2022

Experiences of Adult College Learners as They Acquire Digital Literacy Skills

Albani L. Milton-Smith
Walden University

Walden University

College of Education

This is to certify that the doctoral dissertation by

Albani Smith

has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
the review committee have been made.

Review Committee
Dr. Patricia McGee, Committee Chairperson, Education Faculty
Dr. Christopher Rasmussen, Committee Member, Education Faculty
Dr. Paul Englesberg, University Reviewer, Education Faculty

Chief Academic Officer and Provost
Sue Subocz, Ph.D.

Walden University
2022

Abstract

Experiences of Adult College Learners as They Acquire Digital Literacy Skills

by

Albani L. Milton-Smith

M.Ed., University of Central Oklahoma, 2009

BS, University of Central Oklahoma, 2006

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Educational Technology

Walden University

August 2022

Abstract

A substantial barrier to learning for adult college students over the age of 50 is technology literacy. These students may not have the digital skills required for college, which is a disadvantage for social, educational, and career development. The purpose of this basic qualitative study was to explore the learning supports and types of learning required for digital literacy development of undergraduate college students over 50 attending 4-year institutions. Data sources included interviews with 12 participants over the ages of 50 from six 4-year colleges. After the interviews were completed, six of the 12 students participated in two focus group sessions of three students each. Data analysis involved open coding to identify themes. Results indicated the primary need for support was the learning management system due to participants' inexperience using technology for learning. Skill levels did not match the expectations of college administrators for students to rely on technology for every aspect of learning. When students had learning management system support, they could use the system to learn. Rather than rely on institutional services introduced during coursework, students took ownership of their learning through support from family, peers, and social media resources. Results may help higher education institutions provide better support for these learners to promote positive social change through equitable opportunities for all generations of college students.

Experiences of Adult College Learners as They Acquire Digital Literacy Skills

by

Albani L. Milton-Smith

M.Ed., University of Central Oklahoma, 2009

BS, University of Central Oklahoma, 2006

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Educational Technology

Walden University

August 2022

Table of Contents

List of Tables

Chapter 1: Introduction to the Study

One consistently reported skill essential for college students is digital competency, also known as digital literacy (Alexander et al., 2016; Gilster, 1997; Ray, 2018; Tyner, 2014). Digital literacy includes general capabilities individuals have for living, learning, and working in a digital society while recognizing the changing nature of digital technology and the developing potentials individuals may perceive as digital citizens (Meyers et al., 2013; Ray, 2018). Because higher education institutions (HEIs) deliver information, resources, and online learning tools, students must have the requisite skills to enroll and register for courses and complete much of their coursework online (Borokhovski et al., 2016; Miranda et al., 2018; Reddy et al., 2020). HEIs have both a need and an obligation to aid students in becoming technologically literate. Gilster (1997) introduced the concept of digital literacy in the late 1990s and defined it in academic terms, understanding the groundbreaking impact of the internet on people's lives. Gilster described the digitally literate individual as having specific skills including assembling knowledge, evaluating information, searching the internet, and navigating hypertext.

HEIs have assumed that college students are digitally competent. For example, Martins et al. (2019) stated that because traditional college students—those under the age of 25—have developed digital skills throughout their lives, college administrators have presumed that all incoming college students are technologically ready for the demands of higher education and do not need digital literacy support or training. However, this may not be the case for the fastest growing population of college students, those learners

known as “plus 50” or college students over the age of 50 years (Barr, 2016; Tsai et al., 2017).

In this study, I explored the experiences of college students over 50 years of age as they sought to acquire digital literacy skills within their college environments. The social implications of this study are significant because the digitally informed citizen should be an effective and attentive observer with the ability to assess digital resources and activities that add value and identify disadvantages (Meyers et al., 2013; X. Wang et al., 2021). Furthermore, this mindfulness of interrelated possibilities, socially and other informal means, engenders a responsibility for keeping connections, a critical factor in being digitally literate in the 21st century (Kvavik, 2005; Newman et al., 2018). Chapter 1 includes the background of the study, problem statement, purpose of the study, research questions, theoretical frameworks, nature of the study, definitions, assumptions, scope and delimitations, limitations, and significance.

Background

Colleges and universities try to retain students. Doing so is vital to an institution’s reputation, funding, and viability (Pavlov & Katsamakas, 2020). However, attracting and retaining older college students has been challenging for many universities (Twigg-Flesner, 2018). For example, when students experience difficulties with technology, which occurs most often within the demographic of over-50-years-of-age students, they may be more likely to withdraw from a program of study or earn low grades (Darney & Larwin, 2018). In addition, the independent nature of online enrollment, online coursework, and online management of coursework-related activities, as well as the stress

associated with rigorous academic programs, can provide challenges for students over 50 as they try to form bonds with peers and faculty. Older students may also feel demeaned due to their technological knowledge deficits (MacDonald, 2018). Technology can overwhelm older students, especially if technology is not used in their personal and daily lives. Furthermore, these students' needs may not be apparent to administrators who can and should be supporting them.

Digital literacy requires that individuals understand and work with digital data within different structures using the internet to gain knowledge and improve skills (Betts et al., 2019; Schreurs et al., 2017). However, there is evidence that older college students have low confidence in their technological abilities (Henson, 2015; Sultan & Kanwal, 2017). Betts et al. (2019) discovered that older adults favored personalized learning on a one-to-one basis for learning technology. Results also indicated that some older adults found group sessions a barrier to engaging with digital technology. Without these technical capabilities, older learners may not fully access or participate in technologically driven higher education environments compared to their younger peers (Darney & Larwin, 2018).

Adult students have become a prominent presence in colleges during recent decades and prefer specific ways of learning. These adults' effective learning strategies include inquiry-based learning, active learning, and self-initiated ways to persevere and persist in college success (Hennessy et al., 2021). An operational social environment of inquiry is beneficial for older adults learning technology (Antonucci et al., 2017; Chopik, 2016). Institutions may have underestimated the abilities and needs of the older learner.

Schreurs et al. (2017) found that older adults recognize differences in their knowledge of technology compared to younger generations. These researchers discovered that involvement and experience with technology are vital for older students. Such connection and immersion aid in reducing the stress and anxiety of technology used for these students and reinforce the potential relevance of technology, which promotes self-determination and self-efficacy related to technology.

Not all research confirmed Prensky's (2001a, 2001b) digital divide between digital natives (using technology in childhood) and digital immigrants (adopting technology in adulthood). Friemel (2016), agreeing with Schreurs et al. (2017), argued that the digital divide between the digital natives and the immigrants does not include over-50 college students because it does not differentiate among those who are 50–59 years, those who are 60–69 years, and those who are over 70. Friemel found that the likelihood of internet use decreases by 8% with each added year of age. Adults 50 years and older may experience inequalities in technology abilities compared to younger people, suggesting that Prensky's notion of a digital divide persists.

When students lack social connections with faculty and peers, they risk withdrawing from their studies. Antonucci et al. (2017) showed that links with and through technology are essential for forming relationships within social settings; older students may be the most at risk for failing at this endeavor (Vaportzis et al., 2017). Through technology, new methods to maintain social relations within families and other societal layers, including academia, represent a basis for developing a sense of community. Technological developments expand communication options for older adults

with mobility limitations (Antonucci et al., 2017). Older students' involvement with technology in higher education may reflect how they learn about technology outside of education and the support needed to become proficient and confident with technological devices (Leu et al., 2017).

Older college students tend to acquire technological skills differently than younger students who have used technology throughout their K–20 education. Tsai et al. (2017) examined how older adults learned to use a specific technology such as an iPad. These researchers found that the ability to use software or operate a digital device included an assortment of cognitive, motor, sociological, and emotional skills, which adult learners needed to develop to function in digital environments. These researchers also concluded that both the senior technology acceptance and adoption model (see Renaud & Van Biljon, 2008) and the social cognitive theory (see Bandura, 1977, 1994) provided insight into older adults' technology learning processes.

Active learning focuses on developing learners' skills rather than merely transmitting information (Lipphardt et al., 2017). Lipphardt et al. discovered that older adults desired experiential techniques for learning technologies with a hands-on approach in which they manipulated equipment or other materials. Older adults can learn within a social context and through experimentation that college faculty may not offer in a typical course.

There is evidence that students over 50 value digital access for social connections. They use the internet to maintain friendships and hold casual day-to-day conversations using digital tools (Bixter et al., 2019) such as email and Skype (Quan-Haase et al.,

2017). However, supplementing those accessible digital abilities, rather than forming new ones outside older students' existing competencies, may be transferred to the technology used in college. Quan-Haase et al. (2017) argued that for these students to learn how to become skilled at certain technologies, they require a form of social support, thereby strengthening relationships among student peers young and old. There was a gap in the literature concerning personal perspectives of college students over the age of 50 regarding acquiring technology skills (see Aikens-Alston, 2016). In this study, I identified supports and types of learning that over-50 college students who attended campus-based and online 4-year institutions required for their digital literacy development to keep pace with developments within their learning environments.

Problem Statement

Even though college students over 50 years of age may have made some recent gains in technology use (Darney & Larwin, 2018), this population group is the least expected to gain momentum with ongoing technological shifts and advancements (Tsai et al., 2017; Vassilakopoulo & Hustad, 2021). A substantial barrier to older adult learners using the internet has been a wide-ranging lack of digital literacy (Blažič et al., 2020; Jacobson et al., 2017). College students over 50 years of age may not have the digital skills or habits to use the technologies (Neves et al., 2018) required of them while in college, thereby creating a disadvantage within their social, educational, and career development (Jacobson et al., 2017). In addition, although there was some evidence that students over 50 have a range of technical abilities (Friemel, 2016; Tsai et al., 2017), there was a gap in the research regarding the needs of these learners, how they learn

digital skills, and how best to support them in acquiring these skills (see Jacobson et al., 2017; Schreurs et al., 2017).

For college students over the age of 50 born before their younger peers who are digital natives (Prensky, 2001a, 2001b; Ray, 2018), learning new technologies and computer skills is a requirement to be successful in the digital classroom (Schreurs et al., 2017). Prensky (2001a, 2001b) described digital natives as individuals who have used digital technologies since birth and who have an advantage over *digital immigrants*, defined as those introduced to digital technologies in adulthood who have had to learn about and how to use digital tools in their adult years (Ray, 2018). Digitally literate people use technological developments to enhance their educations, social lives, and careers (Y. Wang et al., 2015); however, digital immigrants may be disadvantaged with technologies that support learning.

College students over 50 years of age are at a greater risk than their younger colleagues for not overcoming academic ordeals and dilemmas (Zhou & Salvendy, 2017). Over-50 college students have reported experiencing difficulties. They struggle with managing their online student accounts, paying their tuition bills, being confident about proper research via the online library, and many other challenges related to being technologically aware (Montalto et al., 2019). This population may be technologically illiterate (Barr, 2016). College is a stressful and challenging environment, and when older students feel daunted or intimidated by digital tools, they may experience reduced academic effort and effectiveness.

Purpose of the Study

The purpose of this basic qualitative study was to explore and better understand the supports and types of learning required for digital literacy development for students over 50 years of age who attended 4-year institutions. For this study, supports were institutional or noninstitutional services or human interactions that improve an individual's digital literacy and comfort level using technology. Types of learning were based on Mezirow's (2009) theory of transformative learning using (a) instrumental learning, which is technical and involves problem-solving, and (b) communicative learning, which is observational and interpretive and involves self-reflection. The digital literacy (Gilster, 1997; Ray, 2018) tenets of comprehension, interdependence, social factors, and duration provided a lens to examine over-50 college students' use of and facility with technology and learning.

Research Questions

RQ1: How do college students over 50 years of age describe their learning as they develop digital literacy skills?

RQ2: What types of support do college students over 50 years of age report most helpful in developing digital literacy?

Conceptual Framework

The conceptual framework for this study included two models: digital literacy and Mezirow's (2009) transformative learning model. I used each framework to understand better how students over the age of 50 acquire digital literacy and what best supports their skill acquisition. The rapid development of digital technologies in the 21st century

requires older individuals to use various cognitive skills to perform and solve different digital environments. For this study, I referred to skills such as digital literacy, which is a mindset enabling users to act in digital environments intuitively and to access a wide range of knowledge embedded in these environments (see Gilster, 1997; Inoue et al., 1997; Lanham, 1995; Pool, 1997; Ray, 2018; Tapscott, 2009).

Digital literacy consists of four tenets: comprehension, interdependence, social factors, and duration (Gilster, 1997; Osterman, 2012; Ray, 2018). For this study, I used two of the four tenets. First, I used the tenet of interdependence to explain the help needed by over-50 college students to succeed academically. Interdependence is how one media form connects with another. Individuals do not create digital materials in isolation or with the intent that no one will see them; therefore, publishing to multiple platforms is easier to accomplish (Perez, 2018; Rashidian et al., 2018). Owing to the profusion of digital material, such media forms not only coexist but also supplement one another and require digital literacy (Becker, 2018). Over-50 college students may not have experience with technology interdependence, which is inherent to learning through current technologies. Second, interdependence is a tension between individuals' yearning for independence and their desiring support from others (Orehek & Kruglanski, 2018). Humans crave personal autonomy, but they also yearn for a connection to others that may constrain a certain amount of individual freedom (Orehek & Kruglanski, 2018). Interdependence in education for over-50 college students may create a collaborative learning environment in which individuals work toward shared goals.

Social factors were the second tenet of digital literacy used to inform this study. Social factors indicate why an individual may need specific support and which social conditions contribute to improved digital literacy (Gilster, 1997; Ray, 2018). The key to the learning process for college students over 50 "is support from environmental factors, which can include the support of family, friends, or those important to the individual's life" (Tsai et al., 2017, p. 34). In addition, social factors may impact an individual's acceptance of or adoption of digital tools and encouragement to access the internet. These factors are relevant to older students because they may not be digitally literate and may require considerable technical and social support (Meyers et al., 2013).

The second theory that constituted the conceptual framework for this study was transformative learning conceived by Mezirow (2009). Mezirow (1997) emphasized how adult learners understand and translate their experiences, which is vital to making sense of the learning process. Transformative learning involves two kinds of learning: (a) instrumental learning, which focuses on learning through task-oriented problem solving, and (b) communicative learning, which involves how individuals communicate their feelings and desires (Howie & Bagnall, 2013; Mezirow, 2009). In the current study, I explored what college students over 50 reported regarding developing digital literacy acquisition using these types of learning to become digitally proficient. Transformative learning is essential for over-50 college students, particularly those returning to college to further their career opportunities (Hoggan, 2016). For Mezirow (2009), the desired transformation outcome is an individual's development of autonomy through a greater sense of self-sufficiency and independence. In addition, some over-50 college students

are facing, possibly for the first time, a technological universe with which they are unacquainted, generating what Mezirow (1997) referred to as a change in an individual's frame of reference, thereby triggering new learning to occur. Combined, these two theories provided insight into the processes used by over-50 college students and the supports that aid them. I provide a more detailed explanation and analysis of digital literacy and transformative learning in Chapter 2.

Nature of the Study

This basic qualitative study was conducted to better understand older students' acquisition of digital literacy skills and potential supports received or needed, and types of learning that best serve older students' needs in developing digital literacy skills. Merriam and Tisdell (2016) asserted that qualitative methodology aids the researcher in gathering evidence. The investigator scrutinizes the experiences of study participants, providing an understanding of each person's distinct beliefs (Merriam & Tisdell, 2016). Through their stories, the participants describe their views of reality, enabling the researcher to comprehend their perceptions and experiences (Teherani et al., 2015). Because little was known about individual perspectives of college students over 50 related to the use of technology within higher education, I used a qualitative approach.

The phenomenon explored in the study was the digital literacy acquisition of college students over 50 years of age. This population tends to lack digital skills or may not have support to use the technologies required of them while in college, creating a disadvantage for those individuals (Jacobson et al., 2017). Digital literacy is a capability in which an individual comprehends and processes information from various sources

presented via digital devices such as tablets, phones, or computers (Ray, 2018; Techataweewan & Prasertsin, 2017). Mezirow's transformative learning can be used to explain learning for other adults because it emphasizes learning through task-oriented problem solving, which is learning appropriate for older students (Knowles, 1984; New England Institute of Technology, 2021; E. W. Taylor & Laros, 2014). The key to these students' learning process includes social factors that may increase their receptiveness to and engagement of digital tools (Bandura, 1977, 1994).

A basic qualitative methodology allows a researcher to inquire about a population's interpretation of experiences, how they made sense of these, and the meaning they gave to their experiences (Merriam, 2009). In my endeavor to understand the experience of acquiring digital literacy, this approach was a good fit. According to Merriam and Tisdell (2016), qualitative researchers make use of "qualitative data collection methods, such as interviews, focus groups, observations, and analysis of documents or artifacts" (pp. 52–53). I obtained data through one-to-one interviews with 12 participants and two focus groups with a small size to allow for in-depth conversation (see Lauckner et al., 2015).

The research process began with recruiting undergraduate college students over 50 years of age through the Walden University participant pool and social media. Once I secured institutional review board (IRB) approval and consent from participants, I collected data through individual interviews and two focus group sessions. Due to the restrictions of the COVID-19 pandemic, I scheduled digital calls for personal interviews for approximately 30–45 minutes using open-ended questions (see Appendix). After

transcription and data analysis of the interviews, I determined topics for the online focus group sessions. Next, I digitally recorded two 1-hour focus group sessions, each with three participants (a total of six individuals) from those who had taken part in the individual interviews. Data analysis involved applying precodes, identifying emergent codes, and determining themes (see Merriam & Tisdell, 2016; Saldaña, 2016) related to participants' descriptions of supports they expressed needing while developing digital literacy. Throughout this process, I identified patterns by looking for parallels, variances, and arrangements within the data (see Saldaña, 2016).

Definitions

Associative learning: A theory based on a learner's error reduction from associations among representations of environmental stimuli (i.e., cues) that signal the occurrence of outcome events. Efficient acquisition of these associations requires discovering and focusing on the most relevant stimuli while ignoring distracting or irrelevant stimuli (Mutter et al., 2019).

Campus-based institution: Campus buildings and grounds are employed as teaching resources, and the campus is related to education. Learners physically commute to or live on campus to receive instruction (Boulton et al., 2019).

Communicative learning: This type of learning occurs when at least two people are trying to figure out what an interpretation means or why they believe what they believe. The goal of communicative learning is to attain an agreement (Mezirow, 1997).

Digital literacy: Instruction delivered via computers, and the ability to absorb and utilize information in many different formats from a variety of sources (Techataweewan & Prasertsin, 2017).

Digital immigrants: A group of people introduced to digital technologies in adulthood and who have learned about and used digital tools after their youth (Prensky, 2001b).

Digital natives: According to Prensky (2001a), people who have been exposed to digital technologies since birth and who have an advantage over those who have adopted technology in adulthood.

Instrumental learning: Learning that is based on behaviors or responses that are impacted (or not) by the current value of the result connected with them and can be either goal-directed acts or habits (Trask et al., 2017).

Mindful learning: A type of learning that involves a relaxed state of mind in which people are actively engaged in the present, aware of new things, and sensitive to context as it helps improve attention, cognitive flexibility, problem solving, emotion, and working memory (Xiao et al., 2017).

mLearning: Mobile learning that combines mobile communications technologies with eLearning, which is any form of electronically delivered learning material emphasizing internet-based technologies through mobile devices (Arvanitis, 2019).

Nontraditional students: This population includes students over 25 years of age who are enrolled in school part-time and are generally financially independent. These

students are full-time employed while enrolled in school, and many of them have dependents, including young children (MacDonald, 2018).

Older learner: Those over 50 years of age who have chosen to return to the classroom in pursuit of additional degrees or to study topics of interest (Barr, 2016; Parks et al., 2013). The term includes other terms that fit this description: over-50 student, plus 50, and adult learner.

Online institution: A degree-offering college or university delivering courses, support services and operation, and activities solely through internet-based learning management system and other systems (Dumford & Miller, 2018).

Online student: A student who does not attend classes on campus and completes their studies through the internet (Stone & O'Shea, 2019).

Assumptions

Assumptions are facts or ideas that individuals perceive or believe to be accurate but are not verifiable (Nkwake, 2013). Assumptions are necessary for research because they allow the researcher to facilitate and conduct the study (Simon & Goes, 2013). One assumption in the current study was that participants would sincerely and openly take part in the interview sessions and the focus groups. A second assumption was that the individuals who participated in the interviews and the focus groups communicated openly and honestly without ulterior motives.

Scope and Delimitations

The purpose of the study was to explore how college students over 50 acquire digital literacy and what supports they reported as helpful in this endeavor. The problem

was that these students might not have had the digital skills required of them. At the same time, college challenges these older students to navigate various aspects of college studies, including managing their online student accounts, paying their tuition bills, being confident about doing proper research via the online library, and many other challenges related to being technologically aware; older students might be considered technologically illiterate (Barr, 2016; Jacobson et al., 2017).

Delimitations of a study result from intentional limitations in the scope of the research and arise via conscious decisions made during the development of the study plan (Simon & Goes, 2013). Delimiting factors include the option of goals, the research questions, the variables of interest, and the theoretical perspectives adopted. In the current study, the first delimitation was choosing the problem. The purpose statement explained the study's intent, set out proposed accomplishments, and included a clear explanation of what the study would not cover (Simon & Goes, 2013).

Delimitations imply limitations on the research design that the researcher has deliberately imposed (Simon & Goes, 2013). Delimitations of the current study restricted the transferability of findings to other populations such as younger students. I had planned to select five students from online institutions who were taking courses online. However, because of the COVID-19 pandemic, all participants were taking courses online. I did not include students under the age of 50 even though nontraditional students may be anyone over the age of 25.

I did not include faculty members as study participants. Nonetheless, faculty members play a vital role as change agents in creating supportive learning environments

for adult learners (Cross, 1994; Qalehsari et al., 2017). Faculty members may have expanded this study by incorporating theory and research used within their learning environments. In addition, faculty often advocate for adult-oriented programs and services on their campuses (Qalehsari et al., 2017). My exclusion of faculty restricted a broader depiction of the problem. Because of the limited population, transferability to other settings was also limited because different institutions vary in demographics and support offered to students.

Limitations

Limitations are potential weaknesses in a study beyond a researcher's control and often emerge from research method and design choices (Cunha & Miller, 2014; Simon & Goes, 2013). One limitation in the current study was using two focus groups, which limited the outcome in addressing the research questions due to the small sample size. Some participants chose not to attend the focus group session after the individual interviews. However, I obtained rich information through the discussions, and the focus groups clarified and elaborated on interview data.

There might have been a limitation in my understanding of the potential participants within a group setting or knowing how to approach them best if they appeared reluctant to participate in a focus group. Nevertheless, I treated all participants with respect and consideration, listened to their opinions with full attention, and provided as much time as needed. Another limitation was that within a qualitative study such as this one, personal bias could have influenced the intended outcome of the study. I addressed any bias by using member checking, also known as participant or respondent

validation, to identify areas that I may have interpreted inaccurately (see Birt et al., 2016).

Significance

Due to their lack of digital literacy, college students over 50 may flounder in their coursework, potentially impeding their academic progress. Because this demographic is an increasing percentage of college students (Schreurs et al., 2017; Tsai et al., 2017), HEIs should consider this population's needs as they seek to acquire digital literacy. Adults achieve digital literacy through practice, which continues beyond an individual's first exposure to technology (Ray, 2018). Older adult learners often need training because they are reluctant to try current or innovative technologies (Techataweewan & Prasertsin, 2017).

Jacobson et al. (2017) identified essential ranges of abilities and technology preferences of older adult learners, indicating a high degree of inconsistent experiences within this generational group. Although the number of adult learners embracing technology continues to grow, there still seems to be a generational gap (Friemel, 2016). For older adults, the benefit of digital literacy skills is critical because their adoption may have tangible benefits to their lives and their careers (Friemel, 2016). Results of this study may help HEIs understand the types of support needed by older adult learners and the types of learning they apply as they use technology tools to gain academic success, which may promote opportunity for all generations so that everyone can be a successful digital learner. In addition, HEIs may use the findings to offer new resources and policies

regarding expectations about digital literacy and keep abreast of current trends (see Neves et al., 2018; Vassilakopoulo & Hustad, 2021).

Summary

This study addressed the problem that college students over 50 years of age typically do not have the digital skills or habits for use with technologies required of them while in college. The purpose of this qualitative study was to identify and understand specific types of learning and needed supports necessary for digital literacy development for these students. Chapter 1 presented the background of the study, including a discussion of several learning approaches appropriate for students over 50, focusing on Mezirow's (1991, 1996, 2009) transformative learning theory. Using a basic qualitative design, I explored the need for support and the type of training required for the over-50 population.

Chapter 2 presents the conceptual frameworks I used for this study, an explanation of the literature search process, and a review of the research literature relating to the study problem, purpose, and research questions. The literature review details the background of the problem and gaps in the current literature. This study's primary goal was to explore the over-50 college student's digital literacy and needed supports for using technology required in higher education.

Chapter 2: Literature Review

New technological learning and teaching tools in HEIs have produced unique teaching and learning strategies requiring students of all ages to adapt and acquire skills that correspond to this changing landscape. These skills are known as digital literacy, a capability in which an individual comprehends and processes information from various sources presented via digital devices such as tablets, phones, or computers (Ray, 2018; Techataweewan & Prasertsin, 2017). One of the groups challenged with embracing digital literacy is learners over the age of 50, who may face new technology with a combination of fear and resistance. However, such technologies have also been met with acceptance and approval of older adults in certain scenarios such as when they are curious about societal progress or wish to be digitally conversant and discover a variety of new technologies (Costa et al., 2019; Vaportzis et al., 2017). The purpose of this basic qualitative study was to identify and better understand the supports for these older learners and whether transformative learning (see Mezirow, 1991) occurs in the development of digital literacy for college students over 50. Transformative learning emphasizes task-oriented problem solving, which is appropriate for older students.

The population of college students over 50 who may be confident with routine uses of technology such as phones and internet access may not understand digital concepts related to skills needed to attain a college degree (Tsai et al., 2017). For older adults, a significant obstacle to discovering modes of technology has been an absence of their digital literacy (Jacobson et al., 2017). The problem is that these students may lack the digital skills or habits for use with technologies required of them while in college,

thereby creating a disadvantage in their college and academic ambitions (Jacobson et al., 2017).

There is evidence that some older students possess a range of technical abilities (Hunsaker et al., 2019; Tsai et al., 2017). However, there is a gap in the research about the needs of these learners, how they best learn digital skills, and how to support them in acquiring digital acuity (Jacobson et al., 2017; Schreurs et al., 2017). Research indicated that a perspective transformation explains the process of how adults learn as they revise their meaning structures (Hoggan et al., 2017). Meaning designs include meaning schemes and perspectives (Mezirow, 1991). Meaning schemes (the smaller components) are "made up of specific knowledge, beliefs, value judgments, and feelings that constitute interpretations of experience" (Mezirow, 1991, pp. 5–6). Higher education administrators cannot support this population's digital literacy acquisition if they do not understand how older students' meaning structures are unique. Chapter 2 includes a description of the literature search strategy and an overview of the conceptual frameworks that informed this study. I then provide a detailed examination and analysis of empirical research related to the research question, followed by a summary of the chapter findings.

Literature Search Strategy

This literature review process involved a comprehensive examination of literature, research, and empirical data for this study addressing adult learning theory and digital awareness in over-50 individuals. I began the search with scholarly and peer-reviewed articles and books using multiple databases including EBSCO, ProQuest, PsychInfo, and PubMed. I also searched Google Scholar and books related to the subject matter. I

focused on literature published between 2010 and 2018 except for seminal works on the topic from earlier dates. Keywords included *digital literacy*, *transformative learning*, *communicative learning*, *digital natives*, *digital immigrants*, *technological skills*, *technology in higher education*, *instrumental learning*, *older adult learners*, *over 50 college students*, and *non-traditional students*. I excluded any literature on adolescents with technological learning challenges, focusing on the older adult population.

Conceptual Frameworks

I recruited college students over 50 years of age who lacked digital skills or did not have support to use the technologies required of them while in college, creating a disadvantage for those individuals (see Jacobson et al., 2017). I used two conceptual frameworks: transformative learning, which relates to how adults learn (Mezirow, 1991), and digital literacy, in which individuals demonstrate digital skills and competence (Gilster, 1997; Prensky, 2001a, 2001b; Ray, 2018).

Transformative Learning Theory

Approaches to adult learning have served as valuable lenses for research on the older learner; these frameworks show practices across various adult learning contexts including the college classroom. I selected Mezirow's transformative learning theory because it emphasizes learning through task-oriented problem solving, a type of learning appropriate for older students (M. S. Knowles, 1984). The key to these students' learning process includes social factors that may influence a favorable reception and engagement of digital tools (Bandura, 1977, 1994). Older students encounter a technologically

immersive environment requiring a change in their frames of reference, generating new learning (Mezirow, 1997).

Mezirow's transformative learning theory emphasizes learning through task-oriented problem solving, a type of learning appropriate for the older student (M. S. Knowles, 1984). Transformative learning is one of the most prominent theories in adult learning research (Mezirow, 2000). Mezirow (1997) described transformative learning as a fundamental transformation of the adults' core frames of reference, often in response to disorienting dilemmas that challenge an individual's existing way of thinking about the world, prompting them to reflect critically on previously held assumptions. For example, an adult college student in a history course may have had preconceived ideas about U.S. history. However, they may discover a changed worldview through new course learning and experience a personal transformation during the learning process. Much of the research on transformative learning has focused on adults in higher education and certain life situations of older adults. Some research has proposed that educators can help stimulate transformative learning by using teaching methods that foster critical reflection (Chukwuedo et al., 2021).

Transformative learning offers a framework that is also distinctively adult oriented and grounded in human communication, as "learning is understood as the process of using a prior interpretation to construe a new or revised interpretation of the meaning of one's experience to guide future action" (Mezirow, 1996, p. 162). Mezirow (1991) explained how adult learners make sense of the meaning of their experiences and how social and other structural supports influence the way adults interpret such

experiences. The dynamics involved in modifying meanings include changes learners must make when they find themselves in a disruptive or unsettling situation, such as when instructors insist older adult students use technology when they are not prepared. For example, the adult online learner encounters many new digital tasks, new digital interfaces, and new ways of approaching learning, thereby disrupting preconceived notions of how one goes about learning. Nonetheless, students over 50 benefited from this learning as they begin to change their customary frames of reference, mostly in response to a confusing or complex challenge. They confront their prior ways of thinking about the world, prompting them to reflect critically on previously held assumptions (Mezirow, 1996, 2009; Ross-Gordon, 2018).

Transformative learning theory explains how adults learn through such moments of imbalance and are reflective of digital learning. The approach is rooted in the belief that learning occurs when learners assign new meaning to earlier experiences (Mezirow, 1990). Learners reinterpret an existing meaning when they begin to see it in a new light.

There are three stages of learning in transformative learning. The first stage involves a revelation that an individual held on to incorrect beliefs or did not know what they should know is frequently a motivation for digging deeper and unearthing information or reviewing their thinking habits. Recognizing that one's beliefs are inaccurate is a dilemma that can be serious. When applied to learning, an instructor must probe what students do not know in order to pique their interest in what they need to learn (Mezirow 1997).

The second stage establishes personal relevance. This is the perspective or response to the question of "what is in it for me?" that motivates people to study in personal, professional, or social settings. Instructors should spark students' interest early on and repeat the value of the content frequently to keep students involved. When adults can see the outcomes of their efforts, they are more driven to learn (Mezirow, 1997).

The third stage involves critical thinking, which is relevant for older learners who are intelligent, logical individuals. These students should make every attempt at introspection (foundation assessment) to motivate them to reconsider their perceptions and opinions. These students will be more inclined to accept and absorb the lesson if an instructor allows them to sort through their emotions and experiences and understand on their own and determine what they need to reject or modify (Mezirow, 1991).

Research Using Transformative Learning Theory

Mezirow's (1997) theory of transformative learning is one of the foundations for adult education and describes alterations during the learning process. This theory also provides direction for personal and social development. Transformative learning allows individuals to reflect on their knowledge and beliefs, guiding learners in contemplating their values (Mezirow, 2000). Lee and Brett (2015) used Mezirow's transformative learning of older adults to illustrate their transition from learner to volunteer.

Educators are expected to adapt to new instructional environments and apply new educational technologies. However, this process can be lengthy and can result in a shift in their viewpoint. Lee and Brett (2015) convened a study with 44 in-service teachers pursuing graduate degrees. To support teachers' transformative learning, the researchers

created and presented a discussion-based online course. The nature of effective online teacher-to-teacher talks was investigated in this qualitative case study of teachers' perspective transformation. The study was based on a theoretical framework that incorporated Mezirow's transformative learning model with Bakhtin's dialogism.

Transformative learning applies to adults learning new technologies and new modes of thinking. Mezirow (2009) described this process as one in which individuals "transform problematic frames of reference (mindsets, habits of mind, meaning perspectives) – sets of assumption and expectation – to make them more inclusive, discriminating, open, reflective and emotionally able to change" (p. 92). Ilomaki and Lakkala (2018) used a qualitative approach to examine older adult staff in two public schools as they experienced a change in the curriculum and leadership involving technology. Although transformation did not come without significant challenges for these groups of school personnel and without mindful awareness of the necessity to change, a change was successful because it was more intrinsic than external factors might enable. Without identifying the need for change and determination to persevere, transformation might not have occurred. Findings indicated that a level of tenacity and resolve in exploring solutions to challenges while focusing on the essential modification in meaning structure ensures that students of all ages can successfully transform.

Nerstrom (2017) used a narrative inquiry to analyze the personal stories of six adult educators who had self-reported prior transformative learning experiences as they went through a graduate program. Through the participant stories, most of whom were over the age of 50, Nerstrom found that participants' self-confidence increased, a critical

component in creating independent thinkers. Individuals with low self-confidence are less likely to be open to new concepts. Mezirow (2000) described self-confidence as a critical factor in fostering transformative learning that is strongly associated with openness to varied views. Mezirow (1994) stated that "building competence and self-confidence in new roles and relationships" (p. 224) is foundational to completing the stages of transformation. Openness to new ideas enables older individuals to reflect critically on previously accepted assumptions.

Mezirow's (1978) transformative learning components include experience, critical reflection, and rational discourse. A 2020 study by King examined these aspects as they sought to understand the connections between learning and social movement, particularly within Lebanon. Using semi-structured interviews and a focus group discussion with learner-activists and adult educators, King discovered that engagement in a social movement challenged and changed learner-activists' understanding of educational status within their respective communities, leading to transformative action addressing problems identified. An emerging element of this study was the ability of an individual to not only think critically but to reflect critically as well, mirroring one of Mezirow's tenets to make a "critical assessment of assumptions" (Mezirow, 1994, p. 224). Thus, transformative learning allows individuals to reconfigure their existing perspectives and realities, demonstrating that they are genuinely qualified to become active agents in assessing and transforming outdated attitudes.

Transformative learning reflects a vision of how adults learn as they connect various personality traits entrenched from their early educational experiences and

personal resources they have developed throughout their lives. Older students' transformative learning focuses on engaging personal factors of critical reflection, creativity, and critical thinking (Mezirow, 1994). Individuals' learning depends on their basic life concepts, values, and responses, encompassing their life experiences. Still, the process of learning is also based on a person's ability for critical thinking, self-direction, and curiosity (Chukwuedo et al., 2021). Strange and Gibson (2017) examined educational practices of students enrolled in study abroad programs through a large south-eastern US university. to determine the efficacy of transformative learning for lifelong learners of vocational studies. These characteristics are intrinsic to Mezirow's transformative learning process. As lifelong learners, the adults studied in Strange and Gibson (2017), research possessed qualities of an ongoing and self-motivated pursuit of knowledge for personal or professional reasons.

Mezirow's theory requires adult learners to be aware of several learning components including critical reflection, metacognitive reasoning, and the questioning of assumptions and beliefs (Hughes & Yarbrough, 2022; Tsimane & Downing, 2020). Personal transformation through learning is not something that happens to students. Instead, it is a dynamic process in which those individuals are actively engaged, including challenging technology and digital literacy topics.

Digital Literacy

Digital literacy is a capability in which an individual comprehends and processes information from various sources presented via digital devices, such as tablets, phones, or computers (Ray, 2018; Techataweewan & Prasertsin, 2017). Digital literacy consists of

several tenets, two of which are a priority in this study. First, interdependence is how one media form connects with another and exists as a trait of human nature wherein tension exists between an individual's yearning for independence and their desiring interdependence with others. Humans crave personal autonomy and desire connection to others which may constrain individual freedom (Cook, 2013; McCarthy-Jones, 2019). Thus, interdependence within learning, specifically for older students, can create a collaborative learning environment wherein individuals work together toward a shared goal. Second, interdependence explains the help and support needed by college students over 50 to succeed academically.

The second tenet of digital literacy that informed this study is the social factor, indicating why an older student may need specific support and which social conditions contribute to improved digital literacy (Gilster, 1997; Ray, 2018). The key to the learning process for students over 50 "is support from environmental factors, which can include the support of family, friends, or those important to the individual's life" (Tsai et al., 2017, p. 34). Social factors may influence an older student's adoption of digital tools and encouragement to access the Internet. These factors are particularly relevant to the over-50 learners because these individuals may not be digitally literate and may need much technical support and social support (Meyers et al., 2013).

The adoption of digital literacy skills to improve the quality of college learning is a critical issue for the HEI digital learning environment. Digital content and learning objects are widespread among students to facilitate self-directed learning (Rashid & Asghar, 2016). However, practical and effective learning with digital literacy requires

students to be eager to acquire knowledge, think critically, and apply existing knowledge to novel knowledge or innovation (McDougall et al., 2018). Rashid and Asghar (2016) argued that technology-rich learning environments could provide students with more significant opportunities to be self-directed in their learning. Such an environment calls for the students to know the proper content selection and manage appropriate usage of the information.

Research on Digital Literacy and Older Adults

Older adults have not grown up with digital tools and may not rely on these tools in the same ways as the younger generations. Thus, they may or may not understand how to use technology to learn, even if they are comfortable using technology for communication or entertainment. Early research in this area by Barnard et al. (2013) revealed two older adult technology literacy components. They conducted two qualitative case studies to explore two models of learning technology: acceptance and rejection. One study viewed the older adults' approval or rejection of digital information from a learning perspective, and the second assessed older learners from a system and user perspective. The main finding of this study showed that the mindset and attitude of the more senior user determined acceptance or rejection of the technology introduced. Thus, as innovative technologies emerge, a new generation of older adults will likely face new challenges.

One of those challenges within the digital environment is a concern about privacy. Elueze and Quan-Haase (2018) performed a study interviewing 40 adults aged 65 and older. Findings indicated that older adults held a wide variety of developmental privacy worries described by five characteristics: fundamentalist, intense pragmatist, relaxed

pragmatist, marginally concerned, and cynical expert. For example, a fundamentalist would avoid social media sites and not engage in services, such as online banking. On the other end of the spectrum, the cynical expert doubted that nothing could protect individuals' privacy against large corporations. The three other categories fell somewhere in between these two. This continuum of privacy concerns expands an existing scale created by Westin (1967) related to the Internet and digital privacy rights. Although there were various and wide-ranging privacy issues in Elueze and Quan-Hasse's study, their findings about older adults' concerns about privacy offers a suitable strategy to overcome hurdles and make progress towards acceptance while trying to engage older adults with the digital environment.

Careful adult digital literacy research categorizes age group differences because some researchers define older adults as those over age 50, while others designate older adults over age 90. Hargittai and Dobransky (2017) examined the digital literacy of older adults, using a U.S. national survey to determine the online skills and behavior of older Americans. The findings indicated a broad scope of internet skills and applications. Individuals with more education and money had more developed digital and internet skills. Furthermore, those with a higher socioeconomic status were able to use the internet for a variety of purposes, including receiving news, completing banking transactions, and socializing with friends and family. These researchers further divided the demographic of older adults into several age categories: aged 55 to 65, aged 65 to 79, and those over the age of 80. When using the term college students over 50, there is a range of potential age brackets as seen in categories defined by the researchers. Hargittai

and Dobransky reported distinct differences in digital use. They needed support as those aged 55–64 described the highest level of skills while those in the 80–97 category expressed the lowest-level skills. Nonetheless, researchers have not produced detailed information about Internet use and skills paired with one or more of the specific age ranges listed above for those aged 65 to 79.

The National Center for Education Statistics (NCES) is a federal organization that collects, analyzes, and reports data related to education in the United States and other nations. In research conducted for NCES, Rampey et al. (2016) noted that literacy in the 21st century requires critical thinking and problem-solving skills within technology-rich environments, using digital communication tools and networks to acquire and evaluate information, communicating with others, and performing practical tasks (Schreurs et al., 2017; Tsai et al., 2017).

Research has shown the importance of planning specific models or strategies to allow the older adult population to acquire and enrich their digital competencies more easily (Di Giacomo et al., 2018; Martínez-Alcalá et al., 2018). The following analysis of the literature identified some of the hurdles that older adults encounter while using technology that they find hard to use. Understanding common barriers that older adults experience when adopting new technologies can provide insight into how better to support them and how to improve digital product design and development. As a result, technology tools can be simpler to use and master, making them suitable for people of all ages.

Literature Review

I examined critical concepts by synthesizing current literature that provides extensive knowledge about the older learner and digital technology. Adopting technology for this population of older adults is contingent upon an individual's attitude, ability, and approach to technology use in learning, both informally and within higher education (Chiu & Liu, 2017). Thus, there is a need for learners of all ages, particularly older adults, to prepare themselves for a future immersed in technology and technology use in education (Prensky, 2012; Vaportzis et al., 2017). This literature review includes research studies primarily published between 2016 and 2021. However, some earlier studies offer insight into the older students' population and their ability to be aware of, comprehend, and learn with ever-changing digital technology. This section provides an overview of the over-50 learners (also referred to as older learners), their learning needs, and technology skills. In addition, there was a gap in the literature about the needs of these learners, how they learn digital skills, and how best to support them acquiring these skills (Jacobson et al., 2017; Schreurs et al., 2017).

Characteristics of the Over 50 Learner

Older adults are active learners (Uemura et al., 2018); most of their learning occurs as self-planned learning projects (Henschke, 2016; Loeng, 2020). Moreover, many individuals over 50 years of age use this period of their lives as a time of learning and personal development (Uemura et al., 2018;).

Much discussion about digital literacy reflects assumptions about generational differences (Prensky, 2001a, 2001b; Ross-Gordon, 2018). Costa et al. (2019) examined

social media use and beliefs among diverse undergraduate students in a quantitative study using data to compare older learners with traditional college learners. The results showed that older adult learners were more inclined to take all their classes online, start their education at one institution, transfer later to another, and enroll part-time. Compared to their younger college peers, older learners were more immersed academically, mingled less with their peers and faculty, and found their college campus less supportive and lacking a means of motivating students. On the other hand, these older adults were more self-sufficient and wiser than their younger peers, albeit not as technologically competent (Costa et al., 2019).

However, older adults can experience barriers to learning, including potential physical limitations and cognitive and social deficits (Di Giacomo et al., 2018). Rangel et al. (2015) explored the importance of instructor delivery style, more so than the actual students' dispositions, cognitive abilities, or even motivation in a study with 156 students. Rangel et al. surveyed students for a semester to capture the progressive relationships between trainer and trainee, if any. Students' assessments of the trainer's expressiveness, rather than their perceptions of the trainer's competency, predicted knowledge transfer intentions. Rangel et al.'s research looked at the experiential learner, someone who has learnt a lot from real-life situations and is most likely a mature adult, such as someone over 50. This learner is more likely to see learning as an internal, experience-based, and personal process rather than a detached (external) process (Kolb, 1984). This research has implications for how to approach and teach older learners about

technology, such as including competent and active engagement by faculty, which allows learners to reflect on themselves (Mezirow, 2009).

Although many older adults benefit from technology-supported learning, some face challenges in adopting modern technologies (Pirhonen et al., 2020; Schreurs et al., 2017). A study by Zheng et al. (2016) addressed diverse and varied findings related to the factor of age (over 50) in technology-based learning to understand older students' learning outcomes better. This study explored the concept of the "redundancy effect," which occurs when learners are exposed to various visual, auditory, and tactile content such as text, imagery, and audio recordings. For example, the authors described a learning module that included animation and narration versus animation, narration, and on-screen text. Due to the redundancy effect, they discovered that movement with voiceover and on-screen text induced irrelevant information processing. The addition of on-screen text overwhelmed visual working memory, resulting in poor learning performance. Furthermore, Zheng et al. discovered that movies with captions (on-screen text) resulted in higher learning results for older learners than videos without captions. As a result of a significant decline in working memory and processing speed, older learners required additional sensory redundancy support in information processing.

Encouragement and reassurance by family and friends may be a factor for digital literacy acquisition for older adults (Blieszner et al., 2019; Martínez-Alcalá et al., 2018; Tsai et al., 2017). For example, Jin et al. (2019) found that such support was a strong predictor for Internet use among older adults, including exploring an encouragement or discouragement factor. It appears to be a function of expected benefits and risks.

Contrary to younger individuals, if the older adults perceived the benefits would compensate for potential hazards, they were more likely to feel encouraged to learn technology; private learning settings were the preferred method over professional courses. Jin et al.'s (2019) quantitative study further examined the nature of the skewed digital divide for adult learners over 65. Jin et al. (2019) concluded that age is the most influential factor for an individual's Internet usage, and with each added year of age, the probability of internet usage decreases.

The internet can reflect an individual's economic, social, and cultural activities and parallels certain offline activities, including inequalities to access training within a digital knowledge-based society (Kromydas, 2017). Tirado-Morueta et al. (2018) aimed to confirm if a relationship existed between levels of internet use for adults over the age of 55 and formal digital literacy support (DLS) programs available to those individuals. Furthermore, they wanted to know if DLS would mediate or reduce the effects of a perceived sociodemographic factor on internet use. Participants designated their level of internet use in such activities as online shopping and banking, online forums and social networks, and instructive exercises, including accessing news and searching for helpful information. The findings revealed that an older adult's sociodemographic characteristics influenced their internet access and use. Age was not correlated with how much they accessed the internet or the mistreatment they received, except in relation to the effect of social position, which is connected to wealth, education, and social resources. Thus, the digital divide between younger and older generations may not be as it seems, as it holds much more complex factors, such as income and education levels.

Learning Expectations and Needs for Older Learners

Learning needs and expectations are vital in sustaining older adults' motivation to learn (Grunschel et al., 2016). Older learners' behaviors focus on meeting specific needs if they believe they can satisfy them; on the other hand, learning motivation decreases if students do not clarify learning needs (Lai & Bower, 2019). Thus, considerations such as supplying an active learning environment and encouraging self-directed learning may aid in fulfilling the needs and expectations of the over-50 learners (Martínez-Alcalá et al., 2018; Morrison & McCutheon, 2019). This section examines how older adults' learning expectations and needs are met within HEIs.

Older adult learners generally cannot easily adjust their busy lives to fit colleges' fixed schedules. They prefer institutions where flexible programs and services (MacDonald, 2018). Betts et al. (2019). Older adults' descriptions of digital technology, and experiences of digital inclusion sessions, were explored using qualitative methods. Seventeen older adults (aged 54 and 85 years) participated in two focus groups that each lasted approximately 90 min to examine how older adults experienced and comprehended technology daily. The conclusions support the findings that this group of older adults is aware of digital technology, is interested in developing more skills, and gaining a better understanding with one-on-one training.

Instructional methods can support the unique needs of older students (Sharp, 2018). The addition of technology into everyday life has become the foundation of the learning facilitation of the adult learner. However, how technology is facilitated in senior learning populations is unknown. Chiu et al. (2019) illustrate the importance of

implementing an active learning environment for these older adults. This study explored several case research methods focused on understanding employment, adjustment, and revision of educational methods experienced instructors at senior learning centers. The results show that the instructors used different teaching resources when teaching older adult learners. The acquisition of technology skills is vital for the older adult learner because of its prevalence across learning experiences (Chopik, 2016).

Martínez-Alcalá et al. (2018) found that for older adult learners to achieve maximum benefits of technology, they must overcome challenges learning how to navigate physical hardware, such as smartphones or an iPad. Martínez-Alcalá et al. (2018) investigated non-traditional adult learners returning to school either after being in the workforce for many years or attempting to complete a college degree after much time away from an academic environment. Participants enrolled in an online developmental writing course and completed a computer literacy assessment before taking the course. Martínez-Alcalá et al. (2018) compared the older learners to traditional college students. They concluded that even though their computer literacy scores were lower, the older non-traditional students outperformed traditional students in course performance. Thus, the technological deficiencies of the older adult learners did not affect their learning outcomes negatively related to their ability to navigate the course successfully. The older adults' self-direction and motivation were critical factors in their accomplishments.

Aging adults often experience a decline in cognitive abilities, such as information processing, learning speed, memory, language, and overall executive functioning (Kazazi et al., 2018; Staff et al., 2018). Pappas et al. (2019) conducted a study of 103 older adult

learners aged over 55 to explore this population's learning needs and investigate their cognitive functioning and its relationship to adopting new digital technologies. Information and communication technologies may have an important influence on the daily lives of older adults. However, Pappas et al. determined that compared to younger students, older adults lagged in their overall digital skills, ability to access the internet, and understanding of and engagement with online learning activities (such as eLearning). Pappas et al. determined that their study participants responded positively to course content that applied to their lives as they preferred to practice what they were learning. The eLearning aspect of this study revealed that learning modules needed to have clearly defined learning outcomes for older adult learners, be concise, and use multimedia rather than text-based designs.

Older students arrive at college with specific life experiences and expectations, which instructors and trainers need to understand to improve students' learning outcomes. For example, it may be that HEI administrators assume students can use technology (Martins et al., 2019). However, HEI administrators may be unaware of students' expectations about technology use in their courses and their self-confidence with technology (Ross-Gordon, 2018). For example, Cirule et al. (2019) used a mixed methods approach to determine undergraduate students' beliefs of their aptitudes using computer technology. Results showed that students over the age of 25 perceived themselves to have a lower aptitude for digital skills than those under 25. Still, they were interested in increasing their knowledge and computer skills. Thus, besides traditional characteristics

of motivation and commitment, ambition, and goals, students entering college classrooms must have a vast array of digital and technological skills.

Technology Skills of the Older Learner

There are unique challenges that impede some students over 50 from using recent technology or accessing the internet. Nonetheless, despite challenges, many older adults retain positive attitudes about technology and understand the benefits of being technically proficient. This section reviews research about older adults and technology who use their perseverance and wisdom to overcome technological challenges rather than allow technology to impede their successes.

Older adults typically have fewer digital skills than traditionally aged students and maybe less persistent in their technology use (Di Giacomo et al., 2018). Beringer (2017) conducted a quantitative study examining the computer literacy skills of seniors and explored the myth that this population does not use the internet. Beringer found that while it's assumed that this age group lacks digital skills, they were more likely to engage if provided with foundational technological knowledge.

The digital divide concept is multifaceted due to various determining factors that promote or discourage Internet and digital access. Studies have cited socioeconomic, institutional, and even physiological factors as potential determinants. However, technological determinism has not entirely explained the emergence and continuance of the digital divide (Friemel, 2016). Lee and Kim (2019) used a mixed-methods study to explore the model of intergenerational tutoring on digital technologies. A group of 55 older adults (average age approximately 70 years) underwent a series of six mentoring

sessions by younger undergraduate students. Using data from pre-and post-test surveys, the researchers documented improvement in older adult learning, including digital literacy, self-efficacy, and a desire to learn more about technology. Additionally, the researchers found that older adults were less anxious and more confident when learning experiences were tailored to their needs and preferences.

Researchers of the digital divide have focused on the have and have-nots in terms of technology access (Hargittai et al., 2019). However, demographic factors such as age, gender, and socioeconomic status may create the digital divide. Yoo (2021) investigated how older adults are expected to use the Internet and mobile devices with Internet-based services like education, health, and communication. Although this research illustrated an increasing number of older adults embracing digital lives, they face unique challenges due to age-related changes. Data showed that unique barriers make it challenging to keep up with advances in technology. This study investigated an introductory course designed for adult learners developing their digital literacy skills. This study highlighted the importance of creating a quality learning environment for adult learners to lead a more productive and enjoyable life with mobile devices.

Generationally, older learners may be less at ease with technology or learning about technology outside traditional classroom training. This hesitancy to learn and adopt modern technologies can impact the ability of the older adult learner to apply and transfer knowledge and skills (Wang et al., 2019). Using a sample of 811 adults over the age of 65, Mostaghel and Oghazi (2017) explored these barriers to learning technology for this older cohort surveying the participants regarding several impeding factors: self-efficacy,

anxiety, self-reported health conditions, cognitive ability, and physical functioning. The results showed that apprehension and anxiety levels when facing new technology tools were significant barriers to learning for most of these seniors. This group of educated older adults who used a variety of tools that could accelerate their acceptance of innovative technology. The results indicated that the more an older adult was aware of their existing knowledge about technology skills the bigger the challenge in acquiring new skills. This may increase anxiety about improving new technology capabilities. This study is one of the few to recommend professional psychologists as potential resources to supply guidelines for the elderly to cope with their anxiety and apprehension toward learning modern technology.

Some researchers have focused on the digital divide related to older adults' technology access disparities versus their younger counterparts (Mitchell et al., 2019). However, merely having access to technologies does not always lead to actual use and adoption (Blackstaffe, 2017; Godoe & Johansen, 2012). For example, Gatti et al. (2017) examined the generational digital divide that might be seen as a reaction to older people's physical and mental decline. Due to societal costs, however, there has recently been focus in connecting the generational digital divide, and many studies have indicated that tablets seem to support the older adults due to functionality and features that accommodate their capability to connect, to be self-sufficient, and to be fully independent; it may enhance their well-being. Findings suggested how to boost self-efficacy while improving learning perspective and tablet usage. The participants' perceptions of their learning process and success in the course, as well as their digital self-efficacy, were investigated using a

qualitative-dominant co-occurrent mixed-methods approach (50 individuals over 65 years old). Even though learning modern technology may be demanding or inaccessible for older adults, such learning can aid older adults' inclusion into the digital society (Vaportzis et al., 2017). A study by Tsai et al. (2017) explored how older adults learned to use a certain technology and the importance of social supports in this process using a qualitative method. The authors discovered that using technology requires a variety of cognitive, physical, sociological, and emotional abilities needed by adult learners to succeed in digital environments. Older adults needed support for the initial set up of their devices and support for learning to use them. Social support in the environment played a crucial role in supplying this help to the older adults through family, friends, and other acquaintances. Support for older adults to sustain socially engaged lives and access the Internet may encourage practical and efficient digital literacy skills as they continue to age. Tsai et al. (2017) perceived ease of use when utilizing technology acceptance and adoption model (STAM) as the learning model for older learners. These two learning models, STAM and the social cognitive theory (SCT) (Bandura, 1977, 1994), was such that, within their study, Tsai et al. (2017) found both models helped to understand older adults' learning processes. Support during the learning process from family or professionals was crucial to provide older adults the confidence to experiment and learn new functions. This finding confirms the need for social support for older students to gain motivation and self-confidence in their technological learning abilities.

Many older adults are deficient in the required digital literacy skills needed to obtain the benefits of digital tools, such as health tracking (Gordon & Hornbrook, 2018).

Gualtieri et al. (2018) examined 100 participants aged 50 to 75 about their abilities to use a specific digital application that recorded physical activity as a potential health benefit. There were several barriers to the successful use of the smartphone devices used in this study. Primarily, individuals with older model phones could not download the tested application. In addition, many participants required much assistance to download and set up the application; vocabulary such as "sync with Bluetooth" confused these older adults needing clarification and assistance. However, Gualtieri et al. discovered that once these older learners overcame barriers to set-up through hands-on training and support, their motivation and enthusiasm in using the specific application increased. In healthcare, obstacles to digital technology can hinder the adoption and use of digital health technologies that rely on smartphone applications.

Some research indicates social implications for older adults' technological abilities and access as younger adults engage in more technology-based communication (Tyler et al., 2020). Using a self-report questionnaire provided to participants, Hunsaker et al. (2019) explored if the oldest adults would be less likely to engage in a formal type of digital exchange, such as a church group's website, a health club, or another organization to which they belonged. Mannheim et al. (2019), through examining demographic differences related to technology use, found variances in technology use, favorable views of technology, and comfort using technology based on age. Younger users were between 18-28, while older adults were over 60. Older adults were more likely to experience growth only in those instances when they had to use technology for a given task. Individual skill levels influenced whether they used technology; younger users were

more likely to have technology-related skills. Older adults, aged 60 to 91, scored the lowest in technology skills, followed by middle-aged adults aged 40 to 59. Older adults, especially those over the age of 60, unlike their younger counterparts, used technology on an as-needed basis, while the younger participants integrated technology into their daily activities. Thus, college students over 50 may require unique support from their higher education institutions, such as offering introductory computer courses, mentoring on navigating the institutions' websites, and possibly creating peer support groups (Tyler et al., 2020).

Technology, Learning, and the Over 50 Learner

Informal Technology Learning for College Students Over 50

Older adults have managed the benefits of technology use versus the potential risks (e.g., risk of failure) (Andrews et al., 2019). This section reviews how older adult learners have successfully learned computer and Internet skills outside formal academic settings. Morrison and McCutheon (2019) conducted a focus group study of 17 older adults, with a mean age of 72 years, to determine whether digital technology functioned to disempower or empower older adults. Findings indicated that older adults described the value of technology as empowering because it eased their daily activities and aided them in keeping certain social relationships.

Nonetheless, these older adults also recognized that technology might also disempower them. They noted that without the proper skill sets or an ability to overcome their fears and anxiety associated with technology use, the digital divide between generations was likely to widen, potentially increasing their social isolation and

diminished access to vital online services (Oliver et al., 2017; Uemura et al., 2018). However, this group of participants was optimistic and held that learning via peer groups was their most comfortable method of learning modern technology.

An individual's healthcare information is increasingly being provided through web-based mediums, creating access to information about maintaining or improving health and managing diseases. This new approach is readily available to all age groups and particularly critical for older adults (Gordon & Hornbrook, 2018). A study of older adults aimed to improve eHealth literacy proposed that collaborative learning, or peer-to-peer learning, developed and tested in public libraries, was the most favored method for the older adult student of technology. Kara et al. (2019) confirmed that collaborative learning was a beneficial method for older adults' learning new technological skills, wherein both the social environment and the personal competencies of the learners situated the environment for valuable learning to happen. As noted by the researchers, participant ages ranged from 61 to 84 years, bringing to the forefront whether influences proven to be effective for the "younger" segment of this older population could be generalized to the "oldest" old.

With the pervasiveness of digital technology in many aspects of society, specific learning activities involved with technology have become essential to the learning processes of older adults (Reneland-Forsman, 2018). Chiu et al. (2019) conducted a multi-case study within adult community learning centers to identify the teaching strategies for older adults and substantiate learning transference. They found that unintended incidents occurred in the teaching of older learners. When faced with such

incidents, the age difference between teacher and students may create a barrier to learning. On the other hand, this shortening gap between the instructor and older students enabled the senior adults more learning opportunities. In addition, when teaching Internet technology, instructors may increase learning if they convert professional terminology to the everyday vocabulary of the elderly participants in the classroom.

College students over 50, as do all generations, use technology daily for multiple reasons thus need knowledge of relevant technology tools and skills (Blieszner et al., 2019). In a study by Seo et al. (2019), the researchers used a mixed methods approach to conduct seven focus groups with older African Americans who were low-income adults aged 55 and over to understand older adults' experiences, knowledge, awareness, and needs in terms of digital skills and literacy. Seo et al. determined that participants showed strong motivation and commitment to learning new technological knowledge and skills. These researchers used the term "technological capital," a concept based on an individual's awareness, understanding, access, and technical capacity (Carlson & Isaacs, 2018). The older adults in this study were inspired, motivated, and enthusiastic as they increased their technological capital as a result.

Some researchers have explored the role of technology and its impact on the potential social isolation of the elderly (Administration on Aging, 2018). For example, Delello and McWhorter (2017) conducted a mixed-methods study to explore whether the information or communication technologies (specifically iPads) might enrich the lives of 135 adults ages 61 to 99 adults. Throughout the study, the researchers performed training on iPads for these older adults. Before the exercise, less than 20% of the participants had

used an iPad. However, by the conclusion of 6 weeks of iPad training, 90% of the participants felt proficient using an iPad, not only a significant increase in iPad competency but allowing these older adults an added venue and tool for staying connected with friends and family.

Some factors encourage or discourage the reception of technology by older adults (Vaportzis et al., 2017). Ma et al. (2016) explored smartphone usage through a mixed-methods study, including pre-questionnaires and personal interviews with 120 older Chinese adults. Age, education, marital status, employment position, source of income, and economic standing each had substantial effects on perceived ease of use and attitude toward smartphone technology. Personality factors were significantly linked with age, demonstrating that 'younger' older individuals were more willing to accept cellphones. These behavioral constructs were favorably impacted by education, indicating that a higher level of education may lead to a more positive attitude toward smartphone technology. All behavioral variables were adversely connected to marital status, implying that non-widowed older persons were more positive about using smartphones. The researchers also discovered that financial circumstances had a positive impact on adoption, with older adults who were financially comfortable being more willing to accept cellphones. Self-satisfaction and relaxing conditions were the key factors impacting user satisfaction and convenience of use with smartphones for this group of older adults, out of all the findings of this study.

Smartphones utilize similar touchscreen technology like iPads, personal computers (P.C.s), point-of-sale systems (when paying at a store), or teleconferencing.

Chiu et al. (2016) explored older adults' learning needs, attitudes, and the impact of using 'entertainment' apps on older adults' physical and psychological well-being when using touchscreen apps on smartphones. Their mixed-methods study presented an 8-week training course designed for a sample of 39 older adults who had or did not have Internet experience. A focus group discussion followed this. After the class, results indicated a substantial decrease in the participants' anxiety levels about Internet use. The study also demonstrated a decreasing trend in the participants' concerns about certain negative perceptions of Internet usage, such as failing eyesight, feelings of fatigue, or lessening their ability to communicate in person Chiu et al. (2016). Thus, suitable training aided older learners in easing learning anxiety regarding technology as it lowered their depressive symptom scores compared to baseline scores. It was also noted these older adults learned new practical skills but at a somewhat slower pace than their younger counterparts similar to the findings of Chiu et al. (2016).

Cognitive decline is a normal aging process; faculties such as reasoning, memory, and information processing generally decline gradually as one age (Willinger et al., 2019). Researchers have explored such abilities, or lack thereof, in older adults and technology-supported learning research. For example, Ware et al. (2017) explored digital learning of a second language as a cognitive stimulant for a group of 14 senior citizens (exact ages were not disclosed) to discover if blended learning incorporating technology effectively mediates some expected cognitive decline. This type of learning was a challenge for some participants, while it eased the learning process for others. Overall, the blended and multimedia methods were beneficial for teaching and motivating these

older individuals to learn a second language. The participants were encouraged to use tablet devices (such as iPads) to look up words reassuring ongoing involvement by supplying the older adults with a tool for self-directed learning. The researchers concluded with a training program and adequate participant motivation. This second language learning method could be an intervention for those with cognitive impairment and even perhaps mediate some of the preliminary stages of dementia.

Due to a certain amount of cognitive decline in older adults, their needs and concerns in learning computer usage and technology may differ from those of younger individuals. Hulur & Macdonald (2020) case study explored how older adults responded to technology training and motivated them to learn. Participants were two adult educators and four older learners. Hulur & Macdonald (2020) concluded that older adults learned modern technology best when the instructor talked them through each step while completing each specific task.

HEI Technology Use by Learners

Colleges and universities try to retain students as supporting high graduation rates is essential to an institution's reputation (Banks & Dohy, 2019; Barr, 2016; Lee & Kim, 2019). However, researchers have found that undergraduate students experience difficulties understanding and using technology, occurring most often within the demographic of students over 50. As a result, they are likely to experience lower grades and higher attrition rates (Banks & Dohy, 2019). This section reviews current research focusing on recent innovations in university use of technology for all students and older learners and how they learn technology in higher education.

Technology Innovations and Student Learning. Because Internet information and communication technologies are transforming much of society, there is little reason to believe they will not be defining factors for innovation within higher education in the coming decades (Department of Education, 2017). Three recent innovations illustrate the use of technology in MOOCs (Andone & Mihaescu, 2018). In addition, HEIs have used learning technology in multiple ways. This section reviews research on MOOCs and several widely adopted HEI tools used to support learning.

HEIs began to use massive open online courses (MOOCs) in the late 2000s as a strategy to provide educational resources to a broader and more global population (Lambert & Hassan, 2018). Since then, MOOCs have provided researchers with many avenues for research. For example, Joo et al. (2018) examined 222 university students' motivation and enthusiasm to use MOOCs, specifically K-MOOCs (Korean MOOCs). The researchers investigated the use of MOOCs from several approaches, including learners' motivation to persist, self-determination, perceived ease of use, and overall satisfaction. For first-time MOOC users, student satisfaction had a significantly positive influence on their intention to continue using MOOCs. This indicated learners needed to feel fulfilled and rewarded with their first MOOC experience if they planned to use MOOCs in the future. Thus, older students' perceived usefulness and ease of use can contribute to these older adults using new learning technologies such as MOOCs.

De Hart and Wentzel's (2020) research illustrates the efficacy of podcasting as a valued and worthy educational resource (Goldman, 2018). Rosell-Aguilar (2013) surveyed almost 2000 users of iTunes U, emphasizing participants who studied new

languages versus those who learned something other than a new language. Most prior studies regarding podcasting as a teaching and learning tool were undertaken with digital natives (teens to early 20s). However, this study surveyed adult users of all ages. Student ages ranged between 25 and 54 for non-language learners (learning something other than a new language) and between 55-64 for those learning a new language. Since that time, there has been no further wide-ranging study on users of iTunes U. Findings indicated users placed value on the quality of the materials available via iTunes U, and they believed the materials helped them learn. In addition, the students over 50 listened to their coursework podcasts on mobile devices, in contrast with findings from prior research. Thus, older students in this study sought alternative technological learning methods as they kept pace with technology.

Alternative learning methods include video and audio podcasts (digital files distributed through the Internet using personal computers or other mobile digital devices), which have evolved rapidly in higher education due to pedagogical possibilities (Al-Ismail et al., 2019). Jiménez-Castillo et al. (2017) examined factors influencing the integration and transfer of knowledge when video podcasts were used as complementary tools to earlier and equivalent conventional lectures on the topic. One of Jiménez-Castillo et al.'s hypotheses stated that "Students' perceived prior knowledge gained from classes has a positive influence on their perceived assimilation" (p. 450) of related content presented in video podcasts. In addition, these researchers found that the ease of use of video podcasts positively affected the perceived usefulness of the podcasts and positively influenced learners' behavioral intention, acceptance, and use of video podcasts.

Mobile learning (mLearning) is a method that not only incorporates podcasts but includes the use of such devices as laptops, digital tablets, personal digital assistants, and mobile phones (Sutton & Desantis, 2017). mLearning has become a tool with vast potential in both classrooms and informal learning outside the classroom. For example, Gezgin (2019) investigated the effect of mLearning support on students' academic success using a database management system course. According to the findings, mLearning positively affected students' academic achievement for the course; the cohort of students supported by mLearning was more successful than those supported only by face-to-face training. Further, mLearning students emphasized their motivation, overall interest, and curiosity in the effects of the mLearning approach on their academic success.

In 2010, the iPad impacted learning approaches and instructor practices (Stec et al., 2020). Using a qualitative case study design, Islim and Sevim-Cirak (2017) explored faculty members' educational use of technology, particularly iPads, and sought their opinions of the educational benefits of technology and their students' technological competencies. Results showed that faculty members used various devices such as iPads, and multiple applications within their classrooms based on their class needs. Despite most faculty participants being digital immigrants, they saw themselves and their current students as technologically capable. These participants reported experience, socioeconomic status, and enthusiasm to use technology affected technological competence for themselves and their students, particularly given the affordability and mobility of iPads.

Formal Technology Learning for Students Over 50. HEIs consider digital literacy skills necessary for successful learning (Kvavik, 2005; Newman et al., 2018). Vaportzis et al. (2017) found that technology was an ever-changing and anxiety-ridden challenge for many adults over 50. This section reviews how seniors have successfully learned computer and Internet skills within academic settings.

Research in this section suggests that the definition of the learner over 50 years of age in higher education has changed over as it relates to their technology capabilities (Dauenhauer et al., 2016; Guest, 2017; Martínez-Alcalá et al., 2018). It may be that as baby boomers returned to school, they brought greater digital literacy as they demonstrated the capacity to learn recent technologies (Torun, 2020). However, HEIs cannot assume older students are digitally literate.

As technology becomes ubiquitous, it supplies opportunities to promote intergenerational connections across demographically different populations and diverse contexts (Boger & Mercer, 2017). Like the study by Lee and Kim (2019), Dauenhauer et al. (2016) administered surveys. They held focus groups with a sample of 132 older adults and the second sample of 20 graduate students who worked alongside the older adults to explore what is known as intergenerational service eLearning. The elders in Dauenhauer et al.'s study wanted to learn computer systems and technology advancements from younger generations. Such knowledge and skills were much more the expertise of those more youthful individuals. Dauenhauer et al. found that older adults, most of whom were well-educated, preferred one-time lectures on learning technology versus committing to an entire course. Still, all were fascinated by the ability to interact

with younger students who were learning the same content. Those graduate students also received help from this type of intergenerational higher learning, cultivating their interest in working and learning alongside elders within their communities. In this multigenerational setting, the older adults stated they learned more effectively. In the same way individuals from diverse racial, ethnic, and gender backgrounds learn to respect and value differing perspectives and contributions, so do people from various generations in learning situations discover and appreciate the vantage point of those older or younger than themselves, a concept known as "reverse mentoring" (Zauschner-Studnicka, 2017).

Many older adults believe they are incapable of learning to use technology (Kuerbis et al., 2017). To explore a means of overcoming this barrier, Martínez-Alcalá et al. (2018) utilized a blended teaching approach so that 98 older adults might develop and improve their digital skills more quickly. One-half of the participants took part in face-to-face workshops, while the other half partook of a blended learning model. As a result, digital literacy increased post-evaluation after the face-to-face workshops, but significantly more so with the combined method. Furthermore, the results regarding the efficacy of the blended workshop confirmed older adults confirmed ease of use, perceived usefulness, attitude toward using, and intention to use technology. The combination of classroom instruction and independent study was beneficial. Moreover, It may be that motivation to learn new technology skills and understanding the usefulness of the skill can enhance digital literacy.

Older adults tend to show less expertise after technology training and take longer to learn than their younger peers; thus, extending the length of activities and examining specific training techniques may better support older adults (Lee & Kim, 2019). Miwa et al. (2017) pursued the effects and retention of knowledge for older adults taking digital learning courses over three years. Participants were divided into two groups: up to 60 years of age and more aged than 61. The researchers found that learners significantly improved their computer skills after taking a digital learning course based on self-report surveys. In addition, those who used computers and accessed the Internet frequently were more likely to retain the skills learned in the digital learning course over three years than those who did not use a computer often. This study indicated that continuing education or ongoing learning courses to be cornerstones in retaining digital literacy skills for older adults.

In the past, some university administrators viewed older adults as incapable of learning due to declining intelligence, memory, and sensory abilities (Lee & Kim, 2019). Zhang et al. (2017) questioned this generalization about older learners within higher education. Using the sociocultural theory and situated learning models, these researchers came to similar conclusions as Dauenhauer et al. (2016). Zhang et al. matched older adults with younger cohorts within specific study areas. Findings indicated that sustained conversations with younger peers helped older adults understand unfamiliar concepts and phenomena. Although the results of this study cannot be generalized to other settings, they reinforce the idea that social relationships among a variety of generations of learners

allow older adults to participate in collaborative learning supported by situated instruction from younger learners.

Many older adult learners can educate themselves in digital technologies but may be susceptible to anxieties that arrive with the new technology use. These anxieties may include psychological issues stemming from learning something unique and foreign to their prior experiences (Vacek & Rybenská, 2017).

Ball et al. (2019) investigated the demographic group with the most significant digital divide being the elderly. The researchers examined how older persons perceive the physical use of information and communication technology (ICTs), focusing on how perceptions differ across generations and circumstances. Nine focus groups provided data for this study. Seniors admitted that ICTs helped them connect with social relationships that were geographically distant, but that they also caused them to feel disconnected from social ties that were geographically close. This phenomenon is known as the "physical-digital gap," It occurs when a group feels excluded or offended when individuals around them use ICTs while they do not or cannot use ICTs. Older generations are typically referred to as digital immigrants (Prensky, 2001a) because their preferred mode of communication is physical face-to-face encounters and conventional manners. However, there are suggestions for bridging the physical-digital divide. However, they were not as technologically savvy as their younger counterparts. Thus, older adults bring many practical skills to college learning, compensating for their lack of direct technological knowledge. The older adults in this study appeared resilient, yet other facets of college life, such as academic performance and perseverance, are significantly impacted by social

anxiety (Boukhechba et al., 2018). Thus, there may be unknown factors impacting digital literacy.

Online education is attractive to older adult learners looking for opportunities to obtain degrees while working and tending to other life commitments (Simmers & Anandarajan, 2018). Alqurashi (2019) examined the relationship between older adult students' satisfaction with the technology used at their online university or college and their intent to continue online education. Using an online survey adapted from the technology acceptance model, 300 older higher education students contributed to the study. It was determined that learner satisfaction was a significant predictor of older learners' intent to continue learning, second only to learner motivation to pursue their education. Thus, in this case, learning technology can occur when the learner is motivated to learn the subject matter.

There are many advantages to online learning, including providing equal opportunities for learners to learn at their chosen pace (Liu et al., 2020). For example, Farhan et al. (2019) explored perceptions of 36 adult learners toward e-learning in higher education using focus group interviews and semi-structured surveys. The results indicated the qualities of self-discipline and effective time management were vital for older students having a multitude of outside school responsibilities (family, jobs, etc.) as they took part in an e-learning course. Furthermore, the results noted older adults required technical training or other preparation before learning online or in a blended setting.

Online and blended learning has become a preferred mode of learning, particularly for some older adults, since studying can be carried out at any place and at any time (Blieck et al., 2019; Galanek et al., 2018). Olivares-Cuhat (2018) explored the suitability of blended learning for older adults learning a second language using technology-enhanced language learning tools. Olivares-Cuhat's study discovered that rather than impeding the learning of a second language for older individuals, proper implementation of the tools in a blended training environment facilitated the academic success of older students.

Older adults may not be as quick to learn technology as their younger counterparts. However, these older individuals may compensate for their lack of learning speed through abundant life experiences. Boakye (2019) examined 20 more aged architecture students accustomed to traditional hand-drafting methods and techniques and challenged by fast-paced technological innovations. Using a basic qualitative design, Boakye identified a necessity for detailed coordination among factors outside the learning environment itself, including interactions with school administrators, teachers, and even the technology software companies who had designed the software used. In addition, these technology companies could contribute to the older learners' professional development by providing internships, reinforcing and encouraging positive experiences, and supporting intellectual growth.

Positive experiences and feeling comfortable with technology are a part of the older adults' needs when learning, and online learning can also facilitate the development of social capital and inclusion (Diep et al., 2017). Rabourn et al. (2018) sought to

understand the college experiences of adult learners over the age of 50. The research sample included 20 adult community college students, and data collection included semi-structured interviews. Findings indicated older adult students to feel they fit in, they needed to feel comfortable and welcomed within the learning group and environment. Diep et al. (2017) confirmed these findings in online and blended environments that allowed older adults to establish social capital, increasing inclusion, which was less likely to occur in traditional learning environments with mixed generations.

For older adults, fear of making errors, or security concerns, is a barrier to learning digital technologies (Knowles & Hanson, 2018). Huyler and Ciocca (2016) explored these issues to understand how technology can support learning for older adults. They determined a primary contributing factor for older adults' adoption of learning strategies using mobile devices, such as text messaging, required a rationale for applying the tool. Thus, older adults may be more compelled to adopt learning technologies when they have a cause for how technology learning can support academic learning.

Mobile technology, platforms, and the ease with which people can access the internet have made it easier to get information and span the technology gap. Ugur et al. (2016) examined the factors that influenced Turkish college students' acceptance of mobile learning, presented an extended model, and analyzed the factors that influenced their acceptance. Students' intrinsic motivation to use mobile learning was a key success factor in the mobile learning adoption process.

This trust and protection of personal information factor may be essential to how older students approach digital technology (Elueze & Quan-Haase, 2018). Hamidi and

Chavoshi (2018) investigated technology usefulness, ease of use, and behavioral intention. In their analysis of the essential factors for adopting mLearning in higher education, Hamidi and Chavoshi used a case study of 300 older college students. In addition to traditional structures of technology adoption such as ease of use and usefulness, the aspect of trust was a significant determining factor for the adult students' acceptance of a given technology.

One of the appeals of mLearning for older adults may be multimedia options that enhance learning. Hao et al. (2017) surveyed 292 adult college students to explore the effectiveness of video lessons delivered for use on a mobile device. Video learning is a sub-group of the broader category of online learning. Within Hao et al.'s study, the discovery was that several factors significantly affect students' behavioral intention to adopt technological learning. Those factors included that mobile apps should be easy to navigate when working on learning tasks. In addition, it should be easy to learn how to use a new mLearning application. Finally, it should be easy to become skillful at using a mLearning application. Thus, for video lessons to be practical via mLearning, a safe and supportive learning environment may improve outcomes.

Technology Support Strategies for Older Learners. In HEIs, instructors have used digital technology using a variety of innovative learning approaches to engage their students (Sutton & Desantis, 2017). However, as higher education shifted from the use of standalone desktop computers to the utilization of mobile devices - such as laptops, tablets, and smartphones - students' usage of these types of devices (Sutton & Desantis, 2017) suggests a need for support strategies targeting older students. Upon entering a

mobile-intensive learning environment, older learners may be at a disadvantage compared to younger learners who may have a higher level of digital literacy and hence do not require as many supports.

Mobile computing, social technology support, and video lectures are just a few ways college educators support students in meeting the challenges of new forms of knowledge transfer and acquisition approaches (Zorn et al., 2018). Instructors have used mobile devices as learning strategies and support tools to promote and reinforce learners' needs and encourage participation in novel ways. Yet, older students may not engage in these activities equitably. This section focuses on an area that may influence digital literacy acquisition for older learners: effective technology support strategies.

Older college students lacking technological awareness and engagement may require support or strategies that their younger counterparts do not (Vaportzis et al., 2017). To counteract deficiencies for older students, some HEIs have designed unique programs to aid older adults in accomplishing their educational goals. In a quantitative study, Bahr et al. (2021) examined in this study, adult students were identified in a community college's student body. The gradations of experience, responsibility, and subject feeling of adulthood that characterize this population of adult learners were illustrated to show the differences. Bahr et al. (2021) found evidence on adult students' participation in higher education and how their approaches to college differ from younger students. Data showed that community college programs and efforts to improve adult students' achievements are examined.

Behaviors such as enthusiasm and positive feelings toward technology usage, along with the absence of fears and doubts, have allowed older people the ability to manage using innovative technology (Anderberg et al., 2019). González and Morales (2019) explored how behaviors and attitudes toward learning digital technology supported older people's successes in a course for learning basic computer skills. The results showed that older individuals remained eager to learn about computers if they remained physically and mentally healthy. Essential supports for learning to use computers for various activities promoted older adults' self-confidence and self-assurance. Understanding and improving behaviors and attitudes may be a strategy to encourage continuing education for students over the age of 50. As with other studies relating to older adults and effective technology learning (Chiu et al., 2019; Gezgin, 2019), these participants had open minds and felt at ease once introduced to the computer software and hardware used in the course.

Although some older learners displayed a reduced interest in learning, their outcomes were better when content was adapted to specific cognitive styles provided within the eLearning environment. Cognitive styles are a person's typical problem-solving method, thinking, perceiving, and processing of information (Sinnott, 2018). Hence, when approaching and supporting older adults' learning experiences via eLearning technology, instructional designers and faculty might consider the cognitive style of each learner (Gezgin, 2019).

With the expanded use of online pre-recorded lectures, Stull et al. (2018) examined instructor recordings for video lessons using transparent whiteboards, an

innovative tool for eLearning. Stull et al. explored learning experiences with traditional whiteboards where the instructor faced away from the camera and the audience. They also used a transparent whiteboard in which the instructor stood behind a clear windowpane facing the video camera. At the same time, the instructor wrote or drew on the glass, and the camera reversed the instructor's writing and drawing so that it was readable for the audience. In this way, learners viewed non-verbal cues such as facial expressions and hand movements of the instructor. Findings indicated that students who viewed online video lessons using transparent whiteboards performed better on learning assessments and rated higher levels of social partnership with the instructor than those who knew via traditional whiteboard methods.

Because of their potential deficits in digital literacy, older students need institutional support (Martínez-Alcalá et al., 2018). Stone and O'Shea (2019) found that supporting older adults and putting them at ease in a learning environment enhanced their ability to learn digital literacy skills, particularly when learning to use mobile devices. Additionally, programs and workshops about mobile devices provided by younger peers (Dauenhauer et al., 2016; Kara et al., 2019) allowed for social support and an improved and less-pressured learning setting. Bennett and Kapusniak also found that supplying broad-minded support methods, such as one-on-one instruction, tutorials, or printed and detailed instructions, aided older adults to be successful in college.

Specific challenges for mLearning include how and who provides instruction about its use and maintenance (Lall et al., 2019). Asiimwe et al. (2017) called attention to the reduction in face-to-face interaction among students, one reason for the high dropout

rates in distance education. Research on digital divides indicates individuals who are overlooked or discounted as learners (such as those who are disabled, or economically disadvantaged) may be further prevented from full participation when ICT is used in learning. They cannot afford the technology or access the personalized assistance they might require (Friemel, 2016). Marginalized students are also often unable to use the ICT due to higher education institutional failures to comply with legal and technical requirements for impaired and disabled students (Brown et al., 2021).

Challenges of Technology-Based Learning for Older Students

This section discusses older students' experiences and challenges when learning new technology. Each type of delivery method of technology-based learning may not work for all learners. For example, mobile technology has become crucial for HEIs due to the wide variety of its benefits (Kvavik, 2005). When university systems integrate mLearning into their educational programs and courses, they provide students access to learning anytime and anywhere. In addition, research indicates students using mLearning understood more effectively than students presented with just face-to-face teaching methods (Gezgin, 2019). Nonetheless, for the older student, mLearning, and other technology-based strategies, may prove problematic.

Often mobile technological features can be overwhelming and intimidating for older users who cannot appreciate such features because they may not understand their usefulness (Khawaji, 2017). In addition, older adults voiced concerns with mLearning as having anxiety about a deficiency in direction, guidance, and support when utilizing

mLearning (Vaportzis et al., 2017), even though mLearning has made learning simpler for collaboration and sharing ideas using the Internet (Lall et al., 2019).

Pimmer et al. (2016) conducted a systematic evaluation of empirical studies on mobile and ubiquitous learning, which indicated the benefits of student use of mobile devices and technology-facilitated delivery of learning materials. Furthermore, as learners attempted and practiced the technologies utilized, these individuals became more engaged and active in and across college classrooms. Thus, the blending of situated and collaborative learning methods using mobile technologies and devices may create new educational opportunities for both young and old.

It may be that the portability of mobile devices enables the communication between learners and learning material, their fellow learners, and educators (Lall et al., 2019), thus overcoming challenges often experienced by older adults. Al-Emran et al. (2016) examined the use of mobile devices within the HEI setting as they investigated quantitatively various factors involved with usage among both students and faculty. These authors considered gender, level of study, smartphone ownership, and age. They found no significant difference between ages and attitudes using mLearning. However, results demonstrated positive attitudes by students toward mLearning and revealed college students are motivated and encouraged to use mobile technology within their academic studies regardless of their ages.

Older students may overcome some challenges by using their skills and capabilities acquired through their life experiences. For example, Babb (2021) examined 3,000 learners over 50 in an online science, technology, engineering, and mathematics

(STEM) class, studying several specific traits, including ethnicity, gender, and non-traditional student status. Findings indicated that older students performed significantly better in the online learning environment. The researchers could not determine which characteristics (motivation or self-directed learning skills) caused the older users to be notably apt in the online environment. However, there was a relationship between age and online content. Older students performed significantly better online than their younger counterparts, with a higher attrition rate. It may be that college students over 50 preferred the autonomy of an online course, while traditional students were not prepared to learn independently.

Summary and Conclusions

There are emerging accounts of the conditions that affect the older college students' engagement and success in learning digital technology and how best to support these students in acquiring technological and digital skills (Jacobson et al., 2017; Schreurs et al., 2017). In addition, research has shown that teaching older students has expanded to include tools and strategies (McKenzie, 2019) and mLearning (Hofstede et al., 2017; Information Resources Management Association, 2016). This literature review has provided insight regarding older adults' learning new technology, including their motivation to learn and commitment to the topic at hand (Lambert & Hassan, 2018; Martínez-Alcalá et al., 2018), the importance of the delivery style of the subject matter (Rangel et al. (2015), peer mentoring by youngers students (Dauenhauer et al., 2016; Seo et al., 2019), and the design of the technology being used (Tsai et al., 2017).

A blend of teaching approaches, such as students collaborating with peers, both young and old (Dauenhauer et al., 2016; Seo et al., 2019), along with more formal methods, for example, assessment milestones and training students on basic technology terminology (Chiu et al., 2019) have shown to be successful learning and support means for older adults learning digital technology. Learning via mobile devices in an informal collaborative setting using an inquiry-based method has also shown to be a successful approach to learning for older adults (Khalaf et al., 2018). On the other hand, these students are all unique individuals with a wide range of learning styles and cognitive capabilities (Bendall et al., 2016). For an older adult to explore learning and using modern technology, teaching methods should engage students in proven and effective learning methods (González & Morales, 2019).

However, this literature review recognizes the limited scope of existing literature regarding personal perceptions of college students over 50 and their experiences with learning and using technology in higher education and informal settings (Jacobson et al., 2017; Schreurs et al., 2017). While instructive and informative in its depth and breadth, this literature review has illuminated limited evidence on the personal beliefs of those over age 50 who have met and overcome challenges when entering new learning environments, particularly those within higher education. This current research will add to existing studies on college-level performance and persistence in adults over the age of 50 by exploring those individuals' subjective experiences. There is a gap in the literature about the needs of these learners, how they learn digital skills, and how best to support

them in gaining these skills (Jacobson et al., 2017; Schreurs et al., 2017). This study's results will help close that gap through generic qualitative research.

This study used a basic qualitative method to explore the perceptions and beliefs of the over 50 students whose digital literacy experience involved transformative learning. Chapter 3 details the study method and design.

Chapter 3: Research Method

The purpose of this study was to explore the insights of college students over the age of 50 who attended traditional 4-year institutions to understand their support needs, shared experiences, and types of learning used for digital literacy development. This chapter includes a description of the study's research design and rationale, the researcher's role, the study's method, issues of trustworthiness, and ethical procedures.

Research Design and Rationale

The purpose of this basic qualitative study was to identify and better understand the learning supports that are most helpful for college students over the age of 50 as they acquire digital literacy. The shared experiences of this group would provide insight into their unique needs to achieve digital literacy. The research questions were the following:

RQ1: How do college students over 50 years of age describe their learning as they develop digital literacy skills?

RQ2: What types of support do college students over 50 years of age report most helpful in developing digital literacy?

The core constructs of this study were digital literacy, transformative learning, and supports for attaining digital literacy. Digital literacy is an individual's ability to comprehend and process information from a wide range of sources as presented via the internet using various devices such as tablets, phones, or computers (Ray, 2018; Techataweewan & Prasertsin, 2017). To attain digital literacy, learners need supports for acquiring the appropriate skills. These may include institutional or noninstitutional services or human interactions that improve people's learning to develop digital literacy

and comfort using technology. For this study, types of learning were based on Mezirow's (2009) theory of transformative learning, including (a) instrumental learning, which is technical and involves problem solving, and (b) communicative learning, which is observational and interpretive and involves self-reflection.

I selected a basic qualitative design for this study because I aimed to interpret the experiences and perceptions of the participants (see Merriam & Tisdell, 2016), who were college students over 50 years of age becoming digitally literate. I did not select a quantitative approach because such research designs focus on measuring statistically significant relationships identified within a large sample to apply findings to a broader population (see Maxwell, 2010). In addition, quantitative research includes singular and objective factors to present unbiased data, with the research process often beginning with a hypothesis and resulting in a cause-and-effect observation (Mertler & Reinhart, 2017; Rottman & Hastie, 2014). Because the intent of the current study was not to measure or collect numerical data that might suggest a cause-effect relationship or apply to a larger population, a quantitative approach was not appropriate.

A basic qualitative study was appropriate for this study for several reasons. First, Merriam and Tisdell (2016) described basic qualitative research as philosophically derived from constructionism, phenomenology, and symbolic interaction. Researchers use this approach when they are interested in "(1) how people interpret their experiences, (2) how they construct their worlds, and (3) what meaning they attribute to their experiences. The overall purpose is to understand how people make sense of their lives and their experiences" (Merriam & Tisdell, 2016, p. 23). Second, bridging a gap in the

literature is one function of qualitative research, bringing about added avenues for exploration (Corbin & Strauss, 2014). Third, qualitative research provides an understanding of individual experiences to better capture people's experiences by using deep descriptions of the meaning of experience (Hays & Wood, 2011).

A qualitative method provides a framework to explore a phenomenon from a range of different perspectives (Lauckner et al., 2015). According to Yin (2014), qualitative methodologies can support theories on human factors and human behaviors. These phenomena include (a) how people experience aspects of their lives, (b) how individuals or groups behave, (c) how organizations function, and (d) how interactions shape relationships (Denzin & Lincoln, 2013; Teherani et al., 2015). According to Merriam and Tisdell (2016), qualitative researchers use data collection methods "such as interviews, focus groups, observations, and analysis of documents or artifacts" (pp. 52–53).

Percy et al. (2015) described the basic qualitative approach as instrumental in studying attitudes and feelings in which data come from individuals' perceptions. I aimed to gather personal accounts of learners over 50 through individual interviews and two focus group sessions. Using a discovery process within the focus group setting, I learned about the students' unique needs, supports, and types of learning required for them to acquire digital literacy. Through individual interviews followed by small focus groups, I questioned, probed, and clarified the experiences of all participants. Together with interviews and focus groups, small sample sizes are suitable for qualitative data collection (G. Guest et al., 2017).

The narrative qualitative design is practical when combining information from various approaches, whether the researcher collects data from a one-on-one interview or by survey (S. J. Taylor et al., 2015). Within a narrative design, the researcher develops a clear understanding of the context of the individual's life (Merriam & Tisdell, 2016). I rejected a narrative qualitative design because I wanted to identify the experiences and ideas that influenced a specific population at a particular stage.

I used a basic qualitative approach that helped me identify emerging perceptions and interpretations that affected a distinctive unit of people at a point in time (see S. J. Taylor et al., 2015). In this study, I gathered descriptions of firsthand experiences and perceptions from a group of students over the age of 50. Although the basic qualitative and phenomenological methodologies are similar, the basic qualitative approach focuses on the varied lived experiences of participants (Merriam & Tisdell, 2016). A phenomenological approach is used to identify the essence or defining characteristic of a shared experience (Patton, 2002; Percy et al., 2015). Exploration in a basic qualitative study includes personal experiences and gaining in-depth descriptive reflections (Creswell & Poth, 2019; Merriam & Tisdell, 2016), which aligned with my research aims.

I rejected grounded theory and case study designs. Researchers select grounded theory to form theories, which was not appropriate for my research. Likewise, a case study design helps the researcher accurately depict a phenomenon within a bounded real-life setting (Creswell & Poth, 2019; Merriam & Tisdell, 2016). This design did not align with my intent to understand the perceptions of older college students who attended

HEIs, and the study did not have a shared context. The research questions were best answered using a basic qualitative design, an exploratory approach intended to seek information about a specific phenomenon experienced by individuals (see Bordens & Abbott, 2011).

Role of the Researcher

In qualitative research, the role of the researcher is that of the data collection instrument that prepares and obtains data from surveys, interviews, and focus groups (Merriam & Tisdell, 2016). Qualitative research requires identifying personal values, assumptions, and biases at the start of a study. I am a training and learning facilitator of online learning for students and an adjunct instructor in my professional work. I had seen the value of supporting students as they develop digital literacy skills and the importance of facilitating a way to help them apply technology skills to produce fluid communication. However, I also saw a substantial barrier for older adult learners using the internet as a wide-ranging lack of digital literacy. They seek to acquire digital literacy skills within their college environments. Thus, I had a bias in favor of technology supports for all learners, regardless of age.

My responsibility as a facilitator and trainer made me aware of the substantial barriers older adult learners encounter when using new technologies. Therefore, I brought certain biases to this study. I made every attempt to safeguard my neutrality by mediating my potential biases. Because I used two focus group sessions to explore participants' beliefs, their ability to communicate accurately and honestly may have provided a limitation because they may have been less willing to disclose their level of digital

literacy. Documenting my potential biases minimized threats to the validity of the study. I consistently monitored potential bias using reflexive journaling (see Merriam & Tisdell, 2016) to reduce possible negative consequences to the research outcomes.

As an educational technology coordinator, it is my job to train faculty and staff to integrate technology into their classrooms, improve student achievement, and ensure that students meet and exceed common core standards. I also identify appropriate technology platforms that support an effective learning environment. In addition, I am an adjunct instructor and use the technology that I train to facilitate learning. This may have introduced potential bias in my study. Therefore, I documented and reflected on any tendencies to misinterpret data that could have affected the results of this study, as suggested by Merriam and Tisdell (2016). Ambiguity and evidence regarding any presumptions within data collection is an extreme concern for researchers (Birt et al., 2016).

I approached this study with an open mind by taking note of all evidence collected. In my professional role as educational technology coordinator, I have firsthand knowledge of training, modeling, and integrating technology standards that meet and surpass the common core standards. Additionally, I have professional relationships throughout the educational system. I made sure that these professional relationships did not impact the research by consistently monitoring the potential of bias using reflexive journaling (see Merriam & Tisdell, 2016). This reduced possible negative consequences to the study's outcomes.

To avoid any personal bias, I utilized specific strategies. First, I did not collect any data from my current place of employment. Instead, I collected data from other institutions that offered online campus-based instruction throughout the United States. Therefore, the chances were minimal that I would know any of the study participants. Plans to avoid bias included keeping a reflexive journal on what was taking place during the study; member checking; admitting my perceptions; and being aware of participants' feedback, opinions, and assumptions (see Merriam & Tisdell, 2016).

Methodology

In this section, I explain the process of implementing the study. Once I secured IRB approval (11-11-20-0535898), I began the research process. The following topics are covered in this section: participant selection logic and procedures for recruitment, participation, and data collection.

Participant Selection Logic

The population for this study was college students over the age of 50 enrolled in traditional 4-year HEIs across the United States. I invited participants to take part in individual interviews followed by two focus group sessions. I used a snowball and convenience sample of 12 students over the age of 50 because it allowed participants to recruit additional participants (see Naderifar et al., 2017). Convenience sampling also allowed me to focus on specific qualities of the study's population to answer the research questions (see Etikan et al., 2016). Convenience sampling requires that participants meet inclusion criteria and is used when a "diverse sample is necessary or the opinion of experts in a particular field is the topic of interest" (Martínez-Mesa et al., 2016, p. 328).

For the current study, the inclusion criteria required individuals to be (a) at least 50 years of age, (b) currently enrolled in a traditional 4-year higher education institution, and (c) voluntarily participating in the study. I assured the participants that they would have confidentiality, that their participation was voluntary, and that they could withdraw from the study at any time.

The number of participants was based on recommendations for qualitative data saturation for interviews and focus groups. The number of participants for individual interviews was 12, following recommendations to obtain rich and deep data (see Creswell & Poth, 2019; Maxwell, 2005; Patton, 2002). For focus groups, Creswell and Poth (2019) recommend the use of five to 25 participants. In a study comparable to mine, Menzies et al. (2017) held focus groups to explore students' experiences and opinions regarding their use of Facebook, with a total of 11 participants divided between two focus groups. I interviewed 12 participants and conducted two focus groups consisting of three interviewed participants each.

The concept of saturation in qualitative research indicates the basis for adequate sampling related to developing a theoretical category in the data analysis process (Sim et al., 2018). Malterud et al. (2016) proposed the concept of information power to determine sample size in qualitative studies. When information-rich data is elicited from a smaller number of participants, fewer participants are needed. Within this study, the ability to reach saturation using guidelines provided by Creswell (2019) determined the sample size to be sufficient to address the research questions. The participants' detailed

descriptions gathered from the interviews and the focus groups thus supplied information power (Malterud et al., 2016).

Procedures for Recruitment and Participation

I recruited college students over the age of 50 through Walden University's participant pool and Facebook. In addition, I sent potential participants a solicitation message. Once I had a pool of potential participants that self-identified their full-time enrollment status of 12 or more credit hours, I sent everyone a consent form via email. I asked each participant to reply to this message with the statement "I consent." I downloaded these messages and stored them on a secure disc as documentation of consent. Once I received permission from participants, I created a document with their names, contact information, and assigned pseudonyms (Participant 1, 2, 3, etc.). From that point forward, I only used assigned numbers on any transcription, data analysis, or report. I kept the original consent forms and list of participants on a secured computer. I then repeated the recruitment process if I had not reached data saturation. Finally, after data collection, I notified participants that this part of the research was completed and asked them if they would like a summary of the research findings.

Data Collection

I began with individual interviews, which were conducted over 3 weeks. To schedule interviews, I used an online scheduling tool to identify possible dates and times. Next, I confirmed with participants a time and date for the interview to take place via Zoom.

The interview, focus group questions, and script I used as a guide are all detailed in Appendix A. Additional data collection that followed the interview process were developed by aligning interview questions with research questions to ascertain what had not been answered. Interview analysis was used to create focus group questions, which I used to direct the focus group sessions.

I began each interview session by describing an overview of the study. The participants understood their participation was voluntary, and they could withdraw from the study at any time, as per the consent form. I also provided my contact information and ensured the participants understood their contribution to the study would be anonymous and confidential. Recorded interviews lasted between 30 and 45 minutes. I explained to each participant that after transcribing the recordings, I would send a summary of the session as a form of member checking (Birt et al., 2016). At the end of the session, I asked for any final comments or questions. I asked that they respond within one week with any corrections, comments, revisions, or additions.

After analyzing all interview data, I identified patterns, areas of consensus, anything that was unique, and areas that required elaboration or clarification to provide a foundation for the two focus group sessions (Barbour, 2007; Merriam & Tisdell, 2016). A focus group is appropriate for college students over the age of 50 because they can communicate their views, listen to what their peers believe, and think about their perceptions while exchanges occur (Merriam & Tisdell, 2016). In addition, because this population appreciates social learning and interaction (Dauenhauer et al., 2016; Khalaf et al., 2018; Seo et al., 2019), they might have revealed more and been more reflective

about their experiences when they heard their peers. A limitation of focus groups may include a possibility of conformity or a reluctance to disagree with other group members. This was not the case in this study

I used an online scheduling tool to identify when at least a total of six participants could participate in one of two online focus group sessions. I then notified participants of the date and time and shared login information to an online Zoom meeting room. I conducted each focus group session with three participants using the general interview protocol and questions derived from the interview data analysis. Each participant signed into every meeting with their assigned participant number. Focus group members wanted their cameras on so I video-recorded the focus group sessions and used their assigned number as their participant's name to ensure anonymity, and then transcribed the entire session verbatim. I kept the interview and focus group recordings and transcriptions in a secure file on an encrypted password-protected external hard drive to ensure confidentiality. I stored this hard drive in a locked file cabinet when not in use.

Focus group sessions were conversational and these questions from Appendix A guided each session. Here are the initial questions that were used to guide the discussion:

- In general, what has been the most challenging thing about returning to school?
- How has using technology shaped the way you think about how courses are taught, how you interact in class, or just how you think about what course you may take next?

- In your interviews, each of you discussed your level of digital literacy and how it compared to your peers. How did you realize that you may not have the same level of skills as your younger peers?
- What type of support do you feel you needed at the beginning of your college of experience to ease you into using the required technology platform for courses?

At the end of each focus group session, I informed the participants that follow-up questions would be sent via email and a summary of the session for their corrections, confirmation, and corroboration of its accuracy if needed. I sent each participant a summary of the session. This form of member checking allowed me to verify my understanding and accuracy (Nowell et al., 2017).

Data Analysis

Data analysis is an iterative process that the researcher begins after collecting each data set and builds upon ongoing analysis as the researcher returns to prior analyses (Merriam & Tisdell, 2016). I used the software NVivo for the organization of the data during the analysis process. After analyzing individual interview transcriptions, I reviewed previous analyses to ensure I did not overlook a pattern that may have emerged throughout the data set. I began this process with the precodes developed from the core constructs of my conceptual framework models, see Table 1. I started with the interview data and used this analysis process to form a basis for the focus group sessions. Next, I identified and applied emergent codes supported by specific statements from interviews and the focus group sessions for both data sets. I then developed categories to form the

basis of themes. Finally, I created themes based on keywords and phrases from participants. A more detailed description follows.

I followed a detailed process of data analysis as outlined by Merriam and Tisdell (2016). First, I entered transcriptions of interviews and my field notes into NVivo, and, as I reviewed the data, I applied precodes to each data set. If the precodes did not reflect the patterns I detected, I used open coding (Merriam & Tisdell, 2016) and created new codes. I kept a running list of all emergent codes and descriptions of their meaning. Once I analyzed all interview data, I identified areas for the follow-up focus group sessions.

Finally, I reviewed the focus group sessions and interview data to determine patterns emerging across data sets. As I did with interview data, I entered all focus group data into NVivo and applied the same process as with the interviews, beginning with precodes and the emergent codes I created. If new patterns emerged, I added them to my running list of codes.

Once I analyzed all collected data, I looked for more significant categories of meaning that formed themes (Merriam & Tisdell, 2016). As I grouped the coded material into tentative themes, I wrote a description of the meaning of that theme. I also referred to my research questions and noted how each theme addressed the research questions and how they centered on the purpose of this study. If discrepant cases were evident, I determined if they revealed an insight into the patterns I identified or if they were exceptions. These are described in Chapter 4. Additionally, while constructing themes, I considered my biases to ensure that my thoughts did not skew the data collection process.

Table 1

Research Questions, Interview Questions, Adult Learning, Digital Literacy, Initial Precodes

RQ	Interview question	Adult learning	Digital literacy	Initial precodes
RQ2	Thinking about your technological abilities, are your abilities consistent with your peers, higher than your peers, or lower than your peers?	Instrumental & Communicative	Interdependence & Social Factors	Learn from peers Critical reflection
RQ2	What software or computer programs do you most often utilize in your college experience?	Instrumental & Communicative	Interdependence	Prior experience
RQ2	In what ways does your use of technology help or hinder your learning?	Instrumental & Communicative		Problem solving Critical reflection Work experience
RQ1 RQ2	What is your primary use of technology in your coursework?	Instrumental & Communicative		Problem solving Relevance Experience
RQ 1 RQ2	What resources do you use when you need assistance with technology in your college experience?	Instrumental & Communicative	Interdependence & Social Factors	Self-directed learning Peers Instructors Family members
RQ 2	Describe which technologies have presented the greatest challenge in your college experience?	Instrumental & Communicative		Relevance Self-awareness Problem solving
RQ1 RQ2	Describe the technological training provided by your institution if any. Was it helpful? If yes, why? If not, why?	Instrumental & Communicative	Interdependence	Self-awareness Problem solving
RQ 1	In general, how do you prefer to learn about new technologies?	Communicative		Critical reflection Problem solving

Issues of Trustworthiness

Measures for validity and reliability of qualitative research include factors known as credibility, transferability, dependability, and confirmability (Korstjens & Moser, 2018). In this section, I detail the actions I took related to these factors to ensure trustworthiness.

Credibility

Credibility establishes whether the research findings represent credible and reasonable information obtained from the participants and represents a correct interpretation of the participants' views (Lincoln & Guba, 2011; Nowell et al., 2017). Within this study, I established credibility by making sure my research process was replicable and transparent. To ensure credibility, I used member-checking to confirm that participants agreed with my interpretation of what they reported. Member checking requires that participants verify their interview accountings' accuracy to help ensure the trustworthiness of the data (Candela, 2019). In addition, member checking permitted the participants to support the findings and verify the research through a summary of the interaction (Yin, 2014). Through validating information gathered within supporting data, I improved the accuracy of the findings.

Ortlipp (2008) stated that reflective practices are an acknowledged part of research design development. As the researcher, I documented the research process through field notes recorded in a journal. I validated every step of the research planning, from the study's design, the sampling processes, data acquisition and analysis, and results and conclusions to ensure transparency, rigor, and consistency (Leung, 2015).

I used member checks to establish trustworthiness (Elo et al., 2014). Member checking is a quality control process used to improve the accuracy, credibility, and validity of what I recorded during the two focus group sessions (Harvey, 2015). In addition, member checking provided an opportunity for self-reflection, enhancement of the findings and shifted the power from the researcher to the participants (Richards, 2003). For this study, I used member checking after each focus group session. I created a summary transcript of each focus group session and sent it to each participant, asking them to review, edit, add, or correct any statement from their perspective. While each person may vary in their recollection, I was more likely to eliminate my own bias or misinterpretation of what participants stated by synthesizing all feedback.

Transferability

Transferability is the degree to which the results of qualitative research apply to other contexts or settings (Leung, 2015). Transferability is challenging in qualitative research because of small sample sizes and the nature of the research process or limited population. While findings may have limited transferability, I followed rigorous steps to make sure the results were accurate. I interacted directly with the participants, probing to uncover details about their experiences and perceptions, establishing an accessible online meeting environment, and scheduling contact convenient for the participants.

Dependability

Dependability showed the research processes – data collection, analysis, and findings - as consistent and potentially repeatable (Merriam & Tisdell, 2016). I verified results and conclusions as consistent with the data collected, evidenced through a data

audit trail in my documented field notes. Dependability infers if other researchers were to examine my research data, they would arrive at a similar analysis (Korstjens & Moser, 2018). I included an audit trail of the research method, documenting what worked and what did not.

Confirmability

Merriam and Tisdell (2016) noted that a qualitative researcher admits their bias, but the approach must be based on confirmable practices, studies, and assumptions. Confirmability is the degree to which other researchers could confirm the research study's findings (Nowell et al., 2017). Confirmability establishes that data and interpretations of the results are not figments of the inquirer's imagination but are derived from the data. My use of reflexivity included critical self-reflection about myself as the researcher – examining biases, preferences, preconceptions, and my relationships with the participants. It revealed how those researcher-participant relationships might have affected the participants' answers to the interview questions (Palaganas et al., 2017). I recognized my biases as I reflected after each interview and coding session and recorded any biases in my reflective journal.

My reflective research journal notated contemplations of the focus group sessions as I reported my thoughts, feelings, potential bias, and observations. I also took field notes during the focus group sessions to maintain confirmability. In addition, I followed suggestions received from my dissertation committee.

To achieve excellence in this study, I followed the guidelines for quality research standards put forth by Walden University, including criteria, process, and documentation

of the interviews and focus groups. Reciprocity between researchers and participants was an essential part of this qualitative research (Palaganas et al., 2017; Sivell et al., 2019). To obtain content validity, I addressed the needs and supports required for the older adult participants. According to Yin (2014), construct validity is the accuracy in which a case study's outcome mirrors the concepts that I addressed through this research. The researcher's analyses of the data from interviews and the focus groups, the member checks, and the reflective journal provided validity. The findings from data collection substantiated a conclusion and recommendations for future research discoveries.

Ethical Procedures

This study followed the rules required by Walden University's internal review board (IRB). In addition, participants received a copy of the informed consent document, which included information about risks, possible benefits of the study findings, the voluntary nature of their participation, and the ability to cease participation at any time.

At the beginning of all interviews and each focus group, I described in detail to the participants of this study the specific ways the study was designed to prevent their distress or emotional harm. Further, I explained that if any of the participants wished to stop, pause, or leave the study, or if they did not want to continue to participate for any reason, they would have the opportunity to depart at any time. Participant withdrawal was minimal as I ensured that all information for participation was clear, and that participation was voluntary. I obtained consent to record the focus group participant discussions through email.

I informed participants that all information was confidential. I kept all digital information in a password-protected file only available to me in a digitally secured file on a separate drive accessed through a password-protected computer and on a USB drive backup copy locked in a filing cabinet in my home. I will shred all paper records produced during data analysis after the required 5-year period. Additionally, I will keep all consent forms digitally in a secure file on a separate drive accessed through a password protected computer and on a USB drive backup copy locked in a filing cabinet in my home. There will be no other access to the data, and I will delete all files and destroy them after 5 years.

Summary

This chapter presented the basic qualitative research design I used to explore how college students over 50 years of age interpret their experiences and perceptions of becoming digitally literate. After receiving Walden University IRB approval, I recruited U.S. college students through the Walden University participant pool and social media, such as Facebook and LinkedIn. Data collection occurred through 12 individual interviews and two focus group sessions. After data collection, I summarized each session and sent transcriptions to the participants to member check. The analysis of the data took place using precodes and emergent coding, after which categorical analysis aided in identifying themes. Once I determined patterns from the interviews, I constructed probes to conduct two focus group sessions. After the data were collected from the focus group sessions, I repeated the data analysis process and selected themes applied to all data sets.

Chapter 4: Results

The purpose of this basic qualitative study was to explore and better understand the supports and types of learning required for digital literacy development for college students over 50 who attend traditional 4-year institutions. The research questions for this study ensured that the purpose of my research was at the forefront. The research questions were the following:

RQ1: How do college students over 50 years of age describe their learning as they develop digital literacy skills?

RQ2: What types of support do college students over 50 years of age report most helpful in their development of digital literacy?

This chapter includes a description of the setting, participant demographics, data collection, data analysis, evidence of trustworthiness, and results.

Setting

Twelve undergraduate college students over the age of 50 who attended six different traditional 4-year institutions around the United States participated in this study. Due to the restrictions of the COVID-19 pandemic, I conducted Zoom sessions for individual interviews and focus groups. Each student participated in a 30- to 45-minute recorded online interview. Because participants resided in different time zones, scheduling focus group dates and times was a challenge. For participant convenience, I conducted two focus groups with six of the 12 interviewed participants based on their schedules.

Demographics

The 12 study participants were college students over the age of 50 who attended a 4-year institution. Seven participants were campus based, and five participants were from online institutions. At the time of the study, the campus-based students were taking online courses due to the pandemic. Each participant indicated that a learning management system (LMS) was required to complete and be successful in all coursework. The students' self-assessed technological ability ranged from lower than to consistent with to higher than their peers. To ensure confidentiality for this study, I omitted all identifying information about each student, and I assigned each participant a number in the order they were interviewed. Table 2 summarizes the demographics of the participants and their self-rated level of digital literacy self-rating participants.

Table 2

Participant Demographics and Digital Literacy Self-Ratings

Participant	Gender	Type of institution	Classification	Location	Digital literacy self-rating
P1	Female	Campus-Based	Sophomore	Southwest U.S.	Higher than Peers
P2	Female	Campus-Based	Junior	Eastern U.S.	Lower Than Peers
P3	Male	Campus-Based	Junior	Southern U.S.	Lower than Peers
P4	Female	Campus-Based	Junior	Southwest U.S.	Lower than Peers
P5	Female	Online	Junior	Southwest U.S.	Lower than Peers
P6	Male	Online	Sophomore	Southwest U.S.	Lower than Peers
P7	Female	Online	Sophomore	Eastern U. S	Lower than Peers
P8	Female	Online	Sophomore	Eastern U.S.	Consistent with Peers
P9	Female	Online	Senior	Eastern U.S.	Lower than Peers
P10	Female	Campus-Based	Senior	Eastern U.S.	Lower than Peers
P11	Female	Campus-Based	Junior	Southern U.S.	Lower than Peers
P12	Female	Campus-Based	Junior	Eastern U.S.	Lower than Peers

Note. Digital literacy self-ratings indicated how participants ranked themselves as compared to peers. Higher than peers: Advanced/Developed/Proficient/Well-Informed. Consistent with peers: Accurate/Steady/On-Pace. Lower than peers: Needs Assistance/More Practice/Unacquainted/Ill Informed.

Participant 1 was a sophomore who returned to school after beginning her undergraduate degree in 1978. Her digital self-rating was higher than my peers. She stated that she had built computers since the late 1970s and she felt comfortable with navigating her institution's LMS.

Participant 2 was a campus-based junior. She gave herself a digital self-rating of lower than my peers. She began her degree because she believed a professional degree would allow her to make more money in her field. This was her third year in her program, and although she had been a student at her institution for 3 years, she still felt uneasy navigating her school's LMS to communicate with her instructors and to submit assignments.

Participant 3 was a junior who attended campus-based courses with a digital self-rating of lower than my peers. He was employed in the field of education and enrolled in the K–12 specialization as a counselor. In his work he counseled students about what they needed to know for the transition from high school to college, but he did not feel comfortable or prepared with his use of digital technology. He saw the importance of helping students prepare to use technology on different levels.

Participant 4 was a junior who returned to school due to a furlough in employment and assessed her digital literacy as lower than my peers. She stated that although returning to school was not her plan, she was happy to have the opportunity to go back, and her furlough offered the chance to do that. During the interview she often reflected on how college differed from when she was there years ago and that the change with technology was overwhelming but that she was up to the challenge. During her first college experience, she recalled seldom using a typewriter to submit a term paper but now everything was submitted and done through technology.

Participant 5 was a junior at an online institution whose biggest challenge was a language barrier, and she rated her digital literacy as lower than my peers. This language barrier caused her to reach out to her grandchildren often, which she said made her feel like a burden to them because they had their own schoolwork to do. She thought being an online student and communicating in English so much would be a benefit. However, because English was not her first language and the LMS was not user-friendly, she struggled. She described the LMS as disruptive to her work because of updates and

outages, yet when she reached out to support offices or personnel for assistance, she felt her concerns were not understood.

Participant 6 was a sophomore attending an online institution. He felt that the process of submitting assignments, taking exams, and using the LMS was very time-consuming and overwhelming. He felt that being able to obtain a degree online was very helpful due to his personal and professional life. His digital literacy self-rating of lower than my peers stemmed from what he perceived was the lack of training from his institution on how to use the system. He thought the institution assumed that students were already comfortable using an LMS to complete and submit assignments, but for him that was not the case.

Participant 7 was a sophomore who attended an online institution with a digital self-rating of lower than my peers. She relied on her grandchildren a great deal for support and as a resource with using her institution's LMS to complete assignments. She repeatedly mentioned that she did not feel like she would be successful until she got a grasp and started to feel comfortable using the required technology. She also stated that she always tried to "go around" technology because she only used it when necessary. Of course, she said she used a cellphone and played games online, but that was the extent of her technology use. She repeatedly said there was no way around it now.

Participant 8 was a sophomore who attended an online institution. She gave herself a digital-self rating of consistent with my peers because she was able to interact with them in her discussions and felt comfortable using her institution's LMS. At first, she was overwhelmed, but at the beginning of her coursework her school required

students to take a course devoted to learning how to navigate the school's LMS. This was very helpful because she was able to get most of her questions and concerns answered about a system that she was not familiar with. She also talked about how completing everything through an online platform was different from anything she had to do in the past. She recognized why it was helpful because she was in class with students from around the world, which she found fascinating.

Participant 9 was a senior who attended an online institution. Although she gave herself a lower than my peers digital literacy rating, she was very excited about her efforts in getting ready to complete her degree. Her rating was based on her perception that she did not seem to be as digitally proficient as other students in her courses who seemed to understand things from the beginning. She also stated that she felt comfortable navigating her institution's LMS. However, it took her a while to feel confident using it.

Participant 10 was a senior who attended a campus-based institution. She rated her digital literacy as lower than my peers because she realized that she was behind with her ease of using technology and her younger counterparts seemed to use the LMS with ease. She stated that she talked to several of her instructors about this and that they agreed that because younger students start using similar systems before they come to college, it may be easier for them to transition faster than someone who has not used this kind of system at all.

Participant 11 was a junior who attended a campus-based institution. She said the pandemic showed her how uncomfortable she was using technology, and she rated herself lower than my peers. Because everything was moved online, she felt that

communication was not the same with her instructors or her peers. She also preferred taking her exams in class and not online because she had a few computer issues that made things difficult. Taking courses in class was her preference. She could not wait until she could get back into the campus-based classroom.

Participant 12 was a student junior who attended a campus-based institution. Her digital-self rating of lower than my peers came from the fact that she felt she needed more technological support on a one-on-one basis. She stated she was more of a tactile learner and that she learned best by doing activities repetitively to get comfortable. Participant 12 talked about using YouTube for assistance with issues with technology. Due to the pandemic, her classes were switched from on campus to online, so that made things a little more difficult for her because she preferred more hands-on instruction. For example, she had to submit an assignment using an online recording system rather than submitting a written assignment.

All 12 participants were aware of their digital skills and used a range of strategies for learning and using required technologies. Participants all were eager to discuss their experiences and provided a rich and thick set of data.

Data Collection

Data collection took place over 6 months. I recruited participants from the Walden University participant pool (a university resource for staff and students to recruit participants) and a Facebook ad that reached students across the United States. These two approaches allowed me to recruit 12 interview participants, of whom six agreed to participate in a follow-up focus group.

Data collection involved interviews with 12 participants through Zoom and two focus groups with three participants each, also through Zoom. Focus Group 1 consisted of Participants 2, 3, and 6. Focus Group 2 consisted of Participants 5, 9, and 11. With each participant's permission, I made an audio recording of each interview available through the Zoom app. After each interview, I forwarded recordings to Rev, an online transcription service that transcribed the interview and focus group recordings. Using an outside transcription service was not initially planned, but using it gave me more time to focus on data collection and analysis. Each focus group participant received an email with a summary of the session.

The information gathered during the focus group not only added to my understanding of students' experiences but also confirmed data collected through the interviews. The focus groups allowed me to capture participants' perceptions in a way that the one-on-one interviews did not. I elicited elaboration from respondents' comments, probing more deeply about their attitudes, feelings, beliefs, experiences, and reactions. When sharing their responses in a group setting, participants may have refined or clarified their perceptions through the interactive dialogue (see Merriam & Tisdell, 2016). Moreover, the focus groups helped me confirm interview data by allowing participants to think aloud, elaborate, and affirm each other's reports.

Data Analysis

The purpose of data analysis is for the researcher to produce a clear meaning for the data by "consolidating, minimizing, and interpreting" the study's findings (Merriam & Tisdell, 2016, p. 202). The data analysis was active and continuous as described in

detail in this section. After data collection, data analysis followed as informed by Merriam (2009) using multiple levels of coding. In the first level, I analyzed interviews and then the focus groups using the precodes (see Table 3), and in the second level, I identified emergent codes. I discovered and noted which precodes applied to the data and utilized line-by-line initial coding to assess the data that did not fit with the pre-established codes to find emergent codes and common repeating patterns in the new qualitative data.

1. Using the precodes, I coded interviews as they were transcribed (see Table 3), reading and re-reading the interviews after each transcript was coded. Data analysis involved applying precodes, and then identifying emergent codes, and finally articulating themes (Merriam & Tisdell, 2016; Saldaña, 2016) related to participants' descriptions and specific supports they expressed as being needed while developing digital literacy.
2. I analyzed each focus group transcript and determined how thematically they were related, after which I added to the existing themes. I made sure to consider differences between interviews and focus group responses.
3. I gathered data until I reached saturation, at which point no new patterns arose.

After analyzing the interview data, I discovered only two outliers in the form of participants who did not fit the general pattern in their self-assessment of digital literacy. The codes from the interviews guided the initial data analysis. I used the same codes from the interviews to build that data analysis from the focus groups. A review of the focus

group transcripts revealed no new codes or any outliers. At the start of focus groups, participants wanted to discuss their ages (between 55 to 60 years of age) and how they felt age played a role in their adoption and impressions of technology. When I analyzed the data, I used both the original precodes and the emergent codes that I devised from data analysis.

Focus group sessions built on the patterns from the interviews. No new codes were identified during analysis of the focus group transcripts. When I went back to look at the interview codes, the themes were the same. As a result, the focus group sessions corroborated the interview findings.

Table 3

Precodes, Codes, and Frameworks: Relationships to Research Questions

Precode	Emergent code	Framework	RQ
Critical reflection,	Reflections of the past	Reasoning process	RQ1
Prior experience	Tech savvy/tech novice	Making meaning of an experience	RQ1
		Transformative learning	
Support/resources	24/7 support, training,	Learning outcomes	RQ2
Social factors	learning platform,	Sustainable development	RQ2
	learning style, step-by-	Digital competence digital	RQ2
	step support, hands-on	literacy	RQ2
	learner, tactile learner		
Problem solving	Essential technology	Enhanced digital workflow	RQ1
		Transformative learning & digital literacy	

Evidence of Trustworthiness

Quality criteria for qualitative research include the trustworthiness of qualitative research's validity and reliability. Therefore, the confirmability of data from the study will indicate trustworthiness through its credibility. Furthermore, the analysis methods must present results in enough detail to allow the reader to determine whether the process

is credible (Korstjens & Moser, 2018). I followed research procedures in this study by observing the overall protocols for conducting interviews and guiding the focus groups. Each interview and focus group participant were informed about confidentiality and protection of their identity at the start of each interview and focus group.

Credibility

I used member-checking to ensure that participants confirmed my interpretation of what they reported to ensure credibility. Member checking requires that participants verify their interview accountings' accuracy to help ensure the trustworthiness of the data (Candela, 2019). After an interview, I sent each participant a summary of our conversation and asked for corrections. The participant member checking improved the accuracy of the findings. I documented the research process through field notes recorded in a journal to further assure credibility. I took notes all throughout, and if something did not work, I rephrased it and identified patterns from my journal.

Transferability

This study had a small sample, which restricts the degree to which the findings can be applied to a broader population. However, I sought to examine the viewpoints of a diverse group of nontraditional students by seeking study participants nationwide from around the United States. The Facebook advertisement reached students in the southern, eastern, and southwestern parts of the United States. While findings may have limited transferability, I followed rigorous steps to make sure the results were accurate. The steps included interacting directly with the participants for as much time needed to establish trust and rapport, probing to uncover details about their experiences and perceptions,

establishing an accessible online meeting environment, and scheduling contact convenient for the participants. The findings illustrate the types of experiences that might be shared by students of a similar age pursuing undergraduate degrees and thus could inform policy and practice at institutions that enroll such students.

Dependability

Dependability infers that if other researchers were to analyze my research data, they would arrive at a similar analysis (Korstjens & Moser, 2018). To confirm dependability, interviews and focus group sessions were recorded through the Zoom application and transcribed by Rev transcription service. Each transcription included a summary, and both the summary and transcriptions were checked verbatim for accuracy. Also, I used member checking during the data collection process and kept detailed records and reports of the study's findings in a secure location to ensure consistency and integrity throughout the study (Merriam & Tisdell, 2016). I verified results and conclusions as consistent with the data collected, evidenced through a data audit trail in my documented field notes.

Confirmability

Confirmability is the degree to which other researchers could confirm the research study's findings (Nowell et al., 2017). Confirmability establishes that data and interpretations of the results are not figments of the researcher's imagination but are derived from the data. My use of reflexivity included critical self-reflection about myself as the researcher – examining biases, preferences, preconceptions, and my relationships with the participants. I recognized my biases as I reflected after each interview and

overview of each transcription summary and recorded any biases in my reflective journal. My journal entries were the basis for anything I learned that would improve data collection. For example, if I used a term a participant did not understand, in subsequent interviews I made sure to use different language. I also noted in my journal when an interview was rushed or incomplete. I then scheduled more time for participants to give feedback if something was not clear. After more reflection of my journal notes, I took the emergent codes and precodes that came from those journal notes and put those codes on post-it notes, and then put them on my wall so that I could see them begin to show me themes and patterns.

To achieve excellence in this study, I followed the Walden University guidelines for quality research standards, including criteria for inclusion, process of data collection, and documentation of the interviews and focus groups. The relationship between researchers and participants was an essential part of this qualitative research to elicit the deep and rich descriptions from participants (Palaganas et al., 2017; Sivell et al., 2019). To obtain content validity, I addressed the needs and supports required for the older adult participants making sure I allowed sufficient time, answered all their questions, and probed to determine anything they might not freely disclose. For both research questions, tables 4 and 5 list the final codes and categorize the themes.

Table 4

Final Codes, Categories, Themes, and Examples for Research Question 1

Final code	Category	Theme	Example
Critical Reflection, Prior Experience	Reflections of the past Tech savvy/tech Novice	*Self-Assessment of digital literacy* describes the participants' ability to understand the technology and apply digital resources to be successful in their work.	I keep trying to go back to the way it was 20 years ago sometimes. It's like why is this button not here, then I realize, "Wait a minute. 20 years ago, was not 1980." (P1)
Technology Environment	Making meaning of an experience, Training, Learning Platform, Learning Style, Step-By-Step Support, Hands-On Learner, Tactile	*Benefits of technology learning Outcomes* involve the essential and significant learning that has been achieved by using technology. *Organizational support needs for skill development* is an environment in which digital tools and resources are used to enhance learning, communicate utilizing critical thinking abilities, and assess material so that the learner may internalize concepts and acquire authentic skills.	I don't know, like a, a town hall or Excel lunch or a PowerPoint lunch that I could go to, maybe just to kind of, you know, see how to do some of these things. (P5)
Problem Solving	Essential Technology Critical Thinking - Use of critical thinking skills to evaluate digital information.	*Enhanced digital learning workflow* is evident by the confident use of technology for information, communications, and problem-solving	I prefer to be told about it, and then immersed and said, "Okay. This is how you do it." Um, you know, kind of an overview, but then a hands-on learning. I guess I'm one of those people that take apart a clock to figure out how it tells time. (P3)

Table 5

Final Codes, Categories, Themes, and Examples for Research Question 2

Final code	Category	Theme	Example quotation
Digital Preparation	Confirmation of technology perception	*Self-assessment of digital literacy*	I am always looking for ways to improve on what I need to know. There is always room for improvement, and I know that especially with technology. P6
Support/Resources	Learner comfortable with and objective about the use of technology. Support to successfully perform in digital environments	*Needing organizational support*	I know I am doing the best I can. Sometimes I feel like teachers forget they were once a student and do not put themselves in our shoes. Things are so different these days. I never thought that submitting an assignment would be a barrier for me. P4
Social Factors	Essential technology, technology advocate, 24/7 support	*Enhanced digital learning workflow*	My kids help me all the time with this, without their help I would not know what I was doing with any of this. I am so glad they know how to do this, and they are encouraging me not to be afraid of using it. I feel like I am going to break something all the time. But it makes me feel better to know that my kids are my resource to get me through. P2
Comprehension	Intellectual capacity, conceptions, knowledge, grasp, understanding	*Benefits of technology learning outcomes*	I understand things different and so I say that is because how I talk, and they talk. I talk, they talk is different to understand maybe, so it's confusing So, uh, it's hard at times, uh, but I am working alone and doing the best I can. P11

Results

The purpose of this basic qualitative study was to explore the learning supports and types of learning required for digital literacy development of undergraduate college students over 50 attending four-year institutions. Themes were developed from the precodes and emergent codes. Four themes and one sub-theme resulted from the analysis of the data. For the first research question, I identified the themes: self-assessment of digital literacy and technology learning outcome with the sub-theme buy-in of LMS. For the second research question, I identified the themes: organizational support needs for skill development and enhanced digital learning workflow. The results are organized by research questions and the themes associate with them.

Research Question 1

The first research question asked how college students over 50 years of age describe their learning as they develop digital literacy skills. Two themes emerged from data analysis: self-assessment of digital literacy and benefits of technology learning outcomes.

Theme 1: Self-Assessment of Digital Literacy

Beyond the understanding required for basic access to various technologies, becoming digitally literate requires a variety of abilities. Adults with limited familiarity with digital environments can improve their understanding of technology through practice and guided training, according to research. The first theme describes how each participant self-assessed their level of digital literacy and how they determined their rating. Participants in this study reported similar assessments about their technological

ability, with 10 out of 12 giving themselves a rating of *lower than my peers*. Participants expressed a commitment to actively develop and improve on the necessary skills to gain digital competence to perform and access the digital platform required to complete courses in their LMS work and improve technology learning outcomes. Participant 4 was a campus-based junior student who talked about her commitment to do whatever was necessary to be successful. She said:

> When I decided to go back to school it was a commitment that my family and I decided to make together. Of course, technology is something that does not come easy to me and it's not second nature to me at all, but I am giving it all I have because I have no choice really. Since every class I have taken has required assignment submissions, discussion posts, and all communication done the same way, it has allowed me to get used to using it and getting somewhat of a comfortability with using the system.

Participants talked about the use of technology being a type of communication barrier and not feeling comfortable using technology at all. Ten out of the 12 participants gave themselves a digital self-rating of lower than their peers. Participant 2, a junior attending a campus-based institution, talked about school never had been difficult for her in the past. She stated, "I never thought not using paper and pencil to submit assignments would cause me as much anxiety as it has with using technology." Participant 9, an online senior, talked about using technology as a way of life. She said:

> Everything we do now involves technology in some way shape or form. I cannot think of anything that we do in life that does have something to with using

> technology to assist us with everyday living. Going back to school to get my degree is something I thought about doing for a long time, but I did not think about if I went back that technology would overwhelm me this much. It is not the curriculum but how I have to show that I know what I am learning by using the leaning system they make us use.

When using the LMS, there is a level of flexibility and acceptance that must be achieved, as participants acknowledged. Participant 9 stated that the aim of educational success will not be reached without acceptance. Participant 3, a campus-based junior, shared that he had been employed at his current job for almost 41 years. He talked about how going back to school was a necessity because he recognized the younger employees operated technology faster and more efficiently. He said:

> As a supervisor, it is my responsibility to train my employees. I cannot fathom not being able to use the technology required to do our job let alone not being able to confidently use the technology I am required to use to complete my assignments for class. I feel like a duck out of water so to speak. I have been really outside of my comfort zone with school primarily because of the technology we have to use. At work it is getting better because the system we use is repetitive. At school, its repetitive but when something goes wrong with it or shuts down or a download does not happen, I am lost.

This theme demonstrated that participants self-assessed digital literacy was often a hurdle for students from the start of their return to college, and for some in the workplace. They wanted to expand their skills by understanding and using learn the LMS because

technology was critical to their educational success. Their comfortability of the process was based on the support they identified and their willingness to adapt and learn.

This sub-theme refers to a series of comments from the focus session participants who said that they did not have to like the LMS, yet they recognized they had to adapt to using it, describing this process as "buy-in." According to all 12 participants in interviews and in focus groups, learning in a digital context while using the HEI's mandated LMS to complete school tasks was overwhelming and challenging. Participants also stated that either insufficient or no training was provided to prepare them to use the LMS. Due to the lack of direction, participants claimed that it appeared that it was expected they already understood how the technology worked. FG

All participants reported a lack of understanding about how to use the LMS for learning. Participant 9 stated that she had never heard of an LMS before, or that it would be necessary for her to communicate with others throughout her coursework. Throughout the interviews and focus groups, this declaration proved to be an anthem. For example, Participant 11 stated, "I would have researched more into the university to see how learning took place and then made sure I had all of the necessary equipment that I needed to be successful." She went on to say, "once I would have learned what I needed to be successful, I would have made sure I knew how to use D2L so that I could be on course with other students."

Some participants saw their lack of preparation to use technology as a reason to consider dropping out. Participant 7 from Focus Group 3 reported that she was on the verge of giving up because she could not figure out how to navigate the LMS. She stated:

> When I went to my very first class, I was so excited and by the end of it almost in tears because I was so overwhelmed not with the course work itself but with the system required to turn everything in…it was so foreign to me.

Participant 3 reported that his institution did not provide adequate preparation and only gave students a piece of paper with seven steps to follow to navigate his LMS. He said:

> I am a fairly fast learner I'd like to think, yes, I learn by doing but I do not think handing me a piece of paper and telling me to have at it is conducive to me achieving great success. I mean I have invested a lot of time of money into my education this time around and I do not want technology of anything to get in the way of this.

Similarly, Participant 5, from Focus Group 2 shared even as junior she still felt overwhelmed. As did others she often felt unprepared. "Sometimes I feel that technology was put in place to weed out or screen who can cut it and who cannot." Even though participants felt unprepared using technology they accepted the fact that it was necessary for the success of their learning outcomes.

Theme 2: Benefits of Technology Learning Outcomes

The second theme also answered the first research question. The benefits of the technology learning outcomes theme describes how technology supported student learning which provides insight into the learning environment while learning was being facilitated. A technology learning outcome is essential and significant learning that students achieve by using technology and relates to their digital literacy. Students benefited from technological learning outcomes because they achieved faster and more

efficiently and the LMS provided more engaging opportunities to practice what they had learned. For example, Participant 9 from Focus Group 3 reported, “When I decided to go back to school, I was worried about what it would be like because it had been so long since I had been in school.” Technology is one of the things that students in my age group should be aware of, as it is not going away and is only becoming more cemented in education. Interview participants 6 and 7 also expressed concern about having the intellectual capacity to comprehend technology and use digital resources to attain their educational goal. Participant 6 from Focus Group 2 said, “I understand that I learn by doing things over and over so the more I use the system the more I will grasp how to use it effectively and I will also get more comfortable with it.”

Students were also concerned about having the capacity to work independently in an online environment. Participant 7 discussed how learning online was convenient but the barrier for her was not having physical contact with someone. She said,

> since the beginning of my program, I have been in the classroom and able to ask my instructors questions right after class or schedule an appointment to go to their office hours. Now, since COVID, there is a gap in waiting and the question I have I sometimes do not remember or remember the right way to ask my instructor since the question is not fresh on my mind.

Students also recognized their need to improve their digital literacy and actively acquire it on their own. Interview participants 5 and 9, and Participant 7 from Focus Group 3, stated that they needed any form of resource to manage the LMS at their HEIs, including tutorials, manuals, workshops, 24/7 support techs, faculty support, and

institutional help. They discussed how the LMS was the primary source of information that contributed to their learning success. They agreed that they could not learn unless they were digitally literate and could use the tools required to complete coursework.

Research Question 2

The second research question asked what types of support do college students over 50 years of age report most helpful in their development of digital literacy? The data generated themes identifying two preferred forms of support: organizational support needs for skill development and enhanced digital learning workflow. Both interview and focus group participants statements showed a consensus through their statements of their experiences.

Theme 3: Needing Organizational Support

The theme organizational support needs for skill development refers to what all participants said they desired to feel and see from their HEI in terms of their learning progress, technology knowledge, and help needs. all of the participants stated they preferred to acquire digital literacy by repetitively practicing so that they could improve digital skills while receiving an assessment with feedback about how to improve. Participants' feedback described growth of digital literacy in regard to types of support they felt they needed at the start of their college experience to ease them into using the required technological platform for courses.

Students described their ability to succeed in a learning setting by utilizing the technology platform to acquire digital literacy with the support of their HEI. Participants frequently used the words assistance, advice, preparation, training, and practice to explain

how the LMS supported their work. These terms functioned as important indicators of why support is necessary in the development of digital literacy abilities. All 12 interview participants discussed their unfamiliarity with an LMS which was required to complete coursework. For example, Participant 1, a campus-based junior, reported that using a program to submit assignment was different but seemed practical. She stated, "I want to always work smarter and not harder, so being able to submit assignments and just communicate using the computer is best and besides my handwriting has gotten worse over the years." Participant 8 discussed the need for updating professional knowledge through training needed for work and academic success. She said:

> Everything seems so rushed these days. What happened to training to get prepared to do your best. I use YouTube videos sometimes to show me how to submit assignments and I have to pause and replay it a few times just to catch up with what is being said.

Students did feel they needed some preparation for relying on technology for learning. Participant 11, from Focus Group 2 a campus-based junior, said training was necessary for technology use because it is not second nature to most people.

> A computer may seem like a foreign object to people in my age group. I use a cell phone, I have a computer and even an iPad that I have been using for a few years now, but to go from the general use of a pencil and paper, to completely using technology, no wonder no one can write anymore. I have always felt that I had a confidence in myself about most things, but that learning management system shook me because I have to use it to be successful and there is no way around it.

Participant 6 said that,

> Although technology is not new to me, using it in this way to look for information is. Everything we submit and every way we communicate is through this system. I am getting used to it, but it is a whole new way of life for me, it really is.

Participant 2 reported during Focus Group 1 that she was almost at the end of her program, but she still was not comfortable with the learning platform. She said,

> I have a year and some change left, so you would think I would be a pro at using the using the system. Not a chance. Technology is not something that I have ever gravitated toward. I am not one of those people that think technology makes life easier. It has made my life difficult for the past 4 years in school.

This theme highlights that the most important factor for students is assistance in developing their digital literacy skills. By continuing to use the LMS necessary at their educational institution, they increased their digital literacy abilities which increased their future work skills.

Theme 4: Enhanced Digital Learning Workflow

The fourth theme also aligned with the second research question. Participants specified what kinds of support they found most beneficial in their digital literacy development. For them, the most effective support enhanced digital learning workflow. This theme refers to how participants figured out how to use the HEI's methods or actions needed to operate the technological learning platform. The definition of enhanced

digital learning workflow is the plan or system that details the processes or actions that are provided by the HEI as resources to operate the technology learning platform.

When expressing the types of help needed to increase digital technology abilities, participants used terminology like workflow, organization, structure, or roadmap. Participants stated that instructors encouraged them to seek out any form of resource that would assist them in successfully using the LMS anytime when they had trouble with it. Some instructors included instructional steps on how to access various portions of the LMS in their syllabus and during course teaching, according to participants, and this made a difference. Participants reported that having access to more support 24 hours a day, 7 days a week would be beneficial because their learning or knowledge of a procedure may differ, help may be needed day or night, and that one-time instruction was insufficient.

Participants had a lot of concern over operating the LMS. They expressed a desire for structure in order to develop a solid understanding and competency in order to successfully manage the system. Participant 5 from focus group 2, an online junior, reported that she needed structure especially when using technology. She stated, the "course curriculum is structured so the learning platform that students are required to use is functional and comprehensible." Participant 3 from focus group 1 stated that "specific instruction is warranted so that there is guidance for us to know what we are doing." She explained that her grandchildren" are my little roadmaps helping me navigate through school." Participants 4, 6, and 8 also stated how family members also helped with navigating the LMS. Thus, organizational structure was more than the course materials

but also how to navigate the system when submitting assignments, communicating via discussion posts, completing exams, and or with questions in general.

LMS course structure and directions helped Participant 4 better comprehend how this technology facilitated the learning process. Another technique for developing a functional workflow is personal organization an additional strategy for building structure. Participant 3 from focus group 1, a campus-based, junior stated that his personal organization is what helped him operate his HEI's LMS. He stated:

> I have to be organized in order to make heads or tails of what I am doing. I have never operated anything like this, Desire2Learn is very new to me, but at the same time I see why it is beneficial to students and teachers. This way it seems to keep everyone honest because everything is submitted and completed in this system.

Participant 4 was unique in that she used her occupational workflow to better comprehend the educational workflow's constructs. A campus-based junior, she talked about working at one place for nearly 30 years and that workflow was an important component of any learning setting. She said:

> Canvas is the system that we have to use to submit all of the assignments and also what we use to communicate especially now because of the pandemic. I brought up my job and workflow because when I first started back to school no one asked if I was familiar with the system, it was just part of the curriculum and required so everyone has to use it.

Participant 5 from focus group 2 stated that it is the responsibility of an HEI to make clear how to use the LMS. She also reported that younger students used the LMS

system with ease because they were used to it. She said, “in my daily life, the only time I use technology is on my cell phone, my computer when I have to send an email or put information on a spreadsheet, and I guess the television at home.” Thus, the younger students had integrated the workflow into their study habits while she, and perhaps her peers, had not.

Situations that were discrepant or ambiguous were discussed during the focus group sessions, then I looked over field notes and transcriptions for clarification and inclusion in the analysis. The only discrepancy in the results was Participant 1 who had prior knowledge and extensive professional experience with technology prior to returning to school. She rated herself with skills higher than her peers. While her skills may have been an asset as she completed coursework, she did have to learn new systems which were unfamiliar. In this way, she was similar to her peers but different in her level of general digital literacy which was above her peers. The research questions did not focus on the distinction of different levels of digital literacy, yet it may be that prior use and practice of online tools are advantageous when learning to use an LMS.

Summary

This study included 12 undergraduate college students over the age of 50 from six different 4-year colleges across the United States. Initial individual interviews were conducted over a 3-week period, from which two focus group sessions were held. I noted patterns, areas of consensus, anything that was unusual, and issues that needed elaboration or clarification after reviewing the interview data to establish a foundation for the two focus group meetings (Barbour, 2007; Merriam & Tisdell, 2016). Six participants

took part in one of two Zoom focus group sessions. Each focus group session consisted of three participants who were asked questions based on the interview data analysis.

I looked over notes and transcriptions for clarity and inclusion in the analysis after identifying any discrepancies or ambiguities. The process of data collection, reporting, and data analysis required an iterative review during the interview and focus group session process, which was not interacted. I took notes on the participants' statements that directly addressed the question, sparked my curiosity, or that I wanted to confirm. I utilized NVivo software to further organize and analyze after coding and conducting preliminary analysis.

Data analysis involved several steps. I started by creating precodes based on the fundamental constructs of my conceptual framework models. After analyzing individual interview transcriptions using the precodes and adding new codes, I reviewed previous analyses to ensure I did not overlook a pattern that may have emerged throughout the data set. I began with the interview data and built a foundation for the focus group sessions by analyzing it. For both data sets, I then identified and applied emergent codes that were supported by particular remarks from interviews and focus group sessions. Then I created categories to serve as the foundation for themes. Themes were then constructed based on the keywords and phrases provided by the participants.

The results were articulated in the themes: self-assessment of digital literacy, benefits of technology learning outcomes, organizational support needs for skill development, and enhanced digital learning workflow. Student needed to learn while

developing technological skills resulting in digital literacy. Family, peers, professors, social media, and HEI support were all sources of assistance.

The key reason over 50 learners reported needing support was their inexperience with using technology for learning, particularly the LMS. They noted that technology was not required daily in their lives unless it was for school. Moreover, adjusting to using the LMS as a requirement for learning was difficult, particularly when support was not readily available.

When LMS support was introduced into instruction, students took ownership of their learning through an enhanced digital learning workflow, with organizational support needs for skill development, aiding in a self-assessment of digital literacy. Students were already driven to seek out alternative resources to facilitate their digital literacy because of the assistance provided by the organization. Participants said they desired a learning environment that was assisted and guided through collaborative and interactive learning experiences because they were not used to using technology, but that was not provided by their HEI's. Their digital literacy development was supported by resources including HEI services, their children, YouTube, and peers.

The focus groups confirmed that there was a need for increased assistance from their HEI with digital literacy. Participants discussed a number of positive aspects of the LMS that was required. They agreed that because technology was required, there was a need for training, support, and confirmation that all students could successfully operate because HEIs assumed that all students understand this type of learning platform.

Chapter 5 offers an interpretation of the findings in reference to peer-reviewed literature and conceptual frameworks, a description of the study's limitations, recommendations for future research, implications for social change, and a final concluding statement.

Chapter 5: Discussion, Conclusions, and Recommendations

The problem addressed in this basic qualitative study was that the over-50 population of students lacks the digital skills or habits of use with technologies required of them while in college, thereby creating a disadvantage in their social, educational, and career opportunities as college students (see Jacobson et al., 2017). The purpose of the study was to learn what supports and types of learning are required for undergraduate college students over 50 attending 4-year institutions to attain digital literacy. The two conceptual frameworks used to guide this study were digital literacy (Tsai et al., 2017) and Mezirow's (2009) transformative learning model. I used each framework to interpret how students over the age of 50 acquired digital literacy and what best supported their skill acquisition.

The college students over 50 years of age who participated in this study required a variety of technical supports, some of which were provided by their HEI while others were self-obtained. Participants said they received help that was informal (e.g., from family or social media platforms) and formal (via instructors, peers, or HEI-provided tutorials). However, assistance was not always available when needed, posing a dilemma for students unfamiliar with their HEI's LMS or other required technologies. Standing out from their peers, two of the participants claimed to be self-sufficient in their use of digital technology by giving themselves a digital technology self-rating of higher than my peers, and neither reported requiring supports from the HEI or other resources.

Participants stated that they benefited from technology support either because they did not have prior knowledge of technology in general or they had no experience

with their HEI's required LMS. The findings revealed that with some training, learners over 50 can use technology and enhance their digital literacy skills with reasonable ease. However, digital technology support networks must be in place and not assumed to exist by HEIs.

Findings indicated a gap between the needs of digital natives and the digital immigrants who required assistance. Participants felt that academic achievement, technological support, and instructional methods impacted their collegiate and life experiences in the process of acquiring digital literacy. This chapter includes interpretation of the findings, study limitations, recommendations, implications, and conclusions.

Interpretation of the Findings

The attitudes and perceptions of the 12 interviewees and focus group members confirmed the findings of previous research reviewed in Chapter 2. In this section, I provide an interpretation of the findings in the context of the conceptual framework and peer-reviewed literature. The immediacy of using technology for learning appeared to require different social interactions (see Gilster 1997; Ray 2018) as a form of Mezirow's (2009) communicative and instrumental (problem solving) learning.

Interpretation of Findings Through the Conceptual Framework

The findings were consistent with the conceptual frameworks for this study: digital literacy (see Glister, 1997) and Mezirow's (2009) transformative learning model. For this study, I focused on two of digital literacy's four principles: interdependence and social factors (see Glister, 1997; Osterman, 2012; Ray, 2018). The two principles that

were demonstrated in this study were social and interdependence transformational learning tenets that students felt were related to academic achievement. Findings indicated that the social context present during coursework influenced students' academic progress.

Interdependence is a mutually responsible relationship between people who share a standard set of beliefs (Kara et al., 2019). This relationship can provide a collaborative learning environment in which learners work together to achieve common academic goals (Glister 1997). Transformative learning involves two kinds of learning: (a) instrumental learning, which focuses on learning through task-oriented problem solving, and (b) communicative learning, which involves how individuals communicate their feelings and desires (Howie & Bagnall, 2013; Mezirow, 2009). Current participants explained they believed their peers had used an LMS since K–12 and that their HEI seemed to assume that all students had a background using this type of system. This confirms Glister's (1997) tenet of interdependence. These results validate Mezirow's (1997) transformative learning theory in how over-50 college students faced, possibly for the first time, a technological universe with which they were unacquainted, generating what Mezirow (1997) referred to as a change in an individual's frame of reference, thereby triggering new learning to occur.

In addition, participants stated in the focus groups and interviews that they reached out to their family members and instructors for navigation guidance when using the required LMS, which reflected Mezirow's (1997) concept of communicative learning. Participants reported that their family members, notably their children or grandchildren,

provided most of their technological support, reflecting Gilster's (1997) factor of social interaction as necessary and a component of digital literacy. Social factors indicate why an individual may need specific support and which social conditions contribute to improved digital literacy (Gilster, 1997; Ray, 2018). Tsai et al. (2017) determined that support from primary social groups provides a form of environmental support, which was confirmed in the current study. All participants reported receiving support from family or friends as they maneuvered through their LMS. Additionally, societal factors may influence a person's acceptance of or use of digital tools, as well as encouragement to use the internet. These factors are especially important for older students who may not be digital natives and may require a lot of technical and social assistance (Meyers et al., 2013).

Interpretation of Findings Related to the Research Questions

In regard to RQ1, participants described their technology skills through their digital self-rating as generally lower than their peers. Most participants reported that they did not have to use technology in their prior educational experience. They said the requirement to use technology as a primary tool for their educational success was overwhelming. They were not digitally literate, as described by Glister (1997) who indicated that a digitally literate person possesses a set of skills that include knowledge acquisition, information analysis, internet access, and hypertext navigation. Although student participants were not completely digitally illiterate, they required assistance in learning how to use the LMS so that they could learn. The immediacy of using technology for learning appeared to require different social interactions (see Gilster 1997;

Ray 2018) as a form of Mezirow's (2009) communicative and instrumental (problem solving) learning.

Over-50 participants in my study reported that they can understand how to use this technology if the HEI provides materials to students so that they can perform the required activities. Interdependence in education, particularly for college students over 50, establishes a collaborative learning environment in which individuals collaborate toward shared academic goals (Kara et al., 2019; Perez, 2018; Rashidian et al., 2018). This form of learning fosters a sense of self-awareness about how students perceive and comprehend their experiences in their social environment (Kara et al., 2019), as current participants reported in their reliance on others, especially for just-in-time learning.

Findings related to RQ2 provided insight into the processes used by over-50 students and the supports that aided them. Participants reported that they felt overwhelmed at the start of their academic degree programs because technology was an essential part of how they had to communicate, submit assignments, complete exams, and achieve overall academic success. However, participants also stated that with consistent use of the HEI's LMS, their digital skills improved. The notion of an LMS was so unfamiliar that participants had to adopt a new way of thinking about how to learn and reframe what it meant to use technology for learning. Participants employed instrumental learning when they learned how to use the LMS required by their HEI to succeed in their courses. Additionally, they received assistance from both informal sources (e.g., family members) and formal sources (e.g., computer orientation) but reported that support was often not available when needed. Vaportzis et al. (2017) found that most older learners

are ready to acquire new technology and are willing to learn how to use it. However, current participants expressed concern over a lack of clarity in instructions and help. Findings revealed that a social support network can be a just-in-time support for older adults who have gaps in their digital literacy, which confirmed Ray's (2018) notion that social factors can support digital literacy. To some extent, current findings confirmed those of Jin et al. (2019) who found that family support, friend support, and personal characteristics such as technology confidence could be a necessary resource for some older students.

Current findings also suggested that self-efficacy may play a role in the acquisition of digital literacy, as illustrated in the participants' desire and willingness to learn new technology. Other studies indicated that older adults are receptive to learning and using a new technology in certain circumstances, for example when they are curious about changes in society or have a desire to be digitally conversant though the use of multiple new technologies (Costa et al., 2019; Vaportzis et al., 2019). Being motivated to achieve a personal or professional goal, combined with a social support system, may be beneficial to older college students in their acquisition of digitally literacy. Tsai et al.'s (2017) findings revealed that older students are confident with routine uses of technology, such as phones and internet access, but they may not understand digital concepts related to skills required for a college degree, such as relying on the LMS to learn. For older adults, a significant obstacle to discovering a variety of modes of technology has been an absence of their personal digital literacy (Jacobson et al., 2017). Current findings added to those from prior research.

The need for social support is not new (Liu et al., 2020); however, having just-in-time support is unique. Whether through interactions with more knowledgeable acquaintances or through the use of tools designed to offer technology learning through information and feedback, over-50 students require support in the moment they are confronted with a lack of knowledge. Current findings not only illustrated digital literacy and transformational learning but also offered evidence of a need for HEIs to offer these types of experiences and supports for older students to help them become agile in learning through and with technology.

Limitations of the Study

There were three limitations in this research. The study included 12 people participating in interviews, followed by two focus groups with three people each. As a result of the small number of participants, the results are limited in their generalizability. This study provided a group of students with an opportunity to discuss their feelings of being unseen. Participants volunteered to take part in the study, which could indicate that they had a unique perspective or trait that I did not look for. Although there was a wide age range (50–60), it is likely that self-selection reflects a tendency or preference for technology (Leedahl, 2020).

The COVID-19 pandemic restrictions were the second limitation. It is possible that some data were missed because I could not interview participants in person or hold focus groups in person. For example, I was unable to observe facial expressions, body language, and other nonverbal cues. Furthermore, older students may not have felt as comfortable communicating for long periods of time using technology as they would

have face-to-face. In a perfect world, interviews and focus groups would have been held in person. Although I was able to obtain all of the data, scheduling issues and reliance on technology (in a group that was already technologically challenged) may have limited what participants reported. A final limitation was omitting demographic data. There may be subtle differences between online versus campus-based students, preferences by sex, and influences of prior education or work.

Recommendations

Given the increasing population of older college students and the increase in online coursework, digital literacy is key for the older student's academic success. Further research is warranted in several areas. The first recommendation is to identify HEI strategies that create support networks in which help is readily available on a constant basis to students who need assistance with LMS navigation. Current findings demonstrated that offering ongoing support can help students deal with technology-related issues as a form of just-in-time learning. The outcomes of this study and the alignment with communicative and instrumental learning (see Mezirow, 2009) facilitated through social and interdependent interactions (see Glister, 1997) affirmed that there is a need for future research to examine how institutions are serving adult learners because of their increasing population, generational differences, and institutional structures that will change over time.

A second recommendation is to replicate this study with a larger sample size using a quantitative survey based on the contrasts between student personal technology use and the technology required for learning. For example, the International Assessment

of Adult Competencies program has been used to determine the digital competence of older adults. A larger sample using a quantitative measure would provide detailed results and address more diverse populations with demographic information not factored into this study (such as gender, subject area, etc.). Future research may reveal subtle differences but using a larger sample size in a quantitative analysis may allow researchers to use data to show a significant relationship between the over 50 population successfully using technology for personal use and failing to successfully operate an LMS in an HEI for educational use.

A third recommendation is to examine stakeholders' perspectives and practices regarding over-50 college students, including advisors, student services, information technology support, and instructors. Stakeholders must keep up with shifting technological trends in the HEI learning environment (Choudhury & Pattnaik 2020). The issue that stakeholders face is rapid technical improvements and corresponding changes in the learning environment, which, when handled effectively, results in an effective digital learning environment. Another suggestion for future research is to include stakeholders as participants to seek their advice and understanding on better supporting over 50 college students in their academic endeavors. Interviewees might include instructional designers, technology trainers, administrators, and faculty.

A fourth recommendation is to look at over-50 college students and their confidence level with digital literacy. Self-motivation (Sentino, 2021) and self-efficacy (Aldhahi et al., 2022; Sumuer, 2018) were suggested by findings but not specifically addressed. Given the shift to emergency remote teaching (Xie & Rice, 2021) because of

the COVID-19 pandemic it may be that learning independently because there was no other choice could reveal personal characteristics of those who were capable of successful technology use. Additionally, comparing digitally proficient and non-tech savvy population of over-50 college students might reveal their psychosocial traits that indicate their preparedness to use technology in their coursework. Moreover, it is unclear if digital competence in the workplace or in one's personal life can be transferred effectively to an academic setting.

Implications

The results of this study have implications for improving the well-being and success of older college students as well as for the approach used to study this population, and how HEIs may consider supports and services to this population. In this section I discuss the implications for practice, research methods, and ideas for positive social change.

Positive Social Change

The findings of this study can affect positive social change when HEIs recognize the unique needs and attributes of the over-50 college student. Students in this study stated that they often felt invisible because their HEI assumed that all students could use the mandatory LMS, and other tools, to achieve academic success. Because the LMS is a critical component for academic success, over-50 college students' dignity and worth will be fostered once they believe that their HEI promotes their growth of digital abilities. The unspoken bias toward and possible exclusion of older students assumed digital competence not only puts them at a disadvantage but contributes to a generational divide

of equity. When HEIs offer services and acknowledge the unique needs of this population they will also bring an awareness of the value of technological support and the necessity for continued training of digital literacy skills of students that require it potentially equalizing opportunity for all generations.

Lastly, the COVID-19 pandemic changed the educational environment dramatically throughout this research period; traditional in-person learning migrated online learning through emergency remote teaching (Xie & Rice, 2021). Thus, a recommendation is to replicate the study in a post-pandemic period to determine if older students who continued learning during the pandemic acquired digitally literacy, had access to different supports, or were able to succeed in different ways when confronted with forced changes in how to learn. It may be that the pandemic inadvertently equalized the digitally literacy gap for digital natives and immigrants. Participants thought that academic achievement, technical support, and teaching approaches influenced their collegiate and life experiences in developing digital literacy. Participants believed that to be effective in the digital classroom, they had to learn recent technologies and develop technological abilities they their younger peers had already acquired.

Methodological Implications

Rather than a qualitative design, correlational or causal comparative/quasi-experimental could reveal relationships between level of competency and other factors, such as discipline of study, age, sex, or workforce history. An assessment would be given to each student from different programs of study to assess their digital literacy skills at the beginning of their entry into the HEI (Bin Mubayrik, 2020). This assessment could

identify a need for or type of training to improve digital literacy. In addition, an examination of the evidence and an evaluation of the advantages and disadvantages from the assessment of the over-50 population not receiving support or training would provide insight for developing digital literacy (Merriam & Tisdale, 2015). Using this comprehensive measure and observation against some objectives and standards or comparing and contrasting will evaluate the learner's technological progress (Yambi, 2018). Looking at learners in different programs of study and different institutions would gather demographic information and assess perspectives, barriers, and attitudes of the over-50s toward the adoption of other technologies (Wang, et. al. 2019).

Recommendations for Practice

HEI's have an opportunity to determine whether or not students who enter college are ready to use the technology required of them. Once a student is admitted into an HEI an assessment could be implement using the HEI's LMS to gauge their competency. In this way the student would be introduced to the system while being assessed of their digital competency.

Once the assessment is completed the student would be required to enroll into a training seminar to ensure their understanding of navigating the LMS system. The course could be counted as a one-credit hour free elective completed during the first semester of their academic career. At the end the of the semester, the assessment could be given again to gauge the students' new understanding of the LMS. HEIs assessment of older adult learners' entry-level skills as they enter college.

Such an assessment given to every student over 50 years of age can gauge what type of technology abilities students have, and the kind of training students need to navigate the institutional LMS to be successful. Additionally, this type of assessment can empower and identify those specific areas in which the student needs to learn, targeting an identified deficit. A student may only need to know a particular process, tool, or strategy.

Using the assessment for a personalized training program can empower the learner and customize their academic experience. This assurance would promote this population's worth, dignity, and development. HEIs have an opportunity to shift away from assumptions about student's digital literacy to document their entry-level skills and abilities.

In addition, college students learning digital literacy skills to function academically at 4-year institutions require guaranteed support of their HEI. An assortment of supports and learning experiences that include hands-on practice can encourage self-reliance and practice before entering a course. This assessment will support this population of over-50 college students as they develop digital literacy skills they will need to succeed and participate in their future careers.

Conclusion

This study provides a better understanding of the over 50 college students' experience developing technology skills. Returning to school for a professional degree can be intimidating if a student has never used or is not familiar with the technology required for academic achievement. According to all the study participants, receiving

continuing and just-in-need support is difficult, especially when institutions assume older students have learned or will learn the LMS on their own and intuitively.

The assumption that all students enrolling in a 4-year institution will grasp the use of an HEI's essential technology requirements is an error. An effective system for students to gauge their digital literacy is a critical strategy for HEIs. Higher education should provide effective and sufficient support to students using mandatory technology in their college curriculum. Moreover, building support around a digital literacy framework and not only the LMS will expand the older student's digital literacy beyond college. To not do so risks the success of students and may cause institutions to fail in their mission of degree completion. The findings of this study may assist higher education institutions in providing better support for these learners, thus balancing opportunities for students of all ages.

References

Administration on Aging. (2018). *2017 profile of older Americans*. https://acl.gov/

Aikens-Alston, C. L. (2016). *Adult learners and technology: Understanding the digital divide in developmental writing courses* [Doctoral dissertation, Olivet Nazarene University]. https://digitalcommons.olivet.edu/

Aldhahi, M. I., Alqahtani, A. S., Baattaiah, B. A., & Al-Mohammed, H. I. (2022). Exploring the relationship between students' learning satisfaction and self-efficacy during the emergency transition to remote learning amid the coronavirus pandemic: A cross-sectional study. *Education and Information Technologies*, *27*(1), 1323–1340. https://doi.org/10.1007/s10639-021-10644-7

Al-Emran, M., Elsherif, H. M., & Shaalan, K. (2016). Investigating attitudes towards the use of mobile learning in higher education. *Computers in Human Behavior*, *56*, 93–102. https://doi.org/10.1016/j.chb.2015.11.033

Alexander, B., Adams-Becker, S., & Cummins, M. (2016). *Digital literacy: An NMC Horizon Project strategic brief*. The New Media Consortium. https://www.learntechlib.org/

Al-Ismail, M., Yamin, M., Liu, Y.-H., & Gedeon, T. (2019). Learner characteristics of m-learning preferences. *International Journal of Information Technology*, *11*(3), 493–505. https://doi.org/10.1007/s41870-019-00279-w

Alqurashi, E. (2019). Predicting student satisfaction and perceived learning within online learning environments. *Distance Education*, *40*(1), 133–148. https://doi.org/10.1080/01587919.2018.1553562

Anderberg, P., Eivazzadeh, S., & Berglund, J. S. (2019). A novel instrument for measuring older people's attitudes toward technology. *Journal of Medical Internet Research*, *21*(5). https://doi.org/10.2196/13951

Andone, D., & Mihaescu, V. (2018). Blending MOOCs into higher education courses-a case study. *Learning With MOOCS (LWMOOCS)*, 134–136. https://doi.org/10.1109/LWMOOCS.2018.8534606

Andrews, J. A., Brown, L. J., Hawley, M. S., & Astell, A. J. (2019). Older adults' perspectives on using digital technology to maintain good mental health: Interactive group study. *Journal of Medical Internet Research*, *21*(2), Article e11694. https://doi.org/10.2196/11694

Antonucci, T. C., Ajrouch, K. J., & Manalel, J. A. (2017). Social relations and technology: Continuity, context, and change. *Innovation in Aging*, *1*(3). https://doi.org/10.1093/geroni/igx029

Arvanitis, P. (2019). Self□paced language learning using online platforms. In M. Dressman & R. W. Sadler (Eds.), *The handbook of informal language learning* (pp. 117–138). John Wiley & Sons.

Asiimwe, E. N., Grönlund, A., & Hatakka, M. (2017). Practices and challenges in an emerging m-learning environment. *International Journal of Education and Development Using Information and Communication Technology*, *13*(1), 103–122. https://www.researchgate.net/publication/

Babb, C. M. (2021). *Academic achievement at a community college: Does course modality matter in Biology?* [Doctoral dissertation, the University of Louisiana at Monroe].

Bahr, P. R., Boeck, C. A., & Cummins, P. A. (2021). Strengthening outcomes of adult students in community colleges. In L. W. Perna (Ed.), *Higher education: Handbook of theory and research* (pp. 217–273). Springer. https://doi.org/10.1007/978-3-030-44007-7_3

Ball, C., Francis, J., Huang, K.-T., Kadylak, T., Cotten, S. R., & Rikard, R. V. (2019). The physical-digital divide: Exploring the social gap between digital natives and physical natives. *Journal of Applied Gerontology*, *38*(8), 1167–1184. https://doi.org/10.1177/0733464817732518

Bandura, A. (1977). *Social learning theory*. Prentice Hall.

Bandura, A. (1994). Social cognitive theory of mass communication. In J. Bryant & D. Zillman (Eds.), *Media effects: Advances in theory and research* (pp. 61–89). Lawrence Erlbaum.

Banks, T., & Dohy, J. (2019). Mitigating barriers to persistence: A review of efforts to improve retention and graduation rates for students of color in higher education. *Higher Education Studies*, *9*(1), 118. https://doi.org/10.5539/hes.v9n1p118

Barbour, R. (2007). *Qualitative research kit: Doing focus groups*. SAGE Publications Ltd.

Barnard, Y., Bradley, M. D., Hodgson, F., & Lloyd, A. D. (2013). Learning to use new technologies by older adults: Perceived difficulties, experimentation behavior and

usability. *Computers in Human Behavior*, *29*, 1715–1724. https://doi.org/10.1016/j.chb.2013.02.006

Barr, J. (2016). The plus 50 population in higher education: Challenges and triumphs. *Journal of Continuing Higher Education*, *64*(1), 51–55. https://doi.org/10.1080/07377363.2016.1130570

Becker, B. W. (2018). Information literacy in the digital age: Myths and principles of digital literacy. *School of Information Student Research Journal*, *7*(2), 2. https://doi.org/10.31979/2575-2499.070202

Bendall, R. C., Galpin, A., Marrow, L. P., & Cassidy, S. (2016). Cognitive style: Time to experiment. *Frontiers in Psychology*. https://doi.org/10.3389/fpsyg.2016.01786

Beringer, R. (2017). Busting the myth of older adults and technology: An in-depth examination of three outliers. In *International Conference on Cross-Cultural Design* (pp. 605-613). Springer.

Betts, L. R., Hill, R., & Gardner, S. E. (2019). "There's not enough knowledge out there": Examining older adults' perceptions of digital technology use and digital inclusion classes. *Journal of Applied Gerontology, 38*(8), 1147-1166. https://doi.org/10.1177/0733464817737621

Birt, L., Scott, S., Cavers, D., Campbell, C., & Walter, F. (2016). Member checking: A tool to enhance trustworthiness or merely a nod to validation? *Qualitative Health Research*, *26*(13), 1802-1811.

Bixter, M. T., Blocker, K. A., Mitzner, T. L., Prakash, A., & Rogers, W. A. (2019). Understanding the use and non-use of social communication technologies by

older adults: A qualitative test and extension of the UTAUT model. *Gerontechnology: International Journal on the Fundamental Aspects of Technology to Serve the Aging Society*, *18*(2), 70. https://doi.org/10.4017/gt.2019.18.2.002.0

Blackstaffe, P. (2017, November 22). *New technology does not always equal success: A lesson in organizational change management*. HDI. https://www.thinkhdi.com/

Blažič, B. J., & Blažič, A. J. (2020). Overcoming the digital divide with a modern approach to learning digital skills for the elderly adults. *Education and Information Technologies*, *25*(1), 259-279. https://doi.org/10.1007/s10639-019-09961-9

Blieszner, R., Ogletree, A. M., & Adams, R. G. (2019). Friendship in later life: A research agenda. *Innovation in Aging, 3*(1). https://doi.org/10.1093/geroni/igz005

Blieck, Y., Ooghe, I., Zhu, C., Depryck, K., Struyven, K., Pynoo, B., & Van Laer, H. (2019). Consensus among stakeholders about success factors and indicators for quality of online and blended learning in adult education: ADelphi study. *Studies in Continuing Education, 41*(1), 36-60. https://doi.org/10.1080/0158037x.2018.1457023

Boakye, E. K. (2019). *Architecture Design Software: A Qualitative Study of Adult Learners' Experiences* [Doctoral dissertation, Capella University].

Boger, J., & Mercer, K. (2017). Technology for fostering intergenerational connectivity: Scoping review protocol. *Systematic Reviews*, *6*(1), 250.

Bordens, K. S., & Abbott, B. B. (2011). *Research design and methods: A process approach*. McGraw-Hill.

Borokhovski, E., Bernard, R. M., Tamim, R. M., Schmid, R. F., & Sokolovskaya, A. (2016). Technology-supported student interaction in post-secondary education: A meta-analysis of designed versus contextual treatments. *Computers & Education*, *96*15-28.

Boukhechba, M., Chow, P., Fua, K., Teachman, B. A., & Barnes, L. E. (2018). Predicting social anxiety from global positioning system traces of college students: feasibility study. *JMIR mental health*, *5*(3), e10101. https://doi:10.2196/10101

Boulton, C. A., Hughes, E., Kent, C., Smith, J. R., & Williams, H. T. (2019). Student engagement and wellbeing over time at a higher education institution. *PloS one*, *14*(11), e0225770. https://doi:10.1371/journal.pone.0225770

Brown, R., Silny, M., & Brown, J. T. (2021). Ableism in the Academy? A systematic review and meta-analysis of experiences of students with disabilities in U.S. higher education. *Social Justice and Education in the 21st Century*, 293-307. https://doi.org/10.1007/978-3-030-65417-7_15

Candela, A. G. (2019). Exploring the function of member checking. *The Qualitative Report*, *24*(3), 619-628. https://nsuworks.nova.edu/tqr/vol24/iss3/14/

Carlson, A., & Isaacs, A. M. (2018). Technological capital: an alternative to the digital divide. *Journal of Applied Communication Research, 46*(2), 243-265. https://doi.org/10.1080/00909882.2018.1437279

Chiu, C., Hu, Y., Lin, D., Chang, F., Chang, C., & Lai, C. (2016). The attitudes, impact, and learning needs of older adults using apps on touchscreen mobile devices: Results from a pilot study. *Computers in Human Behavior*, *63*, 189–197.

Chiu, C. J., & Liu, C. W. (2017). Understanding older adult's technology adoption and withdrawal for elderly care and education: Mixed method analysis from national survey. *Journal of Medical Internet Research*, *19*(11), e374.

Chiu, C. J., Tasi, W. C., Yang, W. L., & Guo, J. L. (2019). How to help older adults learn new technology? Results from a multiple case research interviewing the internet technology instructors at the senior learning center. *Computers & Education*, *129*, 61–70. https://doi.org/10.1016/j.compedu.2018.10.020

Chopik, W. J. (2016). The benefits of social technology use among older adults are mediated by reduced loneliness. *Cyberpsychology, Behavior and Social Networking*, *19*(9), 551–556. https://doi.org/10.1089/cyber.2016.0151

Choudhury, S., & Pattnaik, S. (2020). Emerging themes in e-learning: A review from the stakeholders' perspective. *Computers & Education*, *144*, 103657. https://doi.org/10.1016/j.compedu.2019.103657

Chukwuedo, S. O., Mbagwu, F. O., & Ogbuanya, T. C. (2021). Motivating academic engagement and lifelong learning among vocational and adult education students via self-direction in learning. *Learning and Motivation*, *74*, 101729. https://doi.org/10.1016/j.lmot.2021.101729

Cirule, I., Balta, M., Komarova, I., & Gudele, I. (2019). Senior digital up-skilling–Erasmus Plus Programme Project Dial Case Study. *Economics and Culture*, 82.

Cook, J. (2013). The paradox of autonomy: Relating Winnicott with counselling experience. *Journal of Psycho-Social Studies, 7*(1). http://www.psychosocial-studies-association.org/

Corbin, J., & Strauss, S. (2014). *Basics of qualitative research* (4th ed.). SAGE Publications.

Costa, C., Gilliland, G., & McWatt, J. (2019). 'I want to keep up with the younger generation'-older adults and the web: a generational divide or generational collide? *International Journal of Lifelong Education*, *38*(5), 566-578. https://doi.org/10.1080/02601370.2019.1678689

Creswell, J. W., & Poth, C. N. (2019). *Qualitative inquiry & research design: choosing among five approaches*. SAGE Publication.

Cross, K. P. (1994). *Adults as learners: Increasing participation and facilitating learning*. Jossey-Bass Publications.

Cunha, J. M., & Miller, T. (2014). Measuring value-added in higher education: Possibilities and limitations in the use of administrative data. *Economics of Education Review, 42,* 64-77. https://doi.org/10.1016/j.econedurev.2014.06.001

Darney, K. S., & Larwin, K. H. (2018). Vocational nursing programs in Appalachia: The impact of technology on traditional and non-traditional students' experiences. *Career and Technical Education Research, 43*(2), 101-122. http://hdl.voced.edu.au/10707/501691

Dauenhauer, J., Steitz, D. W., & Cochran, L. J. (2016). Fostering a new model of multigenerational learning: older adult perspectives, community partners, and

higher education. *Educational Gerontology*, *42*(7), 483–496. https://doi.org/10.1080/03601277.2016.1157419

De Hart, K., & Wentzel, L. (2020). The use of podcasts and videocasts by tertiary accounting students in distance education. *South African Journal of Higher Education*, *34*(1), 267-287. https://doi.org/10.20853/34-1-2827

Delello, J. A., & McWhorter, R. R. (2017). Reducing the digital divide: Connecting older adults to iPad technology. *Journal of Applied Gerontology*, *36*(1), 3–28. https://doi.org/10.1177/0733464815589985

Denzin, N. K., & Lincoln, Y. S. (2013). *Strategies of qualitative inquiry*. SAGE Publications.

Department of Education. (2017). *Reimagining the role of technology in higher education: A supplement to the National Education Technology Plan*. Office of Educational Technology, US Department of Education.

Diep, N. A., Cocquyt, C., Zhu, C., & Vanwing, T. (2017). Online interaction quality among adult learners: The role of sense of belonging and perceived learning benefits. *Turkish Online Journal of Educational Technology, 16*(2), 71-78. https://www.researchgate.net/

Di Giacomo, D., Vittorini, P., & Lacasa, P. (2018). Digital skills and life-long learning: Digital learning as a new insight of enhanced learning by the innovative approach joining technology and cognition. *Frontiers in Psychology, 9*. https://doi.org/10.3389/fpsyg.2018.02621

Dumford, A. D., & Miller, A. L. (2018). Online learning in higher education: exploring advantages and disadvantages for engagement. *Journal of Computing in Higher Education*, *30*(3), 452-465.

Elo, S., Kääriäinen, M., Kanste, O., Pölkki, T., Utriainen, K., & Kyngäs, H. (2014). Qualitative content analysis: A focus on trustworthiness. *SAGE Open*.

Elueze, I., & Quan-Haase, A. (2018). Privacy attitudes and concerns in the digital lives of older adults: Westin's privacy attitude typology revisited. *American Behavioral Scientist, 62*(10), 1372-1391. https://doi.org/10.1177/0002764218787026

Etikan, I., Musa, S. A., & Alkassim, R. S. (2016). Comparison of convenience sampling and purposive sampling. *American Journal of Theoretical and Applied Statistics*, *5*(1), 1-4. https://doi.org/10.11648/j.ajtas.20160501.11

Farhan, W., Razmak, J., Demers, S., & Laflamme, S. (2019). E-learning systems versus instructional communication tools: Developing and testing a new e-learning user interface from the perspectives of teachers and students. *Technology in Society*, *59*, 101192. https://doi.org/10.1016/j.techsoc.2019.101192

Friemel, T. N. (2016). The digital divide has grown old: Determinants of a digital divide among seniors. *New Media & Society, 18*(2), 313-331. https://doi.org/10.1177/1461444814538648

Galanek, J. D., Gierdowski, D. C., & Brooks, D. C. (2018, October 25). *ECAR study of undergraduate students and information technology.* EDUCAUSE. https://www.educause.edu/

Gatti, F. M., Brivio, E., & Galimberti, C. (2017). “The future is ours too:” A training process to enable the learning perception and increase self-efficacy in the use of tablets in the elderly. *Educational Gerontology, 43*(4), 209-224. https://doi.org/10.1080/03601277.2017.1279952

Geoghegan, M. W., & Klass, D. (2005). *Podcast solutions: The complete guide to podcasting*. Apress.

Gezgin, D. M. (2019). The effect of mobile learning approach on university students’ academic success for database management systems course. *International Journal of Distance Education Technologies, 17*(1), 15-30. https://doi.org/10.4018/IJDET.2019010102

Gilster, P. (1997). *Digital literacy*. New York, NY: John Wiley.

Godoe, P., & Johansen, T. S. (2012). Understanding adoption of new technologies: Technology readiness and technology acceptance as an integrated concept. *Journal of European Psychology Students, 3*(1), 38–52. http://doi.org/10.5334/jeps.aq

Goldman, T. (2018). The impact of podcasts in education. *Advanced Writing: Pop Culture Intersections*. https://scholarcommons.scu.edu/

González, J. A. C., & Morales, L. D. G. (2019). Digital adult literacy in virtual learning environments. *Proceedings of the Seventh International Conference on Technological Ecosystems for Enhancing Multiculturality.* https://doi.org/10.1145/3362789.3362901

Gordon, N. P., & Hornbrook, M. C. (2018). Older adults' readiness to engage with eHealth patient education and self-care resources: a cross-sectional survey. *BMC Health Services Research*, *18*(1), 220. https://doi.org/10.1186/s12913-018-2986-0

Grunschel, C., Schwinger, M., Steinmayr, R., & Fries, S. (2016). Effects of using motivational regulation strategies on students' academic procrastination, academic performance, and well-being. *Learning and Individual Differences*, 49, 162-170. https://doi.org/10.1016/j.lindif.2016.06.008

Gualtieri, L., Phillips, J., Rosenbluth, S., & Synoracki, S. (2018). Digital literacy: A barrier to adoption of connected health technologies in older adults. *Journal of Medical Internet Research*, *20*(9), 12. https://doi.org/10.2196/11803

Guest, A. (2017). *The changing face of today's student: More diverse, older and requiring more personalized learning*. Acrobatiq. http://acrobatiq.com/

Guest, G., Namey, E., & McKenna, K. (2017). How many focus groups are enough? Building an evidence base for nonprobability sample sizes. *Field Methods, 29*(1), 3-22. https://doi.org/10.1177/1525822X16639015

Hamidi, H., & Chavoshi, A. (2018). Analysis of the essential factors for the adoption of mobile learning in higher education: A case study of students at the University of Technology. *Telematics & Informatics*, *35*(4), 1053–1070. https://doi.org/10.1016/j.tele.2017.09.016

Hao, S., Cui, M., Dennen, V. P., Turel, Y. K., & Mei, L. (2017). Analysis of mobile learning as an innovation in higher education: A comparative study of three

countries. *International Journal of Mobile Learning and Organization, 11*(4), 314-339. https://www.inderscienceonline.com/

Hargittai, E., & Dobransky, K. (2017). Old dogs, new clicks: Digital inequality in skills and uses among older adults. *Canadian Journal of Communication*, *42*(2), 195–212. https://doi.org/10.22230/cjc.2017v42n2a3176

Hargittai, E., Piper, A. M., & Morris, M. R. (2019). From internet access to internet skills: Digital inequality among older adults. *Universal Access in the Information Society*, *18*(4), 881-890. https://doi.org/10.1007/s10209-018-0617-5

Harvey, L. (2015). Beyond member-checking: A dialogic approach to the research interview. *International Journal of Research & Method in Education, 38*(1), 23-38. https://doi.org/10.1080/1743727X.2014.914487

Hays, D. G., & Wood, C. (2011). Infusing qualitative traditions in counseling research designs. *Journal of Counseling & Development*, *89*(3), 288-295. https://doi.org/1002/j.1556-6678.2011.tb00091.x

Hennessy, S., Kershner, R., Calcagni, E., & Ahmed, F. (2021). Supporting practitioner led inquiry into classroom dialogue with a research informed professional learning resource: A design based approach. *Review of Education*, *9*(3), e3269. https://doi.org/10.1002/rev3.3269

Henschke, J. (2016). Self-directed learning [SDL] and andragogy: My take on their contrasting and complementary relationship. *IACE Hall of Fame Repository*. https://trace.tennessee.edu/

Henson, A. R. (2015). The success of nontraditional college students in an IT World. *Research in Higher Education Journal*, *25 International Journal of Research & Method in Education, 40*(4), 345-359. https://www.learntechlib.org/

Hofstede, G., Hofstede, G. J., & Minkov, M. (2017). *Cultures and organizations: Software of the mind: Intercultural cooperation and its importance for survival*. MTM.

Hoggan, C. D. (2016). Transformative learning as a metatheory. *Adult Education Quarterly*, *66*(1), 57-75. https://doi.org/10.1177/0741713615611216

Hoggan, C., Mälkki, K., & Finnegan, F. (2017). Developing the theory of perspective transformation: Continuity, intersubjectivity, and emancipatory praxis. *Adult Education Quarterly, 67*(1), 48-64. https://doi.org/10.1177/0741713616674076

Howie, P., & Bagnall, R. (2013). A beautiful metaphor: Transformative learning theory. *International Journal of Lifelong Education*, *32*(6), 816-836. https://doi.org/10.1080/02601370.2013.817486

Hughes, P. C., & Yarbrough, J. (2022). *Self-directed learning and the academic evolution from pedagogy to andragogy*. IGI Global.

Hülür, G., & Macdonald, B. (2020). Rethinking social relationships in old age: Digitalization and the social lives of older adults. *American Psychologist*, *75*(4), 554-556. https://doi.org/10.1037/amp0000604

Hunsaker, A. E., Nguyen, M. H., Fuchs, J., Djukaric, T., Hugentobler, L., & Hargittai, E. (2019). “He explained it to me, and I also did it myself:” How older adults get

support with their technology uses. *Sociological Research for a Dynamic World, 5*. https://doi.org/10.1177/2378023119887866

Huyler, D., & Ciocca, H. (2016). *Baby boomers: The use of technology to support learning*. Digital Commons. https://digitalcommons.fiu.edu/

Ilomäki, L., & Lakkala, M. (2018). Digital technology and practices for school improvement: innovative digital school model. *Research and practice in technology enhanced learning*, *13*(1), 1-32. https://doi.org/10.1186/s41039-018-0094-8

Information Resources Management Association. (2016). *Human-computer interaction: Concepts, methodologies, tools, and applications*. IGI Global.

Inoue, H., Naito, E., & Koshizuka, M. (1997). Mediacy: What it is? Where to go? *International Information & Library Review, 29*, 403-413. https://doi.org/10.1080/10572317.1997.10762448

Islim, O. F., & Sevim-Cirak, N. (2017). Technology and college students: What faculty members think about the use of technology in higher education. *Malaysian Online Journal of Educational Technology*, *5*(2), 34–50. https://files.eric.ed.gov/

Jacobson, J., Lin, C. Z., & McEwen, R. (2017). Aging with technology: Seniors and mobile connections. *Canadian Journal of Communication*, *42*(2).

Jiménez-Castillo, D., Sánchez-Fernández, R., & Marín-Carrillo, G. M. (2017). Dream team or odd couple? Examining the combined use of lectures and podcasting in higher education. *Innovations in Education & Teaching International*, *54*(5), 448–457. https://doi.org/10.1080/14703297.2016.1148622

Jin, B., Kim, J., & Baumgartner, L. M. (2019). Informal learning of older adults in using mobile devices: A review of the literature. *Adult Education Quarterly*, *69*(2), 120-141.

Joo, Y. J., So, H.-J., & Kim, N. H. (2018). Examination of relationships among students' self-determination, technology acceptance, satisfaction, and continuance intention to use K-MOOCs. *Computers & Education, 122,* 260-272.

Kara, M., Erdogdu, F., Kokoç, M., & Cagiltay, K. (2019). Challenges faced by adult learners in online distance education: A literature review. *Open Praxis*, *11*(1), 5-22.

Kazazi, L., Foroughan, M., Nejati, V., & Shati, M. (2018). Association between age associated cognitive decline and health related quality of life among Iranian older individuals. *Electronic Physician*, *10*(4), 6663–6671. https://doi.org/10.19082/6663

Khalaf, B. K., Zin, M., & Bt, Z. (2018). Traditional and inquiry-based learning pedagogy: A systematic critical review. *International Journal of Instruction*, *11*(4), 545-564. https://eric.ed.gov/

Khawaji, M. A. (2017). *Overcoming challenges in smart phone use among older adults in Saudi Arabia*. [Doctoral dissertation, Iowa State University]. https://doi.org/10.31274/etd-180810-5784

King, G. (2020). *Radical media education practices from social movement media: Lessons from teaching and learning in Lebanon.* In D. Frau-Meigs, M. Hoechsmann, S. Kotilainen, S. R. Poyntz, & M. Pathak-Shelat (Eds.) *The*

Handbook of Media Education Research (441-448). Wiley

Knowles, B., & Hanson, V. L. (2018). The wisdom of older technology (non)users. *Communications of the ACM, 61*(3), 72. https://doi.org/10.1145/3179995

Knowles, M. S. (1984). *Andragogy in action: Applying modern principles of adult learning*. Jossey-Bass.

Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development*. Englewood Cliffs, NJ: Prentice-Hall.

Korstjens, I., & Moser, A. (2018). Series: Practical guidance to qualitative research. Part 4: Trustworthiness and publishing, *European Journal of General Practice, 24*(1), 120-124. https://doi.org/10.1080/13814788.2017.1375092

Kromydas, T. (2017). Rethinking higher education and its relationship with social inequalities: past knowledge, present state and future potential. *Palgrave Communications, 3*(1). https://doi.org/10.1057/s41599-017-0001-8

Kuerbis, A., Mulliken, A., Muench, F., Moore, A. A., & Gardner, D. (2017). Older adults and mobile technology: Factors that enhance and inhibit utilization in the context of behavioral health. *Mental Health Addict, 2,* 136. https://academicworks.cuny.edu/

Kvavik, R. B. (2005, January 1). *Convenience, communications, and control: How students use technology.* EDUCAUSE. https://www.educause.edu/

Lai, J. W. M., & Bower, M. (2019). How is the use of technology in education evaluated? A systematic review. *Computers & Education, 133*, 27-42. https://doi.org/10.1016/j.compedu.2019.01.010

Lall, P., Rees, R., Law, G., Dunleavy, G., Cotič, Ž., & Car, J. (2019). Influences on the implementation of mobile learning for medical and nursing education: Qualitative systematic review by the Digital Health Education Collaboration. *Journal of Medical Internet Research*, *21*(2), e12895. https://doi.org/10.2196/12895

Lambert, L. A., & Hassan, H. (2018). MOOCs and international capacity building in a UN framework: Potential and challenges. In W. Leal Filho, M. Mifsud, & P. Pace (Eds.), *Handbook of lifelong learning for sustainable development* (pp. 155-164). Springer.

Lanham, R. (1995). Digital literacy. *Scientific American, 273(3)*, 198–200. http://www.jstor.org/stable/24981795

Lauckner, H., Paterson, M., & Krupa, T. (2015). Using constructivist case study methodology to understand community development processes: Proposed methodological questions to guide the research process. *The Qualitative Report, 17*(13), 1-22. https://nsuworks.nova.edu/

Lee, K., & Brett, C. (2015). Dialogic understanding of teachers' online transformative learning: A qualitative case study of teacher discussions in a graduate-level online course. *Teaching and Teacher Education, 46,* 72-83. https://doi.org/10.1016/j.tate.2014.11.001

Lee, O. E.-K., & Kim, D.-H. (2019). Bridging the digital divide for older adults via intergenerational mentor-up. *Research on Social Work Practice, 29*(7), 786-795. https://doi.org/10.1177/1049731518810798

Lee, S. R. (2019). *Examining possible relationship of online engagement on older adults' well-being: Path analysis to memory capacity* [Doctoral dissertation, Yeshiva University]. https://www.proquest.com/

Leedahl, S. N., Clark, P. G., & Leconte, B. (2020). Engaging older adult learners through intergenerational learning opportunities. *Innovation in Aging*, *4*(Suppl 1), 553–554. https://doi.org/10.1093/geroni/igaa057.1815

Leu, D., Henry, L., Castek, J., Coiro, J., & Kinzer, C. (2017). New literacies: A dual-level theory of the changing nature of literacy, instruction, and assessment. In *Theoretical models and processes of literacy* (pp. 319-346). Routledge.

Leung, L. (2015). Validity, reliability, and generalizability in qualitative research. *Journal of family medicine and primary care*, *4*(3), 324.

Lincoln, Y. S., & Guba, E. G. (2011). *Naturalistic inquiry*. W. Ross.

Lipphardt, A., Leen-Thomele, E., Coroian, E., & Held, P. (2017). Older adults and learning technology: Innovations in adults' and seniors' education. *Innovation in Aging*, *1*(1). https://doi.org/10.1093/geroni/igx004.3440

Liu, Z. Y., Lomovtseva, N., & Korobeynikova, E. (2020). Online learning platforms: Reconstructing modern higher education. *International Journal of Emerging Technologies in Learning (iJET)*, *15*(13), 4-21. https://doi.org/10.3991/ijet.v15i13.14645

Loeng, A. (2020). Self-directed learning: A core concept in adult education. *Education Research International*. https://doi.org/10.1155/2020/3816132

Ma, Q., Chan, A. H. S., & Chen, K. (2016). Personal and other factors affecting acceptance of smartphone technology by older Chinese adults. *Applied Ergonomics, 54,* 62-71. https://doi.org/10.1016/j.apergo.2015.11.015

MacDonald, K. (2018). A review of the literature: The needs of nontraditional students in postsecondary education. *Strategic Enrollment Management Quarterly, 5*(4), 159-164. https://doi.org/10.1002/sem3.20115

Malterud, K., Guassora, D., & Siersma, V. K. (2016). Sample size in qualitative interview studies: Guided by information power. *Qualitative Health Research, 26*(13), 1753-1760. https://www.researchgate.net/

Mannheim, I., Schwartz, E., Xi, W., Buttigieg, S. C., McDonnell-Naughton, M., Wouters, E. J., & Van Zaalen, Y. (2019). Inclusion of older adults in the research and design of digital technology. *International journal of environmental research and public health*, *16*(19), 3718. https://doi.org/10.3390/ijerph16193718

Martínez-Alcalá, C. I., Rosales-Lagarde, A., de los Ángeles Alonso-Lavernia, M., Ramírez-Salvador, J. A., Jimenez-Rodriguez, B., Cepeda-Rebollar, R. M., Lopez-Noguerola, J. S., Bautista-Diaz, M. L., & Agis-Juarez, R. A. (2018). Digital inclusion in older adults: A comparison between face-to-face and blended digital literacy workshops. *Frontiers in ICT, 5*(21). https://doi.org/10.3389/fict.2018.00021

Martínez-Mesa, J., González-Chica, D. A., Duquia, R. P., Bonamigo, R. R., & Bastos, J. L. (2016). Sampling: How to select participants in my research study? *Anais Brasileiros de Dermatologia*, *91*(3), 326–330. https://doi.org/10.1590/abd1806-4841.20165254

Martins, J., Branco, F., Gonçalves, R., Au-Yong-Oliveira, M., Oliveira, T., Naranjo-Zolotov, M., & Cruz-Jesus, F. (2019). Assessing the success behind the use of education management information systems in higher education. *Telematics and Informatics*, *38*, 182-193.

Maxwell, J. A. (2005). Applied social research methods series: Vol. 42. *Qualitative research design: An interactive approach* (2nd ed.). SAGE Publications.

Maxwell, J. A. (2010). Using numbers in qualitative research. *Qualitative Inquiry* 16(6). 475-482.

McCarthy-Jones, S. (2019). The autonomous mind: The right to freedom of thought in the twenty-first century. *Frontiers in Artificial Intelligence, 2*(19). https://doi.org/10.3389/frai.2019.00019

McDougall, J., Readman, M., & Wilkinson, P. (2018). The uses of (digital) literacy. *Learning, Media and Technology, 43*(3), 263-279. https://doi10.1080/17439884.2018.1462206

McKenzie, L. (2019). The end of the line for iTunes U? *Inside Higher Ed.* https://www.insidehighered.com/

Menzies, R., Petrie, K., & Zarb, M. (2017). A case study of Facebook use: Outlining a multi-layer strategy for higher education. *Education and Information Technologies*, *22*(1), 39-53. https://doi.org/10.1007/s10639-015-9436-y

Merriam, S. B. (2009). *Qualitative research: A guide to design and implementation*. Jossey-Bass.

Merriam, S. B., & Tisdell, E. J. (2016). *Qualitative research*: *A guide to design and implementation*. John Wiley & Sons.

Merrill Lynch & Age Wave. (2016). *Leisure in retirement: Beyond the bucket list: A Merrill Lynch retirement study*. Age Wave. https://agewave.com/

Mertler, C. A., & Reinhart, R. V. (2017). *Advanced and multivariate statistical methods: Practical application and interpretation*. Routledge.

Meyers, E. M., Erickson, I., & Small, R. V. (2013). Digital literacy and informal learning environments: An introduction. *Learning, Media and Technology*, *38*(4), 355-367. https://doi.org/10.1080/17439884.2013.783597

Mezirow, J. (1978). Perspective transformation. *Adult Education*, *28*(2), 100–110. https://doi.org/10.1177/074171367802800202

Mezirow, J. (1990). *Fostering critical reflection in adulthood: A guide to transformative and emancipatory learning*. Jossey-Bass Publishers.

Mezirow, J. (1991). *Transformative dimensions of adult learning*. Jossey-Bass Publishers.

Mezirow, J. (1994). Understanding transformation theory. *Adult Education Quarterly*, 44(4). https://www.newdemocracy.com.au/

Mezirow, J. (1996). Contemporary paradigms of learning. *Adult Education Quarterly, 46*(3), 158–172. https://doi.org/10.1177=074171369604600303

Mezirow, J. (1997). Transformative learning: Theory to practice. *New Directions for Adult and Continuing Education, 74*(74), 5-12. https://www.ecolas.eu/

Mezirow, J. (2000). Learning to think like an adult. Core concepts of transformation theory. In J. Mezirow & Associates (Eds.), *Learning as transformation. Critical perspectives on a theory in progress* (pp. 3-33). Jossey-Bass.

Mezirow, J. (2009). Transformative learning theory. In J. Mezirow, & E. Taylor (Eds.), *Transformative learning in practice: Insights from community, workplace, and higher education* (pp. 18-32). John Wiley.

Miranda, P., Isaias, P., & Pifano, S. (2018) Digital literacy in higher education. In: P. Zaphiris & A. Ioannou (Eds.), *Learning and collaboration technologies. Learning and teaching. LCT 2018. Lecture Notes in Computer Science, vol 10925*. Springer. https://doi.org/10.1007/978-3-319-91152-6_6

Mitchell, U. A., Chebli, P. G., Ruggiero, L., & Muramatsu, N. (2019). The digital divide in health-related technology use: The significance of race/ethnicity. *The Gerontologist*, *59*(1), 6–14. https://doi.org/10.1093/geront/gny138

Miwa, M., Nishina, E., Kurosu, M., Takahashi, H., Yaginuma, Y., Hirose, Y., & Akimitsu, T. (2017). Changing patterns of perceived ICT skill levels of elderly learners in a digital literacy training course. *LIBRES: Library & Information Science Research Electronic Journal*, *27*(1), 13–25. https://doi.org/10.32655/libres.2017.1.2

Montalto, C. P., Phillips, E. L., McDaniel, A., & Baker, A. R. (2019). College student financial wellness: Student loans and beyond. *Journal of Family and Economic Issues*, *40*(1), 3-21. https://doi.org/10.1007/s10834-018-9593-4

Morrison, D., & McCutheon, J. (2019). Empowering older adults' informal, self-directed learning: harnessing the potential of online personal learning networks. *Research and Practice in Technology Enhanced Learning, 14*(1), 1-16. https://doi.org/10.1186/s41039-019-0104-5

Mostaghel, R., & Oghazi, P. (2017). Elderly and technology tools: a fuzzyset qualitative comparative analysis. *Quality & Quantity, 51*, 1969–1982. https://doi.org/10.1007/s11135-016-0390-6

Mutter, S. A., Holder, J. M., Mashburn, C. A., & Luna, C. M. (2019). Aging and the role of attention in associative learning. *Psychology and Aging*, *34*(2), 215–227. https://doi.org/10.1037/pag0000277.supp

Naderifar, M., Goli, H., & Ghaljaie, F. (2017). Snowball sampling: A purposeful method of sampling in qualitative research. *Strides in Development of Medical Education, 14*(3). https://doi.org/10.5812/sdme.67670

Neves, B., Waycott, J., & Malta, S. (2018). Old and afraid of new communication technologies? Reconceptualising and contesting the 'age-based digital divide'. *Journal of Sociology 54,* (2), 236-248. https://doi.org/10.1177/1440783318766119

Nerstrom, N. (2017). Transformative learning: Moving beyond theory and practice. *International Journal of Adult Vocational Education and Technology*, *8*(1), 36–46. https://eric.ed.gov/

New England Institute of Technology. (2021, April 8). *What is adult learning theory?* https://www.neit.edu/

Newman, T., Beetham, H., & Knight, S. (2018). *Digital experience insights survey 2018: Findings from students in UK further and higher education*. JISC.

Nkwake, A. M. (2013). Why are assumptions important? In A. Nkwake (Ed.), *Working with assumptions in international development program evaluation*. [electronic resource]. Springer.

Nowell, L. S., Norris, J. M., White, D. E., & Moules, N. J. (2017). Thematic analysis: Striving to meet the trustworthiness criteria. *International Journal of Qualitative Methods*, *16*(1). https://doi.org/10.1177/1609406917733847

Olivares-Cuhat, G. (2018). How to tailor TELL tools for older L2 learners. *Elia, 18*, 81-104. https://dx.doi.org/10.12795/elia.2018.i18.04

Oliver, A., Tomás, J. M., & Montoro-Rodriguez, J. (2017). Dispositional hope and life satisfaction among older adults attending lifelong learning programs. *Archives of Gerontology and Geriatrics, 72*, 80–85. https://doi.org/10.1016/j.archger.2017.05.008

Onwuegbuzie, A. J. (2018). Communication vagueness in the literature review section of journal article submissions. *Journal of Educational Issues*, *4*(1), 174-190. https://doi.org/10.1177/1609406918788250

Orehek, E., & Kruglanski, A. W. (2018). Personal failure makes society seem fonder: An inquiry into the roots of social interdependence. *PLoS ONE, 13*(8), e0201361. https://doi.org/10.1371/journal.pone.0201361

Ortlipp, M. (2008). Keeping and using reflective journals in the qualitative research process. *The Qualitative Report*, *13*(4), 695-705. https://doi.org/10.46743/2160-3715/2008.1579

Osterman, M. D. (2012). Digital literacy: Definition, theoretical framework, and competencies. In M. S. Plakhotnik, S. M. Nielsen, & D. M. Pane (Eds.), *Proceedings of the 11th Annual College of Education & GSN Research Conference* (pp. 135-141). International University. http://education.fiu.edu/

Palaganas, E. C., Sanchez, M. C., Molintas, M. P., & Caricativo, R. D. (2017). Reflexivity in qualitative research: A journey of learning. *The Qualitative Report, 22*(2), 426-438. https://nsuworks.nova.edu/

Pappas, M. A., Demertzi, E., Papagerasimou, Y., Koukianakis, L., Vouketlatos, N., & Drigas, A. (2019). Cognitive-based eLearning design for older adults. *Social Sciences, 8*(6), 1-18. https://www.researchgate.net/

Parks, R., Evans, B., & Getch, Y. (2013). Motivations and enculturation of older students returning to a traditional university. *New Horizons in Adult Education & Human Resource Development*, *25*(3), 62-75. https://doi.org/10.1002/nha3.20031

Patton, M. Q. (2002). *Qualitative research and evaluation methods.* (3rd ed.). SAGE Publications.

Pavia, L., Cavani, P., Di, B. M., & Giordano, C. (2016). Smartphone addiction inventory (SPAI): Psychometric properties and confirmatory factor analysis. *Computers in Human Behavior, 63,* 170-178. https://doi.org/10.1016/j.chb.2016.05.039

Pavlov, O. V., & Katsamakas, E. (2020). Will colleges survive the storm of declining enrollments? A computational model. *Plos one*, *15*(8), e0236872. https://journals.plos.org/

Percy, W. H., Kostere, K., & Kostere, S. (2015). Generic qualitative research in psychology. *The Qualitative Report, 20*(2), 76-85. https://nsuworks.nova.edu/

Perez, S. (2018). *Vimeo launches tools for simultaneous uploading or livestreaming to Facebook, YouTube, Twitch and others*. Viva Technology. https://techcrunch.com/

PIAAC. (2009). *Problem solving in technology-rich environments: A conceptual framework.* OECD Education Working Papers. https://doi.org/10.1787/220262483674

Pimmer, C., Mateescu, M., & Gröhbiel, U. (2016). Mobile and ubiquitous learning in higher education settings. A systematic review of empirical studies. *Computers in Human Behavior*, *63*, 490–501. https://doi.org/10.1016/j.chb.2016.05.057

Pirhonen, J., Lolich, L., Tuominen, K., Jolanki, O., & Timonen, V. (2020). "These devices have not been made for older people's needs" - Older adults' perceptions of digital technologies in Finland and Ireland. *Technology in Society, 62.* https://doi.org/10.1016/j.techsoc.2020.101287

Pool, C. R. (1997). A new digital literacy: A conversation with Paul Gilster. *Educational Leadership*, 55(3), 6-11. https://eric.ed.gov/

Prensky, M. (2001a). Digital natives, digital immigrants. *NCB University Press, 9*(5), l-6. https://www.marcprensky.com/

Prensky, M. (2001b). Digital natives, digital immigrants, Part II: Do they really think differently? *On the Horizon, 9*(6), l-6. https://www.marcprensky.com/

Prensky, M. (2012). *From digital natives to digital wisdom: Hopeful essays for 21st century learning.* Corwin. https://doi.org/10.4135/9781483387765

Qalehsari, M. Q., Khaghanizadeh, M., & Ebadi, A. (2017). Lifelong learning strategies in nursing: A systematic review. *Electronic Physician*, *9*(10), 5541–5550. https://doi.org/10.19082/5541

Quan-Haase, A., Mo, G. Y., & Wellman, B. (2017). Connected seniors: How older adults in East York exchange social support online and offline. *Information, Communication & Society*, *20*(7), 967-983. https://doi.org/10.1080/1369118X.2017.1305428

Rabourn, K. E., BrckaLorenz, A., & Shoup, R. (2018). Reimagining student engagement: How nontraditional adult learners engage in traditional postsecondary environments. *The Journal of Continuing Higher Education*, *66*(1), 22-33. https://doi.org/10.1080/07377363.2018.1415635

Rampey, B. D., Finnegan, R., Mohadjer, L., Krenzke, T., Hogan, J., & Provasnik, S. (2016). *Skills of U.S. unemployed, young, and older adults in sharper focus: Results from the Program for the International Assessment of Adult Competencies (PIAAC) 2012/2014. First Look. NCES 2016-039rev*. National Center for Education Statistics.

Rangel, B., Chung, W., Harris, T. B., Carpenter, N. C., Chiaburu, D. S., & Moore, J. L. (2015). Rules of engagement: The joint influence of trainer expressiveness and

trainee experiential learning style on engagement and training transfer. *International Journal of Training & Development, 19*(1), 18-31. https://doi.org/10.1111/ijtd.12045

Rashid, T., & Asghar, H. M. (2016). Technology use, self-directed learning, student engagement and academic performance: Examining the interrelations. *Computers in Human Behavior, 63,* 604-612. https://doi.org/10.1016/j.chb.2016.05.084

Rashidian, N., Brown, P., Hansen, E., Bell, E., Albright, J., & Hartstone, A. (2018). *Friend and foe: The platform press at the heart of journalism*. Tow Center for Digital Journalism at Columbia University. https://www.cjr.org/

Ray, A. (2018). Digital literacy. Mehdi Khosrow-Pour, D.B.A. (Information Resources Management Association, USA). In *Encyclopedia of Information Science and Technology, Fourth Edition* (pp. 2225-2234). IGI Global.

Reddy, P., Chaudhary, K., Sharma, B., & Chand, R. (2020). Digital literacy: A catalyst for the 21st century education. In *2020 IEEE Asia-Pacific Conference on Computer Science and Data Engineering (CSDE)* (pp. 1-6). IEEE. https://www.computer.org/

Renaud, K., & Van Biljon, J. (2008). Predicting technology acceptance and adoption by the elderly: A qualitative study. In *Proceedings of the 2008 annual research conference of the South African Institute of Computer Scientists and Information Technologists on IT research in developing countries: Riding the wave of technology* (pp. 210-219). Association for Computing Machinery

Reneland-Forsman, L. (2018). 'Borrowed access' - the struggle of older persons for digital participation. *International Journal of Lifelong Education, 37*(3), 333-344.

Richards, K. (2003). *Qualitative inquiry in TESOL*. Palgrave Macmillan.

Rosell-Aguilar, F. (2013). Podcasting for language learning through iTunes U: The learner's view. *Language, Learning and Technology, 17*(3), 74-93. https://www.researchgate.net/

Ross-Gordon, J. M. (2018). *Research on adult learners: Supporting the needs of a student population that is no longer nontraditional*. Association of American Colleges & Universities. https://www.aacu.org/

Rottman, B. M., & Hastie, R. (2014). Reasoning about causal relationships: Inferences on causal networks. *Psychological Bulletin*, *140*(1), 109–139. https://doi.org/10.1037/a0031903

Saldaña, J. (2016). *The coding manual for qualitative researchers*. SAGE Publications.

Schreurs, K., Quan-Haase, A., & Martin, K. (2017). Problematizing the digital literacy paradox in the context of older adults' ICT use: Aging, media discourse, and self-determination. *Canadian Journal of Communication*, *4 2*(2). https://doi.org/10.22230/cjc.2017v42n2a3130

Sentino, P. (2021). *Adult learners in higher education: How academic motivation influence online learners in a technology-based learning environment* [Doctoral dissertation, The Chicago School of Professional Psychology]. https://www.proquest.com/

Seo, H., Erba, J., Altschwager, D., & Geana, M. (2019). Evidence-based digital literacy class for older, low-income African American adults. *Journal of Applied Communication Research, 47*(2), 130-152. https://doi.org/10.1080/00909882.2019.1587176

Sharp, L. A. (2018). Collaborative digital literacy practices among adult learners: Levels of confidence and perceptions of importance. *International Journal of Instruction*, *11*(1), 153-166. https://doi.org/10.12973/iji.2018.11111a

Sim, J., Saunders, B., Waterfield, J., & Kingstone, T. (2018). *Can sample size in qualitative research be determined a priori? International Journal of Social Research Methodology, 21*(5). https://doi.org/10.1080/13645579.2018.1454643

Simmers, C. A., & Anandarajan, M. (2018). *The Internet of people, things and services: Workplace transformations*. Routledge.

Simon, M. K., & Goes, J. (2013). *Assumption, limitations, delimitations, and scope of the study*. http://www.dissertationrecipes.com/

Sinnott, J. D. (2018). Yes, it's worth the trouble! Unique contributions from everyday cognitive studies. In J. M. Puckett & H. W. Reese (Eds.)*, Mechanisms of everyday cognition* (pp. 73-94). Psychology Press.

Sivell, S., Prout, H., Hopewell-Kelly, N., Baillie, J., Byrne, A., Edwards, M., Harrop, E., Noble, S., Sampson, C., & Nelson, A. (2019). Considerations and recommendations for conducting qualitative research interviews with palliative and end-of-life care patients in the home setting: a consensus paper. *BMJ*

Supportive & Palliative Care, 9(1), e14-e14. https://doi.org/10.1136/bmjspcare-2015-000892

Staff, R., Hogan, M., Williams, D., & Whalley, L. (2018). Intellectual engagement and cognitive ability in later life (the "use it or lose it" conjecture): Longitudinal, prospective study. *BMJ*, *363*, k4925. https://doi.org/10.1136/bmj. k4925

Stec, M., Smith, C., & Jacox, E. (2020). Technology enhanced teaching and learning: exploration of faculty adaptation to iPad delivered curriculum. *Technology Knowledge and Learning,* 25, 651–665. https:doi.org/ 10.1007/s10758-019-09401-0

Stone, C., & O'Shea, S. (2019). Older, online and first: Recommendations for retention and success. *Australasian Journal of Educational Technology*, *35*(1). https://doi.org/

Strange, H., & Gibson, H. J. (2017). An investigation of experiential and transformative learning in study abroad programs. *Frontiers: The Interdisciplinary Journal of Study Abroad*, *29*(1), 85-100.

Stull, A. T., Fiorella, L., Gainer, M. J., & Mayer, R. E. (2018). Using transparent whiteboards to boost learning from online STEM lectures. *Computers & Education, 120,* 146-159.

Sultan, S., & Kanwal, F. (2017). Personal attributes contributing to computer anxiety and computer self-efficacy among distance learners. *Bulletin of Education and Research*, *39*(1), 33-44.

Sumuer, E. (2018). Factors related to college students' self-directed learning with technology. *Australasian Journal of Educational Technology*, *34*(4). https://doi.org/10.14742/ajet.3142

Sutton, K., & Desantis, J. (2017). Beyond change blindness: Embracing the technology revolution in higher education. *Innovations in Education and Teaching International*, *54*(3), 223-228. https://doi.org/10.1080/14703297.2016.1174592

Tapscott, D. (2009). *Grown up digital: How the net generation is changing your world*. McGraw-Hill.

Taylor, E. W., & Laros, A. (2014). Researching the practice of fostering transformative learning: Lessons learned from the study of andragogy. *Journal of Transformative Education*, *12*(2), 134–147. https://doi.org/10.1177/1541344614548589

Taylor, S. J., Bogdan, R., & DeVault, M. L. (2015). *Introduction to qualitative research methods: A guidebook and resource.* John Wiley & Sons, Inc.

Techataweewan, W., & Prasertsin, U. (2017). Development of digital literacy indicators for Thai undergraduate students using mixed method research. *Kasetsart Journal of Social Sciences 39*, 215-221. https://doi.org/10.1016/j.kjss.2017.07.001

Teherani, A., Martimianakis, T., Stenfors-Hayes, T., Wadhwa, A., & Varpio, L. (2015). Choosing a qualitative research approach. *Journal of Graduate Medical Education*, *7*(4), 669–670. https://doi.org/10.4300/JGME-D-15-00414.1

Tirado-Morueta, R., Aguaded-Gómez, J. I., & Hernando-Gómez, Á. (2018). The socio-demographic divide in Internet usage moderated by digital literacy support. *Technology in Society*, *55*, 47–55. https://doi.org/10.1016/j.techsoc.2018.06.001

Torun, E. D. (2020). Online distance learning in higher education: E-learning readiness as a predictor of academic achievement. *Open Praxis*, *12*(2), 191–208. https://dx.doi.org/10.5944/openpraxis.12.2.1092

Trask, S., Thrailkill, E. A., & Bouton, M. E. (2017). Occasion setting, inhibition, and the contextual control of extinction in Pavlovian and instrumental (operant) learning. *Behavioural Processes, 137*, 64-72. https://doi.org/10.1016/j.beproc.2016.10.003

Tsai, H-Y. S., Shillair, R., & Cotten, S. (2017). Social support and "playing around": An examination of how older adults acquire digital literacy with tablet computers. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.2418100

Tsimane, T. A., & Downing, C. (2020). Transformative learning in nursing education: A concept analysis. *International Journal of Nursing Sciences, 7*(1), 91-98. https://doi.org/10.1016/j.ijnss.2019.12.006

Twigg-Flesner, A. (2018). The end of lifelong learning–where have all the mature undergraduate students gone? A literature review and practical recommendations from a case study in England. In P. Blessinger, J. Hoffman, & M. Makhanya (Eds.), *International perspectives on equity and inclusion*. Emerald Group Publishing Ltd.

Tyler, M., De George-Walker, L., & Simic, V. (2020). Motivation matters: Older adults and information communication technologies. *Studies in the Education of Adults*, *52*(2), 175-194. https://doi.org/10.1080/02660830.2020.1731058

Tyner, K. (2014). *Literacy in a digital world: Teaching and learning in the age of information*. Routledge. https://doi.org/10.4324/9781410601971

Uemura, K., Yamada, M., & Okamoto, H. (2018). Effects of active learning on health literacy and behavior in older adults: A randomized controlled trial: Health education to enhance health literacy. *Journal of the American Geriatrics Society, 66*(9), 1721-1729. https://doi.org/10.1111/jgs.15458

Uğur, N. G., Koç, T., & Koç, M. (2016). An analysis of mobile learning acceptance by college students. *Journal of educational and instructional studies in the world*, *6*(2), 1-11.

Vacek, P., & Rybenská, K. (2017). Digital technology in the contemporary lives of senior citizens. *International Journal of Information and Education Technology, 7*(10), 758-762. https://www.researchgate.net/

Vaportzis, E., Gow, A. J., Clausen, M. G., & Gow, A. J. (2017). Older adults' perceptions of technology and barriers to interacting with tablet computers: A focus group study. *Frontiers in Psychology, 8*. https://doi.org/10.3389/fpsyg.2017.01687

Vassilakopoulou, P., & Hustad, E. (2021). Bridging Digital Divides: a Literature Review and Research Agenda for Information Systems Research. *Information systems frontiers: A journal of research and innovation*, 1–15. Advance online publication. https://doi.org/10.1007/s10796-020-10096-3

Wang, S., Bolling, K., Mao, W., Reichstadt, J., Jeste, D., Kim, H. C., & Nebeker, C. (2019). Technology to support aging in place: Older adults' perspectives. *Healthcare, 7*, 60; https://doi.org/10.3390/healthcare7020060

Wang, X., Wang, Z., Wang, Q., Chen, W., & Pi, Z. (2021). Supporting digitally enhanced learning through measurement in higher education: Development and validation

of a university students' digital competence scale. *Journal of Computer Assisted Learning, 37*(4), 1063-1076. https://doi.org/10.1111/jcal.12546

Wang, Y., Niiya, M., Mark, G., Reich, S. M., & Warschauer, M. (2015). Coming of age (digitally): An ecological view of social media use among college students. *Proceedings of the 18th ACM Conference on Computer Supported Cooperative Work & Social Computing*. https://doi.org/10.1145/2675133.2675271

Ware, C., Damnee, S., Djabelkhir, L., Cristancho, V., Wu, Y.-H., Benovici, J., Pino, M., & Rigaud, A.-S. (2017). Maintaining cognitive functioning in healthy seniors with a technology-based foreign language program: A pilot feasibility study. *Frontiers in Aging Neuroscience, 9,* 42. https://doi.org/10.3389/fnagi.2017.00042

Westin, A. (1967). *Privacy and freedom*. Atheneum.

Willinger, U., Deckert, M., Schmöger, M., Schaunig-Busch, I., Formann, A. K., & Auff, E. (2019). Developmental steps in metaphorical language abilities: The influence of age, gender, cognitive flexibility, information processing speed, and analogical reasoning. *Language and Speech*, *62*(2), 207-228. https://doi.org/10.1177/0023830917746552

Wyatt, L. G. (2011). Nontraditional student engagement: Increasing adult student success and retention. *The Journal of Continuing Higher Education, 59,* 10-20. https://doi.org/10.1080/07377363.2011.544977

Xiao, Q., Yue, C., He, W., & Yu, J. Y. (2017). The mindful self: A mindfulness-enlightened self-view. *Frontiers in Psychology*, *8*, 1752. https://doi.org/10.3389/fpsyg.2017.01752

Xie, J., & Rice, M. F. (2021). Instructional designers' roles in emergency remote teaching during COVID-19. *Distance Education*, *42*(1), 70-87. https://doi.org/10.1080/01587919.2020.1869526

Yin, R. (2014). *Case study research design and methods* (5th ed.). SAGE Publications.

Yoo, H. J. (2021). Empowering older adults: Improving senior digital literacy. Published in the Proceedings of the *American Association for Adult and Continuing Education*, 2020 Conference (Online, Oct 27-30, 2020). http://files.eric.ed.gov/

Zauschner-Studnicka, S. (2017). A model for reverse-mentoring in education. *International Journal of Social, Behavioral, Educational, Economic, Business and Industrial Engineering, 11*(3), 546 -553. https://zenodo.org/record/1129019

Zhang, F., Kaufman, D., Schell, R., Salgado, G., Seah, E. T. W., & Jeremic, J. (2017). Situated learning through intergenerational play between older adults and undergraduates. *International Journal of Educational Technology in Higher Education, 14*(1). https://doi.org/10.1186/s41239-017-0055-0

Zheng, R., Smith, D., Luptak, M., Hill, R. D., Hill, J., & Rupper, R. (2016). Does visual redundancy inhibit older persons' information processing in learning? *Educational Gerontology*, *42*(9), 635–645. https://doi.org/10.1080/03601277.2016.1205365

Zhou, J., & Salvendy, G. (2017). *Human aspects of IT for the aged population. Aging, design and user experience:* Third International Conference, ITAP 2017, Held as Part of HCI International 2017, Vancouver, BC, Canada, July 9-14, 2017, Proceedings, Part I. https://link.springer.com/

Zorn, A., Haywood, J., & Glachant, J. M. (2018). *Higher education in the digital age: Moving academia online*. Edward Elgar Publishing.

Appendix: Interview Script and Questions

Welcome! My name is Albani Smith; thank you for agreeing to participate in my research study. As I previously explained, I will use the data from this interview in my dissertation, which is a part of the requirement for my Ph.D. I am interested in learning more about student perceptions of the supports and types of learning required for digital literacy development for college students over 50 years of age who attend a traditional 4-year institution. I am focusing on your experiences with technology in higher education. Adult students have become an increasingly larger presence in colleges during recent decades. My interest in this area comes from my experience as an educational technology trainer who trains adjunct faculty and students to use a learning management system.

While your responses will be part of my research, I will not use your name in my dissertation. You will not receive any direct benefit from participating in my research, but the results of the study have the potential to assist students, faculty, and staff to enhance their support of students needing assistance with navigating technology while trying to successfully earn their degree.

Although you have already signed a consent form, please know that you may withdraw from the interview at any time. Also, although you have consented to being recorded during this interview, I take a few notes to clarify or emphasize topics that may need further clarification or exploration. This interview should take between 30 and 45 minutes. After the interview I will send you a summary for you to review and confirm the accuracy of our conversation. Before are there any questions about the study?

Interview Questions

- Think about your technological abilities. Would you rate your abilities as consistent with your peers, higher than your peers, or lower than your peers? How did you decide to rate yourself as such?
- What computers software or computer programs do you most often utilize in your college experience?
- In what ways does your use of technology help or hinder your learning?
- How do these specific tools support or hinder your learning?
- What resources do you use when you need assistance with technology in your college experience?
- Describe which technologies have presented the greatest challenge in your college experience?
- Are there technologies that you believe you should understand and know better how to use? What might help you to develop these skills?
- Describe the technological training provided by your institution if any. Was it helpful? If yes, why? If not, why?
- In general, how do you prefer to learn about new technologies?

Focus Group Questions

Warmup Opening Questions

- In general, what has been the most challenging thing about returning to school?
- How has using technology shaped the way you think about how courses are taught, how you interact in class, or just how you think about what course you may take next***?***

Introductory Questions

- In your interviews, each of you discussed your level of digital literacy and how it compared to your peers. How did you realize that you may not have the same level of skills as your younger peers?
- What type of support do you feel you needed at the beginning of your college of experience to ease you into using the required technology platform for courses?

Transition Questions

- All of you described how you got help when you couldn't figure something out. Most of you did not rely on university resources.
- What other things could the university do to help you figure out technology challenges?

Key Questions

- Now that you know how much of learning in college depends on using technology, how might you have been better prepared?
- What do you want instructors and administration to know about your experience using technology in your coursework?
- What advice do you have for other students returning to college?

Ending Questions

- Is there anything about technology use in courses and supports for students that has not been mentioned that you feel strongly about?
- Can you see a change or improvement in your technological skills since you started school up until now?