Factors Affecting Technology Integration for Teachers at K-12, Adult Education, and Higher Education Institutions Since Virtual Learning Due to COVID-19

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Factors Affecting Technology Integration for Teachers at K-12, Adult Education, and Higher Education Institutions Since Virtual Learning Due to COVID-19

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Abstract

This quantitative study investigates instructors' perceptions of the factors influencing technology integration in their instruction, spanning the years 2019-2023, encompassing the transition from virtual to in-person learning after COVID-19. It examines technology integration barriers and supports experienced by instructors in the Midwestern United States, namely Missouri, during this period. Additionally, it explores how the virtual learning experience during the pandemic has influenced instructors' self-perceptions of their digital competence. The study encompasses three education sectors: K-12, adult education, and higher education, providing a unique multi-sector perspective. By delving into the post-COVID-19 educational environment, this research aims to offer valuable insights. The methodology involved an online survey.

Results of this study show that despite the abrupt transition to remote learning due to COVID-19, barriers such as lack of time and training that have been identified in previous studies (Basarmak et al., 2020; Ertmer et al., 2012; Ertmer & Ottenbreit-Leftwich, 2010) for decades still prove to have a large impact on the ability of educators to effectively integrate technology in their instruction. It echoes the importance of addressing barriers such as time constraints and emphasizes the need for comprehensive professional development programs, especially in the post-COVID landscape. The findings suggest that institutions should prioritize dedicated time and consistent support for technology integration, particularly in the evolving post-pandemic educational landscape.
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Chapter 1

For decades, schools and universities in the United States invested billions of dollars into the integration of technology into classrooms and curriculum (Barton et al., 2019; EdTech Evidence Exchange A, 2021). While instructors in all education sectors, K-12, adult education, and higher education, continue to increase their technology use in instruction, there is a wide range in the methods, depth, frequency, and success of technology integration. This gap has been observed for decades in numerous studies (Basarmak et al., 2020; Castellano, 2014; Carnegie Commission on Higher Education, 1972; Cuban, 2001; Davis, 1989; Ertmer, 1999; Hioco, 1995; Lee, 1996; Taylor & Eustis, 1999; Van Broekhuizen, 2016). During this time, the evolving gap has been attributed to many things, including budgetary restraints, time, the level of access to innovative tools, instructor and student competency, institutional expectations and support, and the confidence and self-efficacy of the instructors themselves (Basarmak et al., 2020; Davis, 1989; Ertmer, 1999; Ertmer et al., 2012; Ertmer & Ottenbreit-Leftwich, 2010; Medlin, 2001; Stanhope & Rectanus, 2016; Vongkulluksn et al., 2018). In March 2020, technology integration took on a whole new urgency when the World Health Organization (WHO) announced that the spread of COVID-19 had reached the level of a worldwide pandemic and schools worldwide pivoted to virtual learning, almost overnight, with very little time to prepare (Cucinotta & Vanelli, 2020).

Although research has found that inconsistent computer and internet access makes it extremely difficult to integrate technology into existing lesson plans, deficient professional development and training was the most commonly cited reason for the lack of technology implementation (Hesse et al., 2020). The design and implementation of
professional development activities can affect instructors' perceptions of technology integration, digital skills and competencies, and confidence in using technology in a post-COVID-19 teaching environment. As Hesse et al. (2020) reported, administrators can advocate for the latest equipment in connectivity and promote cutting-edge online resources, but impediments to digital education still exist. Thought must also be given to the amount of time required for implementation, the level of teacher competence with the device or program, and the amount of input afforded to teachers during the selection of resources.

**Statement of the Problem**

The COVID-19 pandemic has forced educational institutions worldwide to rapidly transition to virtual learning, making technology integration an essential component of instructional practices across K-12, adult education, and higher education settings. However, despite the urgent need for effective technology integration, many educators face significant challenges in utilizing technology tools and resources to enhance teaching and learning experiences. To address this issue, it is crucial to investigate the factors that influence technology integration for teachers, at all levels, in these diverse educational contexts in order to develop targeted strategies and interventions that support educators in maximizing the benefits of technology integrated instruction.

Understanding the factors that influence K-12, adult education, and higher education technology integration is essential for informing professional development programs, policies, and resource allocation strategies that can support teachers in effectively incorporating technology into their instructional practices (Ertmer &
Ottenbreit-Leftwich, 2010). By identifying the specific challenges faced by teachers in different educational sectors, such as access to technology, pedagogical training, and institutional support, this research aims to provide actionable insights that can inform targeted interventions to enhance technology integration and improve educational outcomes in the post-pandemic era.

Through a comprehensive exploration of factors perceived by educators, this research seeks to contribute to the development of evidence-based strategies and recommendations for supporting teachers in effectively integrating technology into their instructional practices across diverse educational settings.

**Rationale/Purpose**

The purpose of this study is to explore instructors' perceptions of the various factors affecting technology integration into their instruction after virtual learning due to COVID-19, specifically the years 2019-2023. The selected aspects for this quantitative study are the technology integration barriers and supports that are experienced by instructors in the Midwestern United States in the wake of virtual learning due to COVID-19 and during transition back to in-person learning. The perceptions of instructors from three education sectors, K-12, adult education, and higher education, and how the various factors affecting their virtual learning experience during the COVID-19 pandemic has impacted their self-perceptions of their digital competence and technology integration following virtual learning due to COVID-19 will be examined.

While there are numerous studies that investigate the perceptions of instructors, this study is unique in that it looks at the perceptions of instructors regarding technology integration from three independent sectors of education, in addition to exploring the post
COVID-19 educational environment those instructors have experienced. Additionally, it explores whether the virtual learning experience during the COVID-19 pandemic has impacted instructors' self-perceptions of their digital competence. Furthermore, this study seeks to understand instructors' perceptions regarding how institutions can enhance their self-efficacy in technology integration. This study will rely on quantitative data collected using a voluntary, online survey crafted by the researchers (see Appendix A).

**Research Questions**

The key questions guiding this inquiry into the technology integration practices of instructors in K-12, adult education, and higher education are:

1. What factors do instructors currently perceive as having an effect on their level of technology integration?
2. Has the experience of virtual learning, due to COVID-19, altered instructors' self-perceptions of their digital competence?
3. What are instructors' perceptions of how institutions can help improve their technology integration self-efficacy?

**Theoretical Framework**

To address the research questions, the theoretical framework is the structure that will be used to explore published content and research of concepts and theories related to the content of the study. It is a basis for the data analysis and interpretation of the meaning contained in the research data that will be collected. Below is a brief summary of the theoretical frameworks that will be discussed in more depth in chapter 2: (a) the diffusion of innovations theory (b) the self-efficacy theory, and (c) andragogy and the adult learning theory. These sections identify the major influences affecting the
theoretical base of the research. The applications of the principles from these theories provide the foundation for the theoretical framework that guides the systematic analysis of the literature, the formulation of the research objectives, and identification of the research methodology that will be discussed in chapter 3.

**Diffusion of Innovations Theory**

Though E. M. Rogers’ (2003) innovation theory was originally rooted in the field of communication, diffusion research focuses on the variables that influence the plausibility that something new will be adopted by members of a common environment, in the case of this study, a school. Rogers (2003) identified the five-step process, which signifies the social nature of change, as 1) knowledge, 2) persuasion, 3) decision, 4) implementation, and finally, 5) confirmation. This theory also provides different adopter categories, such as innovators, early adopters, early majority, late majority, and laggards, who vary in their readiness to embrace new ideas. Using Rogers’ diffusion of innovation theory (2003) as a framework for this study provides an understanding of how and why innovation spreads at an individual level and then into and through the institutional peer network, but it also provides a framework to categorize the adopter levels and perceived factors reported by participants. With that understanding, this study is able to focus on the factors of the individual instructors and the institution that increase/decrease the probability of innovation diffusion (Fisher, 2005; Medlin, 2001; Parisot, 1995; Thayer, 2013). Identifying and accounting for these factors is necessary in the development of strategies and best practices to foster positive, innovative change in schools.
Self-Efficacy Theory

Albert Bandura's (1977) self-efficacy theory asserts that an individual's belief in their own abilities plays a pivotal role in how they approach and respond to tasks. It is important to consider one’s self-efficacy when discussing an instructor’s belief in their ability to use technology to effectively execute a curriculum or a lesson. Pan & Franklin (2011) stated technology integration in education has been deemed to be important since the early 1980s to provide students with the skills needed for a “competitive global economy” (p. 28). Although technology integration has long been a requirement in many curriculums, many instructors report mid to low levels of technology self-efficacy (Cardullo et al., 2021). If instructors believe they possess the knowledge and/or skills required to integrate technology into their teaching, they may be motivated to incorporate it into their instruction on a regular basis. On the other hand, if instructors lack confidence in their ability to use technology effectively, they may be less likely to try new technologies or may struggle to implement them successfully. “Self-efficacy is a strong predictor of performance in a variety of academic settings” (Maier & Curtin, 2005, p. 353-354). Instructors in K-12, adult education, and higher education settings sometimes fail to regularly utilize the full potential of instructional technologies to improve student learning. Since there is a positive correlation between self-efficacy and the integration of technology, boosting instructors’ confidence in their abilities could lead to a more effective and high-quality integration of these tools (Barton & Dexter, 2020).

Adult Learning Theory

In the mid-1960s, adult educators began studying adult learners and generating several models, theories, and frameworks explaining how adult learners could be
distinguished from children (Merriam, 2018). "It is a nearly unassailable proposition that among the Olympians of North American adult education, the iconic figure of Malcolm S. Knowles stands as the most familiar to adult educators" (Rachal, 2014, p. 81).

Knowles (as cited in Loeng, 2018) defined andragogy as the art and science of helping adults learn. Knowles theorized that the adult learning theory consisted of six key assumptions or characteristics: adults' self-concept, learning experiences, readiness to learn, motivation, need to know, and problem-centered learning (Purwati et al., 2022).

The survey participants for this study are adult educators who may hold various roles, such as teachers, instructors, faculty members, and administrators in K-12, adult education, and higher education institutions. They may also work as instructional designers, responsible for creating plans for technology integration and providing and receiving technology-based professional development training. For these reasons, incorporating adult learning theory as a theoretical framework in this research study could enrich the study's impact. Additionally, it could ensure that the research is contextually sensitive to the needs of adult learners and offer practical insights that could be applied in various educational settings. According to Cercone (2008), instructors, instructional designers, and other professionals working in the design of online environments for adults must understand adult learning theory, especially in terms of its relationship to distance or online learning.

**Significance of Research**

This research aims to offer fresh insights into instructors' perceptions about technology integration, particularly in light of the surge in virtual learning brought about by the COVID-19 pandemic. This study is important because the instructors' perception
of barriers when using technology in teaching, their digital competency, and identifying essential supports are crucial to the successful integration of educational technology (Basarmak et al., 2020; Ertmer et al., 2012; Ertmer & Ottenbreit-Leftwich, 2010).

The results of this investigation may offer insights into the factors that influence instructors’ technology self-efficacy, such as training, support, and pedagogical approaches. It can provide specific strategies and recommendations for instructors to enhance their technology self-efficacy, such as targeted professional development programs, mentoring, and peer collaboration to support the effective integration of technology into their instructional practices.

The dissertation can inform administrators about the importance of technology self-efficacy among instructors and its impact on instructional practices and student outcomes. It can suggest ways for administrators to promote a supportive environment that fosters technological self-efficacy, such as providing resources, infrastructure, ongoing training opportunities, and technology integration initiatives.

This study can contribute to the field of education by expanding the knowledge and understanding of technology self-efficacy among instructors. It can provide empirical evidence and theoretical insights into the factors that influence technology self-efficacy and its relationship to instructional practices and student outcomes. The study may also identify gaps in the current research and suggest areas for future investigation, encouraging further exploration and development of technology self-efficacy theory and its applications in educational settings.

This research can enrich the existing literature on technology integration and self-efficacy by offering a specific focus on instructors' technology self-efficacy. It can
provide a comprehensive review of relevant studies, synthesizing the findings and identifying patterns or discrepancies. It may also propose theoretical frameworks and models that integrate technology self-efficacy with other constructs in the field of education.

**Scope and Delimitations**

This study will rely on quantitative data using an online survey created by the researchers. More details about the instrument are discussed in chapter 3 (see Appendix A). Participants (instructors in the areas of K-12, adult education, and higher education) will be limited to the Midwestern United States and must have 4 or more years of experience as an instructor.

**Definition of Terms**

To facilitate and clarify understanding, key terms are defined herein. The following terms were used operationally in this study. These terms have exclusive and/or multiple meanings based on the context and operational nature of their use. The definitions provide common understanding of the terminology used within the scope of the study.

**Adult Education (AE)** - The term is defined as any activity intentionally designed to bring about learning among those whose age, social roles, or self-perception define them as adults (Merriam & Brockett, 2007, as cited in *A Definition of “Adult Education,”* 2008).

**Blended Learning** - Learning and instruction that takes place in a combination of virtual and in-person environments.
**Digital Equity** - A condition in which all individuals and communities have the capacity to access and effectively use the information technology necessary for full participation in our society, democracy and economy, including civic and cultural participation, employment, lifelong learning, and access to essential services.

**Educational Technology Integration** - Any use or combination of the use of computer hardware/software, digital devices, Internet resources, audio/video resources, and educational theory and/or practice to facilitate instruction and the learning of students with these resources.

**First-order Barriers** - Logistical obstacles that are extrinsic to the instructor, such as access to technology, student abilities and access, infrastructure, and technical support (Ertmer, 1999).

**Instructor** - For the purposes of this study, this term is interchangeable with all terminology used to indicate an individual that is in the position of being a teacher, educator, or instructor in a classroom setting that teaches and instructs students in either a K-12, higher education, or an adult education institution or program.

**Midwestern United States** - For this study, this will only include the states specified by the United States Census Bureau: Illinois, Indiana, Michigan, Ohio, Wisconsin, Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, and South Dakota (2021).

**Perceived Self-Efficacy** – “People's beliefs about their capabilities to produce effects” (Bandura, 1994, p. 1).
**Professional Development** - Refers to any program, activity, or training aimed at improving technology integration instructional practice (Kennedy, 2016, as cited in Osman, 2020).

**Second-order Barriers** - These barriers are intrinsic to the instructor, and include beliefs, attitudes, confidence levels, values, and mindset surrounding technology integration and pedagogy (Ertmer, 1999).

**Technology Integration Matrix (TIM)** - The matrix is a framework used to describe levels of integration and focus the use of educational technology to enhance learning.

**Technology Integration Supports** - Any factor, entity, or infrastructure that provides, enables, or improves student and instructor access to hardware, software, and or Internet, for the purposes of teaching and/or learning.

**Technology Belief Systems** - For this study, we are only referring to the belief systems of instructors surrounding integration of technology into their classrooms and instruction.

**Technology Self-efficacy** - Instructors' beliefs in their ability to effectively handle tasks, obligations, and challenges related to technology integration.

**Summary**

This quantitative study explored instructors’, from the K-12, adult education, and higher education sectors, perceptions of their technology integration self-efficacy and their motivations regarding technology integration. The factors that influence their technology integration after the switch to virtual learning because of COVID-19 was also investigated. Studies on this topic are limited. Through surveys of instructors in all three
sectors, we believe the information will be helpful to administrators, instructors, curriculum writers, and professional development directors of K-12 schools, adult education, and institutions of higher learning to improve future attempts at technology integration. This study sought to add to the discourse around effective technology integration in the wake of COVID-19.

The quantitative study relied on the frameworks provided by the diffusion of innovations theory, the self-efficacy theory, and the adult learning theory. The applications of the principles from these theories provided the foundation for the theoretical framework that guides the systematic analysis of the literature, the formulation of the research objectives, and the identification of the research methodology.

In the next chapter, there will be a review of the literature, followed by the research methodology in chapter 3. In chapter 4, the findings are discussed and in chapter 5, the conclusions.
Chapter 2: Review of Literature

Internet and device usage in the United States has increased so much in the last two decades that by 2019, less than 7% of adults in the US reported not using the Internet, and 94% of households with children reported having access to a computer with the Internet (Digest of Education Statistics, 2020). Despite making considerable gains in getting devices and Internet access into the hands of users, especially with the push for online learning across all education sectors due to COVID-19, serious gaps have formed in implementing technology for instruction (Camilleri, 2021; Camilleri & Camilleri, 2021; Cuban, 2001; Van Broekhuizen, 2016). The simple acquisition of technology may have worked for earlier innovations like TV and video, but the process for integrating modern digital and web-based technology is more complex and requires change in several areas of instruction and learning for instructors and students (Basarmak et al., 2020; Breakstone et al., 2018; EdTech Evidence Exchange, 2020; Johnson, N. et al., 2020; Kopcha et al., 2020). “Whereas initial, supplemental uses may require small changes in classroom management and organizational strategies, more extensive uses [such as VR] tend to challenge traditional classroom culture as well as instructors’ beliefs about the teaching-learning process” (Ertmer, 1999, pp. 47-48).

This review of literature will focus on the theoretical frameworks of the diffusion of technology, technology self-efficacy of teachers, and adult learning theory in relation to barriers and supports to technology integration, as well as teachers' digital competencies. This review will also present literature on the effects of remote learning due to COVID-19 on technology integration for teachers and implications for
best practices for technology integration by teachers in three sectors of education: K-12, adult education, and higher education.

Theoretical Frameworks

In this section, we examine the theoretical frameworks that support the study. They include diffusion of technology, technology self-efficacy of teachers, and adult learning theory. We begin with a discussion on diffusion of innovation.

Diffusion of Innovation

When there is a discussion of teachers learning new technology and integrating it into their instructional practices, it is difficult to avoid inadvertently talking about the diffusion of innovation theory, originally put forth by E. M. Rogers in 1962. Rogers’ book, *Diffusion of Innovations*, is considered by many to be the standard on diffusion theory. This theory is one of the most complete for investigating and explaining the technology adoption process (Fisher, 2005; Medlin, 2001; Thayer, 2013). While this study is focused on the perceptions of potential adopters, this section will give a brief understanding of the diffusion of innovations theory and its basic components.

According to Rogers (2003), “Diffusion is the process by which an innovation is communicated through certain channels over a period of time among members of a social system… a kind of social change” (p. 5-6). Using Rogers’ (2003) diffusion of innovation theory as a framework for this study provides an understanding of how and why innovation spreads at an individual level and then into and through the institutional peer network, but it also provides a framework to categorize the adopter levels and perceived factors reported by participants. This understanding is necessary to focus on the factors of the individual instructors and the institution that increase/decrease the probability of
innovation diffusion (Fisher, 2005; Medlin, 2001; Parisot, 1995; Thayer, 2013). Identifying and accounting for these factors is necessary in the development of strategies and best practices to foster positive, innovative change in schools (Ertmer & Ottenbreit-Leftwich, 2010; Kopcha et al., 2020; Medlin, 2001; Miller et al., 2003).

The theory of diffusion of innovation (Rogers, 2003) focuses on the plausibility that something new will be adopted by members of a common environment, in the case of this study, teachers in a school. He identified a five-step process that individuals go through when adopting an innovation or change: 1) knowledge, 2) persuasion, 3) decision, 4) implementation, and finally, 5) confirmation. Rogers emphasizes that each category progresses through the five steps of the process at different speeds, and because the process of change is socially influenced, an individual’s progress influences how their colleagues might respond to and adopt an innovation.

**Adopter Categories.** The different adopter categories in any given community identified by Rogers (2003) are *innovators, early adopters, early majority, late majority,* and *laggards* and they all vary in their readiness to embrace new ideas. When thinking about the categories, Rogers makes it clear that “innovativeness…is a continuous variable and there are no sharp breaks or discontinuities between adopter categories” (p. 282). The five categories are a continuum of innovative aptitude. A brief description of each category follows:

*Innovators* are the very select minority that actively seek out new ideas, practices, tools, etc. They are the risk-takers that enjoy trying new things and do so without needing influence from their peers. They have a large professional network with other innovators.
Early adopters tend to be more discerning about innovations they adopt and promote. They become technology leaders that communicate their evaluation of the innovation to other instructors, helping to decrease the levels of uncertainty for subsequent adopters.

Early majority adopters make up about one third of the members in the diffusion process. They adopt after considerable deliberation and learn with an institutional peer network. They are also a great source of momentum for the diffusion due to their interconnectedness in the institution’s interpersonal network.

Late majority adopters make up another third of the members of the adoption process. They are skeptical of innovations and want to be sure their investment will be worthwhile. Economic necessity and peer pressure of other instructors are large motivators for this group.

Laggards are a small percentage of the members in the adoption process. They are the last to adopt an innovation because they are the most cautious and require the most reassurance, which is exacerbated by limited resources and a general distrust of innovation and change.

Identifying where individuals fall in this continuum and the characteristics they report, may potentially lead to a better understanding of how changes to technology integration in the teaching environments during the COVID-19 pandemic may affect the innovation processes of instructors and their institutions. For instance, while research has shown that video conferencing is an innovation that has gained mainstream usability (Lawson et al., 2010; Uenuma, 2020) and can benefit distance education, research has also shown that the instructors’ perceptions of it and their technology self-efficacy also
greatly impacts the success of videoconferencing as an instructional integration (Candarli & Yuksel, 2012; Ertmer & Ottenbreit-Leftwich, 2010). Investigating these perceptions can help to understand how to improve the adoption of videoconferencing for some and understanding why adoption may not be feasible, necessary, or desired for others.

The influencing factors that encourage users to cross the tipping point of adoption are of especial interest. Figure 2.1 illustrates the distribution of innovators in a typical school community. The tipping point of adoption is generally when 15-18% of the entire community, which includes all the innovator and early adopter categories and some early majority, works to diffuse an innovation within the rest of the community. It is at this point, with enough of the influential adopters on board, an innovation is on its way to being adopted throughout a community.

**Figure 2.1**

*Adopter Categorization Based on Innovativeness*

*Note.* This chart shows the percentage of adopters in each category and the tipping point of adoption based on the average time to adopt (X) and the standard deviation (sd) for
Individuals in charge of innovation in schools need to understand and encourage the factors that will move teachers towards the tipping point when introducing new technology initiatives. Factors influencing the adoption of an innovation in education toward the tipping point include a) perceived advantages compared to the status quo, b) compatibility with existing values and practices, c) complexity of the innovation, d) trialability before a decision has to be made, and e) observability of results of committing to the innovation (Rogers, 2003). These identified factors can be used to encourage innovation throughout the rest of the community by communicating observable benefits to undecided instructors, gaining support from influential colleagues and administrators, advocating for organizational changes through example and the setting of expectations, and utilizing social networks and communication channels most commonly used and trusted by members of the community.

**Variables That Determine Innovation.** Studies of teachers and school administrators have suggested that identifying specific variables in the innovation process can work to explain how, why, and at what rate an innovation will (or will not) diffuse and be adopted among instructors at an institution (Medlin, 2001; Rogers, 2003). Figure 2.2 demonstrates the diffusion process over time in relation to adopter categories and the existence of various variables that affect diffusion rates. For instance, having more naturally innovative members, i.e., the closer more members are to the bottom left of
Figure 2.2, the faster an innovation is likely to be adopted. However, knowing which variables encourage innovation throughout an organization and then promoting more of those variables can also speed the diffusion of the innovation along the S-curve shown in Figure 2.2, where Innovation I and II have more variables that favor innovation and adoption happens at a faster rate than Innovation III. According to Rogers (2003), the following variables determine how likely/unlikely an innovation will be adopted and appear in every study of innovation diffusion:

- attributes of the innovation itself (the device, software platform, ease of use, how closely it aligns with existing tools/practices, etc.),
- the channels of communication (professional development, sharing of best practices, dissemination of success stories, mandated integration, etc.),
- time (deadlines, timing vs. need, and length of time from introduction),
- the decision-making process and social system of the potential adopters (norms, interconnectedness, approval processes, and personal characteristics of the instructors, students, administration).
Figure 2.2

The Diffusion Process Over Time Based on Different Innovations

Note. This chart demonstrates how innovations spread among the adopter categories in a community \((x=\text{number of adopters across categories})\), relative to the rate of adoption (s-curve) of the innovations over time \((y=\text{time})\). The trajectory of the s-curve can vary based on the attributes and circumstances surrounding the innovation, as well as the distribution of members across adopter categories. It provides three innovation patterns (I, II, and III), each having varying attributes affecting the rate of diffusion (Rogers, 2003, p. 11). From Diffusions of Innovations, 5E by Everett M. Rogers. Copyright © 1995, 2003 by Everett M. Rogers. Copyright © 1962, 1971, 1983 by The Free Press. Reprinted with the permission of The Free Press, a Division of Simon & Schuster, Inc. All rights reserved (see Appendix B).

The Innovation. Rogers (2003) defines an innovation as, “an idea, practice, or object that is perceived to be new by an individual or other unit of adoption” (p. 12). It is important to point out that the newness of an innovation only pertains to the community...
and/or individual and not necessarily that a proposed innovation must be new in origin. For instance, during the COVID-19 pandemic, schools across the country in all sectors of education went to a fully remote model of education using video conferencing platforms like Google Meet and Zoom (Johnson et al., 2020). Video conferencing is not new technology by any means. The concept dates back to at least the 1930s, but it did not become a practical, cost-efficient innovation for education until after the innovations in IP technology, video compression, and high-speed Internet of the late 20th century (Correia et al., 2020; Uenuma, 2020). While video conferencing systems, in particular web-based systems like Zoom, Google Meet, Microsoft Teams, and WhatsApp, have evolved significantly, at the onset of the COVID-19 pandemic, they certainly did not have widespread use in all sectors of education as an instructional tool (Camilleri & Camilleri, 2021; Correia et al., 2020; Uenuma, 2020). It was a “new” innovation to most instructors that had only ever taught in-person, face to face with their students.

When considering the adoption of an innovation, the innovation itself has perceived attributes that affect the rate at which an innovation will be adopted. The more positive the following variables are to instructors, the faster an innovation will be diffused among instructors at an institution:

- **Relative advantage** - expected benefits in relation to the cost of adoption and the extent that the innovation is seen as an improvement.

- **Compatibility** - consistency with existing values and knowledge, past experiences, and needs of potential adopters.

- **Complexity** - the degree of learnability of the innovation along with its ease of use and integration.
- **Trialability** - the extent that an innovation can be used and experimented with before an innovation decision has to be made.
- **Observability** - the extent that the results of an innovation can be seen by an adopter and their peers (Rogers, 2003).

**Types of Innovation-Decisions.** Like many variables in the diffusion of innovation, the decision-making process is on a continuum of these three types of decisions:

- **Optional** - These decisions are made independently of other instructors at the institution.
- **Collective** - These decisions are made by consensus of the majority of professional peers at the institution.
- **Authority** - These decisions are made by a small minority of those in power at the institution, have status, or are technology experts (Rogers, 2003).

Generally, the fastest rate of adoption among instructors follows authoritative decisions made at the departmental or administrative level of an institution. Instructors have little choice in the adoption process when decisions of authority are made. The use of video conferencing with students during times of remote learning due to COVID-19 likely stemmed from positions of authority as the primary mode of instruction when in-person instruction was not possible. (Camilleri & Camilleri, 2021) Other tools used for remote learning, such as submission of assignment and assessment tools were likely more collective and even optional based on the innovative nature of the instructor, the students’
ability, and the needs of the individual coursework (Gray & Lewis, 2021; Johnson, et al., 2020).

**Communication.** How instructors perceive new technologies for integration can be manipulated by how the technology is presented and communicated (including the extent of the efforts used to promote the new technology to the instructors). Mass communication is important for spreading awareness about an innovation and the positive attributes that will result from an innovation, but individual networks are critical for actual adoption, as potential adopters turn to peers for opinions and evaluations (Fisher, 2005; Parisot, 1995; Thayer, 2013). Most instructors will depend on communication about their expertise and experience with an innovation from other individuals in their professional peer network, suggesting that the social process of diffusion relies on this interpersonal communication (Rogers, 2003).

**Self-Efficacy**

The theory of self-efficacy, first introduced by Albert Bandura (1977), provides a framework for understanding and examining the concept of technology self-efficacy. Bandura emphasized the importance of self-belief in predicting human behavior and achievement. According to Bandura's theory, self-efficacy refers to an individual's belief in their capabilities to successfully perform specific tasks in particular situations. In the context of technology, educators' self-efficacy relates to their confidence in their ability to integrate and utilize technological tools and resources to enhance student learning (Paraskeva et al., 2008). The theory of self-efficacy provides insight into our understanding of human motivation, behavior, and development particularly in the way
we think about an instructor’s belief in their own ability to effectively integrate technology into their instruction (Cardullo et al., 2021).

Various studies point to the idea that an individual’s “belief in one’s capabilities contributes uniquely to motivation and action” (Bandura, 2012, p. 179). Factors including anticipated barriers, personal goals, and anticipated incentives contribute to what Bandura (2012) describes as the causal model which highlights the importance of self-efficacy in motivation, action, and personal and organizational effectiveness. The belief in one's capabilities (self-efficacy) has a unique contribution to motivation and action and is central to the causal structures that affect human functioning (Bandura 2012; Maier & Curtin, 2005). Figure 2.3 illustrates how self-efficacy impacts other key factors including goal aspirations, incentives and disincentives linked to expected outcomes, and perceived barriers and opportunities within social systems. These are all essential aspects that determine human behavior, motivation, and success (Bandura, 2012; Johri & Misra, 2014).
Note. Perceived self-efficacy influences motivation and performance achievements both directly and indirectly by affecting goals, expectations of outcomes, and the understanding of social and structural aids and obstacles (Bandura, 2012, p. 180). Reproduced with permission from American Psychological Association. No further reproduction or distribution is permitted (see Appendix C).

Bandura (1977, 1997) argues that an individual's expectations for outcomes are primarily influenced by their self-efficacy beliefs. Individuals form anticipations regarding various outcomes based on how competent they believe they are in executing a particular behavior. Those who view themselves as highly capable in performing a specific task are likely to expect positive results from that behavior (Bandura 1977, 1997, 2012; Pajares, 1996). Bandura (2012) states that since expected outcomes are closely tied
to judgments of self-efficacy, they may not significantly contribute to the prediction of behavior.

Bandura (1977) points out that people's self-perceptions are formed and confirmed through four distinct mechanisms:

- Personal experience of the consequences stemming from their own actions.
- Observations of others, or vicarious experiences.
- Opinions and assessments expressed by others.
- Expansion of their existing knowledge through logical reasoning and the application of inferential rules.

The experiences ideally reinforce both self-efficacy and expectations for outcomes, subsequently shaping behavior. Since the performance of a behavior influences these aspects of self-efficacy and outcome expectations, it is probable that a mutual relationship exists between the performance of an action and the expectations regarding ability and results (Wang et al., 2004). Bandura (1977) further contends that an individual's conviction in their ability to carry out the necessary actions to achieve a desired result is shaped by four cognitive experiences: “mastery experiences, vicarious experiences, social persuasion, and emotional and physiological states” (p. 193).

In relation to the causal model, Albert Bandura's (2012) triadic reciprocal causation is a fundamental concept in his social cognitive theory that explains human behavior as a result of the dynamic interactions between personal factors, environmental influences, and individual behavior. The triadic reciprocal causation model proposes that these three components continuously interact and influence each other, creating a
feedback loop that shapes an individual's thoughts, feelings, actions, and learning experiences.

- **Personal factors (cognition):** This aspect focuses on an individual's cognitive processes, beliefs, and emotions. It includes self-efficacy beliefs, which are an individual's judgments about their capabilities to succeed in specific situations or tasks.

- **Environmental influences (environment):** This component encompasses the external factors in an individual's environment that influence behavior. These influences include the physical environment, social interactions, cultural norms, family, peers, and media.

- **Behavioral factors (actions):** This element involves the observable actions and behaviors of individuals, which are influenced by both personal factors and environmental influences.

The triadic reciprocal causation model illustrates Bandura's (2012) idea of the dynamic interplay between personal factors, environmental influences, and individual behavior emphasizes a continuous, reciprocal relationship where each element can affect and be affected by the others. This framework underscores the complexity of human behavior and the way in which various factors are interconnected in shaping an individual's actions and development, highlighting a more nuanced understanding that recognizes the multifaceted influences on human action (Bandura, 1997, 2012). Figure 2.4 shows how three factors in the triadic reciprocal causation model are not independent of each other but influence each other in a dynamic and reciprocal way illustrating how
behavior can influence personal factors, personal factors can influence the environment, and the environment can influence behavior (Bandura, 1997).

**Figure 2.4**

*Triadic Reciprocal Causation Model*

![Triadic Reciprocal Causation Model](Image)

*Note.* Internal and external factors play a role in the causal model and how three components continuously influence and shape each other, creating a reciprocal relationship that guides an individual's actions and learning experiences (adapted from Bandura, 1997, p. 6). Reproduced with permission from American Psychological Association. No further reproduction or distribution is permitted (see Appendix C).

Bandura (1977) explains that efficacy perceptions shape human behavior through three primary pathways. Firstly, they guide the selection of activities; people tend to take on tasks they feel capable and sure of, while shying away from those that make them feel less competent. Secondly, these beliefs affect the level of effort and tenacity applied to an endeavor—the stronger the belief in one's capabilities, the more effort and persistence is
likely. Lastly, self-efficacy beliefs steer individual thinking and emotional responses. For example, educators in K-12, adult education, or higher education settings with diminished self-efficacy might perceive integrating instructional technology as more challenging than it really is. This belief can lead to stress and a limited perspective on the best ways to address the issue (Gomez et al., 2022). Conversely, high self-efficacy equips instructors with the confidence needed to approach the integration of technology effectively (Pajares, 1995). The confidence of instructors in using technology, or their technology self-efficacy, has the potential to enhance student achievement (Gomez et al., 2022).

**Adult Learning Theory**

The abundance of learning theories and instructional models can overwhelm those seeking to become effective instructors. This statement holds regardless of whether someone is teaching online, in a blended environment, or entirely in-person (Minter, 2011). Adult learning is a complex field that encompasses various practices, such as continuing professional education, basic literacy classes, and on-the-job training. There is no definitive answer as to why and how adults learn. Still, a set of principles and explanations continue to develop and shape our understanding of adult learning (Merriam, 2018). Building on the foundation of being well-versed in their subject matter, adult educators who are more familiar with this knowledge base are better equipped to meet the needs of their adult learners (LINCS B, n.d.).

As education transitions into online platforms, a new and unfamiliar environment emerges, accompanied by unique challenges for both teachers and learners. Adaptation and embracing change are necessary. Professionals creating online learning experiences
should thoroughly understand adult learning theory and how it relates to distance or online learning (Cercone, 2008). Understanding adult learning is key to understanding distance learning (Moore & Kearsley, 1996, p. 153, as cited in Cercone, 2008).

In the adult education setting of adult teachers and adult learners, Lawler (2003) states,

Although we may be at ease with thinking of our various learners from an adult learning perspective, we may be shortsighted in not including teachers of adults as well. When we view teachers of adults as adult learners and their professional development as adult education, we have at our disposal the research and literature from the fields of adult education, adult learning and development, and program development. (p. 15)

When researching andragogy and adult learning theories, “it is a nearly unassailable proposition that among the Olympians of North American adult education, the iconic figure of Malcolm S. Knowles stands as the most familiar to adult educators” (Rachal, 2014, p. 81). Knowles defined andragogy as “the art and science of helping adults learn” (Loeng, 2018, p. 15). While many believe that Malcolm Knowles was the first to introduce the term Andragogy, it was coined by Alexander Kapp, a German educator, in 1833 (Note et al., 2021).

There exists a multitude of approaches to comprehending the concept of andragogy. As noted in LINCS B (n.d.), the literature of the past century has yielded a variety of models, sets of assumptions and principles, theories, and explanations that make up the adult learning knowledge base. According to Henscke (2009), “andragogy had a very slow beginning over a period of almost one century as a term referring to the
theory and practice of adult education” (pp. 3-4). Mews (2020, as cited in Purwati et al., 2022) reported the term "andragogy" originated from the Greek words "andro" meaning "man" and "agogus" meaning "leader of" (p. 2). Andragogy is then defined as “the art and science of helping adults learn” (Knowles, 1980, as cited in Purwati et al., 2022, p. 2).

“Beginning in the mid-1960s, adult educators themselves began studying adult learners, which generated several models, theories, and frameworks explaining how adult learners could be distinguished from children” (Merriam, 2018, p. 22). There are many ways in which an adult learner can be classified. According to psychology, an adult has developed a sense of responsibility for their life and can direct themselves (Knowles, 1984). Adult learners are responsible and self-guided, motivated by personal reasons. Their learning should be practical, relevant, and goal-oriented, with purposeful activities in any effective program (Knowles, 1984, as cited in Kapur, 2015).

Malcolm Knowles theorized the adult learning model consisted of six key assumptions or characteristics: adults’ self-concept, learning experiences, readiness to learn, motivation, need to know, and problem-centered learning (Purwati et al., 2022). According to (Gonzáles et al., 2022), in the early 1970s, Knowles prophesied that instruction would be given electronically in the 21st century, especially for adults. Likewise, as reported by Merriam, (2008) adult learning theory is a constantly growing and developing field. The learner's context, which relates to their particular circumstances, is now given more weight. This strategy links a person's learning process and environment, resulting in a deeper comprehension of learning. Adult educators have always pushed for blending new knowledge and past experiences.
In the study “Beginnings of the History and Philosophy of Andragogy 1833-2000” by Henske (2009), the author provides a section on “Antecedents of Andragogy from 1998-2000”. Some accounts of andragogy worth noting from various authors in this section as it relates to the conceptualization of this research study follows:

● Green (1998) identified five important factors for successful online learning: teachers guiding learners to discover their own knowledge, learners balancing life responsibilities with learning commitments, connecting life experiences to their knowledge base, having clear goals, and self-initiated learning over a long period.

● Savicevic's book (1999) explores the impact of andragogy on literacy, the workplace, universities, training, research, humanistic philosophies, and adult education. It includes definitions and explanations of the subject.

● According to Dewar (1999), it is important to consider the principles of andragogy to facilitate adult learning online. Adults are motivated by maintaining self-esteem and experiencing pleasure. Active participation is crucial for integrating new knowledge. Problem-solving and real-life experiences should be central to learning. Supportive environments that recognize different learning styles are key. Tolerance of anxiety, uncertainty, diversity, and inconsistency is essential. Assessing one's skills and identifying limitations is effective for improving learning.

● Osborn (1999) declared that andragogy has the potential to play an important role in distance learning. However, she found that students need to be coached in the principles of the approach, so they understand the teacher's expectations. Most students have been trained to rely on their teachers for leadership. Some need to
be shown how to take responsibility for their own learning and become self-directed.

- Similarly, Ovesni (1999) supported the idea that andragogy is to generate its own knowledge and can offer something to other sciences in scientific cooperation. Andragogy does not belong to any other science, no matter what that other science is called. It is an integral part of a family of sciences studying education and is neither superior nor subordinate to any other science. Andragogy thus retains its independence from other sciences.

- Monts (2000) suggested that various research issues regarding andragogy need to be explored, such as the effect of instruction of students in self-directed learning on academic success. Instructors and students need training in andragogical teaching and learning to break away from the pedagogical mentality and gain greater effectiveness in utilizing the andragogical model.

Ferreira and MacLean (2018) suggest recognizing an adult learner's previous experience is the most significant motivation for integrating adult learning theory. Even before adult education was a well-known area of study, Lindeman (a Dewey follower and pioneer of adult education) believed that adult experience was a valuable teaching resource. This belief laid the groundwork for integrating prior experience as a crucial assumption in andragogy today.

**Assumptions of Andragogy**

“Depending on which citation is consulted, various authors present andragogy in different ways. Accordingly, it has often been difficult to ascertain both the number and content of the core assumptions of andragogy. This difficulty stems from the fact that the
number of andrological principles has grown from four to six over the years as Knowles refined his thinking” (Knowles, 1989 as cited in Holton et. al, 2001, p. 120). The six key assumptions or characteristics that Malcolm Knowles later theorized are adults' self-concept, learning experiences, readiness to learn, motivation, need to know, and problem-centered learning (Purwati et al., 2022).

The andragogy in practice model by Knowles et al. (2015) and depicted in Figure 2.5 shows the six principles (or assumptions) of the current model, as well as the ones cited in Knowles’ previous works (p. 77). According to Knowles et al. (2014, p. 71), andragogy was originally presented with four assumptions, numbers 2–5 (Knowles, 1980b, 1978, 1975). Assumption Number 6, motivation to learn, was added in 1984 (Knowles, 1984a) and assumption Number 1, the need to know, was added in more recent years (Knowles, 1990, 1989b, 1987). Today there are six core assumptions or principles of andragogy (Knowles et al., 1998, as cited in Knowles et al., 2014).

Additionally, in Knowles et al., (2015), figure 2.5 depicts an enhanced conceptual framework showing how to more systematically apply andragogy across the following multiple domains in adult learning practice: (a) goals and purposes for learning, (b) individual and situation differences, and (c) andragogy: core adult learning principles (Knowles et al., 1998 as cited in Knowles, Holton III, & Swanson, 2015).
"Many educators in various settings utilize the assumptions of andragogy in their educational efforts, albeit fully or in part" (Burge, 1988 as cited in Blondy, 2007, p. 116). Educators in online learning are no exception. Demands of the online learning
environment require educators to be prepared to facilitate courses in ways that are very
different from face-to-face classroom settings (Palloff & Pratt, 1999). Many educators
utilize andragogical assumptions to address these unique demands” (Burge, 1988). The
andragogical approach to adult learning remains one of the most popular learning models,
especially for those new to the field. Although there are some limitations, there are still
opportunities for research and practice improvement (Knowles et al., 2015).

According to Ferreira & MacLean (2018), “If educational technology is to live up
to the promise of enhancing online learning outcomes, a different paradigm for
instructional design and delivery of content is needed.” (p. 11). The study thoroughly
analyzed how to effectively implement adult learning principles into online courses using
Knowles' Andragogical Model's six assumptions. It carefully examined practical
applications, guidelines, and techniques to structure, deliver, and mentor online courses.
Additionally, the study provided an in-depth evaluation of each principle's relative merits
and valuable insights on applying them in an online learning environment (Ferreira &
MacLean, 2018).

**Research in Technology Integration**

This section below includes findings on barriers and supports, digital competency,
the effects of remote learning due to COVID-19 and a discussion of benefits and
challenges instructors face while incorporating technology into diverse educational
settings.

**K-12 - Barriers and Supports**

Throughout its history, technology integration in K-12 schools has faced
challenges (Saubern et al., 2019). In addition to lack of quality professional development
and low technology self-efficacy among instructors, schools can find it costly to keep up with the latest educational technological advancements (Watson, 2006). A survey of public schools, from the 2019-20 school year, conducted by the Institute of Educational Sciences reported that “45% of schools reported having a computer for each student [while] 39% of the student-use computers stayed in a specific classroom” (Gray & Lewis, 2021, p. 3). Many schools, despite resources, are charged with keeping a reliable computing device in the hands of each student as well as providing reliable internet connections (Gray & Lewis, 2021, p. 3). School staff must simultaneously keep up with the latest learning management systems among other platforms to increase and maintain technology integration (Wang et al., 2004).

First-order barriers, extrinsic “obstacles to technology integration that are external to a teacher’s control” (Tawfik et al., 2021, p. 926) such as outdated or inadequate technological infrastructure in schools, including limited bandwidth, outdated devices, and insufficient technical support, can impede technology integration efforts. This exists often due to limited funding where budget constraints can limit the ability of schools to invest in up-to-date technology, software licenses, and ongoing professional development for teachers (Carver, 2016). These barriers, although not originated by the instructor, could subsequently lead to a lack of instructor technology self-efficacy (Inan & Lowther, 2010).

Teachers may also lack sufficient training and professional development in using technology effectively in the classroom and without proper support, they may struggle to integrate technology in meaningful ways (Holden & Rada, 2011). Teachers who do not
receive timely and useful assistance during their technology integration efforts are more likely to not attempt integration for future lessons (Carver, 2016).

Additionally, the focus on high stakes standardized testing may limit opportunities for innovative teaching methods, including technology integration, as time spent on preparation for state tests often detracts from instructor technology integration efforts (Inan & Lowther, 2010). Technology integration should align with clear learning objectives, but without well-defined goals, technology use may become a superficial add-on rather than a meaningful enhancement to learning (Wang et al., 2004).

Finding high-quality, relevant digital content and educational software that aligns with the curriculum can be challenging, limiting the variety of technology tools available to teachers (Barton & Dexter, 2020). Schools have varying needs which makes choosing an educational platform for an entire school or an entire department challenging. Subsequently, rapid technological advancements can lead to the obsolescence of devices and software, making it challenging for schools to keep up with the latest tools (Liu et al., 2017). The constant switch to new educational platforms can cause learning fatigue and a reluctance to participate or complete training on yet another educational software platform (Wang et al., 2004).

**Adult Education - Barriers and Supports**

According to Hesse et al. (2020), administrators can promote advanced online resources and the newest connectivity technology, but barriers to digital education still need to be removed. It is important to consider time for implementation, teacher competence, and the selection of resources.
According to the study by Rose et al., (2019), instructors and programs in adult education and literacy (AEL) classrooms face challenges with limited technology tools and financial support for professional development. The researchers conducted a mixed-method study to examine the technology proficiency of AEL instructors by interviewing programs receiving AEL funding from the Texas Workforce Commission. WIOA, the Workforce Innovation & Opportunity Act mandates that AEL services include digital literacy (U.S. Department of Education, 2015, p.1 as cited in Rose et al., 2019). Inverso et al. (2017, as cited in Rose et al., 2019), also pointed out that teaching digital skills can stimulate higher-order learning, allowing students to combine learning with technology. In spite of the mandates and benefits to incorporating digital literacy into the curriculum, the research notes that limited internet access, limited funding, limited scheduling time, and resistance are barriers to effective technology integration in the AEL classroom.

Additionally, adult basic education (ABE) faces challenges accessing the latest technology due to severe underfunding, leading to a need for appropriate curricula and professional development. Constraints imposed by state and federal policies exacerbate the issue (Rosen & Vanek, 2017). Integrating technology into ABE also faces a major hurdle: the need for clear federal and state policy support and funding. Despite the Workforce Innovation Opportunity Act (WIOA), federal funding for ABE has remained stagnant, and most states have not increased their funding either (Rosen, 2016). Certain states and programs may view WIOA as prioritizing integrated education and training and postsecondary education preparation. As a result, resources may be diverted from individuals with the most fundamental literacy and English language learning needs towards those getting ready for college and career. This reality could further widen the
gap for those with the lowest skill levels in these areas (Jacobson, 2016; Pickard, 2016; Vanek, 2016, as cited in Rosen, 2016).

Focusing solely on college and career-based lifelong learning could harm the importance of lifewide learning. This type of learning encompasses knowledge and skills that benefit individuals and families (Rosen, 2016). According to Reischmann (2014), lifewide learning refers to adults' ongoing personal growth and development through intentional and unintentional learning experiences in their daily lives. This learning process significantly impacts shaping and transforming an individual's personality.

Considering the profound influence of lifewide learning on personal development, it is crucial to acknowledge the role of technology in facilitating this process. As highlighted by Çakıroğlu (2013), the integration of technology faces challenges not only at the institutional level but also among individual educators. Building upon this, Kopcha's research (as cited in Basarmak & Hamutoglu, 2020) sheds light on the specific barriers encountered by adult education teachers, encompassing aspects such as vision, access, beliefs, professional development, and time.

Barriers to incorporating technology can be classified into two categories: those faced by schools and those encountered by individual teachers (Çakıroğlu, 2013, as cited in Basarmak & Hamutoglu, 2020). Kopcha's study (as cited in Basarmak & Hamutoglu, 2020), found that adult education teachers face barriers with technology, citing vision, access, beliefs, professional development, and time as determining factors. Barriers related to vision, belief, and access were most commonly expressed. The study includes the following opinions from researchers relating to barriers and technology:
• Schoepp (2005) identified the significant challenges in integrating technology in education as related to the effective incorporation by teachers while dealing with pre-existing deficiencies.

• According to Ertmer (2012), the obstacles to progress are based on the convictions held by teachers.

• Franklin et al. (2001) pointed out some issues teachers commonly encounter when integrating technology into their teaching, including limited access, time constraints, inadequate evaluation, insufficient professional development, and a lack of clear implementation plans.

• According to Ertmer et al. (2012), integrating technology in the classroom may face potential obstacles due to teachers’ existing knowledge, skills, attitudes, and beliefs.

• According to Muhametjanova (2014), the main issues that need to be addressed are the absence of ongoing training, necessary equipment, technical assistance, sufficient time, and teaching resources.

• Pierson (2001) highlights the crucial importance of teachers possessing both technological and content knowledge for successful technology integration. Teachers require continuous support and training through professional development, coaching, and technical assistance to effectively integrate technology in their classrooms, whether in blended or fully online learning models. This claim is supported by research from Buabeng-Andoh (2012) and Desimone & Garet (2015), as cited in Rosen & Vanek (2017).
Access to technology, technical support, and paid time for professional development is necessary for learning and using new skills and knowledge to integrate technology into education successfully. To effectively handle instructional and programmatic difficulties, teachers and administrators must also develop their skills in evaluating and using technology and software (Rosen & Vanek, 2017).

Examples of successful implementation came from Arizona and Texas, which have incorporated online learning into adult education programs with the help of resources from the IDEAL Consortium, a World Education, Inc. EdTech Center project that offers professional development for teachers and administrators (Rosen & Vanek, 2017).

In their article, Inverso et al. (2017) discuss the impact of technology on adult education and how educators are facing the challenge of adapting to these changes. They share various perspectives on how technology is affecting their work and the lives of their learners. Like many others, educators rely increasingly on technology but struggle with incorporating it into the lives of adult learners. Over the past two decades, there have been significant changes in the technology used in adult education. However, the need for more affordable internet and a scarcity of online educational products geared toward adult learners still pose significant barriers. Despite any challenges, there is a positive outlook on the future of adult education and technology.

**Higher Education - Barriers and Supports**

Work done by Ertmer (1999) and Ertmer et al. (2010, 2012) provides an intuitive categorization of barriers experienced by teachers at all levels, and in virtually every learning institution when integrating technology. The institutional barriers, or “first-order
barriers,” are extrinsic to the teacher and include lack of access to resources, training, and/or administrative support (Ertmer, 1999). The personal, or “second-order barriers,” are intrinsic to the instructor and include their technology self-efficacy, beliefs about technology and instruction, and their level of willingness to change (Ertmer, 1999). Both categories of barriers are ironically still very relevant for teachers looking to integrate technology into their instruction even after decades of funding, innovation, and permeation of technology into almost every aspect of society (Barton et al., 2019; Basarmak & Hamutoglu, 2020; Basarmak et al., 2020; Vongkulluksn et al., 2018).

This study looks beyond the devices and access inherent in external “first-order barriers,” for factors that overcome the internal “second-order barriers” to successful technology integration. Because second-order barriers are the attitudes, beliefs, and practices that are intrinsic to the instructor, they are also naturally influenced by social constructs, cultural landscapes, and pre-existing teaching practices (Ertmer, 1999; Vongkulluksn, Xie, & Bowman, 2018). Studies show that the more technology-rich an instructor’s methods became, the more their existing instruction needed to evolve, including their personal beliefs towards technology, structure of lessons, and their teaching methods (Ertmer 1999; Ertmer & Ottenbreit-Leftwich, 2010; Parisot, 1995; Van Broekhuizen, 2016; Vongkulluksn et al., 2018). Using more technology requires more complex structures in instruction, which makes reaching deeper, more authentic levels of integration even more challenging and time consuming for diffusion of innovation.

The belief system of the instructor can also be a barrier to technology integration. Instructors with more positive, facilitative-value beliefs about integrating technology can better overcome other external barriers by maximizing their resources when integrating
technology into their instruction (Barton et al., 2019; Durff & Carter, 2019; Ertmer, 1999, Vongkulluksn et al., 2018). Changing the beliefs and attitudes of instructors toward technology integration is also necessary. Miller et al. (2003), found that instructors’ mindset about technology consists of three components, all indicative of Ertmer’s second-order barriers (1999):

- pedagogical beliefs,
- technology self-efficacy, and
- value placed on technology for learning.

More recent studies further this by suggesting that professional development may be most effective when targeting the transformation of these components in the instructors’ belief systems and enhancing technology-related skills (Barton et al., 2019; Durff & Carter, 2019; Barton & Dexter, 2020; Ogodo, 2021; Vongkulluksn et al., 2018). Institutions provide professional development, workshops, and training to help teachers effectively use technology in their instruction. However, research shows technology related professional development often focuses only on technology or the specific tool, leaving out integration related to pedagogy and content (Dysart & Weckerle, 2015; Schlager & Fusco, 2003). Professional development is also often not timely or structured to effectively support higher education instructors as adult learners (Dysart & Weckerle, 2015; Lidolf & Pasco, 2020). Simply having devices, technical skills, and isolated professional development to use them is not enough to integrate technology effectively into instruction (Ertmer, 1999; Stanhope & Rectanus, 2016; Van Broekhuizen, 2016).
**K-12 - Digital Competency**

Digital competency, also known as digital literacy or digital skills, refers to the knowledge, skills, and abilities required to effectively use technology and navigate the digital world and is essential for K-12 instructors to effectively integrate technology into their teaching (Falloon, 2020). When an instructor is digitally competent, they can leverage various digital tools and resources to enhance teaching methods, engage students, and create more interactive and dynamic learning experiences. The effective integration of instructional technology empowers the instructor to adapt to technological changes, personalize learning, facilitate blended learning, and seek out innovative teaching approaches (Mannila et al., 2018).

Digital competency is crucial for technology integration as instructors need to be proficient in using various technology tools, such as learning management systems, interactive whiteboards, educational software, and productivity applications. Understanding how to navigate these tools enables teachers to create engaging and interactive learning experiences (Calvani et al., 2010). Moreover, digital competence allows teachers to create and curate digital content, such as online quizzes, multimedia presentations, educational videos, and interactive simulations. These resources can enhance the learning experience and cater to diverse learning styles (Falloon, 2020). Instructors can personalize and differentiate instruction using adaptive learning platforms and data-driven analytics, which require digital competency to effectively analyze student performance data and tailor instruction accordingly (Gomez et al., 2021).

The shift to virtual learning due to COVID-19 shed light on the importance for instructors to possess digital competency as technology played a crucial role in
facilitating online communication with students, parents, and colleagues through various
digital channels, including email, discussion forums, video conferencing, and
collaboration platforms (Moorhouse, 2020). A high level of digital competency is
particularly important for teachers who implement blended learning models, which
combine both in-person and online instruction, in order to utilize technology needed to
teach in-person and virtual students simultaneously (Mannila et al., 2018).

Digital competency equips instructors with the coping skills needed to handle
technical issues that may arise during technology integration, troubleshoot common
problems, and seek technical support when needed (Wang et al., 2004). K-12 instructors
(as well as instructors of adult and higher education) who possess a high level of digital
competency can also serve as role models for their students by modeling responsible and
effective technology use, encouraging students to develop their own digital literacy skills
(Zhu et al., 2010). While it is essential for instructors to have a baseline level of digital
competency, ongoing professional development, peer collaboration, and learning
opportunities can support continuous growth and improvement in this area (Mannila et
al., 2018). Schools and districts play a vital role in providing the necessary resources and
support to help K-12 instructors build their digital competency and successfully integrate
technology into their classrooms. “[Schools] should make sure that the same basic
technological abilities are acquired by everybody, thus eliminating the still existing
disparities due to socio-economic and cultural gaps” (Calvani et al., 2010, p. 169).

**Adult Education - Digital Competency**

Educators must continuously incorporate digital proficiency into their teaching
methods, emphasizing the importance of their confidence in keeping up with the rapid
changes in technology (Mannila et al., 2018). According to Lang (1998, as cited in Kotrlik & Redmann, 2005), “Little theoretical groundwork for technology planning in adult basic and literacy education has emerged. Most studies and resources focus on educational technology in K-12 settings. Those which evaluate technology's potential in adult education usually concentrate on the technology itself—the hardware and software—and not on effective integration” (pp 206-207).

According to Kotrlik and Redmann (2005, as cited in King, 2003), adult basic education teachers become learners as they work to integrate technology into teaching and learning because adult educators have received limited training in this area.

The education system is evolving from teacher-centered to learner-centered with the help of technological integration. Studies have shown the effectiveness of various technological platforms and the preparedness of teachers to adopt new technologies in the classroom. However, more research is needed to understand the attitudes, beliefs, and confidence of teachers who switch from traditional to technologically integrated learning environments. Teachers must acquire the necessary skills and experience to implement pedagogical strategies for technology integration. Constant research and integration of digital competence into instruction are necessary due to the rapid development of technology, making self-efficacy essential for teachers to keep up with the growth (Somera, 2018, as cited in Hartman et al., 2019).

It is common for some teachers to have a hard time embracing change due to their fixed perspective. Even if they try to incorporate new technology tools, they may give up easily if they face any difficulties. Additionally, fear of failure may hinder them from trying new things, as they need support to learn how to use such tools effectively (Dress,
2016, as cited in Hartman et al., 2019). Another source of anxiety can be attributed to teachers transitioning from teacher-centered to student-centered instruction. This can be seen as relinquishing control by the teacher. Educators who are accustomed to traditional methods may require additional assistance when adopting a student-centered approach (Hartman et al., 2019).

As reported by Howard (2013), the concept of “resistance to change” is often applied to teachers who do not integrate technology into their classrooms. According to Porter & Foster (1998, as cited in Rogers, 2000), instructional practices will significantly improve once teachers become comfortable with technology literacy and can evaluate materials. However, according to Keengwe et al. (2008), it is crucial to understand that integrating technology is a multifaceted process that requires comprehending the teachers’ motivations, perceptions, and beliefs regarding technology and learning.

Continuing with this line of thinking, a study performed by Rose et al. (2019) utilized the Will Skill Tool (WST) model for technology integration as a theoretical basis. The objective was to clarify how a teacher’s attitude towards computers (will), their level of technological proficiency (skill), and their access to technology (tools) can positively impact the integration of technology in the classroom and improve student achievement.

According to Hsioung (2002, as cited in Paraskeva et al., 2008), a study conducted by Slough and Chamblee reports that teachers are more likely to incorporate technology in classroom education if they have had positive experiences using it as a tool for instruction. Further, as mentioned in the Software and Information Industry Association report cited by Paraskeva et al. (2008), teachers are more effective after receiving extensive training to integrate technology into the school curriculum. The
report also highlighted that teachers who use communication technologies such as e-mail, newsgroups, and mailing lists to exchange educational ideas demonstrated more significant progress in self-efficacy and confidence than those without access to these tools. This report summarizes research on educational technology spanning the last 20 years.

According to a study by Ginsbury in 1998, incorporating commercial software into classroom instruction requires teachers to adjust their activities to align with the technology-based activities. This adjustment can ensure that technology enhances classroom work. Since the software lacks flexibility, it is up to the teachers to provide flexibility within the system. However, if teachers are unable or unwilling to be creative in this regard, learners may end up on two separate learning paths that need to be integrated and clarified.

LINCS A (n.d.) conducted research that offers a detailed summary of the essential competencies required by adult educators, emphasizing the significance of possessing these skills for effective teaching and better learning outcomes. Four main domains organize the competencies, each with 17 individual and observable competencies. Each competency includes a series of indicators that describe how it is performed in an adult education setting.

These competencies are also instrumental in designing professional development programs. The Competencies were created through a thorough process, which included reviewing the literature on effective teaching and consulting with subject matter experts. They were then tested in adult education programs and validated by various stakeholders.
from all over the country. Nearly 2,000 stakeholders provided feedback through workshops, focus groups, online discussions, and other outreach efforts (LINCS A, n.d.).

**Higher Education - Digital Competency**

Technology integration in teacher education is not a new topic in higher education. In 1995, the Office of Technology Assessment published the report, *Teachers and technology: Making the connection*, examined technology use in schools, including barriers teachers experienced in relation to teaching with technology and their preparedness to use technology in their current practices. This report recognized two important things, first that technology use in the classroom transforms the way teachers teach and second, it is important for students to use technology. The report also demonstrated that integrating technology into curriculum was challenging, much of which was attributed to the lack of training to prepare teachers to use technology effectively. This report concluded three especially relative points with regard to teacher training and preparation to integrate technology:

1) While technology is not a panacea for all educational ills, today’s technologies are essential tools of the teaching trade. To use these tools well, teachers need visions of the technologies’ potential, opportunities to apply them, training and just-in-time support, and time to experiment. (p.1)

2) Helping teachers use technology effectively may be the most important step to assure that current and future investments in technology are realized. (p.2)

3) A majority of teachers report feeling inadequately trained to use technology resources, particularly computer-based technologies. (p.2)
One of the most cited challenges of teachers entering the field is that they did not have enough opportunities to learn, practice, and eventually integrate technology during their teacher education programs (Dysart & Weckerle, 2015; Lidolf & Pasco, 2020; Ottenbreit-Leftwich et al., 2012; U.S. Department of Education, 2006; Wang et al., 2004). After the publication of the *Teachers and technology: Making the connection* (1995) report, many teacher education programs in colleges and universities began studying more effective means for technology integration education for future teachers (Ottenbreit-Leftwich et al., 2012; Truesdale & Birch, 2013). Another report, published by the National Council for Accreditation of Teacher Education (1997) echoed similar findings and offered recommendations that are still relevant but sometimes elusive in higher education. Suggestions included release time for instructors to experiment and collaborate with other sectors of education, incentives and recognition for staff willing to take risks and develop new technology-rich course material, and providing a strong infrastructure for technology, as well as an infrastructure for learning, experimentation, and sharing among instructors (National Council for Accreditation of Teacher Education, 1997). Grants from government entities, corporations, and private donors were also becoming more available. In 1999, the U.S. Department of Education launched a $75 million grant program, *Preparing Tomorrow's Teachers to Use Technology Program* (PT3), to “address a growing challenge in modern education: nearly all elementary and secondary schools are now ‘wired’ to the Internet, but most teachers still feel uncomfortable using technology in their teaching” (U.S. Department of Education, 2006, para. 1).
Teacher education programs have all but moved away from the limited, usually one-and-done course in technology integration to infusing it into all the courses and practicum experiences of preservice teachers (Basarmak et al., 2020; Cantu, 2000; Farjon et al., 2019, Ottenbreit-Leftwich et al., 2012). As teacher education programs began to change how they approached technology integration in their coursework, some also worked to align with K-12 education programs and collaborate with teachers already in the field. Wright & Wilson (2007) detailed the Master Technology Teacher (MTT) initiative at the University of Alabama that involved university faculty, in-service teachers, and preservice teachers. Results of this five-year initiative indicated that the preservice teachers were able to practice using instructional technology in authentic classroom settings while collaborating with experienced teachers (Wright & Wilson, 2007).

**Technological, Pedagogical, and Content Knowledge (TPACK).** With improvements in teacher education programs in the early 2000s, tools were developed to visualize and assess the integration of technology, as well as the technological competency of teachers. Though introduced in 2006, TPACK is rooted in Shulman’s (1987) conception of pedagogy and content knowledge (PCK). Koehler and Mishra (2009) added technology (T) to Shulman’s PCK as a framework for conceptualizing teacher knowledge needed for appropriately integrating technology into their instruction. This new component blends naturally with pedagogy and content knowledge for a conceptual model that effectively demonstrates the integration of technology into instructional practices. T-PACK also describes how having centralized support structures can be used to apply theory and research-based strategies to create more extensive, on-
going professional development for instructors. According to Brantley-Dias and Ertmer (2013), the TPACK framework is an intuitive structure for exploring the teacher domains of knowledge necessary for effective technology integration. Various methods have been developed to measure TPACK, such as teacher-rated Likert scales, surveys and questionnaires, interviews, observations of teaching practices, etc. Those used most frequently utilize self-reporting to document the degree to which participants agree to statements provided because they are simple to administer and provide a cost-effective way to collect quantitative data (Koehler et al., 2012).

Figure 2.6 provides an excellent visual representation of the moving parts involved in TPACK, along with the three domains of knowledge and how they can intersect. TPACK is a framework that conceptualizes the complex intersection of three domains of knowledge: technology, pedagogy, and content (Koehler & Mishra, 2009), the intersection of these three domains being the ultimate goal for teachers when integrating technology. Where these domains of knowledge intersect, exists a deliberate understanding of teaching content with appropriate pedagogical methods and technologies for the most effective teaching and development of 21st-century skills in today’s students.
Note. The components of the TPACK framework (core graphic from http://tpack.org).
Reproduced by permission of the publisher, © 2012 by tpack.org (see Appendix E).

Technology Integration Matrix (TIM). The Technology Integration Matrix (See Figure 2.7) was developed by the Florida Center for Instructional Technology at the University of South Florida, College of Education and first published in 2005. It was being developed during the same time period as TPACK. TIM and TPACK, both brought to light that training teachers to use technology in the classroom could not be done away from the classroom and in isolation from the content and pedagogical structures that were already in place (Harris & Yearta, 2020).

When developing TIM, the developers recognized that the greatest area of need for technology integration in the classroom was at the intersection of TPACK’s “Technological Pedagogical Knowledge” (Harmes et al., 2016, Koehler, 2013). The TIM
model is based on defining deeper levels of technology integration and how the most
effective pedagogical principles apply to instructional technology, while providing
common language for describing and evaluating technology integration in the classroom
(Kozdras & Welsh, 2018). For the purposes of this study, the levels of technology
integration along the top row of the matrix are of especial interest because these levels
also relate to the levels of adopters provided by Rogers (2003) in the diffusion of
innovation theory. Together, the top row and left column of the matrix describe the
activities and characteristics that are displayed in the descriptors for each level of
integration/adoPTION. The common language, characteristics of the learning environment,
and levels of technology integration can all be seen in Figure 2.7.
Figure 2.7

Technology Integration Matrix

The Technology Integration Matrix (TIM) provides a framework for describing and targeting the use of technology to enhance learning. The TIM incorporates five interdependent characteristics of meaningful learning environments: active, collaborative, authentic, and goal-directed. These characteristics are associated with five levels of technology integration: entry, adoption, adaptation, infusion, and transformation. Together, the five characteristics of meaningful learning environments and five levels of technology integration create a matrix of 25 cells, as illustrated below.

Note. Used with permission by The Florida Center for Instructional Technology, fcit.usf.edu, as it appears on their website (fcit.usf.edu/matrix/) (see Appendix F).
Like K-12 teachers and the preservice teachers that are preparing for the classroom, teacher educators at colleges and universities must also understand the constructs of TPACK to create lessons that use technology to build creativity and critical thinking skills to reach more integrated levels on the TIM. All instructors, at every level of education, need exposure to and experience with different technologies in order to fulfill responsibilities (Betrus, 2012; Brush et al., 2001; Truesdale & Birch, 2013).

Instructional technology changes rapidly, so it is challenging just being aware of applications and devices that exist, understanding how they can be used, and knowing how to use them effectively. Creating and maintaining partnerships among colleagues, education sectors, and education programs can help attain the goals of preservice teachers, as well as active teachers, for effective technology integration (Basarmak et al., 2020; Betrus, 2012; Brush et al., 2001; Ottenbreit-Leftwich et al., 2012; Truesdale & Birch, 2013).

**Effect of Remote Learning Due to COVID-19 on Instructional Technology**

Modifying the delivery of education due to events like natural disasters, regional unrest, etc. is not a new strategy (Ayebi-Arthur, 2017; Johnson et al., 2020; Swartz et al., 2018). However, before COVID-19, this was contained to specific communities and regions. The migration to online/distance education that happened in a matter of days worldwide due to COVID-19 was unprecedented and emphasized the need to prepare teachers to use technology effectively (Johnson et al., 2020; Ogodo et al., 2021; Vargo et al., 2021). Building 21st-century skills is difficult when pedagogy does not include or meet the necessary level of engagement with technology. As a result, it creates an environment where effective technology integration into school curriculum and
instruction is not consistent. Because of this, it is necessary to identify the effects remote learning had on all three sectors of education and capitalize on understanding what worked and why. According to Cacicio et al. (2022), “Supporting teachers in shifting mindsets through high quality professional learning is crucial to shifting effective practices online and promoting student achievement” (p. 59).

**K-12 - Effect of Remote Learning**

The COVID-19 pandemic had a profound effect on instructional technology in K-12 education, particularly with the sudden shift to remote learning. The pandemic forced schools and educators to rapidly adopt and adapt technology to facilitate remote and hybrid learning models (UNESCO, 2022). The impact of the pandemic on K-12 instructors' confidence in using technology varied based on individual instructor experiences and contexts. While some instructors reported feeling more confident with technology due to the increased exposure and necessity during remote learning, others faced challenges and felt overwhelmed by the rapid transition to online instruction. “Teachers were challenged by not having proficient computer knowledge and skills to teach and learn in a remote environment” (Cardullo et al., 2021, p. 39).

Despite the infusion of technology into homes, schools, and the workforce, lack of support and other challenges exist in overwhelming numbers. A report published by National Center for Education Statistics (NCES) provided data collected about support given to teachers in public schools prior to the shift to virtual learning prompted by COVID-19 showed the following:

- 49% of K-12 schools “strongly agreed” that teachers in their school want to use technology for teaching.
● “Strong agreement” was lower (18%) when asked if teachers are sufficiently trained in how to use technology, if they have enough training to use technology for teaching (18%), and if technical support was adequate (34%).

● 14% “strongly agreed” that other classroom priorities limited teaching and learning with technology.

● 65% felt a “moderate to high” challenge is teachers’ lack of time to become familiar with and integrate new technologies.

● 50% feel that there is a steep learning curve for teachers with regard to technology and that it is a “moderate to high challenge to stay current with technology.

● 56% are at least moderately concerned with ensuring technology truly contributes to learning (Digest of Education Statistics, 2020, p. 9).

In a policy statement on digital equity, amended in 2018 by the National Education Association (NEA), the organization declares that the ideal K-12 educational environment “should neither be totally technology free, nor should they be totally online and devoid of educator and peer interaction [and that] an environment that maximizes student learning will use a ‘blended’ and/or ‘hybrid’ model situated somewhere along a continuum between these two extremes” (2021). Instructors were forced to contend with a departure from this ideology with a blended or hybrid technology model being mostly impossible. Many institutions were not equipped to support instructors with increasing instructional technology proficiency in the brief time required (Ogodo et al., 2021).

As effective instructor technology integration was already an existing issue (Miles, 2013), the COVID-19 pandemic accelerated the need for integration of instructional technology in K-12 education, both out of necessity and innovation
(Cardullo et al., 2021, p. 39). While many educators may now feel more confident using technology, the pandemic also highlighted the need for ongoing professional development and support to ensure effective and equitable technology integration in K-12 education (Gray & Lewis, 2021). As the pandemic subsides, the experiences and lessons learned during this period will likely shape the future of instructional technology in K-12 schools.

**Adult Education - Effect of Remote Learning**

Due to the COVID-19 pandemic, there was a pressing need to swiftly enhance the provision and assessment of education across all educational institutions (Baker & Lutz, 2021). The pandemic had a significant impact on almost all areas of life, including adult education programs (Bonney & Finn, 2021). Numerous scholars who research adult education have observed that inequalities have had a significant impact on the ability to access and participate in lifelong learning (Watts, 2020). When programs were forced to deliver services remotely due to COVID-19, it transformed adult education, including literacy and language education, high school equivalency preparation, and workforce development initiatives (Belzer et al., 2022). “Unfortunately, most learners and many adult educators were on the ‘wrong side’ of the digital divide, meaning they lacked digital literacy skills and access to hardware, software, and broadband” (Belzer et al., 2022, p. 83). According to Cacicio et al. (2022), before the pandemic, adult education courses were primarily conducted in physical settings across various learning environments. However, it was noted by several states that instructors in adult education needed convincing that virtual learning environments could be just as effective for the success of all learners (Cacicio et al., 2022).
Adult education faculty members have a distinct viewpoint on the shifts in their roles as both educators and students. Additionally, they have the duty of aiding learners in adapting to their unfamiliar academic setting (Baker & Lutz, 2021). Teachers had to assume virtual teaching, using digital technologies, sometimes for the first time, to facilitate their students’ learning (Pozo et al., 2021). Due to this change, teachers had to enhance their competencies to provide high-quality education by modifying their curriculum and instructional methods accordingly (Akram et al., 2021). Achieving this goal entails more than supplying computers and internet connections or transitioning to online platforms. It also involves creating meaningful content in various languages, fostering literacy and education, and rallying community and institutional backing to accomplish community objectives. Technology is a tool that can be powerful, but it should not be the primary objective (Warschauer, 2003; Warschau & Matuchniak, 2010).

Belzer et al. (2022) researched digital learning in adult education before COVID-19. They noted that pre-pandemic distance learning via digital formats was challenging for many educational programs. It was reported that obstacles were faced due to an acute shortage of funds, insufficiently skilled personnel, and an apparent lack of interest from those seeking knowledge. These challenges were evident in federal data on participation in distance education, where, between 2016 and 2019, the number of learners held at just under four percent. Low implementation of digital learning opportunities was also evidenced in survey responses collected from 773 adult educators, tutors, and program administrators between late May and early June 2020. Further noted in Belzer et al. (2022), most survey respondents, administrators, and adult educators had worked in programs not previously offering distance education. Vanek (2022), as cited in Belzer et
al. (2022), noted that most adult educators, even those who worked in distance education programs, lacked prior experience in teaching through distance education and had yet to receive any training.

In contrast, Bonney and Finn (2021) found that before the COVID-19 outbreak, the Coalition on Adult Basic Education (COABE) actively developed strategies and partnerships to enhance adult education providers’ digital skills and competencies. As a result, COABE was well-positioned to support adult education during the pandemic.

Higher Education - Effect of Remote Learning

April of 2020 brought the disruption of more than one billion higher education students around the world when colleges and universities in 185 countries were shuttered due to the COVID-19 pandemic (Marinoni et al., 2020). Research shows that educational technology, when used effectively, improves student engagement (Breakstone, et al., 2018; EdTech Evidence Exchange B, 2021; Kopcha et al., 2020). Though most of these students that experienced the disruption in their education due to COVID-19 had devices and access, providing devices and Internet access, however, does not equate to the same level and quality of technology use (Ertmer & Ottenbreit-Leftwich, 2010). Effective integration of technology requires planning and sound pedagogy or else an instructor's integration attempts can promote disengagement from learning tasks and impede learning (Ertmer et al., 2012).

If one thing was made clear from the COVID-19 pandemic, it was the fact that teachers at all levels of education need intensive support and practice to integrate technology effectively in an ongoing fashion (Camilleri & Camilleri, 2021; Ogodo et al., 2021; Reich, 2021). Without adequate support through professional development and
coaching, they cannot take advantage of new tools and platforms. These concerns are also evident in even higher numbers in higher education institutions due to a common lack of availability when it comes to cohesive, consistent professional development relevant to technology use and integration (Castellano, 2014; Dysart, & Weckerle, 2015; Fisher, 2005; Lidolf & Pasco, 2020; Truesdell & Birch, 2013). For each individual, the innovation-decision period usually occurs in a specific, sequential order of Rogers’ five-step process: 1) knowledge, 2) persuasion, 3) decision, 4) implementation, and 5) confirmation (2003). This sequential order was disrupted for the vast majority of higher education instructors at the beginning of the COVID-19 pandemic in March of 2020. Stay-at-home orders quickly led to significant changes in how instructors were able to interact with students (Camilleri, 2021; Camilleri & Camilleri, 2021; García-Morales et al., 2021; Johnson et al., 2020; Marinoni et al., 2020). There was no time to adapt, research alternatives, consult peer networks, or even align current practices with best practices for online instruction.

A perfect example of the changes at the onset of the pandemic was the exponential increase of using video conferencing for instruction (Camilleri & Camilleri, 2021). For instance, Zoom Video Communications, Inc. had 10 million participants per day in December 2019, prior to the COVID-19 changes, but by April 2020, it soared to over 300 million (Evans, 2020). Other platforms, such as Google Meet and Microsoft Teams, also showed similar increases in daily video conferencing participants (Peters, 2020; Thorp-Lancaster, 2020; Standaert et al., 2021). There was a steep and fast learning curve for a majority of instructors that had maybe never considered teaching remotely or using video conferencing to reach their students.
Another consideration is the possibility of future disruptions in education. As stated by Reich, “As humans reengineer the geochemistry of the planet to be inhospitable to human civilization, climate scientists predict that there will be more disease outbreaks, more floods, more fires, more unbreathable air, and more extreme weather events (2021, para. 23).” This large-scale disruption indicates that education may need to be prepared for future events. Institutions of higher education can and should continue working toward learning how to teach, learn, and use technology more effectively to prepare for whatever may come (Ayebi-Arthur, 2017; Camilleri & Camilleri, 2021; EdTech Evidence Exchange, 2020; Morris, 2019; Reich, 2021).

Financial Burden of Remote Learning

The COVID-19 pandemic had a significant financial impact on educational institutions, particularly concerning technology adoption and infrastructure (UNESCO, 2022). The abrupt transition to remote learning necessitated immediate and substantial investments in hardware like laptops and tablets, as well as software licenses for learning management systems and video conferencing tools. These costs were exacerbated by the need to upgrade existing IT infrastructure to accommodate increased online activity (Zhou et al., 2021). In addition to increased technology expenses, institutions had to allocate funds for professional development to train faculty in remote instruction methods and to bolster technical support services (Hartshorne et al., 2020).

These financial pressures came at a time when many schools, colleges, and universities were already facing reduced income from tuition and state funding. As Zhou et al. (2021) reported, “many districts have been facing flat or declining revenues since the 2008 Great Recession” (p. 2). While government aid programs like the U.S. CARES
Act (Coronavirus Aid, Relief, and Economic Security) helped narrow the technology gap in many schools, they often did not cover the full range of new and unplanned expenses (UNESCO, 2022). Some institutions sought additional funds through private donations and grants, but these sources were not universally accessible, leading to disparities in educational quality (Hanushek & Woessmann, 2020).

Passed on March 27, 2020, the CARES Act was the U.S. government's way of helping American workers, families, and small businesses impacted by the COVID-19 pandemic as it sought to provide immediate and direct economic relief, through allocation of billions of dollars. The law aimed to quickly get financial help to those who needed it by distributing funds to American workers, families, and small businesses, as well as to preserve jobs for industries affected by the pandemic. It also allocated funds to various sectors, including education, to help them navigate the challenges brought about by the pandemic (U.S. Department of Education, 2020).

Educational institutions who lacked technological infrastructure and resources found the pivot to virtual learning challenging (Cucinotta & Vanelli, 2020). The CARES Act sought to aid schools, colleges, and universities in the navigation to virtual learning by addressing the related challenges such as the costs associated with sudden changes to the delivery of instruction (Zhou et al., 2021). Funds were used for various purposes, including purchasing educational technology like student devices and software licenses, improving internet connectivity and reliability for students and staff, and implementing health and safety measures on campuses (Schmidt & Weissman 2021). For higher education, some of the funds were distributed directly to students in the form of emergency financial aid grants (Higher Education Emergency Relief Fund, or HEERF) to
help cover expenses associated with incidents such as job loss and additional educational expenses incurred as a result of the pandemic (U.S. Department of Education, 2020). Although the CARES Act offered a lifeline that enabled educational institutions to adapt more readily to the unprecedented challenges posed by the COVID-19 crisis, the pandemic caused a shift in educational technology, with a financial toll that many institutions are still grappling with (Zhou et al., 2021).

Summary

Integration of technology in education was on the rise for decades before the COVID-19 pandemic, but the diffusion of technology in education has varied among educational institutions and educators. However, the pandemic acted as a trigger for a fast and widespread adoption of digital tools and remote learning, thus accelerating the need for technology integration in education (Thomas, 2016). While the literature indicates various barriers and supports instructors experience when integrating technology, it is not yet known to what extent virtual learning, which occurred as a result of school closures due to COVID-19, has had on instructor perceptions of technology integration, the competency levels and self-efficacy of instructors integrating technology, or how institutions have evolved to support the technology self-efficacy of instructors.

Chapter 3 will discuss the research design, methods, and procedures that will be employed in this study, providing a detailed explanation of how the data will be collected and analyzed to explore the factors K-12, adult education, and higher education instructors face while implementing technology into their instruction since virtual learning due to COVID-19.
Chapter 3: Methodology

This chapter outlines the key components of the methodology of this study, including the research design, development of the survey instrument, participant selection, data collection procedures, and data analysis techniques used. The main objective of this research was to contribute information that encouraged the development of evidence-based strategies and recommendations for supporting teachers in effectively integrating technology into their instructional practices across K-12, adult education, and higher education settings.

The methodology employed in this quantitative research study utilized an online survey as the primary data collection tool. The chosen methodology aligned seamlessly with the research objectives, which allowed for the systematic exploration of the perceptions of instructors at three levels of education, K-12, adult education, and higher education. By using a quantitative approach with an online survey, this study gathered objective and statistically analyzable data pertaining to technology integration barriers and supports experienced by teachers in the Midwestern United States prior to and in the wake of virtual learning due to COVID-19. Quantitative methods provided a structured and systematic means to explore the relationships, patterns, and trends within the reported teacher perceptions, allowing for statistical analyses and objective interpretations of the findings.

Leveraging the power of online surveys offered several advantages, including wider reach, ease of data collection, and quicker responses, which were crucial in obtaining a sizable and diverse group of participants (Wright, 2006). The online survey platform also served as an efficient and accessible means to gather responses from a
diverse and geographically dispersed population, further enhancing the study's credibility. These methodologies ensured the validity, reliability, and generalizability of the study's outcomes, thus contributing to the broader understanding of factors affecting technology integration for teachers at K-12, adult education, and higher education institutions since virtual learning due to COVID-19.

In summary, this chapter delineates the methodological framework used in this quantitative research. The meticulous approach taken in designing the survey and conducting the analysis contributed to the overall thoroughness and reliability of the study's findings, thereby providing valuable insights into the perceptions and technology integration barriers and supports experienced by Midwestern United States instructors at three distinct levels of education in an effort to inform future research endeavors.

**Purpose of Study**

The purpose of this study was to explore teachers' perceptions of the various factors affecting technology integration into their instruction since virtual learning due to COVID-19. The selected aspects for this study were the technology integration barriers experienced and supports provided to teachers in the Midwestern United States prior to and in the wake of virtual learning due to COVID-19. The researchers examined the perceptions of teachers from three education sectors, K-12, adult education, and higher education, and the various factors affecting their technology integration following virtual learning due to the pandemic.

While there are numerous studies that investigate the perceptions of teachers, this study was unique in that it looked at the perceptions of teachers regarding technology integration from three independent sectors of education, in addition to exploring the post
COVID-19 educational environment those teachers have experienced. Additionally, it explores whether the virtual learning experience during the COVID-19 pandemic has impacted instructors' self-perceptions of their digital competence. Furthermore, this study seeks to understand instructors' perceptions regarding how institutions can enhance their self-efficacy in technology integration. The researchers also identified factors and supports that teachers and institutions can utilize to potentially reduce the effects of intrinsic-natured, second-order barriers that are reported by teachers.

**Research Questions**

The key questions guiding this inquiry into the technology integration practices of teachers in K-12, adult education, and higher education were:

1. What factors do instructors currently perceive as having an effect on their level of technology integration?
2. Has the experience of virtual learning, due to COVID-19, altered instructors' self-perceptions of their digital competence?
3. What are instructors' perceptions of how institutions can help improve their technology integration self-efficacy?

Results of this study provide key insights into factors that affect technology integration in classrooms, how virtual learning due to COVID-19 may have altered teacher perceptions, and the teachers’ perceptions of how institutions can improve the technology integration self-efficacy of teachers.

**Human Subject Protections**

This study employed ethical principles, guidelines, and procedures throughout the research process to ensure the protection of human subjects. The commitment to
safeguarding the participants' rights, dignity, and confidentiality was of paramount concern. The plan for this study was reviewed and granted approval by the UMSL Institutional Review Board (IRB) on May 24, 2023 (see Appendix G). After a brief initial deployment to a pilot group, the original IRB-approved survey was amended (see Appendix H), resulting in the final version of the survey that was deployed at the beginning of the 2023-2024 school year for data collection (see Appendix A). IRB approval for the amended survey was received on August 22, 2023 (see Appendix I).

Before participating in the survey, participants were provided a letter of informed consent that included information about the purpose of the study, the research's scope, the time required to participate, as well as what would be done with the information they submitted (see Appendix J). They were informed that their participation was voluntary and that they could withdraw their consent anytime. No identifying information was collected by the survey or included in the study. Additionally, researchers provided their contact information at the submission of the survey in case participants had questions or concerns about the survey or their participation in the study (see Appendix K). By ensuring compliance with these ethical principles and practices, researchers were able to contribute valuable knowledge to the scholarly community while respecting the rights and well-being of those who graciously participated in this study.

**Design for the Study**

A unique aspect of this study was that there were three researchers, each investigating a separate sector of education. Collecting data from K-12, higher education, and adult/continuing education allowed for an opportunity to investigate each sector, but also allowed a comparative look at the same data across sectors. To achieve this, an
online survey was crafted by researchers using Google Forms and deployed to teachers and instructors in the respective sectors. A small pilot group, made up of colleagues of the researchers, was surveyed using the initial IRB-approved survey in May 2023 to test the survey and solicit feedback from participants (see Appendix H). The pilot group consisted of 77 participants (40 K-12, 23 adult education, and 14 higher education participants). In addition to responding to the survey, several participants provided specific feedback about the survey and their experience taking it. Using this feedback, edits were made to the survey. Several questions were updated for clarity, choices were removed to balance the selection options, and some questions were removed entirely because of redundancy or lack of relevance to the research questions. Changes and edits to the survey are discussed in the “Instrumentation” section below. These changes resulted in the final version of the survey that was deployed to collect the research data (see Appendix A). IRB approval was granted for the new version of the survey on August 22, 2023 (see Appendix I).

The final version of the survey was widely distributed through social media groups relative to the desired population (see Appendix L), as well as email solicitations to personal contacts and leadership at relative institutions (see Appendix M). The survey was opened to participants on August 25, 2023, and data was collected until September 15, 2023.

**Population and Sample**

The respondents to the survey had to be employed in at least one of three sectors of education: K-12, higher education, and/or adult/continuing education. They had to be employed in an education institution over the last 4 years in the Midwestern United States.
to ensure that they would have a pre/post COVID point of view and were likely exposed to similar restrictions and protocols due to COVID-19. For the purposes of this study, the Midwestern United States included the states specified in the United States Census: Illinois, Indiana, Michigan, Ohio, Wisconsin, Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, and South Dakota (United States Census Bureau, 2021). To confirm participants were employed in the Midwest region of the United States, participants selected their state from a list provided in the survey to indicate their geographic location.

Though the survey was open to all those states, most respondents came from Missouri, and more specifically, the St. Louis region, as that is where the researchers are located and professionally involved. It is also important to note that the teachers who were the subjects of this research study were likely to have dual roles as teachers, faculty, and administrators in K-12, adult education, and higher education institutions. In addition to being an instructor, they may also have worked to create and plan for technology integration, provide and receive technology-based professional development training, as well as working as instructional designers.

**Instrumentation**

A survey was created using Google Forms, a platform familiar to both the researchers and most educators surveyed. Using an online survey provided several advantages (Wright, 2006). It saved time and increased productivity since the responses to the survey were automatically collected on a Google Sheet and data could be easily transferred to Excel and SAS software for more detailed statistical analysis. An online survey made it possible to collect feedback from a wide range of participants, allowing
for a more comprehensive and varied understanding of their opinions. In addition, using online surveys was an affordable way to depict the characteristics of participants. It also enabled participants to answer questions conveniently without being limited by location or schedule.

Having established the benefits of utilizing Google Forms for our survey, it is important to acknowledge that while surveys are a widely employed and efficient research method in social sciences, they are not without their potential limitations, and can be affected by systematic biases that may render some of the conclusions derived from the surveys invalid (Gürbüz, 2017). According to Pelz (n.d.), some systematic biases may occur in survey research. One of these is non-response bias, which can arise when the targeted respondents have a low response rate. If a large number of respondents do not participate in the survey, it raises concerns about whether they are not responding for a systematic reason. This outcome could affect the validity of the study's results. Another type of bias is recall bias, when subjects have difficulty accurately remembering and reporting past events. The issue can be especially challenging for distant memories where motivations and behaviors may have evolved or become unclear. For example, asking about computer use from a year ago may lead to inaccurate responses due to recall difficulties.

The survey included multiple-choice and Likert-scale questions where participants could select a rating for their choices (see Appendix A). Participants were asked to provide demographic information, rate the significance of factors that influenced their decisions regarding technology integration, and to provide information about factors that affected the integration of technology at their institution. The survey was constructed
using five sections of questions. Each participant responded to only three sections of the
survey.

Section one contains questions relating to age, years of experience, location of
employment, race, gender, and teachers’ basic experience levels with technology
integration. The last question of section one (see question 13 of Appendix A) determined
which section each participant would then be sent to on the form. Using the branching
feature of Google Forms, which allows users to go to specific section of the survey based
on an answer, those that choose “a K-12 school” on question 13 were sent to section two,
those selecting “a college or university” were sent to section three, and those selecting
“an adult or continuing education institution” were sent to section four.

Sections two through four of the survey had identical questions and answer
choices related to their integration experiences and digital competency. However, the
wording was crafted for its relative sector of education, for instance, terms like professor
and adjunct were used for adult and higher education but teacher was used for K-12. It is
important to note that the core questions, answer choices, and data collected were the
same for each of these three sections of the survey. The second section for each
participant included questions about years of experience in their current sector of
education, curricular area of instruction, rating their use and confidence of technology
tools, supports and barriers they experience, and how virtual learning due to COVID-19
might have affected their instruction.

The fifth section of the survey, which is the third section for each participant, was
answered by all participants. This section only had two questions. One was related to the
current resources and user support in relation to what was provided during the COVID-19
pandemic at their institution. The second question of this section asked about the overall culture related to technology integration at institutional level.

Survey - Validity and Reliability

To ensure the survey was functional and clear to participants, a voluntary focus group made up of colleagues of the researchers, as well as the dissertation committee for the study, reviewed and provided feedback on the survey questions in the pilot survey. This process ensured clarity in wording, as well as provided feedback on length and organizational flow of the questions. The survey was initially conducted in May 2023.

The pilot study received 77 responses (40 were K-12 teachers, 15 were higher education teachers, and 23 were teachers at adult education institutions). The pilot-version of the survey was released on May 25, 2023 (see Appendix H). Feedback from this survey allowed researchers to make amendments to the wording and structure of the survey to provide more clarity and function to the instrument.

Based on feedback, findings from the pilot study, and further review of the instrument, several amendments were made during the development of the survey. Small changes in wording and design were made to the pilot version (see Appendix H):

- All instances of “COVID-19” were put in all capital letters for correctness and consistency.
- Question #5 - “inner-city” was changed to “urban” for better word choice.
- Question #7 - “Online/Hybrid” was changed to “Online and/or Hybrid” for clarity.
- Question #10 - Choices were edited to reduce length and add clarity.
● Questions #12, 24, and 36 - “First” and “1-3 years” were removed as options because they were outside of the desired population.

● Questions #17, 29, 41 - Removed a confidence rating request for “Teaching classes that are 100% virtual”, as it was already asked in question #16.

● Questions #18, 30, 42 - “N/A” was edited as an answer selection to say “Never or N/A” for clarity.

● Questions #23, 35, 47 - “school year” was added to clarify the time range in the answer selections.

● Question #48 - changed “technology resources (including user support) in” to “technology resources and user support in”.

In addition to the small wording changes throughout the survey, all forms of narrative responses were removed. In the pilot survey, each participant had two brief opportunities for narrative responses. Question #19 for K-12, #31 for higher education, and #43 for adult education (literally the same question, word for word, for each level of education) allowed for supplemental information about the barriers they experienced when integrating technology. Also, the final question, question #50 for all participants, allowed them to add any additional information they felt was appropriate about their experience and perceptions. Initially, the researchers planned to code these responses for frequency in occurrence of repetitive words and phrases, such as professional development, administrator, resources, barriers, etc. for supplemental information to the survey responses. However, when reviewing the responses from the pilot study, most of the narrative responses were either left blank or the answer simply reiterated or emphasized the answers they chose in the multiple-choice questions. None of the
responses provided any additional insight. Also, feedback from the pilot group indicated that the questions seemed redundant, which is why they were often left blank. It was decided to remove the narrative questions due to redundancy and to save participants time when completing the survey.

Another revision made was to change the number of choice selections on questions that included a Likert or rating scale for selection. It was suggested to change the number of choices to an even number to avoid the participant’s tendency to choose the middle option. The only rating-type questions that were not altered to an even number of responses were the data content for each sector of education in questions 17, 29, 41 and questions 22, 34, 46 because the researchers felt the additional descriptive nature of a fifth option was necessary.

The geographic location of the participants was originally limited to the St. Louis region in Missouri. To confirm the location, question #6 of the pilot survey asked participants to provide the zip code of their institution. However, researchers decided not to limit participants by such a small area and wanted more of a diverse collection of institutions by geographic location than just the St. Louis region. The decision was made to expand the reach of the survey to the Midwestern United States, as defined by the US Census Bureau (2021). Question #6 (My institution is located in this zip code.) was changed from an option to type in the numbers of a zip code to a drop-down menu of states that are considered part of the Midwest Region: Illinois, Indiana, Michigan, Ohio, Wisconsin, Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, and South Dakota.
Data Collection and Analysis

The information submitted by participants was automatically organized into a Google Sheet. Then, it was either analyzed using spreadsheet functionality or transferred to other statistical analysis programs such as Excel and SAS. The researchers employed the software, *SAS On Demand for Academics* for Pearson correlations, and other quantitative methods using Google Sheets and Excel spreadsheets for descriptive statistical analysis. Comparisons and descriptive analysis topics included examining and comparing teacher perceptions of technology adoption, cross comparisons of data collected for each sector of education in the study, and perceptions of how institutions can improve the technology integration self-efficacy of instructors.

Limitations

Because researchers relied on an online survey to gather information from teachers who participated voluntarily, self-selection bias may have been present, as only individuals with a particular interest in the subject or firm opinions may have chosen to respond. Consequently, specific perspectives may have been overrepresented, which, in turn, might have impacted the generalizability of the results. It is also possible that the online survey was not able to reach participants less technically inclined to participate in online research, or ones without an active email account. As a result, accuracy of results may be skewed because the sample of participants who responded might not fully represent the population that was intended to be studied.

In this quantitative research study, the researchers aimed to explore patterns and relationships of the survey results without formal hypothesis testing. The results may not accurately reflect the characteristics and diverse responses of the target population,
limiting the study's external validity. Since a small sample size can pose significant challenges for exploratory quantitative research without a specific hypothesis, the researchers carefully considered the implications of the sample size on the interpretation of the results and were transparent about the study's limitations when presenting the findings. Researchers were also transparent in limitations that might have occurred because of the study's focus on the Midwestern United States, which may have limited the diversity in the responses due to the similarity of participants all being from the same geographic region.

**Summary**

The purpose of this research was to investigate the factors that instructors perceive as influencing their level of technology integration. This chapter explains and justifies the methodology used in this study. The findings of the study can be used to implement several important changes and improvements in educational settings and to create a more effective, inclusive, and technologically advanced learning environment that benefits both instructors and students. By addressing the identified factors, institutions can improve the quality of education and better prepare students for success in a digital age. Chapter 4 will discuss the research findings after the deployment of the survey tool. Findings from the pilot study, released on May 25, 2023, as well as the data collected in the deployment of the final survey at the start of the 2023-2024 academic school year will be discussed.
Chapter 4: Results

This research aimed to examine the factors that instructors in K-12, adult education, and higher education, in the Midwestern United States, perceived as influencing their level of technology integration. It explored whether the virtual learning experience during the COVID-19 pandemic has impacted instructors' self-perceptions of their digital competence. This study also sought to understand instructors' perceptions regarding how institutions can enhance their self-efficacy in technology integration.

In this chapter, the researchers will provide an overview of the defining characteristics of the survey respondents, as well as the study results obtained in relation to the research questions (RQs) and specific survey questions. The key RQs that guided this inquiry into the technology integration practices of instructors in K-12, adult education, and higher education are:

1. What factors do instructors currently perceive as having an effect on their level of technology integration?
2. Has the experience of virtual learning, due to COVID-19, altered instructors' self-perceptions of their digital competence?
3. What are instructors' perceptions of how institutions can help improve their technology integration self-efficacy?

Overview of Demographic Data Collected

This section provides the data reported by the participants and how they defined themselves by race, gender, and age, as well as professional data like years of experience, professional involvement, and level of education. Defining data about experience with online/hybrid instruction, the frequency of technology use, perceived importance of
technology in instruction, and their overall confidence integrating technology are 
included. This section also reports the information provided about the institutions where 
the participants are instructors, such as whether their institution is public or private, the 
geographic location, and their specific state in the Midwest.

Race, Gender, and Age of Participants

There were 421 respondents. The information for race, gender, and age provided 
valuable insights into the composition of the population across distinct educational 
sectors. In terms of sector distribution, the majority of respondents were affiliated with 
higher education (52.5%), followed by K-12 educators (29.9%) and adult education 
professionals (17.6%) (see Figure 4.1). Though the count provided by each educational 
sector resulted in an imbalanced distribution, the total count of participants of 421 still 
reflected a diverse representation of educators across various educational domains.

Figure 4.1

Total Participants by Sector
Regarding racial demographics, the majority of respondents identified as White (81.7%), Black educators accounted for 13.5% of the sample, and a combined total for Asian, Hispanic, Native American, and Multi-Ethnic racial backgrounds accounted for just 4.8% of respondents, underscoring the diversity within the respondents. Table 4.1 provides the individual data of each sector and race.

**Table 4.1**

*Race of Participants by Sector*

<table>
<thead>
<tr>
<th>Sector</th>
<th>W</th>
<th>B</th>
<th>A</th>
<th>H</th>
<th>NA</th>
<th>M</th>
</tr>
</thead>
<tbody>
<tr>
<td>K-12</td>
<td>65.9%</td>
<td>32.5%</td>
<td>0%</td>
<td>0.8%</td>
<td>0%</td>
<td>0.8%</td>
</tr>
<tr>
<td>Adult Ed.</td>
<td>85.1%</td>
<td>8.1%</td>
<td>2.7%</td>
<td>4.1%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Higher Ed.</td>
<td>89.6%</td>
<td>4.5%</td>
<td>1.8%</td>
<td>1.4%</td>
<td>1.4%</td>
<td>1.4%</td>
</tr>
<tr>
<td>Total</td>
<td>81.7%</td>
<td>13.5%</td>
<td>1.4%</td>
<td>1.7%</td>
<td>0.7%</td>
<td>1%</td>
</tr>
</tbody>
</table>

*Note. W=White, B=Black, A=Asian, H=Hispanic, NA=Native American, M=Mixed
Figure 4.2 provides a visual representation of the races that make up the total population of the participants.

**Figure 4.2**

*Race of Total Population*

![Race of Total Population](image)

In terms of gender, 294 identified as female, while only 121 identified as male. Only five respondents identified as non-conforming. This distribution indicated a gender imbalance within the sample. Though not surprising, there was a significantly higher representation of female educators. Figure 4.3 demonstrates the discrepancy in gender of the respondents.
Figure 4.3

Gender of Participants

The data show a diverse range of respondents in terms of age. The largest age group were aged 41-50 years (35.9%), followed closely by those aged 51-59 years (23.8%), ages 33-40 years (16.9%), and ages 60 and above (16.4%). Younger respondents, 18-32 years old, represented a smaller but significant portion of the sample (7.1%). Table 4.2 provides the percentage of participants in each sector and age group.

Table 4.2

Age of Participants

<table>
<thead>
<tr>
<th>Sector</th>
<th>18-32</th>
<th>33-40</th>
<th>41-50</th>
<th>51-59</th>
<th>60+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adult Ed.</td>
<td>0.7%</td>
<td>2.1%</td>
<td>5.0%</td>
<td>5.0%</td>
<td>4.8%</td>
</tr>
<tr>
<td>K-12</td>
<td>3.1%</td>
<td>6.7%</td>
<td>10.9%</td>
<td>6.7%</td>
<td>2.6%</td>
</tr>
<tr>
<td>Higher Ed.</td>
<td>3.3%</td>
<td>8.1%</td>
<td>20.0%</td>
<td>12.1%</td>
<td>9.0%</td>
</tr>
<tr>
<td>Total</td>
<td>7.1%</td>
<td>16.9%</td>
<td>35.9%</td>
<td>23.8%</td>
<td>16.4%</td>
</tr>
</tbody>
</table>
Figure 4.4 provides a visual comparison of each age group by total and by sector.

**Figure 4.4**

*Age Comparison by Sector and Total*

The data pertaining to the participant's education level and experience is provided in Table 4.3. This data yielded valuable insights into the diverse professional backgrounds and expertise within the surveyed population.
Table 4.3

*Education Level and Professional Experience of Participants*

<table>
<thead>
<tr>
<th>Experience of Participants</th>
<th>Sector</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Adult Education</td>
<td>K-12</td>
</tr>
<tr>
<td></td>
<td>4-8</td>
<td>6.9%</td>
</tr>
<tr>
<td></td>
<td>9-15</td>
<td>4.5%</td>
</tr>
<tr>
<td></td>
<td>16-20</td>
<td>3.6%</td>
</tr>
<tr>
<td></td>
<td>21-25</td>
<td>1.7%</td>
</tr>
<tr>
<td></td>
<td>26+</td>
<td>1.0%</td>
</tr>
<tr>
<td>Involvement in Pro. Organization(s) Relevant to Instructional Position</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very Active</td>
<td>5.5%</td>
<td>6.2%</td>
</tr>
<tr>
<td>Active</td>
<td>8.3%</td>
<td>10.5%</td>
</tr>
<tr>
<td>Less Active</td>
<td>3.3%</td>
<td>8.8%</td>
</tr>
<tr>
<td>Not Active</td>
<td>0.5%</td>
<td>4.5%</td>
</tr>
<tr>
<td>Highest Level of Education</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Associates</td>
<td>0.01%</td>
<td>0.03%</td>
</tr>
<tr>
<td>Bachelor</td>
<td>6.7%</td>
<td>4.8%</td>
</tr>
<tr>
<td>Masters</td>
<td>9.0%</td>
<td>18.3%</td>
</tr>
<tr>
<td>Specialist</td>
<td>1.19%</td>
<td>2.85%</td>
</tr>
<tr>
<td>Doctorate</td>
<td>0.7%</td>
<td>3.8%</td>
</tr>
<tr>
<td>Experience Teaching Online and/or Hybrid Pre-COVID</td>
<td></td>
<td></td>
</tr>
<tr>
<td>YES</td>
<td>5.7%</td>
<td>10.0%</td>
</tr>
<tr>
<td>NO</td>
<td>11.9%</td>
<td>20.0%</td>
</tr>
</tbody>
</table>
A significant portion of participants' years of teaching fell within the 9-15 years (26.4%) bracket, followed by 4-8 years (24.9%), 16-20 years (21.6%), 26+ years (13.3%), and 21-25 years (12.8%). The diversity in years of teaching experience offered a comprehensive overall perspective of the respondents. Figure 4.5 below provides more details of the participants' teaching experience by sector.

**Figure 4.5**

*Years of Teaching Experience by Sector*
A considerable proportion of respondents were actively engaged in professional organizations, with 27.8% categorizing themselves as "Very Active" and 39% as "Active." This level of involvement indicated a strong commitment to professional development and networking of the respondents. Figure 4.6 details the involvement of participants in professional organizations related to their instructional position.

**Figure 4.6**

*Participant Involvement in Professional Organizations*
The highest level of education achieved by participants provided additional context to the expertise and commitment to continuing education of the surveyed population. Notably, most respondents held a master’s degree (44.4%), but a notable number also held doctorate (13.3%) and specialist degrees (4.9%), as well, meaning over 62% of respondents possessed advanced degrees. Figure 4.7 provides the highest level of education reported by participants in relation to their sector.

**Figure 4.7**

*Participants’ Highest Level of Education*
Half of the respondents (50.6%) reported having previous experience with online and/or hybrid teaching methods. Broken down by sector, this division looks a lot different with adult education making up only 11%, K-12 as 20%, and then higher education as 69% of the 213 “yes” responses to having experience teaching online and/or hybrid prior to teaching during COVID. Figure 4.8 demonstrates this difference.

**Figure 4.8**

*Participant Experience Teaching Online/Hybrid Pre-COVID*

![Chart showing experience teaching online/hybrid pre-COVID]

**Technology Use and Perceptions of Integration**

Participants reported characteristics regarding frequency of technology use in instruction, their perceived importance of integrating technology in instructions, and their overall confidence when integrating technology as an instructor. Table 4.4 and 4.5 below provide the data collected, as well as the results of a Pearson correlation between frequency of use, perceived importance of technology integration, and instructor confidence integrating technology.
### Table 4.4

**Technology Use and Perceptions of Integration**

<table>
<thead>
<tr>
<th>Perception of Use and Frequency</th>
<th>Sector</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Adult Education</td>
<td>K-12</td>
</tr>
<tr>
<td>Frequency of Active Technology Use in Instruction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Daily</td>
<td>10.7%</td>
<td>21.9%</td>
</tr>
<tr>
<td>2-3 Times a Week</td>
<td>3.1%</td>
<td>5.2%</td>
</tr>
<tr>
<td>At least 1 Time a Week</td>
<td>2.4%</td>
<td>1.2%</td>
</tr>
<tr>
<td>Few Times a Month</td>
<td>0.5%</td>
<td>1.0%</td>
</tr>
<tr>
<td>Rarely/Only If Required</td>
<td>1.0%</td>
<td>0.7%</td>
</tr>
</tbody>
</table>

| Perceived Importance of Technology Integration into Instruction | | | |
| Very Important              | 8.1%          | 11.9%| 25.2%          | 45.1% |
| Important                   | 8.3%          | 15.0%| 22.6%          | 45.8% |
| Less Importance             | 1.0%          | 2.6% | 3.8%           | 7.4%  |
| Not Important               | 0.2%          | 0.5% | 1.0%           | 1.7%  |

| Overall Confidence Integrating Technology as an Instructor | | | |
| Very Confident             | 8.1%          | 13.3%| 27.3%          | 48.7% |
| Confident                  | 7.1%          | 14.3%| 21.9%          | 43.2% |
| Less Confident             | 1.9%          | 1.7% | 3.1%           | 6.7%  |
| Not Confident              | 0.5%          | 0.7% | 0.2%           | 1.4%  |

As Table 4.4 shows, 75.5% of the respondents used technology daily in their instructional practices, indicating a strong reliance on technology for teaching and learning. Additionally, 13.5% reported using technology 2-3 times a week, highlighting its regular integration into instruction. The majority (90.9%) viewed technology as either
"Very Important" (45.1%) or "Important" (45.8%), emphasizing its value in enhancing instructional effectiveness and student engagement. A significant proportion of educators expressed confidence in using technology, with 48.7% feeling "Very Confident" and 43.2% feeling "Confident."

A Pearson correlation coefficient was computed to assess the linear relationship between the perceived importance of technology and the frequency of use with the participants’ overall confidence in integrating technology. Each sector displayed a strong moderate correlation between the frequency of use and the perceived importance (see Table 4.5). In addition, all tests yielded $p$-values well below the 0.05 threshold, indicating that the correlations were not likely due to chance. Though there was less of a correlation between perceived importance and participants’ confidence using technology in K-12, and adult education, the results for all tests are statistically significant.

**Table 4.5**

Importance, Frequency of Use, and Integration Confidence

<table>
<thead>
<tr>
<th>Sector</th>
<th>Pearson Correlation Coefficient for Importance</th>
<th>Perceived Confidence Integrating Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequency of Technology Use</td>
<td>Perceived Confidence</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Integrating Technology</td>
</tr>
<tr>
<td>K-12</td>
<td>$r(124) = .41, p = .000$</td>
<td>$r(124) = .18, p = .038$</td>
</tr>
<tr>
<td>Adult Ed.</td>
<td>$r(72) = .46, p = .000$</td>
<td>$r(72) = .29, p = .012$</td>
</tr>
<tr>
<td>Higher Ed.</td>
<td>$r(219) = .44, p = .000$</td>
<td>$r(219) = .40, p = .000$</td>
</tr>
<tr>
<td>Total</td>
<td>$r(419) = .42, p = .000$</td>
<td>$r(419) = .31, p = .000$</td>
</tr>
</tbody>
</table>

*Note.* The low $p$-value for all tests, in addition to the correlation coefficients provided, indicate a statistically significant correlation for each test that is not likely due to chance.
Institution Type and Location

Table 4.6 below presents a breakdown of the respondents based on institution, community setting, and state affiliation across the educational sectors. This information provided a foundation for understanding the diverse contexts, educational response to COVID, laws, etc. between which educators in each location may operate.

Table 4.6

<table>
<thead>
<tr>
<th></th>
<th>Sector</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Adult Education</td>
<td>K-12</td>
</tr>
<tr>
<td>Institutional Type/Location</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type of Institution</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public</td>
<td>16.6%</td>
<td>28.3%</td>
</tr>
<tr>
<td>Private</td>
<td>1.0%</td>
<td>1.7%</td>
</tr>
<tr>
<td>Type of Community</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban</td>
<td>6.7%</td>
<td>10.2%</td>
</tr>
<tr>
<td>Suburban</td>
<td>5.0%</td>
<td>18.1%</td>
</tr>
<tr>
<td>Rural</td>
<td>5.9%</td>
<td>1.7%</td>
</tr>
<tr>
<td>State</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MO</td>
<td>6.18%</td>
<td>22.80%</td>
</tr>
<tr>
<td>IL</td>
<td>3.3%</td>
<td>1.9%</td>
</tr>
<tr>
<td>OH</td>
<td>0.71%</td>
<td>0.95%</td>
</tr>
<tr>
<td>IN</td>
<td>2.9%</td>
<td>1.4%</td>
</tr>
<tr>
<td>ND</td>
<td>0.48%</td>
<td>0%</td>
</tr>
<tr>
<td>WI</td>
<td>0.48%</td>
<td>1.19%</td>
</tr>
<tr>
<td>IA</td>
<td>0.2%</td>
<td>0%</td>
</tr>
<tr>
<td>KS</td>
<td>1.4%</td>
<td>0.2%</td>
</tr>
<tr>
<td>SD</td>
<td>0.24%</td>
<td>0%</td>
</tr>
<tr>
<td>MI</td>
<td>0.5%</td>
<td>0.7%</td>
</tr>
<tr>
<td>NE</td>
<td>0.71%</td>
<td>0.24%</td>
</tr>
<tr>
<td>MN</td>
<td>0.48%</td>
<td>0.48%</td>
</tr>
</tbody>
</table>
Most respondents were affiliated with public institutions (83.8%). Private institutions had a smaller representation, with just 68 respondents (15.9%). The respondents were distributed across different community settings as follows, urban: 33.3%, suburban: 41.8%, and rural: 24.9%.

The respondents were associated with various states, with the highest representation from Missouri (MO), accounting for 198 individuals (47%). Other notable state affiliations include Illinois (IL) and Ohio (OH), with 30 respondents (7.1%) each. Indiana (IN), North Dakota (ND), and Wisconsin (WI) had 23 respondents (5.5%) each. As demonstrated in Figure 4.9, comparisons between locations would not be reliable due to the large discrepancy in the percentage of participants from each state.

**Figure 4.9**

*Distribution of Total Participants by State*
Comfort Level by Instructional Mode

The survey results presented in Table 4.7 below are based on participants being asked to rate their level of comfort based on the different instructional modes provided. The question, as presented to participants, did not differentiate the potential synchrony of each instructional mode. For instance, online and hybrid instruction can be both synchronous and/or asynchronous while in-person instruction can only be synchronous. Participants were simply asked their comfort level with each mode of instruction that was provided, and asynchronous and synchronous were included as a mode to be rated.

Table 4.7

Comfort Level by Instructional Mode

<table>
<thead>
<tr>
<th>Mode and Sector</th>
<th>Comfort Level</th>
<th>Very Comfortable</th>
<th>Moderately Comfortable</th>
<th>Minimally Comfortable</th>
<th>Not Comfortable</th>
</tr>
</thead>
<tbody>
<tr>
<td>In-Person</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adult Ed.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>16.63%</td>
<td>0.24%</td>
<td>0.48%</td>
<td>0.24%</td>
</tr>
<tr>
<td>K-12</td>
<td></td>
<td>28.50%</td>
<td>1.43%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Higher Ed.</td>
<td></td>
<td>49.17%</td>
<td>3.33%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>94.30%</td>
<td>4.99%</td>
<td>0.48%</td>
<td>0.24%</td>
</tr>
<tr>
<td>Hybrid</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adult Ed.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5.23%</td>
<td>7.84%</td>
<td>4.04%</td>
<td>0.48%</td>
</tr>
<tr>
<td>K-12</td>
<td></td>
<td>8.31%</td>
<td>11.40%</td>
<td>7.36%</td>
<td>2.85%</td>
</tr>
<tr>
<td>Higher Ed.</td>
<td></td>
<td>25.65%</td>
<td>18.76%</td>
<td>6.89%</td>
<td>1.19%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>39.19%</td>
<td>38.00%</td>
<td>18.29%</td>
<td>4.51%</td>
</tr>
<tr>
<td>Online</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adult Ed.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>7.36%</td>
<td>7.13%</td>
<td>2.85%</td>
<td>0.24%</td>
</tr>
<tr>
<td>K-12</td>
<td></td>
<td>9.74%</td>
<td>15.44%</td>
<td>3.33%</td>
<td>1.43%</td>
</tr>
<tr>
<td>Higher Ed.</td>
<td></td>
<td>27.08%</td>
<td>20.19%</td>
<td>4.04%</td>
<td>1.19%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>44.18%</td>
<td>42.76%</td>
<td>10.21%</td>
<td>2.85%</td>
</tr>
</tbody>
</table>
Across all three sectors, participants reported a high level of comfort with in-person instruction. In K-12, 95.2% of respondents reported feeling very comfortable with this mode. Similarly, in adult education, 94.6% expressed high comfort, while 93.7% shared this sentiment in higher education. Online instruction also garnered a considerable level of comfort. In K-12, 84.4% felt at least moderately comfortable, likewise in adult education, 82.4% expressed at least moderate comfort, and 90.1% in higher education felt at least moderately comfortable.

The hybrid mode, which combines in-person and online elements, surprisingly received mixed responses. In K-12, only 65.9% felt at least moderately comfortable, as compared to 74.3% in adult education, and 84.6% in higher education. The hybrid mode of instruction showed decreased comfort by all three sectors when compared to online and in-person modes. Figure 4.10 below, demonstrates the comfort level participants had
with in-person, online, and hybrid modes of instruction. Overall, participants overwhelmingly prefer in-person instruction and are almost 100% “very comfortable”, compared to less than 45% and 40% “very comfortable” with online and hybrid modes, respectively.

Figure 4.10

Comparative View of Instructional Modes

Synchronous instruction involving real-time interaction, defined to participants as “all students meet at the same time, either online or in-person”, was well-received across all sectors. In K-12, 82.6% felt at least moderately comfortable with this mode of instruction, with similar results in adult education (79.7%) and higher education (87.8%). Asynchronous instruction, defined to participants as “students are able to work on the course when it is most convenient for them, individually”, providing flexibility and self-
paced learning, was also met with a favorable response, as 70.6% of K-12, 70.3% in adult education, and 81.4% of higher education respondents reported at least moderate comfort with this mode of instruction. Overall, the participants reported varying levels of comfort across different instructional modes, especially by sector.

Pearson correlation coefficients were computed to assess the linear relationship between prior online/hybrid teaching experience and a participant's comfort with teaching online and hybrid. The results are shown in Table 4.8 below. The total population showed a moderate correlation coupled with a p-value of 0.00 for both online and hybrid, though instructor comfort with hybrid mode was lower for each sector, as well as the total. Adult education and K-12 were not indicative of the total and higher education showed the greatest correlation between these three factors. For K-12, the .02 Pearson correlation coefficient coupled with the p-value=.811 indicated no correlation between teaching online/hybrid pre-COVID and being at least moderately comfortable with teaching online. Also, the hybrid mode in K-12 actually showed a negative correlation and a p-value far exceeding the .05 threshold for statistical significance (r(124) = -.24, p = .790). Adult education only showed a positive correlation with a p-value to indicate statistical significance between experience teaching online/hybrid pre-COVID and comfort level with teaching online ( r(72) = .36, p = .002).
Table 4.8

Pre-Covid Online/Hybrid Experience and Instructional Mode Comfort

<table>
<thead>
<tr>
<th>Sector</th>
<th>At Least Moderately Comfortable</th>
<th>Pre-COVID O/H Exp</th>
<th>Pearson Correlation Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Online (O)</td>
<td>Hybrid (H)</td>
<td></td>
</tr>
<tr>
<td>K-12</td>
<td>84.1%</td>
<td>66%</td>
<td>33.3%</td>
</tr>
<tr>
<td></td>
<td>O: ( r(124) = .02, p = .811 )</td>
<td>H: ( r(124) = -.24, p = .790 )</td>
<td></td>
</tr>
<tr>
<td>Adult Ed.</td>
<td>82.4%</td>
<td>74%</td>
<td>32.4%</td>
</tr>
<tr>
<td></td>
<td>O: ( r(72) = .36, p = .002 )</td>
<td>H: ( r(72) = .21, p = .079 )</td>
<td></td>
</tr>
<tr>
<td>Higher Ed.</td>
<td>90%</td>
<td>85%</td>
<td>67%</td>
</tr>
<tr>
<td></td>
<td>O: ( r(219) = .56, p = .000 )</td>
<td>H: ( r(219) = .41, p = .000 )</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>87%</td>
<td>77.1%</td>
<td>50.6%</td>
</tr>
<tr>
<td></td>
<td>O: ( r(419) = .38, p = .000 )</td>
<td>H: ( r(419) = .29, p = .000 )</td>
<td></td>
</tr>
</tbody>
</table>

Note. O = Online, H = Hybrid. The high p-values for K-12 O and H, and adult education H, indicate an insignificant statistical correlation for those values. The remaining tests showed a high to moderate statistically significant correlation.

Analysis of RQ1

RQ1 focused on investigating and understanding the various elements, circumstances, or conditions that instructors believe influence their ability and willingness to incorporate technology into their teaching practices. Participants were asked, “What factors do instructors currently perceive as having an effect on their level of technology integration?” To help answer the question, specific survey questions were structured to gather information about factors that either facilitate or hinder the participants' technology integration efforts. The association between RQ1 and lack of
time to learn about and try new tools, lack of access to functioning tools/poor infrastructure, expense of tools and their maintenance, lack of administrative support to learn and integrate new things, lack of IT/Tech staff to assist, culture of my institution and expectations for technology use, lack of students experience with technology tools, and not having/knowing about an appropriate tool for the immediate tasks was assessed by examining the collected responses. Because of the differences in the number of respondents by sector, percentage of respondents, as opposed to the actual number of respondents, were used.

**Common Barriers**

When looking at the overall population, there were barriers that had a sizable effect on all three sectors. For instance, 91.5% of the total population reported that a “lack of time to learn about and try new tools” was “often” or at least “sometimes” a barrier. “Expense of technology tools and their maintenance” was also a significant barrier with over 74.8% of respondents reporting that it is at least “sometimes” a barrier. “Not having/knowing about an appropriate tool” is also a barrier at least “sometimes” across sectors (71%). These barriers were reported in significant numbers across all three sectors.

There were some barriers that affected one sector more than others. The most notable was that “culture of their institution and the expectations of technology use” was only a barrier at least “sometimes” for 42.1% of all respondents. However, 54% of K-12 respondents felt that it was at least sometimes a barrier, as opposed to only 40.6% of adult education participants and 35.8% of the higher education respondents (See Table 4.9).
Table 4.9

*Common Barriers Experienced by Instructors*

<table>
<thead>
<tr>
<th>Common Barrier and Sector</th>
<th>Frequency of Experience</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Often</td>
<td>Sometimes</td>
<td>Rarely</td>
<td>Never/NA</td>
</tr>
<tr>
<td>Lack of time to learn about and try new tools</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adult Ed.</td>
<td>51.4%</td>
<td>41.9%</td>
<td>4.1%</td>
<td>2.7%</td>
</tr>
<tr>
<td>K-12</td>
<td>44.4%</td>
<td>46.0%</td>
<td>7.1%</td>
<td>2.4%</td>
</tr>
<tr>
<td>Higher Ed.</td>
<td>45.2%</td>
<td>46.2%</td>
<td>8.1%</td>
<td>0.5%</td>
</tr>
<tr>
<td>Total</td>
<td>46.1%</td>
<td>45.4%</td>
<td>7.1%</td>
<td>1.4%</td>
</tr>
<tr>
<td>Lack of access to functioning tools/poor infrastructure</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adult Ed.</td>
<td>16.2%</td>
<td>47.3%</td>
<td>33.8%</td>
<td>2.7%</td>
</tr>
<tr>
<td>K-12</td>
<td>19.8%</td>
<td>50.0%</td>
<td>25.4%</td>
<td>4.8%</td>
</tr>
<tr>
<td>Higher Ed.</td>
<td>19.5%</td>
<td>48.0%</td>
<td>28.5%</td>
<td>4.1%</td>
</tr>
<tr>
<td>Total</td>
<td>19.0%</td>
<td>48.5%</td>
<td>28.5%</td>
<td>4.0%</td>
</tr>
<tr>
<td>Expense of tools and their maintenance</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adult Ed.</td>
<td>32.4%</td>
<td>48.6%</td>
<td>14.9%</td>
<td>4.1%</td>
</tr>
<tr>
<td>K-12</td>
<td>29.4%</td>
<td>42.9%</td>
<td>19.8%</td>
<td>7.9%</td>
</tr>
<tr>
<td>Higher Ed.</td>
<td>32.6%</td>
<td>41.6%</td>
<td>21.3%</td>
<td>4.5%</td>
</tr>
<tr>
<td>Total</td>
<td>31.6%</td>
<td>43.2%</td>
<td>19.7%</td>
<td>5.5%</td>
</tr>
<tr>
<td>Lack of administrative support to learn and integrate new things</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adult Ed.</td>
<td>9.5%</td>
<td>33.8%</td>
<td>40.5%</td>
<td>16.2%</td>
</tr>
<tr>
<td>K-12</td>
<td>21.4%</td>
<td>35.7%</td>
<td>37.3%</td>
<td>5.6%</td>
</tr>
<tr>
<td>Higher Ed.</td>
<td>19.9%</td>
<td>34.4%</td>
<td>36.7%</td>
<td>9.0%</td>
</tr>
<tr>
<td>Total</td>
<td>18.5%</td>
<td>34.7%</td>
<td>37.5%</td>
<td>9.3%</td>
</tr>
<tr>
<td>Lack of IT/Tech staff to assist</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adult Ed.</td>
<td>17.6%</td>
<td>45.9%</td>
<td>27.0%</td>
<td>9.5%</td>
</tr>
<tr>
<td>K-12</td>
<td>25.4%</td>
<td>35.7%</td>
<td>31.7%</td>
<td>7.1%</td>
</tr>
<tr>
<td>Higher Ed.</td>
<td>18.6%</td>
<td>40.3%</td>
<td>30.8%</td>
<td>10.4%</td>
</tr>
<tr>
<td>Total</td>
<td>20.4%</td>
<td>39.9%</td>
<td>30.4%</td>
<td>9.3%</td>
</tr>
</tbody>
</table>
Table 4.9 Continued

<table>
<thead>
<tr>
<th>Common Barrier and Sector</th>
<th>Frequency of Experience</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Often</td>
</tr>
<tr>
<td>Culture of my institution and expectations for technology use</td>
<td></td>
</tr>
<tr>
<td>Adult Ed.</td>
<td>12.2%</td>
</tr>
<tr>
<td>K-12</td>
<td>14.3%</td>
</tr>
<tr>
<td>Higher Ed.</td>
<td>11.8%</td>
</tr>
<tr>
<td>Total</td>
<td>12.6%</td>
</tr>
<tr>
<td>Lack of student experience with technology tools</td>
<td></td>
</tr>
<tr>
<td>Adult Ed.</td>
<td>47.3%</td>
</tr>
<tr>
<td>K-12</td>
<td>16.7%</td>
</tr>
<tr>
<td>Higher Ed.</td>
<td>19.5%</td>
</tr>
<tr>
<td>Total</td>
<td>23.5%</td>
</tr>
<tr>
<td>Not having/knowing about an appropriate tool for the immediate task</td>
<td></td>
</tr>
<tr>
<td>Adult Ed.</td>
<td>13.5%</td>
</tr>
<tr>
<td>K-12</td>
<td>21.4%</td>
</tr>
<tr>
<td>Higher Ed.</td>
<td>17.2%</td>
</tr>
<tr>
<td>Total</td>
<td>17.8%</td>
</tr>
</tbody>
</table>

When looking at the overall population, there were barriers that had a sizable effect on all three sectors. For instance, 91.5% of the total population reported that a “lack of time to learn about and try new tools” was “often” or at least “sometimes” a barrier. “Expense of technology tools and their maintenance” was also a significant barrier with over 74.8% of respondents reporting that it is at least “sometimes” a barrier. “Not having/knowing about an appropriate tool” is also a barrier at least “sometimes”
across sectors (71%). These barriers were reported in significant numbers across all three sectors.

There were some barriers that affected one sector more than others. The most notable was that “culture of their institution and the expectations of technology use” was only a barrier at least “sometimes” for 42.1% of all respondents. However, 54% of K-12 respondents felt that it was at least sometimes a barrier, as opposed to only 40.6% of adult education participants and 35.8% of the higher education respondents. A Pearson correlation coefficient was computed to assess the linear relationship between how respondents in each sector rated the institutional culture as a barrier and how they perceived the current culture of their institution. When looking at the population as a whole, there was a slightly moderate correlation with a statistically significant $p$-value ($r(419) = -.35, p = .0001$), but when examined by sector, the correlation grew stronger for the sectors that saw the culture of the institution less of a barrier with the correlation in adult education becoming the strongest (see Table 4.10). A strong $p$-value ($<0.000$) was indicated for all sectors except for K-12 ($p=.153$) indicating for the adult education, higher education, and the total of all sectors were statistically significant with moderate to strong correlations between institutional culture as a barrier and instructor perceptions of the current culture of their institution, but K-12 did not have a correlation and any observance of one is likely due to chance.
Another barrier that diverged by sector was having students with a lack of experience with technology tools. Adult education respondents rated this barrier as “often” 47.3% of the time, as compared to just 16.7% for K-12 and 19.5% in higher education. This difference is consistent even when considering those that rated the lack of student experience with technology as “sometimes” being a barrier with 83.8% of adult education respondents, but only 61.1% of K-12 and 68.4% of higher education respondents.

In the adult education sector, notable trends also emerged. In addition to the elevated report of the culture and expectations of their institutions being a barrier, a significant proportion of K-12 educators often cited "Not having/knowing about an appropriate tool for the immediate task" (73%) as a barrier at least “sometimes.” Additionally, a substantial portion of respondents in this sector sometimes encounter challenges related to "Lack of access to functioning tools/poor infrastructure" (69.8%).

Interestingly, this sector exhibits relatively lower percentages for barriers like "Expense
of tools and their maintenance" and "Lack of IT/Tech staff to assist," indicating that financial considerations and technical support are less prominent issues in this sector.

In the K-12 sector there was a distinct emphasis on "lack of access to functioning tools/poor infrastructure" (69.8%) as a significant barrier that is experienced at least “sometimes”. This sector also reported challenges related to "lack of administrative support to learn and integrate new things" (57.1%) and a relatively higher percentage for "not having/knowing about an appropriate tool for the immediate task" (68.2%), indicating a greater need for training and/or communication of available/appropriate tools and time to explore tools for integration.

Among the higher education respondents, there is a prevalent concern about "Expense of tools and their maintenance" (74.2%) as a significant barrier at least “sometimes”. Respondents in this sector also frequently encounter challenges related to "lack of administrative support to learn and integrate new things" (54.3%) and "Lack of access to functioning tools/poor infrastructure" (67.5%). Additionally, higher education exhibits higher percentages for "Lack of IT/Tech staff to assist" (40.3%) compared to the other sectors, suggesting a potentially higher reliance on technical support.

Common Supports

To understand common supports among the participants, they were asked to respond to the following question: “What supports do you find most helpful when learning new technology and integrating it into your instruction?” The survey responses regarding the perceived helpfulness of various supports offered valuable insights into the preferences and needs of educators across the different sectors (See Table 4.11).
Table 4.11

*Supports Perceived as “Most Helpful”*

<table>
<thead>
<tr>
<th>Support</th>
<th>Adult Education</th>
<th>K-12</th>
<th>Higher Education</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professional development sessions provided by your institution</td>
<td>87.8%</td>
<td>84.9%</td>
<td>86.9%</td>
<td>86.5%</td>
</tr>
<tr>
<td>Workshops/conferences/learning opportunities that you seek out and take advantage of outside of your institution</td>
<td>74.3%</td>
<td>54.8%</td>
<td>52.9%</td>
<td>57.2%</td>
</tr>
<tr>
<td>Individual help from an instructional coach or integration specialist at your institution</td>
<td>55.4%</td>
<td>49.2%</td>
<td>54.3%</td>
<td>53.0%</td>
</tr>
<tr>
<td>Time to explore and integrate tools is provided during contracted time</td>
<td>66.2%</td>
<td>69.8%</td>
<td>62.9%</td>
<td>65.6%</td>
</tr>
<tr>
<td>The infrastructure at your institution allows for a more seamless integration</td>
<td>51.4%</td>
<td>46.8%</td>
<td>61.1%</td>
<td>55.1%</td>
</tr>
<tr>
<td>The availability and institutional use of the tool is guaranteed to be long term</td>
<td>66.2%</td>
<td>44.4%</td>
<td>52.9%</td>
<td>66.2%</td>
</tr>
<tr>
<td>Other instructors and/or administrators model its use</td>
<td>64.9%</td>
<td>48.4%</td>
<td>54.3%</td>
<td>54.4%</td>
</tr>
<tr>
<td>There are supports provided by the institution for your students using the tools</td>
<td>55.4%</td>
<td>42.9%</td>
<td>60.6%</td>
<td>54.4%</td>
</tr>
<tr>
<td>My institution provides tools that make sense and improve your instruction and/or the management of your instruction</td>
<td>58.1%</td>
<td>57.1%</td>
<td>57.5%</td>
<td>57.5%</td>
</tr>
<tr>
<td>Resource materials like video instructions and help sheets are made easily available</td>
<td>64.9%</td>
<td>49.2%</td>
<td>59.7%</td>
<td>57.5%</td>
</tr>
</tbody>
</table>
When looking at the overall responses to this question, four things stand out:

1. Significantly less respondents (31.6%) felt that consistent administrative expectations regarding technology integration were helpful. This was also relative to the barrier of “culture of the institution and expectations for technology use”, which also scored lower with only 12.6% of all respondents reporting that it is “often” a barrier.

2. A significant number of respondents (86.5%) found professional development by their institution helpful. Respondents also felt workshops and conferences found outside of their institution were helpful (57.2%).

3. “Time to explore and integrate tools during contracted time” was perceived as helpful by 65.6% of respondents. This response was in direct relation to respondents reporting overwhelmingly that “lack of time to learn about and try new tools” was a significant barrier with over 90% experiencing it at least “sometimes.”

4. “Institutions providing tools that make sense and improve instruction and/or the management of instruction” were reported as being a “helpful support” with almost 58% of all participants.

There were also results that stood out when looking at the individual sectors. For instance, many K-12 respondents did not find “modeled use” by other instructors or administrators as helpful (48.4%) as the adult education respondents (64.9%) or those in higher education (54.3%). K-12 respondents were also not as concerned about the long-term availability and use of tools (44.4%), as the other two sectors with adult education reporting 66.2% and higher education reporting 52.9%.
For adult education, participants reported a strong inclination toward seeking external workshops, conferences, and learning opportunities (74.3%), where K-12 only reported 54.8% and higher education reported 52.9%. They also found “individual help from institutional experts and coaches” (55.4%) to be slightly more helpful than higher education (54.3%) and more significantly helpful than K-12 (49.2%). Similar results were shown for “resource materials like video instructions and help sheets” at 64.9% for adult education, but with higher education just slightly lower (59.7) and K-12 much lower (49.2%). In addition to finding “modeled use by others” as helpful (64.9%), “long-term availability” (66.2%) was also a more of a priority than reported by other sectors.

In higher education, “professional development sessions provided by institutions” (87.3%) and “time allocated for exploration” (62.9%) were viewed as the most vital supports. Additionally, the “availability of resources like video instructions and help sheets” played a substantial role in their own learning and integration with 59.3% reporting these as helpful supports. When looking at more external factors like “technological infrastructure for seamless integration” and “institutional support for student use”, more than 60% of the higher education participants reported them as some of the “most helpful” supports.

**COVID-19 Effect on Ability and Competence to Integrate Technology**

In examining COVID-19’s effect, participants were provided seven statements regarding their skills with technology and asked to rate each statement on a Likert scale from 1-5, with 1 being “increased significantly” and 5 being “decreased significantly” in relation to their perception of an increase/decrease in their ability and /or competence. An overwhelming majority rated their ability and competence as at least “increasing some,”
with only a few participants reporting any type of decrease in ability/competence due to the interruption of traditional classrooms due to COVID-19. Table 4.12 below provides a comprehensive view of how educators' ability and confidence in integrating technology were affected by the COVID-19 pandemic.

**Table 4.12**

*COVID-19 Effect on Ability/Competence to Integrate Technology*

| Statement and Sector | Increased Time | |
|----------------------|----------------|
|                      | Increased      | Increased | About the Same | Decreased Some | Decreased Significantly |
|                      | Significantly  | Some       |                |                |                         |
| My overall technology integration skills for instruction | | | | | |
| Adult Ed.            | 37.8%          | 48.6%      | 12.2%          | 0.0%           | 1.4%                    |
| K-12                 | 47.6%          | 37.3%      | 15.1%          | 0.0%           | 0.0%                    |
| Higher Ed.           | 27.6%          | 51.1%      | 20.4%          | 0.5%           | 0.5%                    |
| Total                | 35.4%          | 46.6%      | 17.3%          | 0.2%           | 0.5%                    |
| My confidence in finding and using new tools | | | | | |
| Adult Ed.            | 31.1%          | 43.2%      | 24.3%          | 0.0%           | 1.4%                    |
| K-12                 | 36.5%          | 36.5%      | 26.2%          | 0.8%           | 0.0%                    |
| Higher Ed.           | 18.6%          | 40.3%      | 40.3%          | 0.9%           | 0.0%                    |
| Total                | 26.1%          | 39.7%      | 33.3%          | 0.7%           | 0.2%                    |
| My interest in technology integration in content | | | | | |
| Adult Ed.            | 32.4%          | 39.2%      | 25.7%          | 1.4%           | 1.4%                    |
| K-12                 | 29.4%          | 38.1%      | 30.2%          | 0.8%           | 1.6%                    |
| Higher Ed.           | 16.3%          | 38.0%      | 43.0%          | 2.3%           | 0.5%                    |
| Total                | 23.0%          | 38.2%      | 36.1%          | 1.7%           | 1.0%                    |
Table 4.12 Continued

<table>
<thead>
<tr>
<th>Statement and Sector</th>
<th>Increased Time</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Increased</td>
</tr>
<tr>
<td></td>
<td>Significantly</td>
</tr>
<tr>
<td>My ability to show others how to use</td>
<td></td>
</tr>
<tr>
<td>Adult Ed.</td>
<td>32.4%</td>
</tr>
<tr>
<td>K-12</td>
<td>33.3%</td>
</tr>
<tr>
<td>Higher Ed.</td>
<td>19.0%</td>
</tr>
<tr>
<td>Total</td>
<td>25.7%</td>
</tr>
<tr>
<td>My ability to choose tools that are appropriate for a given task</td>
<td></td>
</tr>
<tr>
<td>Adult Ed.</td>
<td>23.0%</td>
</tr>
<tr>
<td>K-12</td>
<td>29.4%</td>
</tr>
<tr>
<td>Higher Ed.</td>
<td>13.1%</td>
</tr>
<tr>
<td>Total</td>
<td>19.7%</td>
</tr>
<tr>
<td>My ability to use technology for assessment of student learning</td>
<td></td>
</tr>
<tr>
<td>Adult Ed.</td>
<td>24.3%</td>
</tr>
<tr>
<td>K-12</td>
<td>34.1%</td>
</tr>
<tr>
<td>Higher Ed.</td>
<td>12.2%</td>
</tr>
<tr>
<td>Total</td>
<td>20.9%</td>
</tr>
<tr>
<td>My ability to design/manage a course with an online learning management system</td>
<td></td>
</tr>
<tr>
<td>Adult Ed.</td>
<td>25.7%</td>
</tr>
<tr>
<td>K-12</td>
<td>39.7%</td>
</tr>
<tr>
<td>Higher Ed.</td>
<td>22.6%</td>
</tr>
<tr>
<td>Total</td>
<td>28.3%</td>
</tr>
</tbody>
</table>
In K-12 education, there was a notable surge in technology integration skills, with 47.6% reporting a significant increase. Additionally, 36.5% saw a significant increase in confidence in finding and using new tools. Interest in integrating technology within content experienced a substantial uptick, with 29.4% reporting a significant increase and demonstrating tool usage to others also notably improved, as 33.3% reported a significant increase. Proficiency in selecting appropriate tools for specific tasks increased significantly, with 29.4% noting a rise. Using technology for student assessment saw a substantial surge, with 34.1% indicating a significant increase. Furthermore, participants demonstrated enhanced proficiency in designing and managing courses with online learning management systems, with 39.7% reporting a notable increase.

In adult education, there were positive shifts in technological competence. Notably, 37.8% reported a significant increase in technology integration skills for instruction. Confidence in finding and using new tools also increased, with 31.1% indicating a significant rise. Interest in technology integration within content experienced a modest uptick, with 32.4% indicating a significant increase. Demonstrating tool usage to others showed a modest increase, as well, with 32.4% reporting a significant rise. Selecting appropriate tools for specific tasks witnessed a conservative increase (23%). Using technology for student assessment improved modestly (24.3%). Additionally, proficiency in designing and managing courses with online learning management systems grew, with 25.7% reporting a significant increase.

Higher education educators demonstrated notable advancements in technology integration. A significant 27.6% reported a substantial increase in technology integration skills for instruction. Confidence in finding and using new tools saw a modest surge, with
18.6% indicating a significant rise. Interest in technology integration within content also increased a modest rise, with 16.3% reporting a significant increase. Demonstrating tool usage to others experienced a notable improvement, with 16.3% indicating a significant rise. Additionally, there was a significant enhancement in the ability to choose appropriate tools for specific tasks, with 13.1% reporting a notable rise. Using technology for student assessment witnessed less of a surge, only 12.2% reported a significant increase. Moreover, proficiency in designing and managing courses with online learning management systems grew significantly, with 39.4% reporting a marked increase.

Across all education sectors, there was a significant advancement in overall technology integration skills with over 80% reporting at least some increase. Similarly, confidence in finding and using new tools surged in all sectors, with over 65% of respondents indicating at least some increase. Interest in integrating technology within content also notably improved across the board, with over 60% indicating at least some increase.

**Current Institutional Resources and Supports Relative to Pandemic Levels**

Table 4.13 below shows the percentages relative to the level of institutional support provided for technology integration, particularly in comparison to the support during the COVID-19 pandemic when the majority pivoted to virtual learning. The question posed to participants was, “At what level does your institution currently provide technology resources and user support in relation to what was provided during the COVID-19 pandemic?” Participants were able to select any of the five statements that related to what they perceived as being the relative level of support and resources that they now have.
Table 4.13

*Current Resources and Supports Relative to Pandemic Levels*

<table>
<thead>
<tr>
<th>Level of Resources and Supports</th>
<th>Sector</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>K-12</td>
<td>Adult Education</td>
</tr>
<tr>
<td>Same - My institution has provided a consistent level of technology resources and user support.</td>
<td>36.5%</td>
<td>48.6%</td>
</tr>
<tr>
<td>Less Resources - Technology purchased specifically for teaching and learning during the COVID-19 pandemic was not renewed/maintained since the COVID-19 pandemic.</td>
<td>27.0%</td>
<td>16.2%</td>
</tr>
<tr>
<td>Less Support - Training and support provided specifically for teaching and learning during the COVID-19 pandemic is significantly less accessible/frequent.</td>
<td>19.0%</td>
<td>10.8%</td>
</tr>
<tr>
<td>More Resources - My institution has increased the level of new technology resources for users since COVID-19.</td>
<td>24.6%</td>
<td>32.4%</td>
</tr>
<tr>
<td>More Support - My institution has increased the level of technology learning opportunities to support users.</td>
<td>15.9%</td>
<td>25.7%</td>
</tr>
</tbody>
</table>

The survey results for this question provided insights into how educational institutions have adapted their technology resources and support systems since their initial response to the challenges posed by the COVID-19 pandemic. Among all sectors, 43.5% reported maintaining a consistent level of technology resources and user support since returning to traditional forms of instruction, while only 24% reported less resources...
and only 16.2% indicated a decrease in support.

In adult education, 48.6% reported a consistent level of support, while 16.2% chose not to renew technology resources. Additionally, 10.8% noted a decrease in accessibility of training and support. Within higher education, 45.7% reported consistent support, while 24.9% did not renew technology resources. Furthermore, 16.3% indicated a decrease in accessibility of training and support.

Figure 4.11 depicts how each sector, as well as the total of all participants, perceived their current level of resources and supports in relation to what they had access to during the COVID-19 pandemic. Most participants reported having the same level of resources and support as during the COVID-19 pandemic and the least number of participants reported less resources and support. It is also interesting that all three sectors followed the same pattern of response to create similar curves and data points.

Figure 4.11

Perception of Current Level of Supports and Resources
**Perception of Self and Institution**

Self-perception of one’s skills is a relative factor that determines the level at which instructors will integrate technology into their instruction. Survey question 12 (Which of the following descriptions reflect how you see yourself with regard to integrating technology?) and 48 (How would you describe the current, overall culture of your institution in relation to technology integration?) were intentionally designed to gather insight into how respondents saw themselves and their institution in relation to the adopter categories Rogers (2003) that were discussed in chapter 2. The response options for both questions used wording that mirrored Rogers’ adopter category descriptor. See Table 4.14 and Table 4.15 below.

**Table 4.14**

*Self-Perception of Participant Adopter Levels*

<table>
<thead>
<tr>
<th>Adopter Category Descriptions</th>
<th>Sector</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Adult Education</td>
<td>K-12</td>
</tr>
<tr>
<td>I always want to be the first to try new technology tools and seek out opportunities to do so.</td>
<td>12.2%</td>
<td>7.9%</td>
</tr>
<tr>
<td>I like adopting the innovative ideas of others and I am a leader in sharing and encouraging innovation.</td>
<td>28.4%</td>
<td>34.9%</td>
</tr>
</tbody>
</table>
Table 4.14 Continued

<table>
<thead>
<tr>
<th>Adopter Category Descriptions</th>
<th>Sector</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Adult Education</td>
<td>K-12</td>
</tr>
<tr>
<td>I am comfortable using new technology but like to be intentional and use established &quot;best practices&quot; to implement it.</td>
<td>55.4%</td>
<td>51.6%</td>
</tr>
<tr>
<td>I tend to be hesitant to change and will only adopt new technology after it has been implemented by the majority.</td>
<td>4.1%</td>
<td>5.6%</td>
</tr>
<tr>
<td>I prefer a traditional classroom and am very skeptical of integrating technology to change what has always worked for me.</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
</tbody>
</table>
Table 4.15

*Self-Perception of Institution Adopter Levels*

<table>
<thead>
<tr>
<th>Adopter Category Descriptions</th>
<th>Sector</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Adult Education</td>
<td>K-12</td>
</tr>
<tr>
<td>How would you describe the current, overall culture of your institution in relation to technology integration?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>We like to be the first to try new things. New ideas and information about innovation are shared regularly. Effective technology integration is expected by administration, students, and staff.</td>
<td>13.5% 9.5% 8.6% 9.7%</td>
<td></td>
</tr>
<tr>
<td>We have several staff leaders that work to encourage technology integration, but it isn’t institution wide. We are aware of the need to innovate and are comfortable implementing new things.</td>
<td>55.4% 45.2% 52.5% 50.8%</td>
<td></td>
</tr>
<tr>
<td>We tend to implement new ideas before the average institution. Our staff is cautious and wants to see success stories and evidence of the innovation's effectiveness.</td>
<td>16.2% 23.8% 19.9% 20.4%</td>
<td></td>
</tr>
<tr>
<td>We are hesitant to change and will only adopt an innovation after it has been tried by the majority of other institutions. There are no expectations for technology integration from administration.</td>
<td>10.8% 17.5% 16.3% 15.7%</td>
<td></td>
</tr>
<tr>
<td>We are conservative when it comes to new technology and are very skeptical of change. Administration does not recognize innovation as a necessity.</td>
<td>4.1% 4.0% 2.7% 3.3%</td>
<td></td>
</tr>
</tbody>
</table>
A Pearson correlation coefficient was computed to assess the linear relationship between how respondents reported a self-perception of themselves and how they reported the current culture of their institution. Interestingly, there was virtually no correlation and the $p$-value ($p = .400$) indicated any observable relationship would likely be by chance between these variables for the total number of respondents, $r(419) = .04, p = .400$, with similar results when broken out by sector. Another interesting point is that overall, the respondents rated their institutions as being more innovative than they rated themselves.

When looking at this data in a different way, like in Figure 4.12 below, a clear correlation exists between the adopter categories of Rogers (2003) discussed in chapter 2 and the self-perceived adopter categories reported by respondents to the survey. When looking at the data by sector, the least number of participants placed themselves in the innovator and late majority/laggard categories with the majority reporting themselves in the early majority category. There were some slight variations between sectors but when one looks at the categories reported by participants in for describing their institutions (large dashes in Figure 4.12), respondents perceived their institutions as significantly more early adopting than they rated themselves.
Figure 4.12

Self-Perceived Adopter Levels of Participants

Note. This chart shows a comparison of Rogers’ (2003) adopter categories and participant responses of their ratings of themselves and their institution, based on the continuum of adopter categories. The data from each educational sector is presented, as well as the total for all respondents and their institution. (See questions 12 and 48 in Appendix A).

Analysis of RQ2

RQ2, "Has the experience of virtual learning, due to COVID-19, altered instructors' self-perceptions of their digital competence?" aimed to investigate whether the shift to virtual learning during the COVID-19 pandemic influenced how instructors perceived their proficiency in using digital tools and technology for teaching. The association between RQ2 and years of teaching experience online/hybrid, technology use and perceptions of integration, perceived importance of integrating technology into
instruction, overall confidence integrating technology as an instructor, self-reflection regarding technology integration, comfort level by instructional mode, confidence level integrating specific tools to design/create, and COVID-19 effect on ability and competence to integrate technology were assessed by examining how they relate to each other.

**Years of Teaching Experience Online/Hybrid Pre-COVID-19**

The results in Figure 4.13 provide insights into how participants' prior experience with online/hybrid teaching may have influenced their self-perceptions of digital competence during the pandemic. Additionally, the results reveal significant differences across different education sectors.

**Figure 4.13**

*Teaching Online/Hybrid Pre-COVID-19*
In K-12 and adult education, most participants (67% and 68%, respectively) had no experience with online or hybrid teaching methods before the COVID-19 pandemic. There is a notable contrast in higher education, with most (67%) of participants having prior experience with online or hybrid teaching methods. This result indicates that many higher education participants already had a foundation in digital teaching methods, making the transition to virtual learning more seamless.

**Technology Use and Perceptions of Integration**

The results in Table 4.5 and Figures 4.14 to 4.16 address RQ2. They address the frequency of active technology use, the perceived importance of technology integration into instruction, and the overall confidence integrating technology as an instructor.

**Active Use of Technology.** When asked to indicate the frequency of technology use, the responses were somewhat similar. However, their overall use varied from one extent to the next. It affirms a positive shift in their sense of digital competence and highlights the increased importance attributed to technology integration into instruction.

**Figure 4.14**

*Frequency of Active Technology Use*
The data shows that higher education has the most increased daily technology utilization at 82%. The data also shows that technology plays a vital role in the K-12 education results, with 73% of participants reporting using it daily. While still substantial, adult education demonstrates a slightly lower frequency of daily technology use at 61%.

**Perceived Importance of Integrating Technology into Instruction.** The data on the perceived importance of technology integration reveals a widespread recognition of the importance of integrating technology into instruction across all educational sectors. The results highlight the need for continued emphasis on effective technology integration in instructional practices.

**Figure 4.15**

*Importance of Technology Integration*

In K-12 education, 90% of respondents consider it “Very Important” or “Important”. Similarly, in adult education and higher education, most respondents (93% and 91%, respectively) hold technology integration in high regard.

Further, the relatively low percentages in the "Less Important" and "Not Important" categories indicate a strong consensus on the importance of technology integration.
Important" categories indicate a strong consensus among participants about technology’s crucial role in enhancing teaching and learning experiences. This alignment highlights a consensus on the value of technology integration across these educational settings.

**Overall Confidence Integrating Technology as an Instructor.** The data in Figure 4.16 on the confidence in integrating technology suggests a positive trend in the participant’s confidence in integrating technology, with higher education participants expressing the highest confidence levels. The low percentages of participants reporting less or no confidence indicated an overall positive sentiment towards technology integration in education, with room for growth and improvement in certain areas.

**Figure 4.16**

*Overall Confidence Integrating Technology*

The data indicates a high confidence level among participants in integrating technology across all educational sectors. In K-12, 92% of participants report feeling "Confident" or "Very Confident." Similarly, in adult education and higher education, most participants (87% and 94%, respectively) express confidence in their ability to integrate technology effectively.
Conversely, a relatively small percentage of participants express lower confidence levels in integrating technology across all educational sectors. In K-12, 8% of participants fall into these categories, with slightly higher percentages in adult education (14%) and higher education (6%).

**Self-Reflection Regarding Technology Integration.** The data in Figure 4.17 suggests instructors across all educational levels view themselves as leaders in technology adoption and express comfort in using new technology. Higher education participants expressed the highest confidence levels.

**Figure 4.17**

*Technology Integration Self-Reflection*
Upon analyzing the data, several key observations emerged. A notable percentage of participants across all sectors expressed confidence in their ability to utilize technology. There was a prevalent comfort level with new technology across all educational levels, with the majority of participants expressing confidence ranging from 48% to 55%. The variations between levels indicate that adult education instructors may be slightly more proactive in trying new technology and encouraging innovation.

The data also reveals low hesitancy to change among participants, with percentages ranging from 4% to 7% across all levels. Moreover, no respondents at any level prefer a traditional classroom, indicating an overall openness to technology adoption and a lack of preference for traditional teaching methods.

**Comfort Level by Instructional Mode**

Figure 4.18 below offers valuable insights into respondents' comfort levels in various instructional modes. The levels varied in different ways.

**Figure 4.18**

*Instructional Modes Comfort Levels*
Most participants expressed a very high level of comfort with in-person instruction. In K-12, 95% feel very comfortable, adult education follows closely with 95%, and 94% are very comfortable in higher education. In the K-12 sector, 28% of participants feel very comfortable with hybrid instruction, while 38% are moderately comfortable, and 25% indicate minimal comfort. Adult education shows similar trends, with 30% very comfortable, 45% moderately comfortable, and 23% minimal comfort. There is a significant shift in higher education to hybrid instruction, with 49% very comfortable, 36% moderately comfortable, and only 13% indicating minimal comfort.

The results for online instruction show that in the K-12 sector, 33% feel very comfortable, 52% are moderately comfortable, and 11% indicate minimal comfort. In adult education, 42% feel very comfortable, 41% are moderately comfortable, and 16% express minimal comfort. In higher education, 52% are very comfortable, 38% are moderately comfortable, and only 8% indicate minimal comfort.

Across all sectors, there's a higher comfort level with synchronous instruction compared to asynchronous instruction. In K-12, 53% feel very comfortable with synchronous instruction, 29% are moderately comfortable, and 10% indicate minimal comfort. In adult education, 50% feel very comfortable, 30% are moderately comfortable, and 18% express minimal comfort. In higher education, 60% feel very comfortable, 28% are moderately comfortable, and only 8% indicate minimal comfort with synchronous instruction. Regarding asynchronous instruction, in K-12, 33% feel very comfortable, 38% are moderately comfortable, and 29% express minimal comfort. In adult education, 36% feel very comfortable, 34% are moderately comfortable, and 24% express minimal comfort. In higher education, 51% feel very comfortable, 30% are moderately comfortable.
comfortable, and 14% indicate minimal comfort with asynchronous instruction.

In the K-12 and adult education sectors, there is a notable drop in the percentage of participants who feel very comfortable with hybrid instruction compared to in-person instruction. In several cases, there are percentages of participants who express minimal comfort with certain instructional modes, especially in hybrid and online settings. For instance, in the K-12 sector, there are instances where 25% of participants feel minimally comfortable with hybrid instruction and 11% with online instruction. In the adult education sector, 23% express minimal comfort with hybrid instruction and 16% with online instruction.

Across all sectors, some participants feel only moderately comfortable or even minimally comfortable with asynchronous instruction. For example, in the K-12 sector, 38% feel moderately comfortable, and 29% feel minimally comfortable.

Confidence Level Integrating Specific Tools to Design/Create. The results in Tables 4.16, 4.17, and 4.18 for design and creation, communication, and assessment collectively offer a comprehensive snapshot of participants' self-perceptions regarding their confidence levels for integrating specific technology tools. Altogether, these findings provide a nuanced understanding of how participants have adapted to the digital shift, identifying areas of strength and improvement.
<table>
<thead>
<tr>
<th>Sector</th>
<th>High</th>
<th>Average</th>
<th>Low</th>
<th>Avoidance</th>
<th>No Exp/Access</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Using Technology Tools to Design and Create</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>K-12</td>
<td>47(39%)</td>
<td>56(44%)</td>
<td>14(11%)</td>
<td>4(3%)</td>
<td>5(4%)</td>
</tr>
<tr>
<td>Adult Ed.</td>
<td>28(38%)</td>
<td>24(32%)</td>
<td>14(19%)</td>
<td>3(4%)</td>
<td>5(7%)</td>
</tr>
<tr>
<td>Higher Ed.</td>
<td>76(34%)</td>
<td>88(40%)</td>
<td>40(18%)</td>
<td>1(.5%)</td>
<td>16(7%)</td>
</tr>
<tr>
<td>Total</td>
<td>151(36%)</td>
<td>168(40%)</td>
<td>68(16%)</td>
<td>8(2%)</td>
<td>26(6%)</td>
</tr>
<tr>
<td><strong>Using Microphones and Cameras</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>K-12</td>
<td>52(41%)</td>
<td>58(46%)</td>
<td>12(10%)</td>
<td>3(2%)</td>
<td>1(1%)</td>
</tr>
<tr>
<td>Adult Ed.</td>
<td>36(49%)</td>
<td>32(43%)</td>
<td>5(7%)</td>
<td>1(1%)</td>
<td>(0%)</td>
</tr>
<tr>
<td>Higher Ed.</td>
<td>117(53%)</td>
<td>96(43%)</td>
<td>8(7%)</td>
<td>(0%)</td>
<td>(0%)</td>
</tr>
<tr>
<td>Total</td>
<td>205(49%)</td>
<td>186(44%)</td>
<td>25(6%)</td>
<td>4(1%)</td>
<td>1(.2%)</td>
</tr>
<tr>
<td><strong>Video Production and Screencasting</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>K-12</td>
<td>36(29%)</td>
<td>56(44%)</td>
<td>27(21%)</td>
<td>3(2%)</td>
<td>4(3%)</td>
</tr>
<tr>
<td>Adult Ed.</td>
<td>9(12%)</td>
<td>30(41%)</td>
<td>23(31%)</td>
<td>2(3%)</td>
<td>10(14%)</td>
</tr>
<tr>
<td>Higher Ed.</td>
<td>69(31%)</td>
<td>111(50%)</td>
<td>32(14%)</td>
<td>1(1%)</td>
<td>8(7%)</td>
</tr>
<tr>
<td>Total</td>
<td>114(27%)</td>
<td>197(47%)</td>
<td>82(19%)</td>
<td>6(1%)</td>
<td>22(5%)</td>
</tr>
<tr>
<td><strong>3-D Printers</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>K-12</td>
<td>11(9%)</td>
<td>26(21%)</td>
<td>38(30%)</td>
<td>8(6%)</td>
<td>43(34%)</td>
</tr>
<tr>
<td>Adult Ed.</td>
<td>2(3%)</td>
<td>4(5%)</td>
<td>15(20%)</td>
<td>7(9%)</td>
<td>46(62%)</td>
</tr>
<tr>
<td>Higher Ed.</td>
<td>5(2%)</td>
<td>18(8%)</td>
<td>55(25%)</td>
<td>15(7%)</td>
<td>128(58%)</td>
</tr>
<tr>
<td>Total</td>
<td>18(4%)</td>
<td>48(11%)</td>
<td>108(26%)</td>
<td>30(7%)</td>
<td>217(52%)</td>
</tr>
</tbody>
</table>
In using technology tools to design and create, in the K-12 sector, 39% demonstrated high confidence, 44% had an average level, and 11% showed low confidence. Additionally, 3% tended to avoid using these tools, and 4% reported no experience or access. For adult education, 38% displayed high confidence, 32% had an average level, and 19% had low confidence. Avoidance was observed in 4%, and 7% reported no experience or access. Within higher education, 34% exhibited high confidence, 40% had an average level, and 18% showed low confidence.

Among participants in K-12, 41% displayed high confidence using microphones and cameras, 46% had an average level, and 10% had low confidence. In adult education, 49% displayed high confidence, 43% had an average level, and 7% had low confidence out of 74 participants. Within higher education, 53% exhibited high confidence, 43% had an average level, and 7% showed low confidence.

For video production and screencasting, a digital video recording of your computer screen that usually includes audio, participants in K-12 displayed 29% displayed high confidence, 44% had an average level, and 21% had low confidence. In adult education, 12% displayed high confidence, 41% had an average level, 31% had low confidence, and 14% reported no experience or access. Within higher education, 31% exhibited high confidence, 50% had an average level, and 14% showed low confidence.

Among K-12 participants, 9% displayed high confidence in 3-D printer usage, 21% had an average level, and 30% had low confidence. Avoidance was observed in 6%, and 34% reported no experience or access. For adult education, 3% displayed high confidence, 5% had an average level, and 20% had low confidence. Avoidance was observed in 9%, and 62% reported no experience or access. Within higher education, 2%
exhibited high confidence, 8% had an average level, and 25% showed low confidence.

Avoidance was noted in 7%, and 58% reported no experience or access.

**Table 4.17**

*Confidence Level Integrating Specific Tools to Communicate*

<table>
<thead>
<tr>
<th>Tools and Sector</th>
<th>Confidence Level</th>
<th></th>
<th>Low</th>
<th>Avoidance</th>
<th>No Exp/Access</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>High</td>
<td>Average</td>
<td>Low</td>
<td>Avoidance</td>
<td>No Exp/Access</td>
</tr>
<tr>
<td>Tools for communication and presentation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>K-12</td>
<td>69 (58%)</td>
<td>45 (38%)</td>
<td>8 (6%)</td>
<td>3 (2%)</td>
<td>1 (.4%)</td>
</tr>
<tr>
<td>Adult Ed.</td>
<td>37 (50%)</td>
<td>32 (43%)</td>
<td>5 (7%)</td>
<td>(0%)</td>
<td>(0%)</td>
</tr>
<tr>
<td>Higher Ed.</td>
<td>132 (60%)</td>
<td>80 (36%)</td>
<td>7 (3%)</td>
<td>(0%)</td>
<td>2 (1%)</td>
</tr>
<tr>
<td>Total</td>
<td>238 (57%)</td>
<td>157 (37%)</td>
<td>20 (5%)</td>
<td>3 (1%)</td>
<td>3 (1%)</td>
</tr>
<tr>
<td>Desktop Publishing and Document Formatting</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>K-12</td>
<td>67 (53%)</td>
<td>45 (36%)</td>
<td>9 (7%)</td>
<td>3 (2%)</td>
<td>2 (2%)</td>
</tr>
<tr>
<td>Adult Ed.</td>
<td>32 (43%)</td>
<td>32 (43%)</td>
<td>9 (12%)</td>
<td>1 (.3%)</td>
<td>(0%)</td>
</tr>
<tr>
<td>Higher Ed.</td>
<td>111 (50%)</td>
<td>89 (40%)</td>
<td>14 (6%)</td>
<td>1 (.5%)</td>
<td>6 (3%)</td>
</tr>
<tr>
<td>Total</td>
<td>67 (16%)</td>
<td>45 (11%)</td>
<td>9 (2%)</td>
<td>3 (.7%)</td>
<td>2 (.5%)</td>
</tr>
<tr>
<td>Video conferencing: Zoom, Google Meet, WebEx, Skype, etc.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>K-12</td>
<td>62 (49%)</td>
<td>57 (45%)</td>
<td>6 (5%)</td>
<td>1 (1.5%)</td>
<td>(0%)</td>
</tr>
<tr>
<td>Adult Ed.</td>
<td>40 (54%)</td>
<td>30 (41%)</td>
<td>3 (4%)</td>
<td>(0%)</td>
<td>(0%)</td>
</tr>
<tr>
<td>Higher Ed.</td>
<td>148 (67%)</td>
<td>69 (31%)</td>
<td>4 (2%)</td>
<td>1 (.5%)</td>
<td>(0%)</td>
</tr>
<tr>
<td>Total</td>
<td>250 (59%)</td>
<td>156 (37%)</td>
<td>13 (3%)</td>
<td>2 (.48%)</td>
<td>(0%)</td>
</tr>
<tr>
<td>Social media for communication and/or professional growth</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>K-12</td>
<td>50 (40%)</td>
<td>55 (44%)</td>
<td>15 (12%)</td>
<td>2 (2%)</td>
<td>4 (3%)</td>
</tr>
<tr>
<td>Adult Ed.</td>
<td>20 (27%)</td>
<td>33 (45%)</td>
<td>15 (20%)</td>
<td>3 (4%)</td>
<td>3 (4%)</td>
</tr>
<tr>
<td>Higher Ed.</td>
<td>60 (27%)</td>
<td>99 (45%)</td>
<td>32 (14%)</td>
<td>19 (9%)</td>
<td>11 (5%)</td>
</tr>
<tr>
<td>Total</td>
<td>130 (31%)</td>
<td>187 (44%)</td>
<td>62 (15%)</td>
<td>24 (6%)</td>
<td>18 (4%)</td>
</tr>
</tbody>
</table>
In communication and presentation tools, the K-12 sector demonstrates a high confidence level in 58% of participants, while 38% maintain an average level and 6% exhibit lower confidence. In adult education, 50% of participants display high confidence, 43% operate at an average level, and 7% have lower confidence. All participants report some level of experience or access. In higher education, 60% exhibit high proficiency, 36% maintain average confidence, and 3% express lower confidence. In desktop publishing and document formatting, in the K-12 sector, 53% demonstrate high confidence, 36% maintain an average level, and 7% have lower confidence. In adult education, 43% express high confidence, 43% operate at an average level, and 12% have lower confidence. In higher education, 50% exhibit high proficiency, 40% maintain an average confidence level, and 6% express lower confidence.

In video conferencing, the K-12 sector demonstrates 49% high confidence, 45% operate at an average level, and 5% have lower confidence. In adult education, 54% display high confidence, 41% maintain an average level, and 4% have lower confidence. In higher education, 67% exhibit high proficiency, 31% maintain an average confidence level, and 2% express lower confidence.

In social media for communication and professional growth, K-12 demonstrated 40% high confidence, 44% operated at an average level, and 12% had lower confidence. In adult education, 27% expressed high confidence, 45% maintained an average level, and 20% had lower confidence. In higher education, 27% exhibited high proficiency, 45% maintained an average confidence level, and 14% expressed lower confidence.
Table 4.18

Confidence Level Integrating Specific Tools for Instruction/Assessment

<table>
<thead>
<tr>
<th>Tools and Sector</th>
<th>Confidence Level</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>High</td>
<td>Average</td>
<td>Low</td>
<td>Avoidance</td>
<td>No Expr/Access</td>
</tr>
<tr>
<td>Tools for assessment of student work/learning</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>K-12</td>
<td>56(44%)</td>
<td>50(40%)</td>
<td>14(11%)</td>
<td>1</td>
<td>5(4%)</td>
</tr>
<tr>
<td>Adult Ed.</td>
<td>22(30%)</td>
<td>41(55%)</td>
<td>9(12%)</td>
<td>0</td>
<td>2(3%)</td>
</tr>
<tr>
<td>Higher Ed.</td>
<td>81(37%)</td>
<td>114(52%)</td>
<td>20(9%)</td>
<td>1</td>
<td>5(2%)</td>
</tr>
<tr>
<td>Total</td>
<td>159</td>
<td>205</td>
<td>43</td>
<td>2</td>
<td>12</td>
</tr>
<tr>
<td>Spreadsheet functions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>K-12</td>
<td>49(39%)</td>
<td>53(42%)</td>
<td>21(17%)</td>
<td>3(2%)</td>
<td>0</td>
</tr>
<tr>
<td>Adult Ed.</td>
<td>25(34%)</td>
<td>36(39%)</td>
<td>13(18%)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Higher Ed.</td>
<td>88(40%)</td>
<td>83(38%)</td>
<td>27(12%)</td>
<td>10(5%)</td>
<td>13(6%)</td>
</tr>
<tr>
<td>Total</td>
<td>162</td>
<td>172</td>
<td>61</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td>Researching databases and online resources</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>K-12</td>
<td>50(40%)</td>
<td>68(54%)</td>
<td>5(4%)</td>
<td>2(2%)</td>
<td>1</td>
</tr>
<tr>
<td>Adult Ed.</td>
<td>33(46%)</td>
<td>32(43%)</td>
<td>9(12%)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Higher Ed.</td>
<td>138(62%)</td>
<td>70(32%)</td>
<td>8(4%)</td>
<td>2(1%)</td>
<td>3(1%)</td>
</tr>
<tr>
<td>Total</td>
<td>221</td>
<td>170</td>
<td>22</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Learning Management Systems--Google Classroom, Canvas, Blackboard, etc.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>K-12</td>
<td>65(52%)</td>
<td>53(42%)</td>
<td>7(6%)</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Adult Ed.</td>
<td>30(41%)</td>
<td>26(35%)</td>
<td>15(20%)</td>
<td>0</td>
<td>3(4%)</td>
</tr>
<tr>
<td>Higher Ed.</td>
<td>149(67%)</td>
<td>67(30%)</td>
<td>3(1%)</td>
<td>2(1%)</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>244</td>
<td>146</td>
<td>25</td>
<td>2</td>
<td>4</td>
</tr>
</tbody>
</table>
Participants in K-12 exhibit proficiency, with 44% in high confidence in the tools for assessment for student work/learning category, 40% at an average level, and 11% expressing lower confidence. In adult education, participants show proficiency with 30% in high confidence, 55% at an average level, and 12% expressing lower confidence. In higher education, participants demonstrate 37% high confidence, 52% at an average level, and 9% lower confidence.

In the spreadsheet functions category, K-12 participants show proficiency with 39% high confidence, 42% average, and 17% lower confidence. Adult education participants exhibit 34% high confidence, 49% average, and 18% lower confidence. In higher education, participants demonstrate proficiency with 40% high confidence, 38% average level, and 12% expressing lower confidence.

In the researching databases and online resources category, K-12 participants displayed proficiency with 40% high confidence, 54% average, and 4% lower confidence. Participants in adult education exhibit proficiency, with 46% in high confidence, 43% average, and 12% lower confidence. In higher education, participants demonstrate proficiency with 62% in high confidence, 32% average, and 4% lower confidence.

In the Learning Management Systems (LMS) category, K-12 participants demonstrate a robust proficiency with 52% in high confidence, 42% at an average level, and only 6% expressing lower confidence. In adult education, participants exhibited 41% high confidence, 35% average, and 20% expressed lower confidence. Participants in higher education displayed 67% high confidence, 30% average, and 1% lower confidence.
COVID-19 Effect on Ability and Competence to Integrate Technology

This survey question directly addresses the impact of COVID-19 on participants' ability and competence to integrate technology into their teaching. The K-12, adult education, and higher education educational sectors categorize the data provided in this study (see Table 4.12). Figures 4.19, 4.20, and 4.21 offer insights into how the shift to virtual learning during the COVID-19 pandemic has impacted participants’ perceptions of their proficiency in using digital tools and technology for teaching.

Figure 4.19

K-12 Technology Ability/Confidence

![K-12 Technology Ability/Confidence chart]

Results
- COVID-19 Effect on TI Ability/Competence Increased Significantly
- COVID-19 Effect on TI Ability/Competence Increased Some
- COVID-19 Effect on TI Ability/Competence Increased Same
- COVID-19 Effect on TI Ability/Competence Increased Significantly
Regarding overall Technology Integration (TI) skills, 85% of K-12 respondents reported an improvement, with 48% stating that it had increased significantly and 37% indicating a moderate increase. In their confidence using new tools, 74% of participants felt a positive shift, with 37% experiencing a significant increase and 37% a moderate one. Additionally, 67% showed a greater interest in TI content, with 29% reporting a significant increase and 38% indicating a moderate one.

Participants’ ability to show others and choose appropriate tools also saw improvements. For the ability to demonstrate tools, 77% of respondents felt more competent, with 33% noting a significant increase and 44% a moderate one. In terms of selecting the right tools, 71% indicated enhanced competence, with 29% reporting a significant increase and 42% a moderate one.

Moreover, participants felt more proficient in using technology for assessment, with 71% expressing improvement. Of these, 34% reported a significant increase, and 37% a moderate one. However, when designing with online Learning Management Systems (LMS), the increase was more modest, with 55% indicating enhanced ability. Among these, 16% noted a significant increase, and 39% a moderate one. Overall, these results demonstrate a positive impact of the virtual learning experience on participants’ self-perceptions of their digital competence in the K-12 sector.
Regarding overall Technology Integration (TI) skills, 87% of adult education respondents reported an improvement, with 38% indicating a significant increase and 49% stating a moderate one. In terms of confidence using new tools, 74% of participants experienced a positive shift, with 31% reporting a significant increase and 43% noting a moderate one. Additionally, 71% showed an increased interest in TI content, with 32% indicating a significant increase and 39% a moderate one.

Participants in the adult education sector also saw improvements in their ability to demonstrate tools and select appropriate ones. For the ability to show others, 79% of respondents felt more adept, with 32% noting a significant increase and 47% a moderate one. Regarding choosing the right tools, 72% indicated enhanced competence, with 23% reporting a significant increase and 49% a moderate one.
Furthermore, participants in this sector reported increased proficiency in using technology for assessment, with 66% expressing improvement. Among these, 24% noted a significant increase, and 42% a moderate one. However, when it comes to designing with online Learning Management Systems (LMS), the increase was more modest, with 61% indicating enhanced ability. Out of these, 26% noted a significant increase, and 35% a moderate one. Overall, these findings demonstrate a positive impact of the virtual learning experience on instructors' self-perceptions of their digital competence in the adult education sector.

Figure 4.21

*Higher Education Technology Ability/Confidence*
Regarding overall Technology Integration (TI) skills, 79% of higher education respondents reported an increase in their competence, with 28% stating that it had increased significantly and 51% indicating a moderate increase. In terms of confidence using new tools, 59% of participants felt a positive shift, with 19% experiencing a significant increase and 40% a moderate one. Similarly, 54% showed a greater interest in TI content, with 16% reporting a significant increase and 38% indicating a moderate one.

Participants’ ability to show others and choose appropriate tools also saw improvements. For the ability to demonstrate tools, 58% of respondents felt more competent, with 19% noting a significant increase and 39% a moderate one. Regarding selecting the right tools, 86% indicated enhanced competence, with 13% reporting a significant increase and 35% a moderate one.

Furthermore, participants felt more proficient in using technology for assessment, with 66% expressing improvement. Among these, 12% reported a significant increase, and 32% a moderate one. Additionally, 60% indicated greater ability to design with online Learning Management Systems (LMS), with 23% noting a significant increase and 39% a moderate one. Overall, these results underscore the positive impact of the virtual learning experience on instructors’ self-perceptions of their digital competence within the higher education sector.

Analysis of RQ3

RQ3 sought to examine instructors' perceptions of how institutions can assist instructors with improving their technology integration self-efficacy to improve instruction. The findings provide insights into how institutions can offer support that accommodates a diverse range of instructors with varying levels of comfort and expertise.
in technology use. Addressing the survey results, as they relate to RQ3, holds significant potential to impact various facets of the educational system, benefiting instructors, students, and the broader educational landscape. The following discussion will focus on the outcomes of the survey questions as they pertain to RQ3.

As discussed above, instructors' perceptions of institutional support for technology integration highlighted key barriers. These include a lack of time for learning and trying new tools, insufficient knowledge of appropriate tools for tasks, limited access to functioning tools and poor infrastructure, and a lack of administrative support for learning and integrating new technology. These results point to potential supports institutions can implement to help instructors navigate the barriers to technology integration. Figure 4.22 shows results related to various types of professional development participants perceived as helpful to their technology integration.

**Figure 4.22**

*Type of Professional Development Preferred*
Additional survey results important to institutions seeking to support instructor technology integration were revealed in responses to survey question “What supports do you find most helpful when learning new technology and integrating it into your instruction?” As shown in figure 4.22, overwhelmingly, participants indicated professional development provided by their institution was the support they perceived as most helpful with over 86% choosing this option. Fewer, but still a significant 74.3% of adult education participants indicated workshops, conferences, or learning opportunities sought out and attended outside their institution to be useful while 54.8% of K-12 and 52.9% of higher education participants chose this option. Support in the form of individual help from an instructional coach or integration specialist is valued relatively equally across the sectors (53%). Over 65% of participants felt that time to explore and integrate tools, during contracted time, is valuable to their technology integration.

For the survey question “What institutional supports were put into place for technology use and integration during the COVID-19 pandemic?” participants were asked to evaluate eight statements and to “check all that apply.” The question addressed the specific measures and resources institutions provided during virtual learning. Table 4.19 offers a glimpse into how institutions responded to the immediate need for technology integration and provides insights into the supports provided by institutions during the COVID-19 pandemic.
Table 4.19

*Institutional Support for Instruction/Learning During COVID-19*

<table>
<thead>
<tr>
<th>Support Provided During COVID</th>
<th>Sector</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Additional software applications and/or digital subscriptions were purchased by my institution for staff to integrate.</td>
<td>59.5% K-12, 66.2% Adult Education, 65.6% Higher Education</td>
<td>63.8%</td>
</tr>
<tr>
<td>Additional training and/or professional development opportunities were provided for new software applications and/or digital subscriptions.</td>
<td>45.2% K-12, 58.1% Adult Education, 66.9% Higher Education</td>
<td>58.9%</td>
</tr>
<tr>
<td>Updated and clear protocols/expectations of technology use and integration were established and disseminated.</td>
<td>43.6% K-12, 40.5% Adult Education, 34.8% Higher Education</td>
<td>38.4%</td>
</tr>
<tr>
<td>My institution provided additional computer hardware resources to instructors during the pandemic. (ex. WIFI hotspots, extra monitors, microphones, webcams, etc.)</td>
<td>61.1% K-12, 59.4% Adult Education, 58.8% Higher Education</td>
<td>59.6%</td>
</tr>
<tr>
<td>My institution provided helpful resources related to virtual /hybrid forms of instruction. (ex. examples of best practices, coaching, technology integration specialist, etc.)</td>
<td>40.4% K-12, 39.1% Adult Education, 53.3% Higher Education</td>
<td>47%</td>
</tr>
<tr>
<td>Staff was provided training specific to remote instruction using video conferencing (Zoom, Google Meet, etc.).</td>
<td>57.1% K-12, 58.1% Adult Education, 55.6% Higher Education</td>
<td>56.6%</td>
</tr>
<tr>
<td>Staff was provided training specific to remote instruction using a learning management system (Google Classroom or Canvas).</td>
<td>48.4% K-12, 40.5% Adult Education, 34.8% Higher Education</td>
<td>39.9%</td>
</tr>
<tr>
<td>My institution did not provide any additional supports for technology integration in response to COVID-19.</td>
<td>13.4% K-12, 13.5% Adult Education, 7.6% Higher Education</td>
<td>10.4%</td>
</tr>
</tbody>
</table>
Almost 60% of the participants from the K-12 sector reported that their institutions purchased additional software applications and digital subscriptions for staff integration. About 45% of respondents mentioned that their institutions provided additional training and professional development opportunities for new software applications and digital subscriptions. Additionally, 43.6% of participants stated that updated and clear protocols or expectations of technology use and integration were established and disseminated. A significant number, 61.1% of respondents, reported that their institutions provided additional computer hardware resources, such as Wi-Fi hotspots, extra monitors, microphones, webcams, etc. Results showed that 40.4% of participants indicated that their institutions provided helpful resources related to virtual and hybrid forms of instruction, including examples of best practices, coaching, and technology integration specialists. Results showed 57.1% of respondents mentioned receiving training specific to remote instruction using platforms like Zoom or Google Meet while 48.4% of participants reported receiving training specific to platforms like Google Classroom or Canvas. Interestingly, 13.4% of respondents stated that their institutions did not provide any additional supports for technology integration in response to COVID-19.

For adult education, 66.2% of respondents reported the purchase of additional software applications and digital subscriptions by their institutions. Of the participants, 58.1% indicated that they received additional training and professional development opportunities, while 40.5% of respondents mentioned the establishment and dissemination of updated and clear protocols or expectations of technology use and integration. A total of 59.4% of participants reported that they received additional
computer hardware resources from their institutions. Regarding the provision of resources related to virtual and hybrid instruction, 39.1% of respondents indicated receiving such support. Of the participants, 58.1% mentioned receiving training for remote instruction using platforms like Zoom or Google Meet, and 40.5% of respondents reported training specific to platforms like Google Classroom or Canvas. Only 13.5% of participants stated that their institutions did not provide any additional technology integration supports during the pandemic.

A significant number of respondents from higher education (65.6%) reported that their institutions purchased additional software applications and digital subscriptions as an additional support offered in response to the COVID-19 pandemic while 66.9% of participants indicated receiving additional training and professional development opportunities. A total of 34.8% of respondents mentioned the establishment and dissemination of updated protocols or expectations. A majority of participants, accounting for 58.8%, reported receiving additional computer hardware resources from their institutions. Over half of the respondents, constituting 53.3%, indicated that resources related to virtual and hybrid instruction were made available to them. More than half of the participants, at 55.6%, reported receiving training for platforms like Zoom or Google Meet, while 34.8% of respondents mentioned receiving training specific to platforms like Google Classroom or Canvas. A small fraction of higher education participants, amounting to 7.6%, stated that their institutions did not provide any additional support during the pandemic.

Survey question “At what level does your institution currently provide technology resources and user support in relation to what was provided during the COVID-19
pandemic?” directly addresses instructors’ perceptions of how institutions can help improve their technology integration self-efficacy. Among K-12 respondents, 36% reported their institutions have maintained a consistent level of technology resources and user support since the pandemic suggesting that a significant portion of K-12 institutions aimed to ensure the level of support and resources remained unchanged even after the immediate crisis of the pandemic subsided. Among respondents from K-12 education, 27% indicated that the technology resources acquired during the pandemic were not sustained or renewed post-pandemic. In the K-12 education sector, 19% of respondents reported a decline in the accessibility or frequency of training and support following the pandemic. Among K-12 participants, 24.6% indicated an increase in new technology resources post-pandemic, while 15.9% noted an increase in technology learning opportunities following the pandemic.

In the adult education sector, 48.6% of participants reported experiencing a consistent level of technology resources and user support. From this sector, 16.2% of respondents indicated a decline in the renewal or maintenance of pandemic-specific technology resources, and 10.8% of participants from adult education reported a reduction in the accessibility or frequency of training and support post-pandemic. This could reflect a return to pre-pandemic norms or a belief that the heightened level of support during the pandemic was exceptional and not sustainable long-term. Also, in this sector, 32.4% of respondents mentioned an increase in new technology resources post-pandemic, and 25.7% of participants from adult education indicated an uptick in technology learning opportunities after the pandemic.
A significant number of participants (45.7%) from higher education reported that their institutions maintained a consistent level of technology resources and user support post-pandemic. Among higher education participants, 24.9% indicated a lack of renewal or maintenance of pandemic-specific technology resources, while 16.3% reported a decline in the accessibility or frequency of training and support following the pandemic. This might be indicative of the challenges of managing larger student populations and the complexities of higher education in a post-pandemic world. A portion of the respondents, 26.7%, indicated an increase in new technology resources post-pandemic, and 18.1% noted an increase in technology learning opportunities after the pandemic.

**Summary**

The demographic profile of the participants showcased a diverse representation across various educational domains providing a comprehensive insight into the technological integration practices across various educational sectors during and post the COVID-19 pandemic. While a majority of educators across all sectors reported consistent levels of technological resources and support post-pandemic, there were notable differences in their experiences and perceptions. Barriers such as time constraints, expenses, and institutional culture played significant roles in shaping these experiences. Chapter 5 will discuss survey results in relation to the literature, additional discoveries, implications, and recommendations.
Chapter 5: Discussion

A summary of the research will be discussed and interpreted within the frameworks presented in Chapter 2. The significance of this research, relative to technology integration for instruction across three sectors of education is examined. Implications and recommendations for future research end the chapter.

The scope of the conclusions presented below is limited to the specific data gathered within the constraints of the survey and the respondents’ ability to provide accurate representations of their experience. Thus, applied to other situations, these conclusions may not yield similar assumptions. Still, the conclusions provided are relevant to affirming the results of similar studies and continuing the ever-evolving conversation surrounding technology use in education for teaching and learning.

Since the urgent, unforeseen need to transition to virtual learning at the beginning of the COVID-19 pandemic, technology integration has become an essential component of instructional practices across K-12, adult education, and higher education settings. Still, many educators face significant challenges in utilizing technology tools and resources to enhance teaching and learning experiences. Through a comprehensive exploration of factors perceived by educators, this study contributes to the development of evidence-based strategies and recommendations for supporting teachers in effectively integrating technology into their instructional practices across diverse educational settings.

The findings emphasize the need for tailored strategies and resources, including time, to support educators in different sectors, ensuring that the momentum gained in technological integration during the pandemic is not only maintained but further
improved in the future. Understanding the factors that influence K-12, adult education, and higher education technology integration is essential for informing professional development programs, policies, and resource allocation strategies that can support teachers in effectively incorporating technology into their instructional practices (Ertmer et al., 2010). By identifying the specific challenges faced by instructors in different educational sectors, such as access to technology, pedagogical training, and institutional support, this research can inform targeted interventions to enhance technology integration and improve educational outcomes in the post-pandemic era. The key research questions (RQ) guiding this inquiry into the technology integration practices of instructors in K-12, adult education, and higher education were:

1. What factors do instructors currently perceive as having an effect on their level of technology integration?
2. Has the experience of virtual learning, due to COVID-19, altered instructors' self-perceptions of their digital competence?
3. What are instructors' perceptions of how institutions can help improve their technology integration self-efficacy?

**Implications and Interpretations of RQ1**

When considering the factors instructors currently perceive as influencing their level of technology integration, it is important to first have an understanding of how innovation can diffuse throughout an organization, what it looks like when members of that organization integrate technology effectively, as well as the innate variables that determine if an innovation will even be accepted by educators. Approaching innovation by being deliberate and systematic, relative barriers can be mitigated and supports can be
utilized to their full potential. As a result, the following components warrant further discussion in relation to RQ1:

1. Understanding the relationship between the diffusion process, the continuum of effective integration, and an educator's self-perception of their own innovativeness.

2. Lack of time is a significant barrier that can act as a gatekeeper to innovation.

3. Professional learning, both through the institution, as well as learning self-selected outside of the institution, is significant.

How Innovation Happens and What It Looks Like

Using Rogers’ (2003) diffusion of innovation theory, the answer options provided to participants for how they see themselves with regards to integrating technology and how they describe the culture of their institution relative to technology integration were intentionally crafted to mirror the adopter categories that were discussed in Chapter 2. The different adopter categories identified by Rogers (2003) are innovators, early adopters, early majority, late majority, and laggards and they all vary in their readiness to embrace new ideas. One of the most interesting points of the responses is how they reflected the outline of Rogers’ established bell curve (see figure 2.1) of adopter categories. These results are also interesting because, despite some slight variations between sectors, respondents tended to rate their institution as significantly more early adopting than they rated themselves. There are many reasons why participants could have responded that way, such as their institution having devices or platforms the participants do not know how to use or feeling as if other instructors at their institution are more innovative than they see themselves. However, the researchers did not expect this “me vs.
them” dynamic. A more in-depth, targeted analysis of instructor self-perception with a larger, more diverse sample would provide better insight.

Adopter categories are not the only benefit to understanding the diffusion of innovation theory and how it can explain and guide the process of integrating technology into the classroom. Also recognizing where educators are on the continuum of innovation and helping them navigate the five-step process to embrace innovation creates a systematic foundation for change (Rogers, 2003; Thayer, 2013). It can be used to establish a common language to discuss the innovation process, to categorize innovators in order to understand needs and prioritize supports, as well as reframing technology integration as a change in a social system that requires persuasion and shifts in belief systems and technological self-efficacy (Kozdras & Welsh, 2018, Thayer, 2013). Another necessary component that can encourage successful integration is for institutions to understand and identify the “tipping point” of an innovation and how to move members of the institution up to and beyond that point to a wider acceptance within the organization and eventually to full adoption (Rogers, 2003; Fisher, 2005; Parisot, 1995).

In addition to understanding the diffusion of innovation, institutions can benefit from establishing the consistent use of a common framework such as Koehler and Mishra’s TPACK (2009) (see Figure 2.6) or the Technology Integration Matrix (TIM) (Kozdras & Welsh, 2018) (see Figure 2.7) that were discussed in Chapter 2 (Harris & Yearta, 2020). Establishing a uniform framework can help align content with the appropriate technology tools and to identify weak areas in instruction. An implementation framework like the TIM can help evaluate current technology integration practices and identify areas where targeted professional development would be beneficial and to whom
it would benefit by describing and targeting the use of technology for learning (Kozdras & Welsh, 2018). Similar to Rogers’ (2003) adopter categories, the TIM also provides five descriptive levels for technology integration: entry, adoption, adaptation, infusion, and transformation. A framework such as this enables an institution to have and consistently use clear descriptions of what effective integration looks like for teachers and students, in addition to supporting educators where they are in the continuum of technology integration competence.

**Lack of Time as a Barrier**

A major implication of the results is the *lack of time to learn about/try new tools*, which can have a waterfall effect on effective technology integration. At first glance, lack of time to explore and integrate tools either systematically or organically, is just one of many barriers that the respondents experienced. However, over 90% of participants across all sectors claimed that lack of time is a barrier and deserves to be explored as a core, gate-keeping barrier to technology integration in classrooms. An interesting study published by Francom (2020) cited lack of time as one of the most stable barriers across institutions, time, and levels of instruction. Results from another study reported by Basarmak, et al. (2020) expanded the researchers' interest in exploring lack of time as a barrier and the ongoing effects in education of not addressing it. The study looked at the effect of barriers experienced by teachers using technology and “lifelong learning trends” and found evidence that effective integration of technology by teachers can have an impact on lifelong learning trends of their students, but lifelong learning trends and self-efficacy of teachers could be positively impacted when institutions work to lessen those barriers.
When participants were asked about what they perceive as the most helpful supports for technology integration, *time to explore and integrate tools provided during contracted time* came in second only to *professional development sessions provided by their institution*. So, what becomes apparent with this population is that the most noted barrier and the top two most helpful supports all focus on time as a factor, time to explore and time to learn new tools. Without this dedicated time, instructors have less of an opportunity to build their integration confidence and develop a positive mindset towards using technology in their instruction, which in-turn lowers their technological self-efficacy and inclination to be innovative (Basarmak, et al., 2020).

Lack of time being a major barrier for technology integration in instruction has been known for decades. More than 20 years ago, several researchers, including Ertmer (1999), Cuban (2001), and Jacobson (1998) found that lack of time to explore and integrate technology into the curriculum was the most common challenge, even in technology-rich schools. Taking it back even further, Reich (2021), referring to researchers who were studying an Apple classroom project in the 1980s, said,

> What they found 40 years ago still holds true today: It takes time, even for master teachers, to get to be good at teaching with technology. At first, teachers tend to use new technologies to extend existing practices. Only with time, practice, experimentation, and support do they move on to more novel applications. (para. 14)

Fast forward to the post-COVID teaching environment and the participants in this study, and other recent ones like it, that are still reporting lack of time as one of the primary core barriers experienced when trying to effectively integrate technology beyond
a basic, procedural or substitution level of adoption (Basarmak & Hamutoglu, 2020; Basarmak, et al., 2020; Kempton, 2023; Reich, 2021).

Even before COVID-19, it was clear that simply having devices, technical skills, and isolated professional development to use them is not enough to integrate technology effectively into instruction (Ertmer, 1999; Stanhope & Rectanus, 2016; Van Broekhuizen, 2016). The perceptions the participants reported as their post-COVID-19 experience supported the belief that teachers at all levels of education need time to explore tools, time to develop technology integration plans alongside curriculum, and time to learn and practice using new tools, all in an ongoing fashion (Camilleri & Camilleri, 2021; Ogodo et al., 2021; Reich, 2021).

**Opportunities for Professional Learning Are Important**

The results of studies that address teacher self-perception, availability of time for technology integration, and opportunities for professional development, presented by Ertmer, et al. (2012), Basarmak, et al. (2020), and Kopcha (2012), respectively, are not surprising to the researchers in this study. Over 85% of respondents felt professional development provided by their institution was helpful and 57% of respondents felt self-sought workshops and conferences outside of their institution were helpful. This inclination toward professional learning in relation to technology integration becomes clearer when considering the four variables prescribed by Rogers (2003) that determine how likely/unlikely an innovation would be adopted. These four attributes appeared throughout responses to the survey:

- **attributes of the innovation** - includes ease of use, how closely it aligns with existing tools/practices, adaptability to existing infrastructure, etc.
the channels of communication - includes professional development, coaching/modeling, sharing best practices, dissemination of success stories, etc.

time - deadlines, timing vs. need, time to learn and explore before adopting, length of time to adoption from introduction, etc.

decision-making process and social system of the potential adopters - includes norms, interconnectedness, approval processes, personal characteristics of the instructors, students, administration, etc.

While all four variables were woven throughout the responses in this study, the variable of time and the channels of communication, namely those for professional learning, were instrumental in understanding the data as it related to factors having an effect on participants’ level of technology integration.

The barrier of time was discussed in the previous section but without adequate support through professional development and coaching, educators cannot take advantage of new tools and platforms, even if provided time. A promising development appeared in the results when comparing earlier studies, such as Francom (2020) who found over a 3-year time-series study in K-12 schools that professional development related to technology integration might be declining over time. When looking at the findings in this study, participants reported that during the COVID-19 pandemic they received additional training and/or professional development opportunities related to software applications and digital subscriptions (58.9%), video conferencing (56.6%), learning management systems (39.9%), and information and resources related to virtual and hybrid forms of instruction (47%). Fast forward to post-COVID-19 levels and only 16.2% of respondents reported having less training and support after returning to traditional modes of
instruction, this is in addition to 18.8% saying they actually now have more training and support than during the pandemic and 43.5% reporting levels were about the same pre/post COVID.

Despite the promising results of the above comparison, efficient professional development and training continues to be the most cited reason by teachers for the lack of technology implementation (Hesse et al., 2020). It is essential for instructors to have a baseline level of digital competency, ongoing professional development, peer collaboration, and learning opportunities that can support continuous growth and improvement in this area (Mannila et al., 2018).

**Implications and Interpretations of RQ2**

Research question two (RQ2) states: "Has the experience of virtual learning, due to COVID-19, altered instructors' self-perceptions of their digital competence?" Several trends and patterns emerged as the researchers analyzed the data in response to RQ2. The experience of virtual learning during the COVID-19 pandemic impacted participants' self-perceptions of their digital competence. Across all educational sectors, there was a noticeable increase in confidence and proficiency in utilizing various digital tools for instruction. This shift in perception suggests a willingness to explore and implement innovative teaching methods facilitated by technology. This aligns with the research by Mannila et al., (2018) who argue that educators must continuously incorporate digital proficiency into their teaching methods, emphasizing the importance of their confidence in keeping up with the rapid changes in technology.

While most participants reported a significant increase in their digital skills, it is worth noting that some individuals still expressed lower confidence levels or avoidance
of certain technologies. Teachers’ resistance to change and fear of failure can lead to lower confidence in using technology tools, as found in the literature by Dress (2016, cited in Hartman et al., 2019). Educators accustomed to traditional approaches may require additional support. This suggestion highlights the importance of tailored support and continuous professional development to address varying comfort levels and experiences among instructors. A discussion of further interpretations and implications follow.

**Years of Teaching and Teaching Experience Online Hybrid Pre-COVID-19**

The findings for years of teaching and teaching experience online hybrid pre-COVID-19 highlighted the importance of prior experience in online or hybrid teaching in shaping the participants' confidence and competence in technology integration. These results highlight the crucial role of prior experience as being a factor in shaping confidence and competence in integrating technology. Notably, participants in higher education who had substantial prior virtual teaching experience demonstrated a higher level of comfort and proficiency with virtual learning platforms. This existing foundation of digital competence likely contributed to their elevated confidence levels in using technology for instruction. Based on the adult learning theory framework and the assumptions of andragogy presented in this study, Ferreira & MacLean (2018) emphasized the importance of recognizing the prior experience of adult learners in the learning environment. For this reason, it is essential for instructors who train or teach adults to incorporate and utilize learners' past experiences as a fundamental aspect of the teaching methodology.
Conversely, in the K-12 and adult education sectors, where participants' prior virtual teaching experience was more evenly distributed, the need for swift adaptation to virtual learning due to the pandemic became evident. This indicated that participants in these sectors had to rapidly acquire and adjust their technological skills, potentially resulting in varying levels of confidence and competence in technology integration.

Overall, these findings underscore the significance of prior teaching experience in shaping these participants' readiness to integrate technology, particularly in higher education. It also highlights the importance of targeted support and training programs to address variations in digital competence across different educational sectors. This conclusion is drawn within the context of existing research by Mannila et al., (2018) who argue that ongoing professional development, peer collaboration, and learning opportunities can support continuous growth and improvement in this area.

**Perceived Importance of Technology Integration**

The findings for questions related to “Technology Use and Perceptions of Integration - Active Use of Technology”, “Perceived Importance of Integrating Technology into Instruction”, “Overall Confidence Integrating Technology as an Instructor”, and “Self-Reflection Regarding Technology Integration” underscore the shifts in how technology is integrated into instruction across various educational sectors. In higher education and K-12, participants demonstrated a high level of comfort and reliance on digital tools, integrating technology into their daily teaching. This suggests a potential alignment in the frequency of technology use between these two sectors. A possible explanation for the alignment of frequency of technology use between these two sectors can be found in the literature by Rogers (2000), who argues that colleges and
universities produce K-12 teachers, so technology competencies should be taught to primary and secondary schools and their teachers. These competencies should also be taught to higher education professors, regardless of their discipline. Further, found in the literature by Parker (1997, as cited in Rogers, 2000), argues that faculty members serve as role models for prospective teachers and their use of, and attitudes toward, educational technology significantly impact future teachers’ implementation of technology in instruction. Conversely, while the adult education sector showed a slightly lower percentage of daily technology use, it still indicated a substantial reliance on digital tools for instructional purposes within this domain. This highlights a contrast in technology integration levels between higher education and adult education.

Moreover, the perceived importance of technology integration into instruction is universally recognized across all educational sectors. Most participants in higher education, K-12, and adult education categorized it as "very important" or "important." This underscores the crucial role of technology in instruction, with minimal percentages indicating lower importance. This shared sentiment likely stems from the amplified reliance on technology during the COVID-19 pandemic, indicating a notable shift in participants' perceptions of its importance in the educational landscape. This shared sentiment likely stems from the amplified reliance on technology during the COVID-19 pandemic, indicating a notable shift in participants' perceptions of its importance in the educational landscape. This shift in perceptions is aligned with the argument in the literature by Ibrahim et al. (2020), who argue that COVID-19 indirectly changed the landscape of the country's education system.
Additionally, the results show a positive and balanced trend in participants' confidence levels in integrating technology. Across all sectors, the majority expressed being very confident, followed by a similar portion reporting confidence in using technology. This indicates an overall positive shift in participants' self-perceptions of digital competence, reflecting notable improvement in their confidence in using technology for instructional purposes. Furthermore, participants across all educational sectors exhibited similar patterns in self-reflection regarding technology integration, with a balanced distribution in categories like "First to try technology" and "Leader in sharing and encouraging innovation." This suggests no significant difference in how participants perceived their roles in technology integration. Each sector also demonstrated a comparable proportion of participants comfortable with new technology, indicating a relatively uniform level of engagement and confidence across different educational domains. The data also indicated receptiveness to adopting new technologies, though a small portion in each sector expressed reluctance, implying varying levels of preparedness and comfort when adapting to technological shifts.

**Comfort Level by Instructional Mode**

The findings shed light on participants' preferences and comfort levels with different instructional modes. Across all sectors, in-person instruction emerged as the preferred choice, indicating a strong confidence in traditional face-to-face teaching methods. Building on the insights of the literature by researchers Sankar & Sankar (2010), face-to-face communication is the most effective way to deliver instruction because it allows the participants to provide visual cues and verbal feedback and communicate via body language. They also contend that face-to-face training is
beneficial when the learners need more computer skills to access the information in online training. However, there was also a notable level of moderate comfort expressed for the hybrid mode, which integrates both in-person and online elements. Similarly, many participants felt moderately comfortable with entirely online instruction. Both synchronous and asynchronous modes displayed consistent patterns of comfort levels, with a substantial percentage feeling very comfortable, while some expressed moderate comfort. This suggests that participants generally demonstrated confidence in adapting to various modes of instruction. Nonetheless, a percentage of participants reported minimal comfort, particularly in hybrid and asynchronous methods. This highlights the importance of recognizing educators' varying comfort levels and preferences when planning and implementing different modes of instruction. This conclusion aligns with the scholarly perspectives of Thiele et al. (2014), who argue that choosing tools aligned with learning objectives, assessing faculty and student comfort, planning for distractions, and overcoming barriers are necessary for successful implementation.

Confidence Integrating Tools for Design, Communication, and Instruction

The findings from the study also provide insights into instructors' confidence levels with specific technology tools across different educational sectors. In adult and higher education, there is a trend of lower confidence, especially with 3-D printers, suggesting a need for additional support or training. Teachers across all sectors demonstrate confidence in using microphones and cameras. Confidence levels vary for video and screencasting tools, with adult education participants typically reporting average confidence.
Regarding communication tools, participants show varying comfort levels. Communication and presentation tools receive universal high confidence, indicating widespread comfort in their use for instruction. However, desktop publishing and document formatting differ. In K-12 and higher education, confidence levels are evenly distributed between high and average. In contrast, adult education had a higher proportion of average confidence, suggesting a potential area for additional support. Video conferencing tools receive high confidence across all sectors, confirming instructors’ comfort in using them for communication and instruction. This heightened confidence may have been particularly pronounced during periods of remote learning prompted by COVID-19, where video conferencing emerged as the primary mode of instruction due to the unavailability of in-person classes. This conclusion is drawn within the context of existing research by Camilleri & Camilleri (2021), in Chapter 2.

K-12 educators show high confidence in professional social media usage, suggesting enhanced exposure or training. In their study on K-12 teachers, Hunter & Hall (2018) found that increased social network use was positively linked to higher trust and comfort levels with these platforms. This suggests that enhanced exposure and training in social media can boost educators’ confidence and trust in utilizing these networks professionally. Additionally, the study highlights a positive association between trust in social networks and the adoption of evidence-based Classroom Management strategies, emphasizing the potential benefits of such exposure for instructional practices and professional development. In adult and higher education, confidence levels are more evenly distributed between high and average, indicating a comparable confidence level.
However, both sectors have a lower percentage of participants in the high confidence category, potentially signifying a need for additional training or support.

Participants across all educational sectors, including higher education, exhibit high confidence in researching through databases and online resources and utilizing Learning Management Systems (LMS) such as Google Classroom, Canvas, and Blackboard. This is particularly evident in higher education, where a substantial proportion reports exceptionally high confidence, underscoring their strong reliance on LMS platforms for instructional purposes. The need for educators, including school staff, to stay current with the latest learning management systems and other platforms for enhanced technology integration is emphasized in studies like Wang et al. (2004).

Regarding assessing student work and facilitating learning, participants in the K-12 sector demonstrate balanced confidence levels. In contrast, both adult and higher education express a recognized need for improvement or additional training, as participants report only average confidence in this domain. Regarding utilizing spreadsheet functions, participants across all sectors exhibit varying degrees of confidence. In the K-12 sector, confidence levels are distributed between high and average. Participants in adult education indicate room for improvement, with a significant proportion expressing average confidence. Higher education participants display a comparable distribution between high and average confidence levels.

These results highlight educators from different educational sectors have distinct comfort levels and preferences in integrating technology into their teaching practices. Drawing these conclusions within the context of existing research by Baran & Uygun (2016 as cited in Alemdag et al., 2020), who argue that the effectiveness of the design-
based learning (DBL) approach, which includes collaborative artifact designs, discussions, and reflections, has been consistently observed in the development of Technological Pedagogical Content Knowledge (TPACK) and technology integration practices across diverse teacher education contexts.

While there are areas of high confidence and proficiency, particularly in using communication tools, researching online resources, and employing LMS, there are also areas where participants expressed lower levels of confidence, such as utilizing 3-D printers or specific design and creation tools. This result aligns with a study by Cheng et al. (2023) that argues that teachers’ pedagogical, self-efficacy, and technology value beliefs were generally not correlated with their 3D printing integration practices except for a negative correlation between teachers’ self-efficacy in pedagogical content knowledge. While 3D printing integration is seen as beneficial for students, it is not without challenges, including logistic and technical issues, lack of time and resources, insufficient ability to connect 3D printing with curriculums, and teaching students with individual differences.

The data also highlights the impact of prior experience with online or hybrid teaching on educators’ confidence and competence in technology integration. This suggests that targeted training and support programs are particularly beneficial for those with limited prior experience. Furthermore, the findings emphasize the significance of considering educators’ comfort and preferences when designing instructional approaches. This tailored approach can help create a more effective and engaging learning environment for educators and students.
COVID-19 Effect on Ability and Competence to Integrate Technology

In the K-12 sector, participants demonstrated a significant surge in their overall technology integration skills, signifying a substantial improvement in proficiency. They also reported a balanced distribution of confidence in using new tools, with a notable number experiencing a significant increase. The interest in technology integration content was evenly distributed, and participants noted a balanced increase in their ability to instruct others. Similarly, in adult education, a significant proportion of participants noted improvement in their overall technology integration skills, showcasing a substantial increase. Confidence in using new tools was distributed evenly, with a considerable number reporting a significant increase. Interest in technology integration content displayed a fairly even distribution. Notably, participants exhibited a significant increase in their ability to demonstrate and share knowledge. In higher education, respondents reported a moderate improvement in their overall technology integration skills, with most noting a moderate increase. Confidence in using new tools showed a balanced distribution, indicating a comparable comfort level. The interest in technology integration content was fairly evenly distributed. A substantial proportion noted a significant increase in their ability to instruct others, reflecting a willingness to share knowledge and skills. Participants also displayed an improved ability to choose appropriate tools, with a balanced distribution between significant improvement and some improvement.

In summary, the analysis results for RQ2 underscore the dynamic nature of technology integration in education and the need for ongoing professional development to enhance educators’ digital competence across various educational sectors. The
disparities in confidence levels regarding technology integration across different educational sectors could be attributed to several factors.

Firstly, distinct pedagogical philosophies in each sector play a significant role. These philosophies shape how technology is integrated into instruction, influencing instructors' comfort levels with specific tools. As discussed in chapter 2, TPACK, a framework by Koehler and Mishra (2009), encapsulates integrating technology, pedagogy, and content knowledge. It emphasizes the optimal blend of these domains for effective teaching and fostering 21st-century skills in students.

Additionally, research in chapter 2 by Somera (2018, as cited in Hartman et al., 2019) argued that the education system is shifting towards learner-centeredness with technological integration. Studies confirm the effectiveness of various platforms and teacher readiness for tech adoption. However, more research is needed on the attitudes and confidence of transitioning teachers. Acquiring skills for tech-integrated pedagogy is crucial. Continuous research and digital competence integration are vital due to rapid tech development, highlighting the importance of teacher self-efficacy. Moreover, the availability of resources varies across sectors. Differences in funding for technology, access to training programs, and the presence of technical support can significantly impact confidence levels. Additionally, the specifics of the curriculum in each sector may dictate the necessity and proficiency required in using specific tools for design and creation.

Again, with reference to the literature in chapter 2, Inverso et al. (2017) argue that teaching digital skills can promote higher-order learning through technology integration. However, limited internet access, funding, scheduling time, and resistance pose barriers
to implementing digital literacy in the adult education literacy (AEL) classroom. Rosen & Vanek (2017) argue that adult basic education (ABE) needs help with technology access due to underfunding. This argument highlights the need for appropriate curricula and professional development.

Further, when many schools, colleges, and universities were already experiencing reduced income from tuition and state funding, additional financial pressures emerged. This aligns with research in chapter 2 by Zhou et al. (2021) who argues that since the Great Recession of 2008, numerous districts have been dealing with stagnant or declining revenues (p. 2).

Professional development opportunities also contribute to the disparities. Variances in the availability and effectiveness of training programs for instructors in different sectors can significantly influence their confidence levels in using instructional technology.

Instructors' prior experience and exposure to specific tools or technologies are another crucial factor. Those with more familiarity and practice will likely feel more comfortable using them in their instructional practices.

The teaching context and the nature of subjects taught in each sector are additional considerations. Different subjects and learning environments may require varying levels of technological integration, influencing confidence levels accordingly.

Moreover, the characteristics and needs of the student population play a role. Student demographics can impact the emphasis placed on certain technologies, which, in turn, affects instructors' confidence in using them effectively.
Institutional support and leadership also play a vital role. The level of encouragement and support from the educational institution, as well as administrative policies, significantly influence instructors' confidence in using instructional technology.

Lastly, the quality and availability of technology infrastructure, including hardware and software, can greatly impact confidence levels. This argument aligns with the study by Inan & Lowther (2010), discussed in Chapter 2, which contends infrastructure barriers can lead to a lack of instructor self-efficacy.

Disparities in technology resources can lead to variations in instructors' comfort levels with specific tools. By recognizing and addressing these factors, educational institutions can develop tailored strategies to bridge the confidence gaps and promote effective technology integration across all sectors.

Implications and Interpretations of RQ3

The findings provided notable insight into the instructors' perceptions of how institutions can help improve their technology integration self-efficacy. Bandura’s (1997) self-efficacy theory is a foundational aspect of the study. The theory emphasizes the belief in one's capabilities to organize and execute the courses of action required to manage prospective situations. In the context of technology integration, this would pertain to instructors' beliefs in their ability to effectively use and integrate technology into their teaching.

Barriers to Technology Integration

High levels of instructor self-efficacy are associated with more effective teaching practices and improved student outcomes. Instructors who believe in their ability to make a difference tend to be more motivated and persistent in their teaching efforts (Barton &
Barriers can often interfere with an instructor’s willingness to put forth the effort necessary to implement technology consistently and with fidelity. For K-12 respondents, the most frequently cited barrier to technology integration was the "Lack of time to learn about and try new tools," with 44.4% of K-12 participants indicating they often experience this barrier while 51.4% of all respondents cited this as a barrier. This is a higher percentage than both K-12 and higher education sectors (45.2%). However, it is noteworthy that only 19.5% of higher education respondents often feel a "Lack of IT/Tech staff to assist," which is slightly lower than the K-12 sector.

Survey results related to the barriers participants cite as impediments to instructional technology integration add depth to the existing literature. While previous studies (Bell, R. L., Maeng, J. L., & Binns, I. C., 2013) have highlighted time constraints and lack of support as common barriers, this study provides a more in-depth examination by examining three educational sectors, thus offering a more granular understanding of the challenges faced by instructors. Institutions can leverage these insights to design targeted interventions and support programs, ensuring more effective and seamless technology integration.

**Technology Supports Instructors Perceived as “Most Helpful”**

Existing literature emphasizes the role of professional development in enhancing self-efficacy (Holden & Rada, 2011). In the current study, a significant number of participants affirmed the need for more comprehensive training programs with 86.5% of all respondents citing “Professional development sessions provided by your institution” as what they find most helpful during the technology integration process. Findings based on integration barriers in education point to a need for institutions across all sectors to
prioritize dedicated professional development time for technology integration (Dysart, S., & Weckerle, C. 2015). External workshops and conferences are particularly favored by the adult education sector, with 74.3% of respondents finding them helpful, a notably higher percentage compared to the K-12 and higher education sectors. This could point to the adult educators having more schedule flexibility or those institutions emphasizing professional development as an extension to their existing job. Ultimately, time to develop technology integration skills during contracted time is seen as preferable by all three sectors with 65.6% of respondents indicating it as a helpful support. Since COVID-19, instructors desire extended time for development of instructional skills needed especially for the development of skills in technology (Baker & Lutz, 2021).

**Support Provided by Institutions for Instruction/Learning During COVID-19**

In response to COVID-19, institutions addressed the immediate need for technology integration by providing various supports during the transition to virtual learning. The supports varied across the different educational sectors in this study. Participants collectively reported (63.8%) that “additional software applications and/or digital subscriptions were purchased by my institution for staff to integrate.” Although there seems to be no shortage in the programs and systems educational institutions implement in response to increasing technology needs, this often does not solve the issue of instructors needing time to implement technology. It was a top barrier for all the participants. This suggests that dedicated time within their professional schedule is crucial for instructors to effectively learn and implement new technologies (Kopcha et al., 2020). Since COVID-19, instructors have seemed to benefit from the increase of technology integration resources made available as survey results show that the virtual
learning experience altered instructors' self-perceptions of their digital competence. For instance, 85% of K-12 respondents, 87% of higher education respondents, and 79% of adult education respondents reported an increase in their competence in demonstrating and selecting the right tools. A primary factor in determining the level of technology integration an instructor employs, is the amount of time to learn and practice newly acquired skills (Hartshorne et al., 2020). Institutions can utilize this information to make sure to allow for sufficient practice time whenever they require instructional technology to be implemented.

The implications of this study are clear: for instructors to effectively integrate technology into their teaching, they need both the tools and the training to use them. Institutions that wish to enhance technology integration should prioritize professional development and provide consistent support to their staff. Moreover, understanding the barriers instructors face, such as time constraints, can help institutions develop targeted interventions to address these challenges. The findings also suggest that as the world of education continues to evolve in the face of challenges like the COVID-19 pandemic, the need for effective technology integration will only grow. Institutions that prioritize this now will be better positioned to deliver high-quality education in the future.

**Recommendations and Future Research**

There are several gaps in the type and scope of the data collected for this study that would benefit from further research. There were also several complications in the actual design of the study and survey instrument that deserve mentioning. These items would need to be addressed to extend and further the findings and assumptions developed through this study.
While taking the survey, participants were routed to a different survey page based on their indicated sector. After deploying the survey, the researchers questioned if three separate surveys would have served the needs of the study just as well as the segregated version, without complicating the structure of the raw data. This study also relied on the basic features of Google Forms, which reduced the structural options, as well as the options for data collection and management. Employing another survey platform, such as Qualtrics, might yield a more functional tool. However, the overall design of the survey allowed all the data to remain in one depository and the familiarity of using Google Forms in Education was likely beneficial for the researchers and the respondents.

A large discrepancy between the number of respondents from each state presented another limitation. Any analysis that used the participants’ state as a variable was in no way representative of the population. Missouri accounted for almost half the participants with the balance divided between the 11 other states. For instance, one sector had zero participants from several states and all three sectors had some states with only one or two participants. This limitation made it impossible, based on the survey results, to come to any conclusions about participants from specific locations. It is suggested to either find more successful ways to encourage participation from other states, such as soliciting at state/regional educator conferences or contacting relative professional organizations to help solicit invitations to participate. Researchers also have the option of limiting the scope to focus on gathering respondents in single states or even regions within single states.

There was a vast difference in the number of participants per sector. The majority of respondents indicated they were from higher education. There are many reasons why
this may have happened, but the researchers feel that the wording of the question was not clear in relation to the sector an instructor is employed and where their actual position is simply housed. Survey question 13 stated, “I am answering this survey as an instructor at”, and then gave the following options: “a K-12 school”, “a college or university”, and “an adult or continuing education institution.” Participants were then directed to the section of the survey belonging to the sector of education they chose. The researchers found that what respondents chose did not always accurately represent the sector in which they were an instructor. As it is written, respondents were asked to select their institution, but researchers really wanted to know the sector they were an educator for, not where their position was simply housed. The researchers believe this led to at least part of the discrepancy between the number of participants in each sector. For instance, those working in adult education programs are often employed by K-12 or community college institutions, which may lead respondents to choose K-12 or higher education when they are really employed in adult education.

A third limitation that appeared in the data was the lack of diversity in race and gender. Just the nature of the discrepancy in numbers may have created an unintended bias that was not addressed. With an overwhelming majority of participants being women (70%) and 57% being specifically White women, it was impossible to explore any results related to gender and race. Researchers did not consider the effect this may have on results. Participants that were not White or women may have different experiences with technology and different self-perceptions relative to technology integration in instruction that are unique from the majority. However, because this study did not target under-represented groups, it is impossible to obtain results without this discrepancy.
To extend this study and continue exploring the topic of how teacher perceptions affect technology integration, more in-depth and complex analysis of the following topics is recommended:

- Explore how lack of time is interrelated to other significant barriers, as well as why institutions are so willing to keep purchasing devices, platforms, etc. but are not as willing to maximize their investment by purchasing the relative training packages, investing in technology coaches and integration specialists, or providing dedicated time for teachers to explore and learn new technology tools.

- Take a deeper dive into tools that teachers use effectively to achieve more innovative paths to teaching and learning. Investigate why some tools are more effective than others for a larger count of instructors. This study collected data on how teachers perceived their competence using specific tools but there were not enough variables to provide a comprehensive analysis of topics related to specific tools.

- Limit or expand the population and geographic location of participants to obtain a more consistent distribution of participants. Changing the focus to more or less, wider or narrower, etc. can provide additional key correlations that may be missed in a more generalized study such as the one presented here.

- Apply different frameworks and conceptual models in order to look at the supports and barriers relative to technology integration, technology self-efficacy of instructors, and the evolution of these topics through different lenses.

- In addition to applying a different framework, a study to explore how institutions approach technology integration from the beginning of introduction through to
adoption would be interesting. It would be worth comparing different methods of introduction, communication, management, and adoption to explore how it might affect the longevity and sustainability of innovations within individual institutions.

- Reduce the focus from this study to just barriers or supports for instructors regarding technology integration. One could also center the focus on just instructors or institutions and how they navigate, plan, and carry out technology integration initiatives.

- This study intentionally omitted student achievement in relation to technology integration by instructors, but this is a topic that needs exploring, especially when researchers discuss effective use of technology by teachers. To be labeled “effective,” it also needs to correlate to improvement and innovation in the education of students.

- Apply Rogers’ (2003) diffusion of innovation theory to other aspects of change in education. The researchers in this study feel the framework provided by the theory, if applied in the initial planning stages, can be instrumental in predicting and managing the process of change in technology integration.

- Studies that delve into the enduring effects of the COVID-19 pandemic on educators' proficiency in integrating technology. A long-term approach would enable researchers to track the evolution of these skills over an extended period, offering insights into the long-term impact of this unforeseen period.

- A critical area of focus should be an in-depth examination of each educational sector. Tailoring investigations to each sector could uncover nuanced patterns and
unique challenges educators face when integrating technology, i.e., specific tools, teaching methodologies, or institutional policies that have a bearing on educators' confidence and competence.

- Investigating how educators' digital competence impacts student success can offer crucial insights for educational policy and practice.

**Conclusion**

This study examined the critical role of the diffusion of innovation theory, adult learning theory, and self-efficacy theory for instructors across various educational sectors in relation to technology integration. It echoes the importance of addressing barriers such as time constraints and emphasizes the need for comprehensive professional development programs, especially in the post-COVID landscape. The findings suggest that institutions should prioritize dedicated time and consistent support for technology integration, particularly in the evolving post-pandemic educational landscape. By focusing on these key areas, institutions can enhance instructors' technology integration self-efficacy, ultimately leading to more effective teaching practices.
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Appendix A

Final Amended Survey

Instructor Perceptions of Factors Affecting Technology Integration

Your submission of this form serves your consent to participate in a research study. Click here to review the information about the study and how your information will be used.

* Indicates required question

1. My age is best described as *
   Mark only one oval.
   
   [ ] 18-25
   [ ] 26-32
   [ ] 33-40
   [ ] 40-50
   [ ] 51-59
   [ ] 60+

2. My gender is best described as *
   Mark only one oval.
   
   [ ] Female
   [ ] Male
   [ ] Transgender
   [ ] Non-binary/non-conforming
   [ ] Prefer not to respond

3. My race or ethnicity is best described as *
   Mark only one oval.
   
   [ ] American Indian or Alaskan Native
   [ ] Asian/Pacific Islander
   [ ] Black or African American
   [ ] Hispanic
   [ ] White or Caucasian
   [ ] Other: ____________________________

4. Describe your educational background by selecting all that apply: *
   Check all that apply.
   
   [ ] High school diploma
   [ ] Associates degree
   [ ] Professional trade/workforce education program
   [ ] Bachelor's degree
   [ ] Master's degree
   [ ] Specialist degree
   [ ] Doctorate
   [ ] Other: ____________________________
5. How involved are you in professional organizations that are relevant to your position as an instructor?

Mark only one oval.

- I am not an official member of any professional organization related to my position. I do not attend meetings or conferences for professional organizations.
  1.  

- I am a very active member of at least one professional organization. I attend meetings regularly and often read professional publications related to my position.

6. The institution where I am an instructor is

Mark only one oval.

- Public
- Private

7. The geographic location where I am an instructor is best described as

Mark only one oval.

- Urban
- Suburban
- Rural

8. My institution is located in this state:

Mark only one oval.

- Illinois
- Indiana
- Iowa
- Kansas
- Michigan
- Minnesota
- Missouri
- Nebraska
- North Dakota
- Ohio
- South Dakota
- Wisconsin
9. I taught online and/or hybrid prior to Covid-19. *

   *Mark only one oval.
   
   ☐ Yes
   ☐ No

10. Overall, on a scale of 1-4, how important do you feel it is to integrate technology in your instruction. *

   *Mark only one oval.

   It is not really important in relation to other factors of my instruction.

   __________

   1

   2

   3

   4

   It is one of the most important factors in my instruction.

11. I actively use technology in my instruction *

   For this study, "using technology" is defined as any use or combination of the use of computer hardware/software, digital devices, Internet resources, audio/video resources, and educational theory and/or practice to facilitate instruction and the learning of students with these resources.

   *Mark only one oval.

   ☐ daily
   ☐ 2-3 times a week
   ☐ at least once a week
   ☐ a couple times a month
   ☐ rarely/only when required

12. Which of the following descriptions reflect how you see yourself with regard to integrating technology: *

   *Mark only one oval.

   ☐ I always want to be the first to try new technology tools and seek out opportunities to do so.
   ☐ I like adopting the innovative ideas of others and I am a leader in sharing and encouraging innovation.
   ☐ I am comfortable using new technology but like to be intentional and use established "best practices" to implement it.
   ☐ I tend to be hesitant to change, and will only adopt new technology after it has been implemented by the majority.
   ☐ I prefer a traditional classroom and am very skeptical of integrating technology to change what has always worked for me.
13. I am answering this survey as an instructor at

Mark only one oval.
- a K-12 school. Skip to question 14
- a college or university. Skip to question 25
- an adult or continuing education institution. Skip to question 36

Technology use by instructors at K-12

Please answer the following questions from the view point of an instructor at a K-12 institution. This section will help researchers understand your experience and confidence integrating technology into your instruction.

14. Years you have worked providing instruction at the K-12 Level *

Mark only one oval.
- 4-8 years
- 9-15 years
- 16-20 years
- 21-25 years
- 26+ years

15. At what grade levels are you currently working? *

Check all that apply:
- K-2
- 3-5
- 6-8
- 9-12
- Other:

16. What is your specific curricular area(s) of instruction? *

________________________________________________________

17. Rate your overall confidence integrating technology as an instructor.*

Mark only one oval.

I struggle integrating technology. I am not confident using technology with students.

1
2
3
4

I am confident using most tools. I like to research and try new tools that I can bring to my instruction.
18. Please rate the following instructional modes by your comfort level: *

*Mark only one oval per row.*

<table>
<thead>
<tr>
<th>Instructional Mode</th>
<th>Very Comfortable</th>
<th>Moderately Comfortable</th>
<th>Minimally Comfortable</th>
<th>Not at All Comfortable</th>
</tr>
</thead>
<tbody>
<tr>
<td>in-person</td>
<td></td>
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<tr>
<td>online</td>
<td></td>
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<tr>
<td>hybrid—a sizeable portion of the course is online with a few in-person sessions as a class</td>
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<tr>
<td>synchronously—all students meet at the same time, either online or in-person</td>
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<tr>
<td>asynchronously—students are able to work on the course when it is most convenient for them, individually.</td>
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</tbody>
</table>
19. My confidence level when integrating these specific technology tools as an instructor is *

*High* confidence includes competent use of "advanced" features. *Average* is everyday use of standard features by the majority of users. *Low* is struggling with basic features. *Avoidance* is if you intentionally do not use the tool because of a lack of confidence using it. *No experience with* is if you have never used it or you do not have access to this tool.

*Mark only one oval per row.*

<table>
<thead>
<tr>
<th>Tool</th>
<th>High</th>
<th>Average</th>
<th>Low</th>
<th>Avoidance</th>
<th>No Experience With/Access To</th>
</tr>
</thead>
<tbody>
<tr>
<td>Email</td>
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<td></td>
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</tr>
<tr>
<td>Spreadsheet functions</td>
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<td></td>
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</tr>
<tr>
<td>Video production/screencasting</td>
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<tr>
<td>Desktop publishing and document formatting</td>
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<tr>
<td>Learning Management Systems (LMS)-- Google Classroom, Canvas, Blackboard, etc.</td>
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<tr>
<td>Video conferencing-- Zoom, Google Meet, WebEx, Skype, etc.</td>
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<tr>
<td>Researching databases and online resources</td>
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<tr>
<td>Using microphones and cameras</td>
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<tr>
<td>3-D printers</td>
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<tr>
<td>Tools for assessment of student work/learning</td>
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<tr>
<td>Using technology tools to design and create</td>
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<tr>
<td>Tools for communication and presentation</td>
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<tr>
<td>Social media for communication and/or professional growth</td>
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</table>
20. What are some barriers that you currently experience when attempting to integrate technology?

Mark only one oval per row.

<table>
<thead>
<tr>
<th></th>
<th>Often</th>
<th>Sometimes</th>
<th>Rarely</th>
<th>Never or N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of time to learn about and try new tools</td>
<td></td>
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<tr>
<td>Lack of access to functioning tools/poor infrastructure</td>
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<tr>
<td>Expense of tools and their maintenance</td>
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<tr>
<td>Lack of administrative support to learn and integrate new things</td>
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<tr>
<td>Lack of IT/Tech staff to assist</td>
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<tr>
<td>Culture of my institution and expectations for technology use</td>
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<tr>
<td>Lack of student experience/ability with technology tools</td>
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<tr>
<td>Not knowing/approaching the appropriate tool for the immediate task</td>
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</table>

21. What supports do you find most helpful when learning new technology and integrating it into your instruction? Select all that apply and add any supports that you find most helpful.

Check all that apply:

- Professional development sessions provided by your institution
- Workshops/conferences/learning opportunities that you seek out and take advantage of outside of your institution
- Individual help from an instructional coach/instructional specialist at your institution
- Time to explore and integrate tools is provided during contracted time
- Administration makes it a building/department expectation that is consistent over time
- The infrastructure at your institution allows for more seamless integration
- The availability and institutional use of the tool is guaranteed for the long term
- Other instructors and/or administrators model its use
- There are supports provided by the institution for your students using the tools
- My institution provides tools that make sense and improve your instruction and/or the management of your instruction
- Resource materials like video instructions and help sheets are made easily available
- Other:
22. What institutional supports were put into place for technology use and integration during the Covid-19 pandemic?

Check all that apply.

- Additional software applications and/or digital subscriptions were purchased by my institution for staff to integrate.
- Additional training and/or professional development opportunities were provided for new software applications and/or digital subscriptions.
- Updated and clear protocols/expectations of technology use and integration were established and disseminated.
- My institution provided additional computer hardware resources to instructors during the pandemic. (ex. WIFI hotspots, extra monitors, microphones, webcams, etc.)
- My institution provided helpful resources related to virtual and hybrid forms of instruction. (ex. examples of best practices, coaching, technology integration specialist, etc.)
- Staff was provided training specific to remote instruction using video conferencing (Zoom, Google Meet, etc.).
- Staff was provided training specific to remote instruction using a learning management system (Google Classroom or Canvas).
- My institution did not provide any additional supports for technology integration in response to Covid-19.

□ Other: ____________________________________
23. How do you feel Covid-19 has affected your ability and competence to integrate technology * into your instruction?

Mark only one oval per row.

<table>
<thead>
<tr>
<th>My overall technology integration skills for instruction</th>
<th>Increased significantly</th>
<th>Increased some</th>
<th>About the same</th>
<th>Decreased some</th>
<th>Decreased significantly</th>
</tr>
</thead>
<tbody>
<tr>
<td>My confidence in finding and using new tools</td>
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<tr>
<td>My interest in technology integration in my context</td>
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<tr>
<td>My ability to show others how to use tools</td>
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</tr>
<tr>
<td>My ability to choose tools that are appropriate for a given task</td>
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<td>My ability to use technology for assessment of student learning</td>
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<tr>
<td>My ability to design/manage a course with an online learning management system</td>
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</tbody>
</table>

24. How did your institution respond to Covid-19, in relation to the teaching and learning environment? (Please check all that apply.)

Check all that apply.

- [ ] We pivoted to 100% virtual instruction for the remainder of the 2019-2020 school year after the March 2020 "Stay at home" orders.
- [ ] Remote instruction was primarily synchronous using a video conferencing platform such as Zoom or Google Meet.
- [ ] Remote instruction was primarily asynchronous using a learning management system such as Google Classroom or Canvas.
- [ ] We remained 100% remote for at least the first semester of the 2020-2021 school year.
- [ ] My institution transitioned back to in-person learning using a hybrid model of virtual and in-person instruction before going back 100% in person.
- [ ] My institution returned to 100% in-person learning for all of the 2020-2021 school year.
- [ ] My institution continues to develop or subscribe to an ongoing online program for those students/families that still want to remain virtual.
- [ ] Other: ____________________
Technology use by instructors in higher education

Please answer the following questions from the viewpoint of an instructor at an institution of Higher Education. This section will help researchers understand your experience and confidence integrating technology into your instruction.

25. Years you have worked providing instruction at an institution of Higher Education? *

Mark only one oval.

☐ 4-8 years
☐ 9-15 years
☐ 16-20 years
☐ 21-25 years
☐ 26+ years

26. Please select your position *

Mark only one oval.

☐ adjunct
☐ full time professor
☐ department/institution leadership
☐ Other: __________________________

27. What is your curricular area(s) of instruction? *

____________________________________

28. Rate your overall confidence integrating instructional technology as an instructor. *

Mark only one oval.

I struggle integrating technology. I am not confident using technology with students.

1

2

3

4

I am confident using most tools. I like to research and try new tools that I can bring to my instruction.

____________________________________
29. Please rate the following instructional modes by your comfort level:*  

Mark only one oval per row.

<table>
<thead>
<tr>
<th>Mode</th>
<th>Very comfortable</th>
<th>Moderately comfortable</th>
<th>Minimally comfortable</th>
<th>Not at all comfortable</th>
</tr>
</thead>
<tbody>
<tr>
<td>in-person</td>
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<td>synchronously—all students meet at the same time, either online or in-person</td>
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</table>
30. My confidence level when integrating these specific technology tools as an instructor is *

*"High" confidence includes competent use of "advanced" features. "Average" is everyday use of standard features by the majority of users. "Low" is struggling with basic features. "Avoidance" is if you intentionally do not use the tool because of a lack of confidence using it. "No experience with" is if you have never used it or you do not have access to this tool.

Mark only one oval per row.

<table>
<thead>
<tr>
<th>Tool Description</th>
<th>High</th>
<th>Average</th>
<th>Low</th>
<th>Avoidance</th>
<th>No Experience With/Access To</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spreadsheet functions</td>
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<tr>
<td>Video production/screencasting</td>
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<tr>
<td>Desktop publishing and document formatting</td>
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<td>Learning Management Systems (LMS)—Google Classroom, Canvas, Blackboard, etc.</td>
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<tr>
<td>Video conferencing—Zoom, Google Meet, WebEx, Skype, etc.</td>
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<tr>
<td>Researching databases and online resources</td>
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<td>Using microphones and cameras</td>
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<td>3-D printers</td>
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<td>Tools for communication and presentation</td>
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<td>Social media for communication and/or professional growth</td>
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</tbody>
</table>
31. What are some barriers that you currently experience when attempting to integrate technology?

Mark only one oval per row.

<table>
<thead>
<tr>
<th></th>
<th>Often</th>
<th>Sometimes</th>
<th>Rarely</th>
<th>Never or N/A</th>
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<tbody>
<tr>
<td>Lack of time to learn</td>
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<tr>
<td>about and try new tools</td>
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<tr>
<td>Lack of access to</td>
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<td>functioning tools/poor</td>
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<td>infrastructure</td>
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<td>Expense of tools and</td>
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<td>their maintenance</td>
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<td>Lack of administrative</td>
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<td>support to learn and</td>
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<td>integrate new things</td>
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<td>Lack of IT/tech</td>
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<td>staff to assist</td>
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<td>and expectations for</td>
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<td>technology use</td>
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<tr>
<td>Lack of student</td>
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<tr>
<td>experience with</td>
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<td>technology tools.</td>
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<td>Not having/knowing</td>
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<td>about an appropriate</td>
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<td>tool for the immediate</td>
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<td>task</td>
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</table>

32. What supports do you find most helpful when learning new technology and integrating it into your instruction?

Select all that apply and add any supports that you find most helpful.

Check all that apply:

- [ ] Professional development sessions provided by your institution
- [ ] Workshops/conferences/learning opportunities that you seek out and take advantage of outside of your institution
- [ ] Individual help from an instructional coach to integration specialist at your institution
- [ ] Time to explore and integrate tools is provided during contracted time
- [ ] Administration makes it a building/department expectation that is consistent over time
- [ ] Infrastructure at your institution allows for more seamless integration
- [ ] Availability and institutional use of the tool is guaranteed to be long term
- [ ] Other instructors and/or administrators model its use
- [ ] Resources provided by the institution for your students using the tools
- [ ] My institution provides tools that make sense and improve your instruction and/or the management of your instruction
- [ ] Resource materials like video instructions and help sheets are made easily available
- [ ] Other:
33. What institutional supports were put into place for technology use and integration during the *Covid-19 pandemic?

Check all that apply.

- Additional software applications and/or digital subscriptions were purchased by my institution for staff to integrate.
- Additional training and/or professional development opportunities were provided for new software applications and/or digital subscriptions.
- Updated and clear protocols/expectations of technology use and integration were established and disseminated.
- My institution provided additional computer hardware resources to instructors during the pandemic. (ex. WIFI hotspots, extra monitors, microphones, webcams, etc.)
- My institution provided helpful resources related to virtual and hybrid forms of instruction. (ex. examples of best practices, coaching, technology integration specialist, etc.)
- Staff was provided training specific to remote instruction using video conferencing (Zoom, Google Meet, etc.).
- Staff was provided training specific to remote instruction using a learning management system (Google Classroom or Canvas).
- My institution did not provide any additional supports for technology integration in response to Covid-19.
- Other: _______________________________
34. How do you feel Covid-19 has affected your ability and competence to integrate technology into your instruction? * 

Mark only one oval per row.

<table>
<thead>
<tr>
<th></th>
<th>Increased significantly</th>
<th>Increased some</th>
<th>About the same</th>
<th>Decreased some</th>
<th>Decreased significantly</th>
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</thead>
<tbody>
<tr>
<td>My overall technology integration skills for instruction</td>
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<tr>
<td>My confidence in finding and using new tools</td>
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</table>

35. How did your institution respond to Covid-19, in relation to the teaching and learning environment? (Please check all that apply.) * 

Check all that apply:

- [ ] We pivoted to 100% virtual instruction for the remainder of the 2019-2020 school year after the March 2020 "Stay at home" orders.
- [ ] Remote instruction was primarily synchronous using a video conferencing platform such as Zoom or Google Meet.
- [ ] Remote instruction was primarily asynchronous using a learning management system such as Google Classroom or Canvas.
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- [ ] My institution returned to 100% in-person learning for all of the 2020-2021 school year.
- [ ] My institution continues to develop or subscribe to an ongoing online program for those students/families that still want to remain virtual.
- [ ] Other: ____________________________________

*Skip to question 47*
Technology use by Adult and Continuing Education Instructors

Please answer the following questions from the view point of an instructor in a program for Adult and Continuing Education Instructors. This section will help researchers understand your experience and confidence integrating technology into your instruction.

36. Years you have worked providing instruction at an institution for Adult and Continuing Education:

Mark only one oval.

☐ 4-8 years
☐ 9-15 years
☐ 16-20 years
☐ 21-25 years
☐ 26+ years

37. Please select your position *

Mark only one oval.

☐ adjunct
☐ full time professor
☐ department/institution leadership
☐ Other: __________________________

38. What is your specific curricular area(s) of instruction? *

_________________________________________________________

39. Rate your overall confidence integrating instructional technology as an instructor: *

Mark only one oval.

I struggle integrating technology. I am not confident using technology with students.

1

2

3

4

I am confident using most tools. I like to research and try new tools that I can bring to my instruction.

_________________________________________________________
40. Please rate the following instructional modes by your comfort level:

Mark only one oval per row.

<table>
<thead>
<tr>
<th></th>
<th>Very comfortable</th>
<th>Moderately comfortable</th>
<th>Minimally comfortable</th>
<th>Not at all comfortable</th>
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<tr>
<td>in-person</td>
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<td>hybrid—a sizeable portion of the course is online with a few in-person sessions as a class</td>
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<td>synchronously—all students meet at the same time, either online or in-person</td>
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<td>asynchronously—students are able to work on the course when it is most convenient for them, individually.</td>
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</table>
41. My confidence level when integrating these specific technology tools as an instructor is *

*High* confidence includes competent use of “advanced” features. *Average* is everyday use of standard features by the majority of users. *Low* is struggling with basic features. *Avoidance* is if you intentionally do not use the tool because of a lack of confidence using it. *No experience with* is if you have never used it or you do not have access to this tool.

*Mark only one oval per row.*

<table>
<thead>
<tr>
<th>Tool Description</th>
<th>High</th>
<th>Average</th>
<th>Low</th>
<th>Avoidance</th>
<th>No Experience With/Access To</th>
</tr>
</thead>
<tbody>
<tr>
<td>Email</td>
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<tr>
<td>Spreadsheet functions</td>
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</table>
42. What are some barriers that you currently experience when attempting to integrate technology?

*Mark only one oval per row.*

<table>
<thead>
<tr>
<th></th>
<th>Often</th>
<th>Sometimes</th>
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<tr>
<td>Expense of tools and their maintenance</td>
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<tr>
<td>Lack of administrative support to learn and integrate new things</td>
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<tr>
<td>Lack of IT/Tech staff to assist</td>
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<tr>
<td>Culture of my institution and expectations for technology use</td>
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<tr>
<td>Lack of student experience with technology tools.</td>
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<tr>
<td>Not having/knowing about an appropriate tool for the immediate task</td>
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</table>

43. What supports do you find most helpful when learning new technology and integrating it into your instruction?

Select all that apply and add any supports that you find most helpful.

*Check all that apply.*

- Professional development sessions provided by your institution
- Workshops/conferences/learning opportunities that you seek out and take advantage of outside of your institution
- Individual help from an instructional coach or integration specialist at your institution
- When time to explore and integrate tools is provided during contracted time
- When administration makes it a building/department expectation that is consistent over time
- When the infrastructure at your institution allows for a more seamless integration
- When the availability and institutional use of the tool is guaranteed to be long term
- When other instructors and/or administrators model its use
- When there are supports provided by the institution for your students using the tools
- When my institution provides tools that make sense and improve your instruction and/or the management of your instruction
- When resource materials like video instructions and help sheets are made easily available
- Other: _________________________________
44. What institutional supports were put into place for technology use and integration during the Covid-19 pandemic?

Check all that apply.

☐ Additional software applications and/or digital subscriptions were purchased by my institution for staff to integrate.

☐ Additional training and/or professional development opportunities were provided for new software applications and/or digital subscriptions.

☐ Updated and clear protocols/expectations of technology use and integration were established and disseminated.

☐ My institution provided additional computer hardware resources to instructors during the pandemic. (ex. WiFi hotspots, extra monitors, microphones, webcams, etc.)

☐ My institution provided helpful resources related to virtual and hybrid forms of instruction. (ex. examples of best practices, coaching, technology integration specialist, etc.)

☐ Staff was provided training specific to remote instruction using video conferencing (Zoom, Google Meet, etc.).

☐ Staff was provided training specific to remote instruction using a learning management system (Google Classroom or Canvas).

☐ My institution did not provide any additional supports for technology integration in response to Covid-19.

☐ Other: __________________________________________
45. How do you feel Covid-19 has affected your ability and competence to integrate technology into your instruction?

Mark only one oval per row.

<table>
<thead>
<tr>
<th>My overall technology integration skills for instruction</th>
<th>Increased significantly</th>
<th>Increased some</th>
<th>About the same</th>
<th>Decreased some</th>
<th>Decreased significantly</th>
</tr>
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<tbody>
<tr>
<td>My confidence in finding and using new tools</td>
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</table>

46. How did your institution respond to Covid-19, in relation to the teaching and learning environment? (Please check all that apply.)

Check all that apply.

- [ ] We pivoted to 100% virtual instruction for the remainder of the 2019-2020 school year after the March 2020 "Stay at home" orders.
- [ ] Remote instruction was primarily synchronous using a video conferencing platform such as Zoom or Google Meet.
- [ ] Remote instruction was primarily asynchronous using a learning management system such as Google Classroom or Canvas.
- [ ] We remained 100% remote for at least the first semester of the 2020-2021 school year.
- [ ] My institution transitioned back to in-person learning using a hybrid model of virtual and in-person instruction before going back 100% in person.
- [ ] My institution returned to 100% in-person learning for all of the 2020-2021 school year.
- [ ] My institution continues to develop or subscribe to an ongoing online program for those students/families that still want to remain virtual.
- [ ] Other: ________________________________

Skip to question 47
Current Status of Your Institution

47. At what level does your institution currently provide technology resources and user support in relation to what was provided during the Covid-19 pandemic? *

Check all that apply.

☐ Same - My institution has provided a consistent level of technology resources and user support.
☐ Less Resources - Technology purchased specifically for teaching and learning during the Covid-19 pandemic was not renewed/maintained since the Covid-19 pandemic.
☐ Less Support - Training and support provided specifically for teaching and learning during the Covid-19 pandemic is significantly less accessible/frequent.
☐ More Resources - My institution has increased the level of new technology resources for users since Covid-19.
☐ More Support - My institution has increased the level of technology learning opportunities to support users.
☐ Other: ____________________________

48. How would you describe the current, overall culture of your institution in relation to technology integration? *

Mark only one oval.

☐ We like to be the first to try new things. New ideas and information about innovation are shared regularly. Effective technology integration is expected by administration, students, and staff.
☐ We have several staff leaders that work to encourage technology integration but it isn't institution-wide. We are aware of the need to innovate and are comfortable implementing new things.
☐ We tend to implement new ideas before the average institution. Our staff is cautious and wants to see success stories and evidence of the innovation's effectiveness.
☐ We are hesitant to change, and will only adopt an innovation after it has been tried by the majority of other institutions. There are no expectations for technology integration from administration.
☐ We are conservative when it comes to new technology and are very skeptical of change. Administration does not recognize innovation as a necessity.

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Your name, address, phone number and email:

Christina Northrup-Thompson

211 Shumate Ave.

Maryland Heights, MO 63043

314-809-3449

cnorthrup-thompson@mail.umsl.edu

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Last updated October 2022
Appendix E

Permission from TPACK.org to Use Figure 2.6

Conditions have been met for the permission below, retrieved July 31, 2023 from:


Using the TPACK Image
Published on May 11, 2011 by M. Koehler

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If those conditions are met, there is no need to contact tpack.org, Matthew Koehler, or Punya Mishra. We hereby grant permission to use the image under the above stipulations.
Appendix F

Permission From FCIT to use Figure 2.7

Re: Permission to use image of TIM in dissertation...
James Welsh <jlwelsh@usf.edu>
Tue 4/25/2023 8:08 AM

To:
Northrup-Thompson, Christina <cnorthrup-thompson@mail.umsl.edu>

Cc:
tim@fcit.us <TIM@fcit.us>;
royw <royw@mac.com>

WARNING: This message has originated from an External Source. This may be a phishing expedition that can result in unauthorized access to our IT System. Please use proper judgment and caution when opening attachments, clicking links, or responding to this email.

Hi Christina,
The Florida Center for Instructional Technology (FCIT) at the University of South Florida is pleased to grant you non-exclusive permission to reproduce the Technology Integration Matrix as it appears on our web site (fcit.usf.edu/matrix/) for the purposes described in your permission-request email (copied below). By accepting this permission, you agree to include the credit “The Florida Center for Instructional Technology, fcit.usf.edu” in all forms of publication/production.
Good luck with your work!
James

James L. Welsh, Ph.D.
jlwelsh@usf.edu
Director, FCIT
University of South Florida, College of Education
http://fcit.usf.edu/
Appendix G

Original IRB Letter of Approval

May 24, 2023

Principal Investigator: Christina Northrup-Thompson
Department: Education EDD-Doctorate

Your IRB Application to project entitled Factors Affecting Technology Integration for Teachers at K-12, Adult Education, and Higher Education Institutions Since Virtual Learning Due to COVID-19 was reviewed and approved by the UMSL Institutional Review Board according to the terms and conditions described below:

<table>
<thead>
<tr>
<th>IRB Project Number</th>
<th>2096703</th>
</tr>
</thead>
<tbody>
<tr>
<td>IRB Review Number</td>
<td>392748</td>
</tr>
<tr>
<td>Initial Application Approval Date</td>
<td>May 24, 2023</td>
</tr>
<tr>
<td>IRB Expiration Date</td>
<td>May 24, 2024</td>
</tr>
<tr>
<td>Level of Review</td>
<td>Exempt</td>
</tr>
<tr>
<td>Project Status</td>
<td>Active - Exempt</td>
</tr>
<tr>
<td>Exempt Categories</td>
<td>45 CFR 46.104d(2)(6)</td>
</tr>
</tbody>
</table>

Risk Level: Minimal Risk

Edited to remove mention of collecting email addresses. This document serves as the informed consent agreement for participants as well as the invitation for participation. It will be linked or posted in all solicitations to participants.

Edited to remove the question that collects email addresses and added two questions—one question in section 1 is about the participants perceived innovator level and then a question in section 5 about the innovative culture of their institution. This is the survey that will be used for this study. There are 26 questions for each participant. Each participant will answer questions from section 1 and section 5 but depending on the sector of education they are employed in, they will answer the questions in section 2 (K-12), section 3 (higher education), or section 4.
(adult and continuing education). The survey is anonymous and it is expected to take approximately 10 minutes for participants to complete.

Edited to remove mention of collecting email addresses. This is a copy of the email that will be sent to representatives/administrators at the institutional level. The informed consent (also included as an attachment to this application) will be attached to the email and we request that the representative/administrator distribute it to instructors at the institution, inviting them to participate.

Edited to remove mention of collecting email addresses. This is a copy of the email that will be sent to potential participants through direct email contact by the researchers. In addition to the informed consent included in the text of the email, participants are able to link directly to the survey for participation.

Edited to remove mention of collecting email addresses. This is the post that will be released to contacts and relative professional organizations on social media outlets such as Twitter, LinkedIn, and Facebook. It includes an invitation to participate and a link to the informed consent agreement that is also attached to this application—which then includes a link to the actual survey.

The principal investigator (PI) is responsible for all aspects and conduct of this study. The PI must comply with the following conditions of the approval:

1. Enrollment and study related procedures must remain in compliance with the University of Missouri regulations related to interaction with human participants at https://www.umsystem.edu/ums/rules/collected_rules/research/ch410/410.010_research_involving_humans_in_experiments.
2. No subjects may be involved in any study procedure prior to the IRB approval date or after the expiration date.
3. All changes must be IRB approved prior to implementation utilizing the Exempt Amendment Form.
4. The Annual Exempt Form must be submitted to the IRB for review and approval at least 30 days prior to the project expiration date to keep the study active or to close it.
5. Maintain all research records for a period of seven years from the project completion date.

If you are offering subject payments and would like more information about research participant payments, please click here to view the UM Policy: https://www.umsystem.edu/ums/policies/finance/payments_to_research_study_participants

If you have any questions or concerns, please contact the UMSL IRB Office at 314-516-5972 or email to irb@ums.edu.

Thank you,
UMSL Institutional Review Board
Appendix H

Original Pilot Survey

Note: An electronic version is available here:
https://drive.google.com/file/d/10y9Hkj$qDwAzeLH-xYxg$qBwJ7dUUCwDnj/view?usp=drive_li
https://drive.google.com/file/d/10y9Hkj$qDwAzeLH-xYxg$qBwJ7dUUCwDnj/view?usp=drive_linknk

Instructor Perceptions of Factors Affecting Technology Integration

Your submission of this form serves as your consent to participate in a research study. Click here to review the information about the study and how your information will be used.

* Indicates required question

1. My age is best described as *
   Mark only one oval.
   - 18-25
   - 26-32
   - 33-40
   - 40-50
   - 51-59
   - 60+

2. Describe your educational background by selecting all that apply. *
   Check all that
   - High school diploma
   - Associates degree
   - Professional/trade/workforce education program
   - Bachelor’s
   - Master’s
   - Specialist degree
   - Doctorate
   - Other:

3. How involved are you in professional organizations that are relevant to your position as an instructor? *
   Mark only one oval.
   - I am not an official member of any professional organizations related to my position. I do not attend meetings or conferences for professional organizations.
   - 1
   - 2
   - 3
   - I am a very active member of at least one professional organization. I attend meetings regularly and often read professional publications related to my instruction.
4. The institution where I am an instructor is.*
   *Mark only one oval.*
   
   [ ] Public
   [ ] Private

5. The geographic location where I am an instructor is best described as.*
   *Mark only one oval.*
   
   [ ] Inner-city
   [ ] Suburban
   [ ] Rural

6. My institution is located in this zip code.*
   ________________________________

7. I taught online/hybrid prior to Covid-19.*
   *Mark only one oval.*
   
   [ ] Yes
   [ ] No

8. Overall, on a scale of 1-5, how important do you feel it is to integrate technology into your instruction.*
   *Mark only one oval.*
   
   It is not really important in relation to other factors of my instruction.

   1
   2
   3
   4
   5

   It is one of the most important factors in my instruction.
9. I actively use technology in my instruction.

For this study, "using technology" is defined as any use or combination of the use of computer hardware/software, digital devices, Internet resources, audio/video resources, and educational theory and/or practice to facilitate instruction and the learning of students with these resources.

Mark only one oval.

☐ daily
☐ 2-3 times a week
☐ at least once a week
☐ a couple times a month
☐ rarely/only when required

10. Which of the following descriptions reflect how you see yourself with regard to integrating technology.

Mark only one oval.

☐ I always want to be the first to try new technology tools and seek out opportunities to do so. I am often the first to develop new ideas.
☐ I like adopting new technology and the innovative ideas of others. I am a leader in sharing and encouraging innovation.
☐ I am comfortable using new technology but like to be intentional and use established "best practices" to implement it.
☐ I tend to be hesitant to change and will only adopt new technology after it has been implemented by the majority.
☐ I prefer a traditional classroom and am very skeptical of integrating technology to change what has always worked for me.

11. I am answering this survey as an instructor at

Mark only one oval.

☐ a K-12 school. Skip to question 12
☐ a college or university. Skip to question 24
☐ an adult or continuing education institution. Skip to question 36

Technology use by Instructors at K-12

Please answer the following questions from the viewpoint of an instructor at a K-12 institution. This section will help researchers understand your experience and confidence integrating technology into your instruction.

12. Years you have worked providing instruction at the K-12 Level

Mark only one oval.

☐ 1-3 years
☐ 4-8 years
☐ 9-15 years
☐ 16-20 years
☐ 21-25 years
☐ 26+ years
13. At what grade levels are you currently working? *
   Check all that apply:
   - [ ] K-2
   - [ ] 3-5
   - [ ] 6-8
   - [ ] 9-12
   - [ ] Other: ____________________________

14. What is your specific curricular area(s) of instruction? *
   ____________________________

15. Rate your overall confidence integrating technology as an instructor: *
   Mark only one oval.
   ____________________________
   I struggle integrating technology. I am not confident using technology with students.

   1
   2
   3
   4
   5

   I am confident using most tools. I like to research and try new tools that I can bring to my instruction.
16. Please rate the following instructional modes by your comfort level: *

*Mark only one oval per row.*

<table>
<thead>
<tr>
<th></th>
<th>Very comfortable</th>
<th>Moderately comfortable</th>
<th>Minimally comfortable</th>
<th>Not at all comfortable</th>
</tr>
</thead>
<tbody>
<tr>
<td>in-person</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>online</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hybrid--a</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>sizeable portion of</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>the course is online</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>with a few in-person</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>sessions as a class</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>synchronously--</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>all students</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>meet at the same</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>time, either online</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>or in-person</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>asynchronously--</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>students are able to</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>work on the course</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>when it is most</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>convenient for them,</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>individually.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
17. My confidence level when integrating these specific technology tools as an instructor is: *

"High" confidence includes competent use of "advanced" features. "Average" is everyday use of standard features by the majority of users. "Low" is struggling with basic features. "Avoidance" is if you intentionally do not use the tool because of a lack of confidence using it. "No experience with" is if you have never used it or you do not have access to this tool.

Mark only one oval per row.

<table>
<thead>
<tr>
<th>High</th>
<th>Average</th>
<th>Low</th>
<th>Avoidance</th>
<th>No Experience With/Access To</th>
</tr>
</thead>
<tbody>
<tr>
<td>Email</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spread sheet functions</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Video production/screencasting</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Desktop publishing and document formatting</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Learning</td>
<td>Management</td>
<td>Systems (LMS)—Google Classroom, Canvas, Blackboard,</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Video conferencing—Zoom, Google Meet, WebEx, Skype, etc.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teaching classes that are 100% virtual</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Researching databases and online resources</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Using microphones and cameras</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3-D printers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tools for assessment of student work/learning</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Using technology tools to design and create</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tools for communication and presentation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social media for communication and/or professional growth</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
18. What are some barriers that you currently experience when attempting to integrate technology? 

*Mark only one oval per row.*

<table>
<thead>
<tr>
<th></th>
<th>Often</th>
<th>Sometimes</th>
<th>Rarely</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of time to learn about and try new tools</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lack of access to functioning tools/poor infrastructure</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Expense of tools and their maintenance</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lack of administrative support to learn and integrate new things</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lack of IT/Tech staff to assist</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Culture of my institution and expectations for technology use</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lack of student experience/ability with technology tools</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not having/ knowing about an appropriate tool for the immediate task</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

19. Use this space to expand on your perception of barriers that you experience when integrating technology. Please include ones that you experience that may not be listed in the previous list:

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
20. What supports do you find most helpful when learning new technology and integrating it into your instruction? Select all that apply and add any supports that you find most helpful.*

Check all that apply:

☐ Professional development sessions provided by your institution
☐ Workshops/conferences/learning opportunities that you seek out and take advantage of outside of your institution
☐ Individual help from an instructional coach to integration specialist at your institution
☐ When time to explore and integrate tools is provided during contracted time
☐ When administration makes it a building/department expectation that is consistent over time

☐ When the infrastructure at your institution allows for a more seamless integration
☐ When the availability and institutional use of the tool is guaranteed to be long term
☐ When other instructors and/or administrators model its use
☐ When there are supports provided by the institution for your students using the tools
☐ When my institution provides tools that make sense and improve your instruction and/or the management of your instruction
☐ When resource materials like video instructions and help sheets are made easily available

☐ Other:________________________

21. What institutional supports were put into place for technology use and integration during the Covid-19 pandemic? *

Check all that apply:

☐ Additional software applications and/or digital subscriptions were purchased by my institution for staff to integrate.
☐ Additional training and/or professional development opportunities were provided for new software applications and/or digital subscriptions.
☐ Updated and clear protocols/expectations of technology use and integration were established and disseminated.
☐ My institution provided additional computer hardware resources to instructors during the pandemic. (ex. WiFi hotspots, extra monitors, microphones, webcams, etc.)
☐ My institution provided helpful resources related to virtual and hybrid forms of instruction. (ex. examples of best practices, coaching, technology integration specialist, etc.)
☐ Staff was provided training specific to remote instruction using video conferencing (Zoom, Google Meet, etc.).
☐ Staff was provided training specific to remote instruction using a learning management system (Google Classroom or Canvas).
☐ My institution did not provide any additional supports for technology integration in response to Covid-19.

☐ Other:________________________
22. How do you feel Covid-19 has affected your ability and competence to integrate technology into your instruction?*

*Mark only one oval per row:

<table>
<thead>
<tr>
<th>My overall technology integration skills for instruction</th>
<th>Increased significantly</th>
<th>Increased some</th>
<th>About the same</th>
<th>Decreased some</th>
<th>Decreased significantly</th>
</tr>
</thead>
<tbody>
<tr>
<td>My confidence in finding and using new tools</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>My interest in technology integration in my content</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>My ability to show others how to use tools</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>My ability to choose tools that are appropriate for a given task</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>My ability to use technology for assessment of student learning</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>My ability to design/manage a course with an online learning management system</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
23. How did your institution respond to Covid-19, in relation to the teaching and learning environment? *

Check all that apply:

☐ We pivoted to 100% virtual instruction for the remainder of the 2019-2020 after the March 2020 "Stay at home" orders.
☐ Remote instruction was primarily synchronous using a video conferencing platform such as Zoom or Google Meet.
☐ Remote instruction was primarily asynchronous using a learning management system such as Google Classroom or Canvas.
☐ We remained 100% remote for at least the first semester of 2020-2021.
☐ My institution transitioned back to in-person learning using a hybrid model of virtual and in-person instruction before going back 100% in person.
☐ My institution returned to 100% in-person learning for all of 2020-2021.
☐ My institution continues to develop or subscribe to an ongoing online program for those students/families that still want to remain virtual.
☐ Other: __________________________

Skip to question 48

Technology use by Instructors in Higher Education

Please answer the following questions from the viewpoint of an instructor at an institution of Higher Education. This section will help researchers understand your experience and confidence integrating technology into your instruction.

24. Years you have worked providing instruction at an institution of Higher Education? *

Mark only one oval.

☐ 1-3 years
☐ 4-8 years
☐ 9-15 years
☐ 16-20 years
☐ 21-25 years
☐ 26+ years

25. Please select your position *

Mark only one oval.

☐ adjunct
☐ full time professor
☐ department/institution leadership
☐ Other: __________________________

26. What is your curricular area(s) of instruction? *
27. Rate your overall confidence integrating instructional technology as an instructor: *

Mark only one oval.

- I struggle integrating technology. I am not confident using technology with students.
  1
  2
  3
  4
  5

- I am confident using most tools. I like to research and try new tools that I can bring to my instruction.
28. Please rate the following instructional modes by your comfort level. 

*Mark only one oval per row.*

<table>
<thead>
<tr>
<th>Instructional Mode</th>
<th>Very comfortable</th>
<th>Moderately comfortable</th>
<th>Minimally comfortable</th>
<th>Not at all comfortable</th>
</tr>
</thead>
<tbody>
<tr>
<td>in-person</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>online</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hybrid--a sizeable portion of the course is online with a few in-person sessions as a class</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>synchronously--all students meet at the same time, either online or in-person</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>asynchronously--students are able to work on the course when it is most convenient for them, individually.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
My confidence level when integrating these specific technology tools as an instructor is:

* "High" confidence includes competent use of "advanced" features. "Average" is everyday use of standard features by the majority of users. "Low" is struggling with basic features. "Avoidance" is if you intentionally do not use the tool because of a lack of confidence using it. "No experience with" is if you have never used it or you do not have access to this tool.

Mark only one oval per row.

<table>
<thead>
<tr>
<th>Tool</th>
<th>High</th>
<th>Average</th>
<th>Low</th>
<th>Avoidance</th>
<th>No Experience With/VAccess To</th>
</tr>
</thead>
<tbody>
<tr>
<td>Email</td>
<td></td>
<td></td>
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<td>Tools for communication and presentation</td>
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<td>Social media for communication and/or professional</td>
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</table>
30. What are some barriers that you currently experience when attempting to integrate technology? *  
Mark only one oval per row:

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<th>Often</th>
<th>Sometimes</th>
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<td>Not having/learning about an appropriate tool for the immediate task</td>
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31. Use this space to expand on your perception of barriers that you experience when integrating technology. Please include ones that you experience that may not be listed in the previous list:

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
32. What supports do you find most helpful when learning new technology and integrating it into your instruction? Select all that apply and add any supports that you find most helpful. *

Check all that apply.

☐ Professional development sessions provided by your institution
☐ Workshops/conferences/learning opportunities that you seek out and take advantage of outside of your institution
☐ Individual help from an instructional coach or integration specialist at your institution
☐ When time to explore and integrate tools is provided during contracted time
☐ When administration makes it a building/department expectation that is consistent over time
☐ When the infrastructure at your institution allows for a more seamless integration
☐ When the availability and institutional use of the tool is guaranteed to be long term
☐ When other instructors and/or administrators model its use
☐ When there are supports provided by the institution for your students using the tools
☐ When my institution provides tools that make sense and improve your instruction and/or the management of your instruction
☐ When resource materials like video instructions and help sheets are made easily available
☐ Other: ________________________________

33. What institutional supports were put into place for technology use and integration during the Covid-19 pandemic? *

Check all that apply.

☐ Additional software applications and/or digital subscriptions were purchased by my institution for staff to integrate.
☐ Additional training and/or professional development opportunities were provided for new software applications and/or digital subscriptions.
☐ Updated and clear protocols/expectations of technology use and integration were established and disseminated.
☐ My institution provided additional computer hardware resources to instructors during the pandemic. (ex. Wi-Fi hotspots, extra monitors, microphones, webcams, etc.)
☐ My institution provided helpful resources related to virtual and hybrid forms of instruction. (ex. examples of best practices, coaching, technology integration specialist, etc.)
☐ Staff was provided training specific to remote instruction using video conferencing (Zoom, Google Meet, etc.).
☐ Staff was provided training specific to remote instruction using a learning management system (Google Classroom or Canvas).
☐ My institution did not provide any additional supports for technology integration in response to Covid-19.
☐ Other: ________________________________
34. How do you feel Covid-19 has affected your ability and competence to integrate technology into your instruction?*  
*Mark only one oval per row.

<table>
<thead>
<tr>
<th></th>
<th>Increased significantly</th>
<th>Increased some</th>
<th>About the same</th>
<th>Decreased some</th>
<th>Decreased significantly</th>
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</thead>
<tbody>
<tr>
<td>My overall technology integration skills for instruction</td>
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<tr>
<td>My confidence in finding and using new tools</td>
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<td>My interest in technology integration in my content</td>
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<td>My ability to show others how to use tools</td>
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<td>My ability to choose tools that are appropriate for a given task</td>
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<td>My ability to use technology for assessment of student learning</td>
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<tr>
<td>My ability to design/manage a course with an online learning management system</td>
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</tbody>
</table>
35. How did your institution respond to Covid-19, in relation to the teaching and learning environment? *

Check all that apply:

☐ We pivoted to 100% virtual instruction for the remainder of the 2019-2020 after the March 2020 “Stay at home” orders.
☐ Remote instruction was primarily synchronous using a video conferencing platform such as Zoom or Google Meet.
☐ Remote instruction was primarily asynchronous using a learning management system such as Google Classroom or Canvas.
☐ We remained 100% remote for at least the first semester of 2020-2021.
☐ My institution transitioned back to in-person learning using a hybrid model of virtual and in-person instruction before going back 100% in-person.
☐ My institution returned to 100% in-person learning for all of 2020-2021.
☐ My institution continues to develop or subscribe to an ongoing online program for those students/families that still want to remain virtual.
☐ Other: ____________________________

Skip to question 48

Technology use by Adult and Continuing Education Instructors

Please answer the following questions from the viewpoint of an instructor in a program for Adult and Continuing Education Instructors. This section will help researchers understand your experience and confidence integrating technology into your instruction.

36. Years you have worked providing instruction at an institution for Adult and Continuing Education: *

Mark only one oval.

☐ 1-3 years
☐ 4-6 years
☐ 9-15 years
☐ 16-20 years
☐ 21-25 years
☐ 26+ years

37. Please select your position *

Mark only one oval.

☐ adjunct
☐ full time instructor
☐ department/institution leadership
☐ Other: ____________________________
38. What is your specific curricular area(s) of instruction? *

__________________________________________

39. Rate your overall confidence integrating instructional technology as an instructor: *

Mark only one oval.

________________________
I struggle integrating technology. I am not confident using technology with students.

1
2
3
4
5

________________________
I am confident using most tools. I like to research and try new tools that I can bring to my instruction.
40. Please rate the following instructional modes by your comfort level.

*Mark only one oval per row.*

<table>
<thead>
<tr>
<th></th>
<th>Very comfortable</th>
<th>Moderately comfortable</th>
<th>Minimally comfortable</th>
<th>Not at all comfortable</th>
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<tbody>
<tr>
<td>in-person</td>
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<tr>
<td>online</td>
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<tr>
<td>Hybrid—A sizeable portion of the course is online with a few in-person sessions as a class</td>
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<tr>
<td>Synchronously—All students meet at the same time, either online or in-person</td>
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<tr>
<td>Asynchronously—Students are able to work on the course when it is most convenient for them, individually.</td>
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</table>
41. My confidence level when integrating these specific technology tools as an instructor is: *

*High* confidence includes competent use of "advanced" features. *Average* is everyday use of standard features by the majority of users. *Low* is struggling with basic features. *Avoidance* is if you intentionally do not use the tool because of a lack of confidence using it. *No experience with* is if you have never used it or you do not have access to this tool. *Mark only one oval per row.*

<table>
<thead>
<tr>
<th>Technology Tool</th>
<th>High</th>
<th>Average</th>
<th>Low</th>
<th>Avoidance</th>
<th>No Experience With/Access To</th>
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<tr>
<td>Email</td>
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<td>Spreadsheet functions</td>
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</table>
42. What are some barriers that you currently experience when attempting to integrate technology? 

Mark only one oval per row:

<table>
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<tr>
<th>Lack of time to learn about and try new tools</th>
<th>Often</th>
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<th>Rarely</th>
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<tr>
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43. Use this space to expand on your perception of barriers that you experience when integrating technology. Please include ones that you experience that may not be listed in the previous list:

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44. What supports do you find most helpful when learning new technology and integrating it into your instruction? Select all that apply and add any supports that you find most helpful.

Check all that apply:

- Professional development sessions provided by your institution
- Workshops/conferences/learning opportunities that you seek out and take advantage of outside of your institution
- Individual help from an instructional coach or integration specialist at your institution
- When time to explore and integrate tools is provided during contracted time
- When administration makes it a building/department expectation that is consistent over time
- When the infrastructure at your institution allows for a more seamless integration
- When the availability and institutional use of the tool is guaranteed to be long term
- When other instructors and/or administrators model its use
- When there are supports provided by the institution for your students using the tools
- When my institution provides tools that make sense and improve your instruction and/or the management of your instruction
- When resource materials like video instructions and help sheets are made easily available
- Other: ________________

45. What institutional supports were put into place for technology use and integration during the Covid-19 pandemic?

Check all that apply:

- Additional software applications and/or digital subscriptions were purchased by my institution for staff to integrate
- Additional training and/or professional development opportunities were provided for new software applications and/or digital subscriptions
- Updated and clear protocols/expectations of technology use and integration were established and disseminated
- My institution provided additional computer hardware resources to instructors during the pandemic. (ex. WIFI hotspots, extra monitors, microphones, webcams, etc.)
- My institution provided helpful resources related to virtual and hybrid forms of instruction. (ex. examples of best practices, coaching, technology integration specialist, etc.)
- Staff was provided training specific to remote instruction using video conferencing (Zoom, Google Meet, etc.)
- Staff was provided training specific to remote instruction using a learning management system (Google Classroom or Canvas)
- My institution did not provide any additional supports for technology integration in response to Covid-19
- Other: ________________
46. How do you feel Covid-19 has affected your ability and competence to integrate technology into your instruction? *

Mark only one oval per row:

<table>
<thead>
<tr>
<th>My overall technology integration skills for instruction</th>
<th>Increased significantly</th>
<th>Increased some</th>
<th>About the same</th>
<th>Decreased some</th>
<th>Decreased significantly</th>
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<tbody>
<tr>
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</table>

47. How did your institution respond to Covid-19, in relation to the teaching and learning environment? *

Check all that apply:

- [ ] We pivoted to 100% virtual instruction for the remainder of the 2019-2020 after the March 2020 “Stay at home” orders.
- [ ] Remote instruction was primarily synchronous using a video conferencing platform such as Zoom or Google Meet.
- [ ] Remote instruction was primarily asynchronous using a learning management system such as Google Classroom or Canvas.
- [ ] We remained 100% remote for at least the first semester of 2020-2021.
- [ ] My institution transitioned back to in-person learning using a hybrid model of virtual and in-person instruction before going back 100% in person.
- [ ] My institution returned to 100% in-person learning for all of 2020-2021.
- [ ] My institution continues to develop or subscribe to an ongoing online program for those students/families that still want to remain virtual.
- [ ] Other: ___
Current Status of Your Institution

48. At what level does your institution currently provide technology resources (including user support) in relation to what was provided during the Covid-19 pandemic? *
   Mark only one oval.
   ○ Same - My institution has provided a consistent level of technology resources and user support.
   ○ Less Resources - Technology purchased specifically for teaching and learning during the Covid-19 pandemic was not renewed/maintained since the Covid-19 pandemic.
   ○ Less Support - Training and support provided specifically for teaching and learning during the Covid-19 pandemic is significantly less accessible/frequent.
   ○ More Resources - My institution has increased the level of new technology resources for users since Covid-19.
   ○ More Support - My institution has increased the level of technology learning opportunities to support users.
   ○ Other: __________________________

49. How would you describe the current, overall culture of your institution in relation to technology integration? *
   Mark only one oval.
   ○ We like to be the first to try new things. New ideas and information about innovation are shared regularly. Effective technology integration is expected by administration, students, and staff.
   ○ We have several staff leaders that work to encourage technology integration but it isn’t institution-wide. We are aware of the need to innovate and are comfortable implementing new things.
   ○ We tend to implement new ideas before the average institution. Our staff is cautious and wants to see success stories and evidence of the innovation’s effectiveness.
   ○ We are hesitant to change, and will only adopt an innovation after it has been tried by the majority of other institutions. There are no expectations for technology integration from administration.
   ○ We are conservative when it comes to new technology and are very skeptical of change. Administration does not recognize innovation as a necessity.

50. Is there anything else you would like to add to the information you provided in this survey about your teaching environment, barriers you experience, supports you need and/or already have access to, or how you integrate technology in your instruction?

______________________________________________________________________________________________________________________________

______________________________________________________________________________________________________________________________
Appendix I

IRB Letter of Approval for Amended Survey

August 22, 2023

Principal Investigator: Christina Northrup-Thompson
Department: Education EDD-Doctorate

Your Exempt Amendment Form to project entitled Factors Affecting Technology Integration for Teachers at K-12, Adult Education, and Higher Education Institutions Since Virtual Learning Due to COVID-19 was reviewed and approved by the UMSL Institutional Review Board according to the terms and conditions described below:

<table>
<thead>
<tr>
<th>IRB Project Number</th>
<th>2096703</th>
</tr>
</thead>
<tbody>
<tr>
<td>IRB Review Number</td>
<td>396946</td>
</tr>
<tr>
<td>Initial Application Approval Date</td>
<td>May 24, 2023</td>
</tr>
<tr>
<td>Approval Date of this Review</td>
<td>August 22, 2023</td>
</tr>
<tr>
<td>IRB Expiration Date</td>
<td>May 24, 2024</td>
</tr>
<tr>
<td>Level of Review</td>
<td>Exempt</td>
</tr>
<tr>
<td>Project Status</td>
<td>Active - Exempt</td>
</tr>
<tr>
<td>Risk Level</td>
<td>Minimal Risk</td>
</tr>
<tr>
<td>Approved Documents</td>
<td>This is the new version of the survey questions with all the completed changes that we would like to use.</td>
</tr>
</tbody>
</table>

The principal investigator (PI) is responsible for all aspects and conduct of this study. The PI must comply with the following conditions of the approval:

1. Enrollment and study related procedures must remain in compliance with the University of Missouri regulations related to interaction with human participants at [https://www.umsystem.edu/ums/rules/collected_rules/research/ch410/410.010_research_involving_humans_in_experiments](https://www.umsystem.edu/ums/rules/collected_rules/research/ch410/410.010_research_involving_humans_in_experiments).
2. No subjects may be involved in any study procedure prior to the IRB approval date or after the expiration date.
3. All changes must be IRB approved prior to implementation utilizing the Exempt Amendment Form.
4. The Annual Exempt Form must be submitted to the IRB for review and approval at least 30 days prior to the project expiration date to keep the study active or to close it.
5. Maintain all research records for a period of seven years from the project completion date.
If you are offering subject payments and would like more information about research participant payments, please click here to view the UM Policy: https://www.umsystem.edu/ums/policies/finance/payments_to_research_study_participants.

If you have any questions or concerns, please contact the UMSL IRB Office at 314-516-5972 or email to irb@umsl.edu.

Thank you,
UMSL Institutional Review Board
Appendix J

Informed Consent for Participation

Dear Fellow Educator,

You are invited to participate in a research study that investigates the factors instructors perceive as affecting their level of technology integration, how virtual learning, due to COVID-19, may have altered instructors' self-perceptions of their digital competence, and perceptions of how institutions can improve the technology integration self-efficacy of instructors.

**Project Title:** Factors Affecting Technology Integration for Teachers at K-12, Adult Education, and Higher Education Institutions Since Virtual Learning Due to COVID-19

**Principal Investigators:** Stephanie Collins, Lisa Hollins, Christina Northrup-Thompson

**Department Name:** Department of Education, University of Missouri–St. Louis

**Faculty Advisor:** Dr. Paulette Isaac-Savage

**IRB Project Number:** 2096703

**Please review the following information:** Participation only involves taking a 10-minute online survey. No individually identifying information will be used from the data provided. Your submission is anonymous.

Your participation is voluntary, and you may choose not to participate or withdraw your consent at any time. You will NOT be penalized if you choose not to participate or withdraw. There are no direct benefits for participation. However, through this study we hope to expand the knowledge base of current teacher perceptions and instructional technology integration practices.

There are no known risks associated with this research. We will do everything we can to protect your privacy. Your identity will not be revealed in any publication that may result from this study. In rare instances, a researcher's study must undergo an audit or program evaluation by an oversight agency (such as the Office for Human Research Protection) that would lead to the disclosure of your data and any other information collected by the researcher.

If you have any questions or concerns regarding this study, contact one of the investigators:

- Stephanie Collins - s.collins@mail.umsl.edu
- Lisa Hollins - lhollins@mail.umsl.edu
- Christina Northrup-Thompson - cnorthrup-thompson@mail.umsl.edu
Or, you may also contact the faculty advisor, Dr. Paulette Isaac-Savage - episaac@umsl.edu

You may also contact the University of Missouri–St. Louis Office of Research Compliance, at (314) 516-5972 or irb@umsl.edu regarding your rights as a research participant.

If you agree to the items below, please click here to begin the survey:

- You have read the above information.
- You voluntarily agree to participate.
- You have been an instructor at a K-12, higher education, and/or adult education institution in the Midwest region for at least 4 years.

Thank you for considering to participate.
Appendix K

Survey Submission Confirmation Notice

Your responses have been recorded. We appreciate your participation. If you have any questions or concerns regarding this study, problems arise as a result of your participation, or you wish to withdraw your submission, you may contact one of the investigators:

* Stephanie Collins - s.collins@mail.umsl.edu
* Lisa Hollins - lhollins@mail.umsl.edu
* Christina Northrup-Thompson - cnorthrup-thompson@mail.umsl.edu

Or you may also contact the faculty advisor, Dr. Paulette Isaac-Savage - episaac@umsl.edu
You may also contact the University of Missouri–St. Louis Office of Research Compliance, at (314) 516-5972 or irb@umsl.edu regarding your rights as a research participant.
Appendix L

Social Media Script for Invitation Survey Participation

You are invited to participate in a research study about instructors and technology integration. This research investigates the factors instructors perceive as affecting their level of technology integration, how virtual learning, due to COVID-19, may have altered instructors' self-perceptions of their digital competence, and perceptions of how institutions can improve the technology integration self-efficacy of instructors. Please consider taking a short, 10-minute anonymous survey to participate.

For more information and to participate, please [click this link](#).
Appendix M

Invitation Letter to Institutions for Distribution

Dear Fellow Educator,

Instructors at your institution are cordially invited to participate in a research study conducted by Stephanie Collins, Lisa Hollins, and Christina Thompson from the University of Missouri-St. Louis. This study hopes to expand the knowledge base on current teacher perceptions and instructional technology integration practices. Our team requests your assistance with forwarding the attached invitation and informed consent to participate to the instructors at your institution in hopes that they will participate in the anonymous 10-minute, online survey. Participants and their institutions will not be identified in the data collected.

This study will use the responses from this survey to investigate:
- factors instructors perceive as affecting their level of technology integration,
- how virtual learning, due to COVID-19, may have altered instructors' self-perceptions of their digital competence, and
- perceptions of how institutions can improve the technology integration self-efficacy of instructors.

If you have any questions about this study, contact one of the following researchers:
- Stephanie Collins - s.collins@mail.umsl.edu
- Lisa Hollins - lhollins@mail.umsl.edu
- Christina Northrup-Thompson - cnorthrup-thompson@mail.umsl.edu

Or, contact the faculty advisor, Dr. Paulette Isaac-Savage - episaac@umsl.edu. You may also ask questions or state concerns regarding your rights as a research participant to the Office of Research Administration at 314-516-5897.

If you do not wish to assist by disseminating this survey, no further action is required on your part. However, we sincerely hope you will consider distributing the attached information to instructors at your institution and encourage their participation.

Thank you in advance for any assistance you can provide.