in some students.

There are various reasons why a student may feel uncomfortable approaching librarians with questions. Some theorize that students perceive the librarian as an institution instead of an individual. Thus, they approach communication with the norms they would for approaching an institution. For example, a student who expects the librarian to be friendly and helpful may

approach the librarian differently than a student who expects the librarian to be there only to help if they need help finding the information.

In the library and information science field, library anxiety remains a significant concern and is the basis for research studies for administrators and librarians. Library professionals aim to reduce or eliminate conditions that impact access to information. Library anxiety can affect decision-making in locating, identifying appropriate data and using relevant information. These are the three stages in the information-seeking process. Libraries are information resources, especially for college students. As such, it is helpful to examine students' perceptions of libraries and provide ways to reduce barriers that may hinder their academic performance.

Based on the research focus, the following question was formulated: What are the determinants for reducing library anxiety in first-year college students' information-seeking behavior? Related questions are as follows: (1) Can interactive applications included as part of the information retrieval process decrease library anxiety? (2) Can familiarity with the library decrease library anxiety? This study generalized and described the factors of library anxiety as perceived by first-year college students. Through descriptive and inferential statistics, this study suggests that interactive applications may reduce library anxiety when embedded in the information-seeking process. Using the Paired Samples T-test, the data showed for at least one of the factors that there was a significant difference after the interactive application was added. The Affective factor of library anxiety, which includes perceptions of inadequacy using library resources, showed a significant difference in the inferential statistics.

Based on the overall pre-test survey responses, the data showed that all factors contributed to library anxiety, with Staff Barriers receiving the lowest ranking. However,

additional research might yield more definitive results because this study was a pilot and the sample size were small. Libraries are primary information resources for college students. As such, there is a need to examine students' perceptions of libraries and provide ways to reduce barriers that may hinder their academic performance. Anxiety is a barrier that library professionals need to continue to investigate as students, technology, society, and information change. Libraries will only remain relevant and places for discovery and free expression if they continue to be adaptable information resources. Barak Obama stated at the 2005 American Library Association Conference: "More than a building that houses books and data, libraries represent a window to a larger world, the place where we have always come to discover big ideas and profound concepts that help move the American story forward and the human story forward" (p. 48).

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APPENDIX A: LIBRARY ANXIETY SCALE SURVEY

Library Anxiety Scale

Sharon L. Bostick, Ph.D

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A=Strongly Disagree B=Disagree C=Undecided D=Agree E=Strongly Agree
--

1. I'm embarrassed that I don't know how to use the library.
2. A lot of the university is confusing to me.
3. The librarians are unapproachable.
4. The reference librarians are unhelpful.
5. The librarians don't have time to help me because they're always on the telephone.
6. I can't get help in the library at the times I need it.
7. Library clerks don't have time to help me.
8. The reference librarians don't have time to help me because they're always busy doing something else.
9. I am unsure about how to begin my research.
10. I get confused trying to find my way around the library.
11. I don't know what to do next when the book I need is not on the shelf
12. The reference librarians are not approachable.
13. I enjoy learning new things about the library.
14. If I can't find a book on the shelf the library staff will help me.
15. There is often no one available in the library to help me.
16. I feel comfortable using the library.
17. I feel like I'm bothering the reference librarian if I ask a question.
18. I feel safe in the library.
19. I feel comfortable in the library.
20. The reference librarians are unfriendly.
21. I can always ask a librarian if I don't know how to work a piece of equipment in the library.

22. The library is a comfortable place to study.
23. The library never has the materials I need.
24. I can never find things in the library.
25. There is too much crime in the library.
26. The people who work at the circulation desk are helpful.
27. The library staff doesn't care about students.
28. The library is an important part of my school.
29. I
 `n```` want to learn to do my own research.
30. The copy machines are usually out of order.
31. I don't understand the library's overdue fines.
32. Good instructions for using the library's computers are available.
33. Librarians don't have time to help me.
34. The library's rules are too restrictive.
35. I don't feel physically safe in the library.
36. The computer printers are often out of paper.
37. The directions for using the computers are not clear.
38. I don't know what resources are available in the library.
39. The library staff doesn't listen to students.
40. The change machines are usually out of order.
41. The library is a safe place
42. The library won't let me check out as many items as I need.
43. I can't find enough space in the library to study.

On Thu, Mar 21, 2019 at 11:40 AM Sharon Bostick <sbostick@iit.edu> wrote:

Sharon L. Bostick, Ph.D.
Dean of Libraries
Galvin Library
Driving Innovation through Knowledge and Scholarship

Illinois Institute of Technology
35 West 33rd Street
Chicago IL 60616-3793

sbostick@iit.edu

library.iit.edu

312-567-3293

Dear Elizabeth,

Thank you for your interest in the Library Anxiety Scale. You have my permission to use it for your research and I am attaching a copy of it. Please note that any changes to the instrument must be cleared by me, as it is copyrighted and statistically validated.

I would appreciate a copy of the results when your research is completed. And I would love to hear about your study. Please use my personal email, sharonlbostick@gmail.com.
Good luck!

Best wishes,

Sharon

APPENDIX B: IRB APPROVAL



PRAIRIE VIEW A&M UNIVERSITY

A Member of the Texas A&M University System

To: Elizabeth Brumfield, Principal Investigator

From: **Tony Maloy, MPA**, Associate Director, Export Controls
Office of Research Compliance

Date: April 7, 2022

Re: *Reducing Library Anxiety in Information Seeking Behavior of First Year College Students*

After review of your application, it has been determined the proposed activities described do not meet the definition of research with human subjects and is exempt according to federal regulations and IRB approval is not needed.

Thank you for the time and effort put into preparing and submitting your application. If you have any further questions, please call the Office of Research Compliance at (936) 261-1588.

Tony Maloy, MPA
Associate Director, Export Controls
Office of Research Compliance
Office: 936.261.1588
Email: tlmaloy@pvamu.edu

APPENDIX C: CURRICULUM VITAE

Elizabeth Brumfield

EDUCATION

Prairie View A&M University, College of Education, Prairie View, Texas

Educational Leadership PhD program

Dissertation topic: Reducing library anxiety in first year students at an HBCU

University of Pittsburgh, School of Library and Information Science (SLIS) -- Joint program with Carnegie Mellon University (CMU), Pittsburgh, PA

Completed coursework for Library and Information Science, PhD

Dissertation proposal: Library Technology at Historically Black Colleges and Universities

Certificate of Advanced Studies (36 credit hours), Library and Information Science (2009)

Master Library and Information Science-- (2002)

University of Pittsburgh, School of General Studies, Pittsburgh, PA

Bachelor—Communication w/ Minor--Legal Studies, magna cum laude (2000)

PROFESSIONAL EDUCATION

- Harvard University, College of Education, Library Leadership Institute. Cambridge, MASS (2011)
- Emory University, ECDS/HBCU Digital Scholarship Summer Institute. Atlanta, GA. (2014)
- Institutional Review Board (IRB), 101 & 201. PRIMR. San Antonio. (2015)

PROFESSIONAL LICENSES and CONTINUING EDUCATION COURSES

- Microassist.Com--Creating Accessible Documents. Certificate (2019)
- TXDLA Accessibility Design. Certificate (2019)
- Introduction to Teaching Online—CITI. Certificate (2018)
- Augmented Reality and ARCCore on Coursera. Certificate (2018)
- Creating Mobile Apps with HTML5. University of Houston. Certificate (2015 & 2018)
- Copyright for Educators & Librarians on Coursera. Certificate (2018)
- Google Developer License—Mobile applications (2018)
- Pennsylvania Department of Education. Certificate of Public Librarianship. (2002)

EXPERIENCE

Distance Services Librarian/Head NWHC Library

John B. Coleman Library, Prairie View A&M University

2006 – Present

- Provides reference service to students, faculty, and staff, demonstrating competence in evaluating complex inquiries and challenging research project requiring independent judgment and the ability to translate questions into search strategies.
- Developed the *Research & Instruction for Online Students* self-enroll course in eCourse
- Proficient in OPACs, ILS, SPSS, Qualtrics, search engines, web design and mobile apps software, developed grant funded mobile apps.
- Coordinating a virtual sign language pilot project for the library with SignAll, a Hungarian developer of deaf technology.
- Serve as Beta-Tester for database vendors: ProQuest Historical Newspapers, Credo Reference, NBC Learn, Alexander Street Press, Turnitin, and RefWorks. CHOICE 360, Publons, Scholastica, and Journal of New Librarianship.
- Served on the Southern Association of Colleges and Schools Commission on Colleges (SASCOC) Committee
- Coordinated library special events.
- Writer and editor of the Northwest Houston Center Library quarterly newsletter, F.Y.I.

Manager, Job and Career Education Center

2002 – 2006

Carnegie Library of Pittsburgh

- Responsible for writing business plans and submitting government proposals for funding, providing career education and computer training.
- Managed a rotating staff of up to 17 employees, including librarians, Career Counselors and student interns.
- Worked with federal agencies and Community Intensive Supervision programs to assist incarcerated and juvenile adjudicated students to find employment. Had a 90% satisfaction ranking among clients.

Adjunct Professor/Lecturer/Teaching Assistant

2001 – 2007

University of Pittsburgh, School of Library and Information Science

- Created online and face-to-face curriculum and instruction. Courses taught included:
 - *Diversity Awareness Resources and Services,*
 - *Cultural Diversity in Libraries and Information Systems,*
 - *Understanding Information,*
 - *Library Management,*
 - *Grant Writing for Libraries,*
 - *Marketing and Media Relations.*
- Worked as a teaching assistant prior to adjunct status under the direction of Library and Information Science faculty.

Library Assistant, Foundation Center

2000 – 2002

Carnegie Library of Pittsburgh

- Assisted nonprofit organizations, through teaching and grant research, in the acquisition of over 3 million in grant funds and sponsored programs, clients included *A Second Chance*, *Jewish Federation of Greater Pittsburgh*, *Animal Friends*, and *Dress for Success*.
- Wrote articles in the departments' newsletter *Charitable Reminders*.

**Library Assistant, Homewood Branch Library
Carnegie Library of Pittsburgh**

1990 – 2000

- Responsible for providing library service to children, teens and adults.
- Created a successful 10-year Cultural Lecture series program, partially funded by Carnegie Museum of Art Film and Video Department, which brought in renowned filmmakers and guest speakers.
- Served on the Pittsburgh Mayor, Thomas Murphy's Youth Council. Created and received funding for an annual youth essay contest, from 1995 to 1998.
- Maintained a newspaper column for the library in the *Homewood Brushton Informer*.
- Received funding from the Pittsburgh Arts Council and the Manchester Craftsmen Guild to travel to Kenya for a special project documenting the nutrition, gardening differences in African and African Americans, co-author a book from the experience, entitled, *Foods that Shake the Soul*.

**Special Events Assistant (part-time),
Carnegie Museums/Music Hall/MOA Film**

1990 --2002

- Assisted with planning, public relations and marketing of major events. Required excellent customer service hosting celebrities, performers, governmental leaders, and multiple nonprofit organizations.
- Required financial accuracy of ticket sales and budgets.

**Data Editor Supervisor, Automation & Information Technology Department
Carnegie Library of Pittsburgh**

1988 – 1990

- Responsible for managing a team of data editor, charged with the conversion of the library system (18 branches) from Dewey Decimal to Library of Congress. Completed the conversion 6 months ahead of schedule.

PUBLICATIONS

- Brumfield, E.J. (2022). Virtual Tech Tuesdays. “. ” <https://sites.google.com/view/rne-leadership-institute/ebook-beyond-virtual-and-hybrid-programs>
- Brumfield, E.J. (2022, Dec). Five Favorites Segment. BCALA Professional Development Digest
- Brumfield, E.J. (2021, July7). Censoring the teaching of critical race theory hinders our freedom. <https://www.pvamu.edu/blog/opinion-censoring-the-teaching-of-critical-race-theory-hinders-our-freedom/>
- Brumfield, E.J. (2020, July 17). During the coronavirus pandemic, reading is essential. <https://www.pvamu.edu/blog/opinion-during-the-coronavirus-pandemic-reading-is-essential/>
- Buffalo Soldiers Commemorative Program (booklet)—currently seeking application into the Library of Congress Archives
- Section 17.01.7, Administration, Oversight and Reporting of Intellectual Property. Texas A&M University, Copyright Policy Reviewed. Jan 2020
- Ordinary Man: Black Power in Overalls, published 2012, accepted by the Library of Congress , 2019

- Brumfield, E.J. *Who's the Real Dummy?* Issues in Higher Education, Aug 2018
- Brumfield, E.J. (2018). *Pre-publication Review of Connecting Faculty Candidates with the Library: Lessons Learned from the Literature and the Field*. Journal of New Librarianship. Aug 2018
- Brumfield, E.J. (2018). Taste of Freedom: Coleman Library's Juneteenth Celebration Cookbook.
- Brumfield, E.J. (2018). Pipefitters Local Union NO. 562 et al., Petitioners, v. United States in *Money in American Politics: An Encyclopedia*, ABC-CLIO Publishers, David Schultz, Editor
- Sato-Hutchinson, C. & Brumfield, E.J. (2018) Minority among Minorities: a Japanese Librarian at a HBCU. In *Asian American Librarians and Library Services: Activism, Collaborations and Strategies*. Rowman & Littlefield Publishers. Edited by J.H. Clarke; R. Pun and M. Tong.
- Brumfield, E.J. (2017). *Pre-publication Review of Empirical Study of Transformational Leadership, Quality Culture, and Performance of Top Universities in Qs Ranking*. Sage Open.
- Brumfield, E.J. (2017). *Springer eBooks*. Charleston Advisor. Choice 360; Choice reviews.
- Brumfield, E.J. (2017). *The Meaning of Michelle: 16 Writers on the Iconic First Lady and How Her Journey Inspires Our Own by Veronica Chambers (a book review)*. BCALA News: Black Caucus of the American Library Association Inc. v. 44, issue 2, Spring 2017
<http://bcala.org/Spring2017SpreadsInteractive/Spring2017SpreadsInteractive.html>
- Brumfield, E.J. (2015). *Shaking the Money Tree: Creating a Financial Literacy Program at Your Library*. Culture Keepers IX: Meet at the Gateway: Re-imagining Communities, Technologies, and Libraries: Proceedings of the 9th National Conference of African American Librarians". St. Louis, Miss. July 2015
- Brumfield, E.J, Barksdale-Hall, R. & Mitchell, A.B. (2015). *Getting Family Stories Published and Broadcast: An Overview*. Journal of the Afro-American Historical and Genealogical Society/Conference Proceedings.
- Brumfield, E.J. (2012). *An Ordinary Man: Black Power in Overalls*. Blurb Publishers. Houston, TX
- Brumfield, E.J. (2010). *Applying the Critical Theory of Library Technology to Distance Library Services*. Journal of Library and Information Service for Distance Learning. v. 4, no. 1&2, p 1-9
- Brumfield, E.J. (2008). *Library Outreach to Juvenile Offenders in Intensive Supervision Probation Programs (Community Centered House Arrest)*. ERIC (Education Resource Information Center).
- Brumfield, E.J. (2008). *Using Online Tutorials to Reduce Uncertainty in Information Seeking Behavior*. Journal of Library Administration and Management, v.48 no. 3&4 (Fall 2008)
- Brumfield, E.J. (2008). *Using Online Tutorials to Reduce Uncertainty in Information Seeking Behavior*. 13th Campus Library Services Conference Proceedings. S.M. Mathson & J.A. Garrison (Ed). Mount Pleasant, Central Michigan Pub. pp. 81-90
- Spink, A., Brumfield, J., Park, M., Alvarado-Albertorio, F., Narayan, B. (2007). *Multitasking information behavior in public libraries: A survey study*. Journal of Librarianship and Information Science, v. 39, no. 3
- Brumfield, E.J. (2006). *The Public Library: Meeting the Needs of a Diverse Workforce*. Multicultural review.
- Brumfield, E.J. (2006). *Distance in Distance Education*. Multicultural Review. v.14, n.1
- Brumfield, E.J. (2006). *Mastering the pre-employment tests*. E-Resource Magazine. v.7 (5)
- Spink, A., Brumfield, J., Park, M., Alvarado-Albertorio, F., Narayan, B. (2005). *Multitasking Information Behavior*. Journal of the American Society for Information Technology.
- Brumfield, E. J. (2001). *Librarians as Communication Specialist*. Bibliofile.
- Graham, L. & I. Parker, E.J. Brumfield. (1997). *Foods That Shake the Soul*. Three Rivers Garden Project, PA

PRESENTATIONS

- Virtual Tech Tuesdays(June 2022). Introducing Beyond Virtual and Hybrid Programs: How Libraries Recreated a Community During the COVID-19 Pandemic.
https://www.reforma.org/ev_calendar_day.asp?date=12%2F2%2F22&eventid=83
- Games and Gamification in Libraries (June 16, 2022). Digital Library Federation Twitter Chat.

https://wiki.diglib.org/2022.06.16_Digital_Library_Pedagogy_Twitter_Chat

- Kaleidoscope Project (April 2022). Association of Research Libraries Conference. Toronto, Canada. <https://www.arl.org/category/our-priorities/diversity-equity-inclusion/kaleidoscope-program/>
- Virtual Sign Language at Prairie View A&M University (June 2-3, 2021) HBCU Library Alliance 9th Membership Meeting: So You Know Who We Are: HBCU Libraries In Full View . <http://efaidnbmnnnibpcajpcglclefindmkaj/http://hbculibraries.org/docs/HBCU-2021-Program.pdf>
- Assistive Technology Library Project. (Dec 2021). PVAMU Faculty Friday
- Celebrating the Rhythms of Toni Morrison's Life through Music, Dance and Spoken Word. Feb 18, 2022. <https://www.youtube.com/watch?v=BpULEPGDLtg>
- American Library Association, EDI Assembly. (June 2021). Equity, Diversity & Inclusion. <https://2022.alaannual.org/programming/poster-sessions>, <https://www.eventscribe.net/2022/alaannual/searchbyposterbucket.asp?f=PosterTrack&pfp=PosterTopic>
- ACRL Distance and Online Services Workshop on Accessibility (167 attendance-virtual plus 143 views on YouTube) <https://www.youtube.com/watch?v=Z8v-htl3YvE>
- PVAMU Research and Innovation Workshops (2021) Gamification in Research.
- From Slave Plantation to Research Institution: Using Augmented Reality for Engagement and Discussion, IFLA, Greece. Aug 2019
- Faculty Friday (May 9, 2019)—“Are We There Yet—Accessibility and Libraries”
- College of Business –YPBLS Entrepreneurship Program—Mobile App Development
- *IRB and Librarians*. ALA African American Librarians Association Luncheon. June 22, 2019
- *Slave Plantation to Research Institution: Preserving our History with AR*. ALA, New Orleans, June, 2018
- *Implications of Augmented Reality and Information Seeking Behavior in Libraries*. Distance Library Services Conference, San Antonio, April 11-13, 2018
- *Creating Mobile Apps*, College of Business-Teen Entrepreneur Program, Apr 26-27, 2018
- *Changing Perspectives through Exchange*. IFLA Conference, Wroclaw, Poland
- *Creative Library Workshops*. HBCU Faculty Development Conference. Washington, D.C., Oct 16, 2016
- *Portfolio of a Librarian*. Routledge Distance Learning Librarianship Luncheon. ALA Annual. Orlando, FLA., June 2016
- *Mobile Apps, Using, Creating*. National Conference of African American Librarians (NCAAL), St. Louis, Mo, Aug 2015
- *Shaking the Money Tree: Financial Literacy at Your Library*. NCAAL, St. Louis, Mo., Aug, 2015.
- *In Motion: Providing Faculty Support* (webinar). HBCU Library Alliance Conference, Atlanta, GA., 2015
- *Art in Communication of Libraries*. SUNYLA Conference. Purchase College, NY. June 2015
- *Mobile Apps for Non-Programmers*. SUNYLA Conference. Purchase College, NY. June 2015
- *Highlights & Takeaways—Emory/HBCU Library Alliance Summer Institute*. Webinar, March 5, 2015
- *Mobile Apps for Non-Programmers*. Center for Teaching Excellence. April 2015
- *Assessing Library Support for Faculty Research*. TAMU Assessment Conference. Feb. 2015
- *Revolutionizing Library Browsing Mobile Applications and Augmented Reality*. IFLA. Lyon, France, 2014
- *Using Augmented Reality in Information Retrieval*. Learning Times/The Handheld Librarian, Feb 2014
- *Library Mobile Solutions*. HBCU Faculty Development Conference. New Orleans, Sept. 2013
- *Getting Family Stories Published and Broadcast*. 34th National Conference of the Afro-American Historical and Genealogical Society, Nashville, Tennessee, Sept 7-11, 2013
- *Games and Information Literacy*. Poster session. IFLA, Suntec City, Singapore, Aug 15-21, 2013.
- *Games vs Tutorial for Online Teaching*. HBCU Faculty Development Conference, Orlando, FLA, Oct 2012
- *Cultivating a Culture of Philanthropy*, ALA, Dallas, TX, June 2012
- *Plagiarism and Copyright Infringement*. PVAMU Conference, Aug 2011
- *Financial Literacy @ Your Library*. Diversity and Outreach Fair. ALA, New Orleans, LA, June, 2011
- *Grant Writing for Nursing*. Medical Academy, Houston, TX, Oct, 2010

- *From Dewey Decimal to Virtual Reality Libraries*. HBCU FDN, Oct, 2010
- *The Library as a Progressive Agent of Technology*. Distance Learning Conference, Atlanta, GA, Sept, 2010
- *HBCU Libraries and Technology, an Exploratory Study*. NCAAL, Birmingham, AL, Aug, 2010
- *Exploratory Study of HBCU Library Technology*. NAASA, Baton Rouge, Louisiana. Feb, 2010
- *Technology and the HBCU Librarian*. HBCU FDN Symposium, Atlanta, GA, Oct, 2009
- *Culture & the Online Environment: Perceptions of Time and Distance*. NAME, LA. March, 2009
- *Internet Technologies and the HBCU Librarian*. HBCU FDN, Washington, D.C. Oct, 2008
- *Using Online Tutorials to Reduce Uncertainty in Information Seeking Behavior*. Off Campus Library Services Conference. Salt Lake City, Utah, April, 2008
- *Using Library E-resources to Enhance Student Learning*. TAMU, College Station, TX, Feb, 2008
- *Distance education and culture*. NAASA. Baton Rouge, LA, Feb, 2007.
- *Cultural Implications and Distance Education*. Pennsylvania Library Association Conference, Pittsburgh, PA. (2003)

GRANTS AND AWARDS (LAST 10 YEARS)

- 2019—Qatar Harvey Fund--Fellowship
- 2018—Digital Library Federation Fellowship-HBCU Library Alliance/IMLS grant
- 2017--Telemedicine Grant, NSF, Paul Johnson, College of Agricultural, Principal Investigator
- 2017—Digital Library Federation Fellowship-HBCU Library Alliance/IMLS grant
- 2017—BCALA Distinguished Service to the Library Profession award
- 2017—Conference Fellowship Award, ALA—IFLA-Poland Conference--Travel Grant
- 2016—Conference Fellowship Award, American Library Association/IMLS—Columbus, Ohio
- 2016—Routledge Distance Learning Librarianship Conference Sponsorship Award
- 2014—Library Mobile Solutions Pt 2--Texas State Libraries and Archives Commission, IMLS
- 2014—Emory University, ECDS/HBCU Digital Scholarship Institute Award
- 2013—Library Mobile Solutions--Texas State Libraries and Archives Commission, IMLS
- 2011—Library Leadership Institute Scholarship Award, Harvard University School of Education,

PROFESSIONAL AFFILIATIONS (BOARD REPRESENTATIONS)

- Chair-Office of Diversity, Literacy, Outreach and Inclusion Advisory Committee, American Library Association (2020-2021)
- Serve on the Executive Board of the Black Caucus of the American Library Association (2016-2020)
- Serve as Member-At-Large for the American Library Association, Office for Diversity, Literacy and Outreach Services (2018-2020)
- Served on the American Library Association Diversity Research Grants Advisory Committee (2019)

APPENDIX D: INFORMED CONSENT



You are invited to participate in a research study, and survey questionnaire, that explores the use of interactive technology to reduce library anxiety in the information seeking behavior of first year college students. You were selected as a possible participant because you have been identified as a first year student and over 18 years old.

Title of Study: Reducing Library Anxiety in Information Seeking Behavior of First Year College Students

This study is being conducted by: Principal investigator, Elizabeth Jean Brumfield, doctoral candidate in the Prairie View A&M University, Educational Leadership program.

Background Information: The purpose of this study is to survey a student's perceptions about libraries and then determine if students feel differently after they have used interactive websites and applications that are designed to help them feel more comfortable with the library.

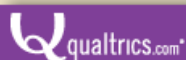
If you agree to participate in this study, we will ask you to complete a 2 part survey about using a library. You may answer as many or few questions as you wish. The second part of the survey asks you to re-evaluate 7 of the questions from the survey while using the interactive links. To see if the interactive links assisted in your perception of libraries, you will be asked to retake the survey in about a week.

This project has been reviewed by PVAMU Institutional Review Board for the Protection of Human Subjects. Phone 936-261-1553. Office of Research & Innovation.

Please respond below if you wish to participate in the study.

- ☐ I wish to participate in the study and complete the survey
- ☐ I do not wish to participate in the study and will not complete the survey
- ☐ I would like more information about the study

Survey Powered By [Qualtrics](#)



The following survey questions will include interactive links. Please use the interactive links to answer your survey questions.
You must Bookmark the interactive survey page to prevent going to the first page of the survey each time. You will see the Bookmark at the top of the Survey page.



I am unsure about how to begin my research

(Watch Library Orientation video <https://www.youtube.com/watch?v=DplN2DRhz4Y>)

- ☐ Strongly disagree
- ☐ Disagree
- ☐ Undecided
- ☐ Agree
- ☐ Strongly agree

I get confused about how to find my way around the library

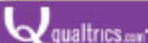
(View video <https://www.thinglink.com/card/1521583939347546115>)

- ☐ Strongly disagree
- ☐ Disagree
- ☐ Undecided
- ☐ Agree
- ☐ Strongly agree

I don't know what to do next when the book I need is not on the shelf

(Request books from Interlibrary Loan <https://www.pvamu.edu/library/departments/circulation-dept/interlibrary-loan/>)

- ☐ Strongly disagree
- ☐ Disagree
- ☐ Undecided
- ☐ Agree
- ☐ Strongly agree

 qualtrics.com

A lot of the university is confusing to me

(Take tour <https://www.youvisit.com/tour/59950?fromSearch=1&wph=1&skipPrompt=1&fromSearch=1>)

☐ Strongly disagree

☐ Disagree

☐ Undecided

☐ Agree

☐ Strongly agree

The librarians are unapproachable

(Find contact information for your librarian <https://pvamu.libguides.com/c.php?g=910877&p=6560923>)

☐ Strongly disagree

☐ Disagree

☐ Undecided

☐ Agree

☐ Strongly agree

I can't get help in the library at the times I need it.

Ask questions any time--Ask-a-Librarian Link <https://pvamu.libguides.com/c.php?g=908034&p=7167691>

☐ Strongly disagree

☐ Disagree

☐ Undecided

☐ Agree

☐ Strongly agree

Good instructions for using the library's computers are available

Find information on printers/laptops, etc <https://www.pvamu.edu/library/laptops-print-scan-copy/>

☐ Strongly disagree

☐ Disagree

☐ Undecided

☐ Agree

☐ Strongly agree

