Preservice and First-year Teachers’ Intention to Use and Actual Use of Technology-enabled Learning: A Case Study

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PRESERVICE AND FIRST-YEAR TEACHERS’ INTENTION TO USE AND
ACTUAL USE OF TECHNOLOGY-ENABLED LEARNING: A CASE STUDY

by

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DEDICATION

This dissertation is dedicated to the participant partners who allowed me to share the stories of their entry into the field of education. Their persistence, passion, and care for their students, even in the face of significant challenges, inspires me in my own work. Without them, this work would not have been possible.
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Abstract

The purpose of this qualitative, embedded single case study was to provide a rich description and explore the unique development and evolution of preservice teachers’ intention to use and actual use of technology-enabled learning (TEL) during student teaching and first-year teaching. The study followed four middle level education majors at a mid-size public teaching university in the southeastern United States over the course of the 2021 calendar year, during their student teaching experience (Spring 2021) and into their first semester as novice teachers (Fall 2021). Ajzen's Theory of Planned Behavior (TPB) guided this qualitative inquiry. Interviews, observations, and analysis of teaching artifacts (e.g., lesson plans, lesson reflections, and TEL artifacts) were conducted to triangulate the data. In addition to applying theory-based qualitative codes to the data, open coding was conducted to identify emerging themes across the body of evidence. Findings extended previous TPB research regarding preservice teachers’ intention to use TEL and yielded practical implications for teacher educators seeking to increase TEL intention and use in preservice and novice teacher populations.
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List of Abbreviations

Attitude Toward Behavior (ATT)
College of Education (COE)
Institutional Review Board (IRB)
Perceived Behavioral Control (PBC)
Pre-Service Teachers (PST)
Subjective Norm (SN)
Technology-enabled Learning (TEL)
Theory of Planned Behavior (TPB)
CHAPTER ONE

INTRODUCTION

Technology-enabled learning (TEL) is the student-centered use of technology as a cognitive tool to communicate, collaborate, develop critical thinking skills, and solve authentic problems (Ertmer & Ottenbreit-Leftwich, 2012; Jonassen, 1994; Jonassen, 2005; Nelson & Hawk, 2020). This construct focuses not on what specific technology is used for learning but on how technology is used to support active, student-centered learning in the classroom. TEL centers the learning and agency of students and requires that the teacher serve as a facilitator of the learning process (Ertmer & Ottenbreit-Leftwich, 2012; Hsu, 2016). The construct is used to describe the interconnection between technology and a social constructivist pedagogical approach.

The construct of TEL is not new. Scholars have advocated for and established the positive impact of TEL over the last two decades (Barak, 2017b; Bower et al., 2013; Ertmer & Ottenbreit-Leftwich, 2012; Hirsh-Pasek et al., 2015; Jonassen; 1994; Jonassen, 2005; Vannatta & Beyerbach, 2000), and professional and accrediting organizations, such as the International Society for Technology in Education (ISTE) and the Council for the Accreditation of Educator Preparation (CAEP), have centered the need to prepare educators and students to be active, engaged, constructive users of technology (CAEP, 2022; ISTE, 2017). However, the field of education has remained slow to adopt student-centered practices in general and slow to evolve in its adoption of technology to facilitate student-centered, social constructivist
pedagogical practices (Barak, 2017a; Lee, 2018; Nelson & Hawk, 2020; Smagorinsky & Barnes, 2014; Tondeur et al., 2016).

The need to bridge the digital divide has come to the forefront in the last five years, and in particular during the recent COVID-19 pandemic (Ali et al., 2021; Lee, 2020). As a result, technology hardware has become more ubiquitous and accessible than ever in school environments (Gao & Hayes, 2021). However, research and practice have clearly demonstrated that bridging the digital divide is not just about access to hardware and software. Technology use, as with any learning initiative, is about how those learning tools are used and who has agency in the learning space (Doucet et al., 2020; Ertmer & Ottenbreit-Leftwich, 2012). Unfortunately, in many cases, technology is used only to drill, monitor, and police student behavior (Heath & Segal, 2021; Rafalow, 2018). This behaviorist, compliance-focused approach to technology integration reinforces teacher-centered approaches to teaching and learning (Teras et al., 2020). This can result in lower student engagement (Wu & Huang, 2007) and lower learning achievement than those engendered by student-centered approaches (Gorowara & Lynch, 2019), and can reinforce and even deepen inequities that are already present in classroom power dynamics (Heath & Segal, 2021; Puckett & Rafalow, 2020; Rafalow, 2018; Teras et al., 2020). For example, Rafalow (2018), in his comparison of the uses of technology across three middle school campuses, found that white, affluent students were more likely to have access to curriculum and classroom activities that used TEL and promoted the active development of their digital skills than low-income students and students of color, who were more likely to learn from teachers who used technology as a tool for consuming information and perceived technology as “threatening to learning” (p. 1421). Using technology
to construct knowledge, create, and collaborate in the learning process, all skills and competencies inherent in TEL, democratizes the learning space, motivates and engages learners, and challenges them to think more deeply about course content (Blackburn & Hewitt, 2020; Mills & Herring Watson, 2021; Liu et al., 2019); therefore, TEL is a valuable style of instruction for all learners, making its use an issue of equity in the classroom space.

**Problem of Practice Statement**

While TEL has been established in the literature as an effective approach to teaching and learning with technology, and there are teachers throughout the educational landscape who use TEL and are working as change agents in support of TEL (Admiraal et al., 2017), TEL has not been widely adopted into common pedagogical practices (Scherer & Teo, 2019). Colleges of education play a significant role in facilitating TEL adoption as these programs prepare and shape preservice teachers’ attitudes and behaviors regarding technology use, which preservice teachers take into the field as they become in-service teachers. To further TEL integration, preservice teachers are of particular interest as a population because they represent the future of the field of education.

Some teacher preparation programs and colleges of education have sought to facilitate this shift in beliefs about how teaching and learning with technology should look by adopting program-deep and program-wide approaches to teaching about and modeling TEL (Buss et al, 2015; Buss, Foulger, & Su, 2021; Tondeur et al., 2012; Voithofer & Nelson, 2021). However, even in programs of study that center TEL and student-centered teaching practices, recent research found that preservice teachers’ intention to use TEL in their future classrooms decreases as they move through their programs of study and is lowest during
their final student teaching experience (Herring Watson & Rockinson-Szapkiw, 2021). While there are many published studies regarding preservice teachers’ perceptions of, attitudes toward, and intentions to use technology that employ a variety of methodologies (e.g., Farjon et al., 2019; Joo et al., 2018; Nelson & Hawk, 2020; Sanchez-Prieto et al., 2019), few studies examine TEL specifically or focus on the transition period of student teaching and first-year teaching (Han et al., 2017; Nelson & Hawk, 2020). The development and evolution of preservice teachers’ attitudes, and in turn, their intentions and actual use of TEL during student teaching and first-year teaching is not well understood, creating a need to study this phenomenon, or focus of interest -- how preservice teachers’ descriptions of, intentions to use, and actual uses of TEL develop and evolve throughout their experiences as student teachers and first-year in-service teachers.

**Purpose Statement**

The purpose of this qualitative, embedded single case study is to provide a rich description and explore the unique development and evolution of preservice teachers’ intention to use and actual use of technology-enabled learning (TEL) during student teaching and first-year teaching. The study also aims to provide lessons that can be learned from preservice teachers who have completed a TEL-rich program of teacher preparation and are entering the field to test their TEL intentions in their teaching actions. This inquiry is rooted in social constructionism (Savin-Baden & Major, 2013; Yin, 2018). Ajzen’s (1985) Theory of Planned Behavior (TPB) guides the inquiry.

According to Ajzen (1985; 1991), a person’s intention to pursue a particular behavior, in this case, the use of TEL, is informed by three constructs: attitude toward the behavior (i.e., what
a person thinks about the behavior), subjective norms (i.e., what a person perceives others think about the behavior), and perceived behavioral control (i.e., whether a person feels they have enough control over their abilities and environment to engage in the behavior). While the TPB was first applied to research in the health sciences (Armitage & Connor, 2001; Blue, 1995), it has since seen broad application in education research related to teachers’ technology adoption (e.g., Cullen & Greene, 2011; Gretter & Yadav, 2018; Li et al., 2016; Sadaf et al., 2012; Sadaf & Johnson, 2017). In the present study, the TPB was used to guide the development of interview protocols and as a theoretical lens from which to derive a priori codes as a means of focusing on significant data elements.

This study, in alignment with the qualitative approach, which limits the scope of participation, delimits the sample to preservice teachers who are middle level education majors. The case or “bounded system” is defined as a shared cohort that have participated in and graduated from the same program of study in the college of education at a mid-size public teaching university in the southeastern United States. Study participants completed their student teaching semester in the same suburban school district during the Spring 2021 semester and began their first year of teaching during the Fall 2021 semester in various public-school districts in the same state in which they attended college.

In order to provide a rich description, data were collected from a variety of sources, which represent what Yin (2018) called the “full variety of evidence” (p. 12). Interviews were conducted with the participants at the beginning and end of student teaching and at the beginning and mid-point of the first year of teaching. Direct observations were conducted during both student teaching and first-year teaching semesters, and lesson plans and TEL artifacts were also
examined for evidence of TEL use. These layers of evidence provide important insight regarding potential barriers to TEL use and how teacher educators and teacher education programs can cultivate intention to use TEL among preservice teachers and better support educators in their intention to use and actual use of TEL during novice teaching.

**Significance of the Study**

This embedded single case study allowed for an in-depth exploration and rich description of the intention to use and actual use of TEL by middle level education majors during student-teaching and first-year teaching experiences. While the TPB has often been used as a theoretical framework to guide research into preservice teachers’ intentions to use various types of technology (Sadaf et al., 2012; Salleh & Laxman, 2015; Valtonen et al., 2015) and to adopt specific curricula or teaching strategies (Gretter & Yadav, 2018; Sadaf & Johnson, 2017; Voet & De Wever, 2020), a common criticism of the TPB is that intention does not equal action. These study results addressed this criticism since participants’ use of TEL was examined through their transition from preservice to in-service teaching. This study created the opportunity to determine not only what factors appear to influence intention but also whether, if at all, intention to use TEL leads to actual use. Theoretically, the study results provided further validation for the application of TPB in describing preservice and first-year in-service teachers’ intention to use and actual use of TEL. The themes generated from the study also illuminate ways in which the TPB may be expanded when studying TEL.

Results from this study also yield practical implications for colleges of education by providing insight into what learning experiences within the participants’ shared program of study they deemed most impactful on their intention to use and actual use of TEL. This, then, can
inform program development within colleges of education that are seeking to advance the use of TEL among their preservice teachers. As this study follows participants into their first-year teaching experiences, the findings also have practical implications for educators who work to support novice teachers during the induction period (i.e., 1-3 years of teaching). Supporting the pedagogical and technological skill development of novice teachers is one way to ensure their success in improving K-12 students’ engagement, motivation, and learning outcomes. The study findings can also inform the development and implementation of interventions designed to increase intention to use and actual use of TEL with both preservice and novice teacher populations.

**Research Questions**

This study focused on four primary research questions. Broad, open-ended, “how” questions were developed in alignment with Creswell and Creswell’s (2018) recommendations for forming qualitative research questions. These questions create space to explore the “complex set of factors surrounding the central phenomenon [TEL] and present the broad, varied perspectives or meanings that participants hold” (Creswell & Creswell, 2018, p. 133). The primary questions also align with the case study design by helping to define and bound the case while remaining flexible and adaptive enough to account for the unique experiences of the study participants (Yin, 2018).

**RQ1:** How do preservice teachers describe technology-enabled learning? How do they describe their current technology-enabled learning beliefs and behaviors?
RQ2: How do preservice teachers describe their technology-enabled learning experiences? How do preservice teachers perceive these experiences influenced their technology-enabled learning intentions and behaviors during student teaching?

RQ3: How do first-year teachers describe their technology-enabled learning experiences? How do first-year teachers perceive these experiences influenced their technology-enabled learning intentions and behaviors in their classrooms?

RQ4: How, if at all, do teachers’ intention to use and actual use of technology-enabled learning evolve during student teaching and first-year teaching semesters?

Definitions

**Attitude Toward Behavior.** A person’s judgments about a behavior, based on his or her own beliefs and experiences (Ajzen, 1985)

**Novice Teacher.** A teacher who holds a valid teaching license and is within their first three years in the field (Davis & Cearley-Key, 2016)

**First-year Teacher.** A teacher who holds a valid initial teaching license and is within their first year of teaching in the field (Brock & Grady, 2007)

**Intention.** How much effort a person is willing to exert toward a given behavior (Ajzen, 1991)

**Middle Level Education.** Operationally defined as grades 4-8, in alignment with the teaching licensure in the state where the study was conducted (DESE, n.d.a).

**Perceived Behavioral Control.** A measure of how easy or difficult a person feels it would be to engage in a given behavior (Ajzen, 1991); a person’s information, skills and
abilities, power of will, and emotions and compulsions can all impact his or her feelings of control over the ability to engage in a particular behavior (Ajzen, 1985)

**Subjective Norm.** An individual’s beliefs about what others will think about the decision to perform a given behavior (Ajzen, 1985)

**Preservice teacher.** A student who has been fully admitted to a college of education with the intent of pursuing a degree and initial licensure in the field of education (Goulette & Swanson, 2018)

**Student teaching.** A semester of embedded field experience in which a preservice teacher works alongside a mentor teacher in a K-12 classroom setting. Student teaching is typically completed in the final semester of a preservice teachers’ degree program (Clark & Newberry, 2019)

**Technology-enabled learning.** The student-centered use of technology as a cognitive tool to communicate, collaborate, develop critical thinking skills, and solve authentic problems (Ertmer & Ottenbreit-Leftwich, 2012; Jonassen, 1994; Jonassen, 2005; Nelson & Hawk, 2020)
CHAPTER TWO

REVIEW OF THE LITERATURE

The Theory of Planned Behavior (TPB) provides a theoretical lens to describe the intention to use and actual use of technology-enabled learning (TEL) among preservice and first-year in-service teachers. Given that the term “technology-enabled learning” is not widely used in the existing literature, this literature review focused on peer-reviewed studies addressing the keywords of preservice and novice in-service teachers, pedagogical beliefs, social constructivism, educational technology integration, teacher preparation, and field experiences. Therefore, the following review provides a brief explanation of Ajzen’s (1985; 1991) TPB as a means to examine the constructs that contribute to intention and actual use and then explores what is known regarding preservice and novice teachers’ technological and pedagogical attitudes, factors that contribute to intention to use and actual use of TEL, and experiences with technology in the field of education.

Theoretical Context

Theory of Planned Behavior

The Theory of Planned Behavior is composed of three constructs that contribute to the development of an intention to perform a specific behavior (Ajzen, 1991). Originally published in 1985, Ajzen’s Theory of Planned Behavior extended Fishbein and Ajzen’s Theory of Reasoned Action. The Theory of Reasoned Action includes two main factors: attitude (i.e., what a person believes about a behavior) and subjective norm (i.e., what a person believes others think about a behavior). The TPB integrates the addition of a third construct, perceived behavioral control, to describe how much control a person feels they have over their choice to engage in the
behavior (Ajzen, 1985; Gretter & Yadav, 2018; Li, Li, & Franklin, 2016). Ajzen (1991) theorized that each of these constructs is informed by salient antecedent beliefs. According to the TPB, behavioral beliefs inform attitudes, normative beliefs inform subjective norm, and control beliefs inform perceived behavioral control. The connections among the constructs in the TPB are illustrated below in Figure 1, and the three primary constructs of the TPB are explored in the following sections.

Figure 1

Constructs of the Theory of Planned Behavior


Attitude Toward Behavior
Attitude toward a behavior is defined in the TPB as a person’s judgments about a behavior, based on his or her own beliefs and experiences (Ajzen, 1985). Ajzen (1985) noted that positive attitudes lead to positive intention, and therefore, can be linked to participation in a given behavior. Essentially, for a person to develop an intention to act, he or she must deem the activity worthy of the time and effort necessary to engage in the act (Ajzen, 1991; Gretter & Yadav, 2018; Sadaf et al., 2012). In the field of education, attitude has frequently been found to be one of the most significant predictors of intention to integrate educational technology among preservice and in-service teachers (Cullen & Greene, 2011; Lamb, 2011; Li et al., 2016; Sadaf et al., 2012; Teo & van Schaik, 2012). For example, in recent studies, Sungur-Gul and Ates (2021) found that attitude significantly contributed to the intention to use mobile learning. Herring Watson and Rockinson-Szapkiw (2021) found that attitude significantly predicted preservice teachers’ intention to use TEL in their future classrooms.

Subjective Norm

Subjective norm (SN) measures an individual’s beliefs about what others will think about the decision to perform a given behavior (Ajzen, 1985). Social pressure may manifest itself differently based on context, and social pressure can come from a variety of populations. For example, in their quantitative study examining teachers’ intention to integrate technology, Teo et al. (2016) identified administrators, other faculty members, parents, and students as populations that could positively impact SN by influencing teachers’ normative beliefs regarding the use of educational technology. A qualitative study regarding preservice teachers’ intention to teach media literacy skills indicated that SN could be influenced by preservice teachers’ university instructors, future K-12 students, and cooperating teachers in field experience placements.
In short, individuals or groups held in high esteem can influence an individual’s intention to act.

However, it is noteworthy to mention that SN is often found to be the weakest predictor of behavioral intention and behavior itself, indicating that personally held attitudes and beliefs, as well as an individual’s feelings of personal control over the behavior, are more likely to predict intention than an individual’s concern with what others might think about their decision to choose a particular behavior (Armitage & Conner, 2001; Blue, 1995; Gretter & Yadav, 2018; Teo & van Schaik, 2012; Teo et al., 2016). Scholars have identified a number of reasons this may be the case. For example, in their study of in-service teachers, Teo et al. (2016) suggested that the lack of significant effect of SN could be attributed to teachers’ years of experience, stating that teachers with more experience may not be as prone to use technology simply because of administrative or organizational pressure to do so. They noted that individuals with strong personal beliefs about a behavior may be less likely to be swayed by social pressure, indicating a divergent relationship between attitude and SN (Teo et al., 2016).

While SN may not exhibit as much predictive power as the other two constructs in the TPB, some studies using TPB have found SN to be a significant indicator of intention. In their study using TPB to measure preservice teachers’ beliefs and attitudes about technology, Cullen and Greene (2011) noted that respondents expressed beliefs that future students would want to learn with technology because it is more enjoyable; respondents were also concerned with using technology to gain the approval of their future administrators and the parents of their future students (Cullen & Greene, 2011). Additionally, Teo (2009) found SN to be a significant factor contributing to preservice teachers’ attitude toward computer use. Perceived social pressure from
peers and university faculty instructors within their program of study as well as future administrators, K-12 students, and parents have the potential to impact preservice teachers’ normative beliefs, thus impacting SN as a contributing factor in the development of intention (Gretter & Yadav, 2018; Herring Watson & Rockinson-Szapkiw, 2021; Sadaf & Johnson, 2017). These studies demonstrated that preservice and novice teachers may still be forming their own attitudes toward TEL, and thus, may be more likely to cite the opinions of others when describing their intention to use TEL.

**Perceived Behavioral Control**

Perceived behavioral control (PBC) is a measure of how easy or difficult a person feels it would be to engage in a given behavior (Ajzen, 1991; Cheng, 2019). The construct of PBC stems from an individual’s beliefs regarding their control over a given situation. Ajzen (1985) stated that a person’s information, skills, and abilities, power of will, and emotions and compulsions can all impact feelings of control over the ability to engage in a particular behavior. Ajzen (1985) initially aligned PBC closely with the concept of self-efficacy, which Bandura (1977) defined as an individual’s belief that he or she can be successful in achieving a certain outcome. In considering preservice and novice teachers’ PBC regarding their use of TEL, many teacher preparation program faculty and administrators strive to align their coursework and field experiences with Bandura’s (1977) four sources of self-efficacy: performance accomplishments, vicarious experiences, verbal persuasion, and emotional arousal (Clark & Newberry, 2018; Pfitzner-Eden, 2016). Doing so can increase preservice and novice teachers’ confidence in their ability to succeed in the profession (Wall, 2016), and specifically, to integrate technology into
their teaching (Batane & Ngwako, 2016; Joo et al., 2018; Ottenbreit-Leftwich, Glazewski et al., 2018).

Ajzen (2002) later clarified the definition of PBC, stating that the construct is inclusive of both internal and external factors, including personal capability to perform an action, access to necessary resources, and the belief that any obstacles encountered can be overcome (Ajzen, 2002). This more nuanced view of PBC accounts for both internal factors, the beliefs and attitudes that contribute to self-efficacy, as well as external factors, like the conditions of the environment in which the behavior is to be performed. It aligns with the highly complex problem of determining which of a number of factors might impact preservice and novice teachers’ intention to use TEL. For preservice teachers, in particular, course requirements, assignment instructions, personal comfort with and exposure to technology and student-centered pedagogical practices, student teaching placements, and other factors can contribute to the individual’s perception of how easy or difficult it might be to successfully use TEL (Cullen & Greene, 2011; Gretter & Yadav, 2018; Li et al., 2016; Sadaf et al., 2012). For novice teachers, their status as beginning teachers, support (or lack of support) from administration and other K-12 faculty, and technology infrastructure within the school environment can all contribute to how easy or difficult they might perceive the use of TEL (Ottenbreit-Leftwich, Liao et al., 2018; Stein et al., 2020; Tondeur et al., 2017). The relationship between these constructs is illustrated in Figure 2.
Figure 2

Factors contributing to perceived behavioral control


Applications of the Theory of Planned Behavior

In the last decade, the TPB has seen frequent application in the field of education as a theoretical framework through which to examine intention and behavior in relation to technology use. It has been applied quantitatively (Cheng, 2019; Cheon et al., 2012; Gómez-Ramirez et al., 2019; Li et al., 2016; Salleh & Laxman, 2015; Teo et al., 2016; Teo & van Schaik, 2012), qualitatively (Gretter & Yadav, 2018; Sadaf & Johnson, 2017), and using mixed methods (Lamb, 2011; Sadaf et al., 2012). Other theoretical models, such as the Technology Acceptance Model (TAM) and the Unified Theory of Technology Acceptance and Use (UTAUT) have also been used for this purpose (Cheng, 2019; Cheon et al., 2012; Gómez-Ramirez et al., 2019; Li et al., 2016; Mathieson, 1991; Teo & van Schaik, 2012; Teo et al., 2016). However, Cheng (2019) found that the TPB provides more robust explanations of both intentions and behavior than the
TAM, and Teo et al.’s (2016) study asserted that the UTAUT is overly complex and complicated. Additionally, Cheon et al. (2012) argued that because perceived behavioral control is a significant factor in technology adoption and is unique to the Theory of Planned Behavior, TPB holds more explanatory power than the TAM and UTAUT. These findings indicate that the TPB provides a strong theoretical lens through which to describe the complex internal and external factors that contribute to or detract from preservice and first-year teachers’ intention to use and actual use of TEL (Cheng, 2019; Cheon et al., 2012; Teo et al., 2016).

Some scholars have argued that intention is not action; this is a common limitation in research that uses the TPB (Cheon et al., 2012; Cullen & Greene, 2011; Li et al., 2016; Sadaf et al., 2012). However, research in the field of preservice teacher education has found a strong correlation between intention and action (Ajzen, 1991; Cheon et al., 2012; Gómez-Ramírez et al., 2019; Li et al., 2016; Sadaf et al., 2012; Teo et al., 2016) and describing the use of TEL during student teaching and first-year teaching provides an opportunity to determine if an intention to use TEL that is developed during teacher preparation translates to actual use of TEL in the field.

**Technology Intentions to Use and Actual Use of Preservice and Novice Teachers**

Much of the TPB literature regarding technology adoption has focused on intention. Indeed, preservice and novice teachers are of particular interest in regard to their intention to use and actual use of TEL because they represent the future of the field. Field experiences, particularly student teaching internships situated at the end of preservice teachers’ programs of study, provide an authentic context in which to practice using TEL, which is cited as an important factor in increasing actual use of technology once preservice teachers enter the field as first-year teachers (Brenner & Brill, 2016; Ottenbreit-Leftwich, Liao et al., 2018; Tondeur et al.,
Student teaching is where intention to use TEL can translate into action. Currently, there are few studies specifically examining the role of field experiences in influencing intention to use and actual use of TEL. Nelson and Hawk (2020), who explored the impact of early field experience observations on preservice teachers’ attitudes toward technology, noted the need to examine the role of field experiences in developing preservice teachers’ beliefs about technology integration and intention to use TEL, which can ultimately translate to use as preservice teachers become novice in-service teachers.

Research from the early 2000s seemed to express a hopefulness that new teachers would be more “digitally able” (Starkey, 2010, p. 1430), particularly given their greater access to technology hardware and software than previous generations of novice teachers (Lei, 2009; Prensky, 2005). However, more recent research has indicated that while today’s preservice and novice teachers may use technology on a daily basis to conduct personal business and consume information and media (Rideout & Robb, 2019), they do not have an innate natural ability to transfer basic daily technology skills to the use of technology for academic purposes (Thompson, 2013; 2015) or for planning and designing instruction for their students (Chai et al., 2017; Koehler et al., 2019). Indeed, even as devices are more accessible (Gao & Hayes, 2021), novice teachers report many of the same barriers to technology use in the classroom that were reported a decade ago, including limited technology infrastructure (Ottenbreit-Leftwich, Liao et al., 2018; Tondeur et al., 2017), lack of support for innovative instruction among K-12 administrators and faculty (Stein et al., 2020), and lack of planning time (Brenner & Brill, 2016; Stein et al., 2020). These barriers and their related lack of perceived behavioral control often hinder the use of TEL.
However, as TPB literature has demonstrated, preservice and novice in-service teachers’ beliefs (i.e., behavioral beliefs, normative beliefs, and control beliefs) precede and inform each of the constructs of the TPB (i.e., attitudes, subjective norm, and perceived behavioral control), which ultimately inform intention to use technology and actual use of it. While research has discussed barriers, it has also highlighted that positive attitudes, high self-efficacy, and perceived control over their teaching actions and environment do predict and correlate with intention (Gurer & Akkaya, 2021; Joo et al., 2018; Nelson & Hawk, 2020; Pozas & Letzel, 2021) and that preservice and novice teachers do often express strong intention to use technology to support student learning in their K-12 classrooms (Farjon et al., 2019; Herring Watson & Rockinson-Szapkiw, 2021).

Technology Beliefs and Attitudes of Preservice Teachers

It is important to note that while beliefs and attitudes are distinct constructs within the TPB, it has been noted that the two terms are often used interchangeably in the existing literature regarding technology adoption of preservice teachers (Nelson, 2020). However, in this study, the construct of pedagogical beliefs, discussed in this section, is considered a salient antecedent belief for attitude toward TEL since the construct of TEL is inclusive of both technology use and social constructivist teaching practices. Thus, it is valuable to consider the literature related to both preservice teachers’ pedagogical beliefs and their attitudes toward technology. For example, Gurer and Akkaya (2021), in their survey study with 714 preservice mathematics teachers, found that positive attitudes toward technology were the strongest predictor of intention to use technology. Participants who expressed constructivist-oriented pedagogical beliefs were more likely to express positive attitudes toward technology and an intention to use technology in their
teaching. Similarly, Teo et al. (2021) conducted a review of the literature related to preservice teachers’ training to use technology to promote the development of 21st century skills (e.g., collaboration, critical thinking, creativity, problem solving, and lifelong learning). They found that constructivist pedagogical approaches were consistently evident across the empirical literature in studies focused on cultivating positive beliefs, attitudes, and intentions regarding technology use among preservice teachers. Essentially, preservice teachers who hold student-centered, constructivist pedagogical beliefs and positive attitudes toward technology are more likely to hold positive beliefs about the use of technology as a “knowledge building” tool (Teo et al., 2021, p. 14), which aligns with the operational definition of TEL.

However, researchers should be careful not to view pedagogical beliefs as a binary (e.g., either student-centered/constructivist or teacher-centered/behaviorist) as cautioned by Tondeur et al. (2016) in their systematic review of qualitative studies. Belief systems can influence preservice teachers’ attitudes toward constructivist pedagogies and TEL (Tondeur et al., 2016). Specifically, teachers’ beliefs about the nature of knowledge impact the ways in which they believe knowledge should be shared with others, thus informing pedagogical beliefs and ideas about the role technology should play during instruction (Chai et al., 2017; Tondeur et al., 2016). For example, positive attitudes toward technology contribute to more constructivist uses of technology just as technology-rich environments can positively impact teacher beliefs and attitudes (Tondeur et al., 2016). This more nuanced view of evolving beliefs about pedagogy and technology is particularly important when considering preservice teachers, given that preservice teachers’ pedagogical beliefs and attitudes toward technology are more “recently formed, are more dynamic and thus, are more open to change” (Tondeur et al., 2016, p. 557) as they gain
knowledge and skills in their teacher preparation programs (Chai et al., 2017; Kramarski & Michalsky, 2015).

Interestingly, many studies related to preservice teachers’ beliefs about and attitudes toward technology are conducted with samples of preservice teachers who are within their first year of teacher preparation (Farjon et al., 2019; Nelson & Hawk, 2020; Sanchez-Prieto et al., 2019; Valtonen et al., 2015). However, Sadaf et al. (2012) noted that preservice teachers’ ideas about technology use in their future classrooms are likely to evolve with time and experience, making it valuable to consider changes in pedagogical and technological beliefs and attitudes over time. Herring Watson and Rockinson-Szapkiw’s (2021) findings supported this idea as they included classification (i.e., undergraduate freshman, sophomore, junior, or senior) as a predictive variable in their study of preservice teachers’ intention to use TEL and found that preservice teachers’ intention to use TEL was highest among first-year undergraduate preservice teachers and lowest among preservice teachers in their final year of study. While Farjon et al. (2019) collected data primarily from first-year preservice teachers, they did collect data across time and found that after three months in their teacher preparation program no change had occurred to participants’ will to use technology for teaching. Furthermore, they found that will, which is largely informed by attitudes, had decreased at six months, even as those participants reported that they perceived an increase in their skill with technology for teaching (Farjon et al., 2019). Herring Watson and Rockinson-Szapkiw (2021) also further noted that these shifts in attitudes as preservice teachers move through their programs of study could be informed by their increasing understanding of the complexities of teaching practice. Preservice teachers may perceive the idea of TEL as highly engaging and appealing, but come to realize that actually
using TEL, while also taking into consideration the constraints of the physical school environment, curricular mandates, and classroom management, is a more daunting task.

Even taking into consideration decreases in positive attitudes toward technology as preservice teachers move through their programs of study, these quantitative studies demonstrate positive attitudes toward technology are still largely found to be the most common significant predictor of preservice teachers’ intention to use technology in their future classrooms (Farjon et al., 2019; Gurer & Akkaya, 2021; Herring Watson & Rockinson-Szapkiw, 2021; Pozas & Letzel, 2021; Sadaf et al., 2012). However, by nature, quantitative studies do not demonstrate why and how, if at all, preservice teachers’ positive attitudes toward TEL inform their intention to use and actual use of TEL, particularly during field experiences, such as student teaching, into their first year of teaching in K-12 classrooms.

**Technology Beliefs and Attitudes of Novice Teachers**

While there is a significant body of literature regarding the technology beliefs and attitudes of preservice teachers at varying stages of progress toward their degree and initial licensure (Farjon et al., 2019; Gurer & Akkaya, 2021; Herring Watson & Rockinson-Szapkiw, 2021; Kramarski & Michalsky, 2015; Sadaf et al., 2012), there is little research specifically focused on the technology beliefs and attitudes of novice teachers who have been in the field less than three years and are experiencing the realities and complexities of teaching as beginning teachers. The research that does exist tends to focus on the quality and effectiveness of their preparation to use technology received from their teacher preparation programs (Brenner & Brill, 2016; Ottenbreit-Leftwich, Liao et al., 2018; Tondeur et al., 2017). For example, Brenner and Brill (2016) used a mixed methods design to investigate how novice teachers felt that teacher
education practices had helped or hindered their technology integration practices in the classroom. They surveyed and conducted follow-up interviews with teachers in their second through fourth years of teaching and found that a majority of study participants (87%) self-reported high levels of technology adoption in their classrooms (Brenner & Brill, 2016). The novice teachers in their study tended to report their highest positive responses for teacher-centered uses of technology (i.e., using Web browsers, creating slideshows and digital presentations, and organizing data in spreadsheets) while they reported less confidence in facilitating student-centered, technology-enabled learning (i.e., using technology to support problem-based learning and allowing students to demonstrate knowledge in non-traditional ways) (Brenner & Brill, 2016). Brenner and Brill (2016) also found that novice teachers found “their school environments to be more inhibitive of technology integration than their own knowledge or access to knowledge” (p. 140), citing lack of time, lack of software, and too much content to cover as prohibitive to meaningful technology use. This indicates that while teacher preparation programs are shifting to more effective, program-deep and program-wide approaches to modeling and promoting TEL, the K-12 landscape may still present barriers to innovative approaches to teaching and learning.

Stein et al. (2020) reported similar findings about barriers within K-12 school environments in their qualitative study, stating that “participants do well with the integration and implementation of technology in class, but they resent the lack of support from school management for technology integration in teaching” (p. 154). In their examination of the technology beliefs and practices of novice math teachers from student teaching until their third year of teaching (Gurevich et al., 2017; Stein et al., 2020), they found that, over time,
participants gained confidence in their ability to use technology to enhance student learning, implement constructivist pedagogies, and increase motivation for learning through the use of technology; however, they consistently reported insufficient support from school management as a barrier to the use of TEL.

**Lack of Research on Actual Use of TEL**

The empirical literature is replete with studies on preservice and novice teachers’ intention to use technology; however, despite statistical modeling and theoretical literature illustrating the connection between intention and action, qualitative scholars have argued that, given the complexities of teaching practice, intention to use technology is not enough to support novice teachers’ actual use of TEL (Ottenbreit-Leftwich, Liao et al., 2018). Both preservice and novice teachers may have high self-efficacy and strong intention to use TEL when they are in, and when they graduate from, their programs of study, but the challenges of navigating the “reality shock” of entering the field and being solely responsible for their classroom spaces may outweigh their intentions and stunt their ability to persist in the face of barriers to actually use technology for teaching and learning (Ottenbreit-Leftwich, Liao et al., 2018; Tondeur et al., 2017).

In their qualitative case study with second- and third-year novice teachers, Ottenbreit-Leftwich, Liao (2018) and their colleagues found that participants expressed strong positive beliefs about and intention to use student-centered approaches to technology during student teaching when they were still in their programs of study. Yet, their actual use upon entering the field as novice teachers was far more impacted by whether resources to support that use were available in their school environments. Tondeur et al. (2017) followed six Dutch teachers from
preservice teacher training to their second year of teaching and agreed that the limited uses of technology by novice teachers were often dominated by more teacher-centered uses of technology, rather than the more student-centered approaches that align with TEL. However, their participants did report limited uses of TEL, such as the use of inquiry models (e.g., WebQuests) and project-based learning (Tondeur et al., 2017).

Typically, studies examining novice teachers’ uses of technology have delimited their study participation by recruiting participants who are considered to be “digitally able” (Starkey, 2010, p. 1430), “reported regular (i.e., daily or weekly) use of technology to support learning and instruction” (Tondeur et al., 2017, p. 161), or who held a computer educator license and thus would be considered proficient in the use of technology for teaching and learning (Ottenbreit-Leftwich, Liao et al., 2018). However, even given their personal skill and expertise in using technology for teaching and learning, the novice teachers in previous studies expressed difficulty in regularly using technology in their classrooms as second- and third-year teachers (Brenner & Brill, 2016; Ottenbreit-Leftwich, Liao et al., 2018; Tondeur et al., 2017). In these studies, researchers noted the “praxis shock” (Tondeur et al., 2017, p. 158) that can occur when preservice teachers enter the field as first-year teachers; however, they elected to collect data during the second and third year of teaching, a time when participants were reflecting back on their first year, rather than documenting the use of technology during the first year of teaching as participants are navigating that unique experience.

**Summary**

The literature demonstrates that researchers have employed a variety of methodological approaches to better understand the intention to use TEL, and some studies have examined its
use (or lack thereof) in the K-12 classroom; however, scholars have noted the value of future studies that employ qualitative designs that can illustrate the complexities of how and why intentions to use TEL are formed during preservice teachers’ programs of study and how those intentions translate into the actual use of TEL by preservice and first-year teachers (Herring Watson & Rockinson-Szapkiw, 2021; Hur et al., 2015; Joo et al., 2018). While attitudes and intentions, and the beliefs that inform them, can be quantitatively measured, the research has shown that preservice and novice teachers’ salient antecedent beliefs about pedagogy (e.g., teacher-centered/behaviorist or student-centered/constructivist) and technology are complicated (Kramarski & Michalsky, 2015; Tondeur et al., 2017; Tondeur, van Braak et al., 2016; Tsai & Tsai, 2019) and closely linked to how they see technology modeled during instruction, both by mentor teachers (Nelson, 2017; Nelson & Hawk, 2020) and by college of education faculty (Chai et al., 2017; Tondeur et al., 2017). Qualitative approaches can provide valuable insight into how and why preservice and novice teachers’ attitudes and intentions are established during their programs of study and whether, if at all, they lead to the actual use of TEL among preservice and novice teachers as they enter the K-12 space as student teachers and first-year teachers. Exploring this phenomenon in more depth and detail will allow researchers to develop more targeted interventions for fostering constructivist beliefs, positive attitudes toward TEL, and ultimately, intention to use TEL. Additionally, there is a need to investigate the role of student teaching experiences in cultivating intention to use and actual use of TEL, as this is a setting that has only been explored in a limited number of previous studies (Elstad & Christopherson, 2017; Liu, 2016; Nelson, 2020).
CHAPTER THREE

METHODOLOGY

While there is a significant body of literature regarding preservice teachers’ attitudes about and intention to use technology in their future classrooms, there is a scarcity of literature describing how those attitudes and intentions translate into actual use in the field during student teaching and first-year teaching. The present study seeks to address this gap in the literature (Nelson, 2020; Tondeur et al., 2017). Chapter Two offered background information on preservice and novice teachers’ attitudes and intentions regarding, and actual use of, TEL and argued that Ajzen’s (1985;1991) Theory of Planned Behavior (TPB) provides an appropriate theoretical lens through which to examine the central phenomenon of intention to use and actual use of TEL among preservice and first-year teachers. Additionally, the literature review established the scarcity of literature specifically related to student teachers’ and first-year teachers’ intention to use and actual use of TEL in their classrooms and positioned an argument for the use of qualitative approaches as necessary to examine the depth and complexity of this phenomenon. Chapter Three outlines the design of this study and describes the study’s participants, settings, methods, analysis, and the researcher’s positionality.

The Investigation Plan

In this study, I employed a qualitative, embedded single case study design. The qualitative method chosen for this study is “aimed at investigating the way in which people make sense of their ideas and experiences” (Savin-Baden & Major, 2013, p. 11). Savin-Baden and Major (2013) acknowledged that while “facts about behavior may be established ... facts are always context bound” (p. 8). The qualitative approach allowed for “exploring and
understanding the meaning individuals or groups ascribe to a social or human problem” (Creswell & Creswell, 2018, p. 4) and examined a phenomenon, with development and evolution of preservice teachers’ intention to use and actual use of TEL fitting into the category of a phenomenon, that can be more fully understood when explored through an in-depth, rich description where preservice teachers relate their stories fully and provide information about how and why they developed their ideas about TEL within the context of their teacher preparation, student teaching, and first-year teaching experiences.

A case study design was used because it allowed for complex exploration in one specific setting concerning preservice teachers’ development and evolution related to TEL. This design allowed me to investigate, “a contemporary phenomenon in depth (i.e., intention to use and actual use of TEL) and within its real-world context (i.e., student teaching and first-year teaching),” especially as “the boundaries between phenomenon and context may not be clearly evident” (Yin, 2018, p. 15). The intention to use and actual use of TEL (the phenomenon of interest) is wrapped up within teaching context, pedagogical decision-making, and learning environment and is further influenced in this study by the participants’ status as novice teachers (Hammond et al., 2009; Ottenbreit-Leftwich et al., 2018; Tondeur et al., 2017). A hallmark of case studies is that they are “bounded by time and activity, and researchers collect detailed information using a variety of data collection procedures over a sustained period of time” (Creswell & Creswell, 2018). In this study, I sought to describe the phenomenon of TEL as used by participants within the same bounded system (graduates of the same program of study in a college of education) over the course of a calendar year (student teaching and first-year teaching).
Additionally, Yin (2018) argued that case study designs are appropriate “when the relevant behaviors still cannot be manipulated” (p. 12). In the present study, participants’ intention to use and actual use of TEL will not be manipulated through an intervention; rather, the study seeks to fill the identified gap in the literature by providing rich, thick description of the intention to use and actual use of TEL for middle level education preservice teachers during this period of transition in their early professional careers.

I primarily relied on Yin’s (2018) guidance for bounding a case and conducting case study research. Yin (2018) stated that a single-case design was “eminently justifiable under certain conditions,” including where the case represents “a critical test of an existing theory... [or] a common case, or where the case serves a revelatory purpose” (p. 53). This study sought to further understand how and why, if at all, preservice teachers’ intention to use TEL decreases during student teaching (Herring Watson & Rockinson-Szapkiw, 2021) and illuminate what happens to their intention and use of TEL during first-year teaching. To do this, I used an embedded single-case design by selecting four instances of the case as sub-units of analysis (Yin, 2018). This aligns with Yin’s (2018) argument that researchers conducting single-case studies should aim to have more than two instances of the case to strengthen their findings and “blunt criticism and skepticism” regarding the rigor of the research (p. 62). It also created space to note replication across participants as well as instances when participants’ attitudes, intentions, and uses of TEL diverged (Yin, 2018).

**Participant Characteristics**

Participants were selected for this study by using both convenience and purposeful sampling. A convenience sample of preservice teachers was drawn from the middle level
education program in a college of education at a mid-size public teaching university in the southeastern United States. The preservice teachers selected for participation in this case study were delimited to those pursuing degrees in middle level education (as defined by the licensure requirements in the state where the study was conducted) (DESE, n.d.a) at the institution where I am a faculty member.

Invitations to participate in the study were extended by email to nine preservice teachers in the middle level education program who, by December 2020, had completed all required coursework for the degree except for their final student teaching semester. My email invitation explained the purpose of the present study and included a copy of the informed consent for their review. Four preservice teachers responded to the email to express their interest in participating in the study and supplied their signed informed consent. They met the following purposeful sampling criteria: (a) enrollment in Internship II (e.g., student teaching) during the Spring 2021 semester; (b) completion of the same coursework within the middle level education program of study at the college of education; and (c) a willingness to be observed in their teaching and participate in interviews during the Spring and Fall 2021 semesters. Demographic information for the study participants is provided in Table 1.
Table 1

Participant Demographics

<table>
<thead>
<tr>
<th>Participant Pseudonym*</th>
<th>Student-teaching placement</th>
<th>First-year teaching placement</th>
<th>Gender</th>
<th>Race/Ethnicity</th>
<th>Age</th>
<th>Licensure Area(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hazel</td>
<td>5th grade math</td>
<td>6th grade math</td>
<td>Female</td>
<td>White</td>
<td>22</td>
<td>Math/Social Studies</td>
</tr>
<tr>
<td>Brooke</td>
<td>5th/6th grade science</td>
<td>8th/9th grade science</td>
<td>Female</td>
<td>White</td>
<td>21</td>
<td>Science/Math</td>
</tr>
<tr>
<td>Don</td>
<td>6th grade math</td>
<td>7th/8th grade math</td>
<td>Male</td>
<td>Black</td>
<td>22</td>
<td>Science/Math</td>
</tr>
<tr>
<td>Rae</td>
<td>5th grade science</td>
<td>8th grade science</td>
<td>Female</td>
<td>Black</td>
<td>27</td>
<td>Science/Social Studies</td>
</tr>
</tbody>
</table>

*Participants self-selected pseudonyms

Settings

The sample for this study was selected from the middle level education program in a college of education at a mid-size public teaching university in the southeastern United States, which was established in 1907. The college is “dedicated to providing exemplary programs for the preparation of professional educators, including teacher preparation […] instructional technologies […] and other related professional fields” (College of Education, n.d., Mission statement, para. 1). The college offers four CAEP-accredited undergraduate programs that lead to initial teacher licensure: elementary education (123 credit hours), special education (122 credit hours), middle level education (121 credit hours), and secondary education (18-hour minor in conjunction with a content area major). Secondary programs are inclusive of ten content area concentrations (i.e., English language arts, social studies, family and consumer sciences, physical education, science, math, computer science, art, music, and world languages). In alignment with their CAEP-accredited status and with the national push to prepare teachers to effectively use technology during K-12 instruction (CAEP, 2017; ISTE, 2017; OET, 2017), these programs of
study have prioritized the need to ensure all teacher candidates graduate having had robust experiences with technology in a teaching and learning context. All undergraduate programs (i.e., elementary education, special education, middle level education, and special education) in the college of education employ a 1:1 mobile learning initiative with iPads, so students are exposed to a variety of software, apps, and open educational resources (OER) throughout their programs of study.

All four participants completed a Bachelor of Science in Education (BSE) in Middle Level Education that employed a program-deep and program-wide approach to teaching preservice teachers how to use technology for teaching and learning. The middle level education program requires students to take a two-hour stand-alone educational technology course during the first semester after full admission to the college of education, typically during junior year. Classes within this program of study are largely residential in format; however, due to the COVID-19 pandemic, the participant partners in this study experienced their final block of methods courses (i.e., Classroom Management, Classroom Assessment, Strategies for Reading and Writing, Advanced Strategies for Middle Level, and Internship I) as either fully online or hybrid courses during the Fall 2020 semester. In addition to being CAEP-accredited, the middle level education program has also received Association for Middle Level Education (AMLE) approval. Therefore, all coursework in the middle level education program is aligned to AMLE and CAEP standards. Other standards used to ground the program include Interstate Teacher Assessment and Support Consortium (InTASC) standards, the ISTE Standards for Educators, and Diversity Proficiencies that were developed within the college of education.
While the present study is bounded by the participants’ program of study, each participant was placed for student teaching in separate K-12 classrooms. The student teaching course, Internship II, follows a gradual release model in which preservice teachers are paired with a mentor teacher and slowly work up to full control of the classroom space as the semester progresses. During the student teaching semester, preservice teachers are observed while teaching five times by the university supervisor. Two of these observations are conducted virtually, and three of the observations are conducted in-person. Preservice teachers are also informally observed multiple times by the mentor teacher with two mentor teacher observations considered formal observations reported to the university supervisor. One of the formal supervisor-observed lessons must be a technology-enhanced lesson that is scored on a supplementary, technology integration-focused rubric. During the student teaching semester, preservice teachers must also develop a full unit plan and conduct an analysis of their impact on student learning.

All four participants completed their student teaching in the same suburban K-12 public school district during the Spring 2021 semester. In response to the COVID-19 pandemic, this school district initiated a 1:1 Chromebook program for all middle school students in the district. Two of the participants (Don and Brooke) were placed at the same middle school serving a diverse population of 5th-7th grade students. The other two participants (Hazel and Rae) were the only preservice teachers placed at their respective middle schools, which also serve students in grades 5-7. Information about student teaching placements was collected from the state department of education data center (ADE Data Center, n.d.) and is provided in Table 2.
Table 2

Student teaching placements (Spring 2021)

<table>
<thead>
<tr>
<th>Participant pseudonym</th>
<th>School pseudonym</th>
<th>Student pop. *</th>
<th>Grade levels served</th>
<th>% SPED</th>
<th>% Low income students</th>
<th>% BIPOC students</th>
<th>Avg. Class Size</th>
<th>Community type</th>
<th>1:1 status &amp; device</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hazel</td>
<td>MS 1</td>
<td>568</td>
<td>5-7</td>
<td>14%</td>
<td>48%</td>
<td>38.0%</td>
<td>17</td>
<td>Suburban</td>
<td>1:1; Chromebooks</td>
</tr>
<tr>
<td>Brooke</td>
<td>MS 2</td>
<td>534</td>
<td>5-7</td>
<td>12%</td>
<td>68%</td>
<td>56.1%</td>
<td>15</td>
<td>Suburban</td>
<td>1:1; Chromebooks</td>
</tr>
<tr>
<td>Don</td>
<td>MS 2</td>
<td>534</td>
<td>5-7</td>
<td>12%</td>
<td>68%</td>
<td>56.1%</td>
<td>15</td>
<td>Suburban</td>
<td>1:1; Chromebooks</td>
</tr>
<tr>
<td>Rae</td>
<td>MS 3</td>
<td>744</td>
<td>5-7</td>
<td>11%</td>
<td>54%</td>
<td>49.6%</td>
<td>17</td>
<td>Suburban</td>
<td>1:1; Chromebooks</td>
</tr>
</tbody>
</table>

*School population is reported for the 2020-2021 academic year.

Upon completing their student teaching and graduating from their program of study, each of the participants was hired by a different school district. All four participants accepted teaching positions in the same state as the college of education from which they graduated. Information about the schools in which the study participants were hired was collected from the state department of education data center (ADE Data Center, n.d.) and is provided below in Table 3.

Table 3

First-year teaching placements (Fall 2021)

<table>
<thead>
<tr>
<th>Participant pseudonym</th>
<th>School pseudonym</th>
<th>Student pop. *</th>
<th>Grade levels served</th>
<th>% SPED</th>
<th>% Low income student</th>
<th>% BIPOC students</th>
<th>Avg. Class Size</th>
<th>Community type</th>
<th>1:1 status &amp; device</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hazel</td>
<td>School 1</td>
<td>593</td>
<td>5-6</td>
<td>11%</td>
<td>26%</td>
<td>18.6%</td>
<td>18</td>
<td>Suburban</td>
<td>1:1; Chromebook</td>
</tr>
<tr>
<td>Brooke</td>
<td>School 4</td>
<td>579</td>
<td>8-9</td>
<td>12%</td>
<td>38%</td>
<td>7.9%</td>
<td>12</td>
<td>Suburban</td>
<td>1:1; Chromebook</td>
</tr>
<tr>
<td>Don</td>
<td>School 2</td>
<td>221</td>
<td>7-12</td>
<td>12%</td>
<td>85%</td>
<td>39.5%</td>
<td>11</td>
<td>Rural</td>
<td>1:1; Chromebook</td>
</tr>
<tr>
<td>Rae</td>
<td>School 3</td>
<td>1,515</td>
<td>8-9</td>
<td>14%</td>
<td>51%</td>
<td>46.6%</td>
<td>17</td>
<td>Suburban</td>
<td>1:1; Chromebook</td>
</tr>
</tbody>
</table>

*School population is reported for the 2020-2021 academic year.
Data Collection Methods

This study utilized three methods of data collection at multiple points in time across a calendar year (February to November 2021) to address the research questions: semi-structured interviews, observations of teaching, and documents/teaching artifacts. During observations, participants also provided copies of their lesson plans and TEL artifacts for me to review in conjunction with each observation. These methods allowed me to triangulate the data to ensure trustworthiness (Gall et al., 2014; Merriam & Tisdell, 2016) and “build a coherent justification for themes” (Creswell & Creswell, 2018, p. 200). The use of these instruments allowed me to gain insight into how the participants intended to use and actually used TEL during student teaching and first-year teaching and illuminated how their attitudes about technology and pedagogy informed their evolving intentions and actions regarding TEL.

One-on-One Interviews

One-on-one interviews served as a primary source of data in this study, as they provided insight into the attitudes and intentions of each participant regarding TEL. Yin (2018) argued that “interviews can especially help by suggesting explanations (i.e., the “hows” and “whys”) of key events, as well as insights reflecting participants’ relativist perspectives” (p. 118). In this case, the interviews illuminated how the participants’ experiences in the middle level program of study in the college of education informed their ideas about and uses of TEL in their own teaching. The interviews also allowed participants to reflect on how their unique teaching environments during student teaching and first-year teaching affected their intention to use and actual uses of TEL. Finally, because interviews were conducted at four different points in time over the course of a calendar year, they provided information about how, if at all, participants...
intention to use and actual use of TEL evolved as they left the supportive environment of
the middle level education program in the college of education and entered the field as first-year
teachers.

I developed the interview protocol using literature regarding Ajzen’s (1985) Theory of
Planned Behavior and preservice teachers’ beliefs about TEL as well as Savin-Baden and
Major’s (2013) guidance for interview protocol development. I also garnered feedback on the
protocol from faculty members with backgrounds in qualitative research at both the University of
Memphis and the study site. This feedback was used to make appropriate revisions to the
protocol before both phases of data collection (i.e., January 2021 and August 2021). The
questions aimed to garner participants’ descriptions of how they define TEL, as well as
their perceptions of their attitudes toward, intentions to use, and actual uses of TEL in their
teaching practices. I utilized the same interview protocol during both participants’ student
teaching semester and during first-year teaching. Follow-up questions in the protocol that were
designed to ask participants about their specific experiences during either student teaching or
first-year teaching were labeled accordingly (e.g., Spring 2021 or Fall 2021) on the protocol.
Additionally, two questions were added to the protocol for the Fall 2021 interviews based on
feedback from the dissertation committee. The protocol used for Spring 2021 interviews is
provided in Appendix A, and the protocol used for Fall 2021 interviews is provided in Appendix
B. All interviews were conducted using Zoom video conferencing software and employed a
semi-structured interview protocol (see Appendices A and B). Interviews were recorded, with
participants’ permission, and transcribed for review and analysis.
**Direct Observations**

Direct observations of teaching were used to describe participants’ actual uses of TEL. This aligns with Yin’s (2018) suggested uses of direct observations as part of a case study. Participants were asked to schedule observations of lessons that they felt represented their use of TEL. Thus, I was able to determine if their personal definitions of TEL aligned with the operational definition of the construct. A semi-structured observation protocol template was developed, based on guidance from Merriam and Tisdell (2016) and underwent critical review by my dissertation committee chair. An example of the observation protocol template can be found in Appendix C. Due to the COVID-19 pandemic, direct observations were conducted via Zoom video conferencing software, rather than in person. Therefore, I conducted the observations as what Savin-Baden and Major (2013) call a “peripheral participant” (p. 396) and what Merriam and Tisdell (2016) call a “complete observer” (p. 145). While the participant and their middle school students were aware of my presence in the room via a computer, I was not physically present in the space. This encouraged the middle school students in the room to behave as they normally would if I were not in the classroom space and allowed me to maintain my role as an objective observer of how TEL was employed during the lesson. A limitation of this arrangement was that I was only able to visually observe the part of the classroom that was in my line of sight, based on where the participant placed the computer in the classroom. I collaborated with each participant partner prior to the beginning of the observed lesson to ensure I could see and hear as much as possible during the lesson observation. During the observation, I used the observation protocol template to take field notes, script the lesson, make note of key uses of TEL during instruction, and sketch the physical classroom space. Following the observation, participants
were invited to share lesson plans and other lesson artifacts with me, and these were included as links within my observation field notes.

**Documents/ Artifacts**

Documents reviewed for this study were used to “corroborate and augment evidence from other [data] sources” (Yin, 2018, p. 115). They included lesson plan documents and digital artifacts designed and developed by the participants to facilitate TEL with their middle school students during the observed lessons. For example, Brooke provided a link to a Google Site that she built to facilitate a “digital escape room” that supported her students’ understanding of the parts of an animal cell in her 5th grade science classroom. Don provided a link to a set of Google Slides designed to serve as a “digital notebook” that facilitated students’ exploration and application of the order of operations in his 7th grade math classroom. Additionally, each participant provided a copy of a “philosophy of education” statement, a required assignment in their program of study for review and analysis.

Creswell and Creswell (2018) argued that, in addition to adding interest to the body of evidence, documents and artifacts can provide information that may be less evident in observations and interviews, and Savin-Baden and Major (2013) stated that documents “tend to reveal what people do or did as well as what they value” (p. 410). In this case, review of the lesson plans illustrated the participant partners’ intentions to use TEL, particularly given the nature of lesson plans as documents expressing what the participants intended to do to facilitate learning. The digital artifacts provided insight into how the participants were applying TEL within the content they designed and developed to facilitate the lesson and demonstrated potential coherence or conflict between their personal definitions of TEL and their applications.
of the construct in their teaching practice. The philosophy of education statement provided another means of comparing the participants’ stated pedagogical and technological beliefs with their teaching actions during the study.

Therefore, the documents and digital artifacts collected during the study contributed to a richer understanding of how preservice teachers’ descriptions of, intentions to use, and actual uses of TEL developed and evolved throughout their experiences as student teachers and first year in-service teachers (Creswell & Creswell, 2018; Savin-Baden & Major, 2013).

Table 4 provides an overview of the alignment between the research questions, data collection methods, and instrumentation in this study.

**Table 4**

*Research Questions, Method Alignment, and Corresponding Instrumentation*

<table>
<thead>
<tr>
<th>Research Questions</th>
<th>Method Alignment</th>
<th>Corresponding Instrument Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RQ1:</strong> How do preservice teachers describe technology-enabled learning? How do they describe their current technology-enabled learning beliefs and behaviors?</td>
<td>One-on-One Interviews</td>
<td>Intro, 1, 2, 3, 6, 8, 11, 15</td>
</tr>
<tr>
<td><strong>RQ2:</strong> How do preservice teachers describe their technology-enabled learning experiences? How do preservice teachers perceive these experiences influenced their technology-enabled learning intentions and behaviors in their student teaching classrooms?</td>
<td>One-on-One Interviews</td>
<td>3, 4, 5, 6, 7, 9, 10, 12, 13, 14</td>
</tr>
<tr>
<td><strong>RQ3:</strong> How do first-year teachers describe their technology-enabled learning experiences? How do first-year teachers perceive these experiences influenced their technology-enabled learning intentions and behaviors in their classrooms?</td>
<td>One-on-One Interviews</td>
<td>4, 5, 6, 7, 9, 10, 12, 13, 14</td>
</tr>
<tr>
<td><strong>RQ4:</strong> How, if at all, do teachers’ intention to use and actual use of technology-enabled learning evolve during student teaching and first-year teaching semesters?</td>
<td>Observations, Documents/Artifacts, One-on-One Interviews</td>
<td>Field Notes All questions</td>
</tr>
</tbody>
</table>
Data Collection Procedures

Before collecting data, IRB approval was obtained at the university from which study participants were recruited as well as at the University of Memphis (see Appendices D and E). After the study was approved by IRB, recruitment emails were sent to potential participants (see Appendix F), and the informed consent letter was attached to the recruitment email. Participants were instructed to return a signed copy of the informed consent via email and retain a copy for their own records. In the recruitment email, potential participants were encouraged to carefully read the informed consent document and reach out to me with any questions they had before confirming their participation in the study. Interviews and observations were not scheduled until informed consent was obtained from each participant. Only individuals who returned a signed consent form were participant partners in this study.

After completing these steps, participants were invited to schedule initial one-one-one interviews using an online appointment scheduling tool (Calendly). Interviews took place via Zoom video conferencing software and were recorded. At the beginning of each interview, consent to participate and consent to record the session were confirmed with each individual in the study. One-on-one interviews were conducted during February 2021 and April 2021 to capture participants’ beliefs and intentions at the beginning and end of their student teaching semester and again during September 2021 and November 2021 to capture participants’ beliefs and intentions at the beginning and mid-point of their first year of teaching. Observations were conducted during March 2021 and October 2021 via Zoom video conferencing software. This allowed me to view the lessons as a passive observer and to avoid disrupting the learning
environment. Participants provided teaching artifacts (e.g., lesson plans, slide shows, and online interactive tools) as an additional data source during observations. For each one-on-one interview and observation, I kept detailed memos.

Data collection took place from February 2021 to November 2021. All data were stored in secure locations (both on and offline) and were only accessible to myself and the research team. The schools in which the participants were teaching were given pseudonyms and participants self-selected pseudonyms to maintain confidentiality. All data were collected virtually. A multi-method approach to data collection was employed in this study. I conducted direct observations and collected teaching/TEL artifacts from those observations and engaged participants in one-on-one interviews. Collecting data from multiple sources is a key element of rigorous qualitative research (Creswell & Creswell, 2018; Gall et al., 2014) and of case study design, in particular (Savin-Baden & Major, 2013; Yin, 2018). Additionally, the use of interviews and observations in combination allowed me to determine whether “self-reported data” from interviews aligned with “actual information” from observations (Savin-Baden & Major, 2013, p. 392). Since self-reported data can, at times, be over-positive, it is important to pair it with researcher observations. In this study, the use of interviews, observations, and documents allowed me to observe how and to what extent, if at all, participants’ actual uses of TEL aligned with their stated intentions to use TEL.

Analysis

In qualitative research, analysis is “iterative and cyclical” and often occurs throughout and beyond the data collection phase of the inquiry (Savin-Baden & Major, 2013, p. 435). I adopted this approach in this case study, “playing with the data,” as suggested by Yin (2018, p.
Throughout the data collection process, I elected to “play” with the data by writing memos and notes to myself while transcribing interviews and reviewing field notes and teaching artifacts and by developing a matrix to organize data to determine which information fit within a priori codes and which information suggested themes beyond the theoretical propositions with which I began the study (Saldana, 2016; Yin, 2018).

Upon completion of all data collection, I fully immersed myself in the data, by reading interview transcripts line by line and reviewing observation field notes and teaching artifacts provided by the participant partners. Through this immersion, I developed an overall sense of my data. During this immersion, I also continued memoing throughout and adding to the analytic matrix that I constructed during the data collection phase. This facilitated my ability to categorize data into themes (Creswell & Poth, 2018; Saldana, 2016; Yin, 2018). Additionally, pre-established a priori codes, based on my review of the literature and theory were used in conjunction with memoing, reading, and reviewing to funnel and refine significant data into meaningful themes (Stake, 1995) since a challenge of analyzing qualitative data is the amount of data and differentiating significant versus trivial information (Yin, 2018).

Per Yin’s (2018) guidance, the study employed two analytic strategies. In the first cycle of analysis, theoretical propositions guided the coding process. Since this case study employed Ajzen’s (1985) Theory of Planned Behavior as a theoretical lens, the constructs of the theory (e.g., attitude, subjective norm, perceived behavioral control, intention, and actual use) were established as a priori codes (Saldana, 2015), which allowed me to focus on the significant data elements. One proposition from the TPB was that positive attitudes toward TEL would lead to positive intention, or expressions of intention to use TEL from the participants. Additionally, the
empirical literature helped to guide my analytical work. For example, Herring Watson and Rockinson-Szapkiw (2021) found that attitudes and perceived behavioral control made significant individual contributions to preservice teachers’ intention to use TEL. Therefore, I was able to use this theoretical and empirical guidance to identify words and short phrases expressing positive attitude, descriptions of self-efficacy and perceived controllability, and intention in interview transcripts and examine how these sentiments were linked to one another. These words and phrases were highlighted and then placed in the analytic matrix created in a Word document and viewed in combination with one another to generate themes.

The themes derived from the theory were applied to each data source; interview transcripts, observation field notes, and written artifacts were examined. Words and phrases that aligned with the established a priori codes were highlighted and categorized accordingly. However, open and inductive coding was also conducted during a second cycle of analysis in order to explore how, if at all, the established theory might be extended, given the experiences and perception of the study participants, especially where phrases and words did not fit within the a priori codes (Yin, 2018). Throughout each cycle of analysis, I collaborated with my chair. We had several meetings to discuss and refine the themes I identified across the data sources. While all a priori codes were agreed upon before proceeding with data collection, we both individually identified themes that expanded the TPB. These emerging themes were discussed, and agreed upon themes were collaboratively developed. This allowed me to confirm patterns in the data and establish ways in which the TPB might be extended based on the findings in this study.
Trustworthiness and Ethics

This qualitative case study was designed to prioritize the co-creation of knowledge with participant partners who were empowered to share their voices and experiences so that the study might provide a rich, thick description of their experiences as student teachers and first-year teachers using TEL in their teaching practice. These methods align with a social constructionist philosophical stance that acknowledges the social nature of knowledge construction. While quantitative studies are described in terms of their rigor, validity, and reliability, Savin-Baden and Major (2013) argued that the majority of qualitative scholars do not apply these terms, which represent “positivist claims to knowledge” that do not align with the goals of qualitative research (p. 474). Therefore, a discussion of ethics and trustworthiness within this study design is necessary.

Since this study sought to provide rich, thick description of the beliefs and experiences of the participant partners, a qualitative approach to establishing trustworthiness was more appropriate. Lincoln and Guba (1985) identified four criteria by which qualitative scholars might establish the trustworthiness and quality of their research: credibility, dependability, confirmability, and transferability. Credibility “rests on the notion that study results should be convincing and, therefore, are to be believed” (Savin-Baden & Major, 2013, p. 475). Part of establishing credibility is also recognizing one’s potential biases in examining the data and reporting findings (Yin, 2018). To address this, I employed member checking throughout the data collection and analysis phases of the study to determine the accuracy of my findings (Creswell & Creswell, 2018). All interview transcripts were shared with participants for their review and approval throughout the research project. At the mid-point (early September 2021)
and end of the study (December 2021), member checking focus groups were conducted with all participants to confirm the study findings, correct any misrepresentations, and create space for participants to comment on my interpretation of the data (Savin-Badin & Major, 2013; Yin, 2018). It was important to me that my participants felt like full partners in this study, and that they felt their voices and experiences were accurately represented in my writing.

Dependability refers to how well the research processes and procedures were documented throughout the study (Savin-Baden & Major, 2013). To ensure dependability, I followed a semi-structured protocol for all interviews and observations (see Appendices A, B, and C). I also used analytical memos throughout the data collection and analysis phases of this research project. Using memos allowed me to document my thinking and preliminary findings throughout the research process and record the rationale for my decisions throughout the research process (Saldana, 2014). As is noted by qualitative scholars (Savin-Baden & Major, 2014; Merriam & Tisdell, 2016; Yin, 2018), data analysis is an ongoing, parallel process that begins during data collection. Writing memos also helped me to establish that my analysis and findings were representative of the data collected, rather than my personal beliefs about the phenomenon under study. This also helped to address the confirmability of this study (Savin-Baden & Major, 2013).

Additionally, the use of both one-on-one interviews and direct observations allowed for triangulation through multiple methods of data collection (Creswell & Creswell, 2018; Savin-Baden & Major, 2013; Yin, 2018) and provided the opportunity to gain a thorough understanding of participants beliefs about, intention to use, and actual uses of TEL. These forms of data collection supported one another and allowed me to confirm what participants said by observing
what they actually did during observed lessons (Savin-Baden & Major, 2013). Creswell and Creswell (2018) also suggested that prolonged time in the field can enhance the trustworthiness of a qualitative study. This study was conducted over the course of a calendar year, during which time I was able to develop a more in-depth understanding of why and how TEL is used, or not, among these participants. These understandings contributed to a rich, thick description of the participants’ experiences with the central phenomenon.

Generalizability to other contexts was not a main goal of this study, given the small sample size and qualitative nature of the research. The goal of this study was to describe how, if at all, preservice and first-year teachers intend to use and actually use TEL. The generalizability of these study findings is, admittedly, very limited, given the specific context of the study. However, transferability, as defined by Lincoln and Guba (1985), refers to the “application of similar findings elsewhere” (Savin-Baden & Major, 2013, p. 475). Thus, this study offers transferability, particularly to teacher education scholars seeking to examine their own program practices regarding TEL and to those who mentor and support first-year teachers’ instructional practices during the induction period.

Subjectivity Statement

Given the qualitative approach in this case study, it is critical to state how my identities and philosophical assumptions inform and align with this study’s design (Creswell & Poth, 2018). When engaged in qualitative inquiry, it is impossible to fully remove researcher bias from the interpretation of the data; thus, it is vital to provide a subjectivity statement that describes how I approach research overall and how my views of reality and the nature of knowledge have influenced this study (Savin-Baden & Major, 2013).
Creswell and Poth (2018) outlined how our philosophical assumptions, our ontology and epistemology, inform the lines of inquiry we choose to explore and the methodologies we employ. As a qualitative researcher, I have adopted an idealistic ontology, operating from the perspective that “reality is subjective and is constructed by individuals and groups” (Savin-Baden & Major, 2013, p. 57). This aligns with my epistemological belief that knowledge is socially constructed and embedded within “history, context, culture, language, and experience” (Savin-Baden & Major, 2013, p. 62). The idea of the researcher and participant partners co-constructing knowledge resonates with my values as an educator. I believe deeply in the value of reciprocal learning and shared experiences. As a teacher educator whose research primarily focuses on preservice teachers, I also value the acknowledgement of power structures that is central to a social constructionist epistemology (Burr, 2003). Burr and Dick (2017) argued that “power relations exist both at the level of society […] and between individuals” (p. 64). This is particularly evident for preservice and first-year teachers who experience power dynamics at both levels within the system of education. In this study, I was transparent with my participant partners about the inherent power structures in the teacher/student, mentor/mentee, and researcher/participant relationships. I did my best to minimize power dynamics, emphasizing their roles as partners in this study and centering their experiences as they moved through this pivotal season in their early careers. While I was not acting as an instructor for any of the participants during the timeline of the present study, I had served as their course instructor for multiple courses during previous semesters and had a professional relationship with each participant partner prior to the start of the study.
Burr (2003) challenged scholars to remember that “we should not assume that our ways of understanding are necessarily any better, in terms of being any nearer the truth, than any others” (p. 4). Rather, we must center the experiences of our participant partners, value the truth of their experience, and recognize that their understanding is historically, socially, and culturally constructed (Burr, 2003; Savin-Baden & Major, 2013). This is true across systems, but I find a social constructionist lens particularly valuable as a guiding principle in the context of education systems, as these systems often feel particularly grounded in ideas about “the way we’ve always taught.” This philosophical stance aligns well with Ajzen’s (1985) TPB as the constructs of the theory are all socially informed by antecedent beliefs. In particular, preservice teachers’ attitudes about technology and pedagogy are “socially and culturally constructed” by their environment (e.g., their K-12 learning experiences, their mentor teacher(s), other teachers on their hallway, access to physical resources) (Savin-Baden & Major, 2013, p. 28). Additionally, technology-enabled learning, as a student-centered pedagogical approach, pushes back against more established teacher-centered approaches (Ertmer & Ottenbreit-Leftwich, 2012).

My own experiences as an educator sparked my interest in working with preservice teachers and researching the intention to use and actual use of TEL, in particular. As a novice teacher, I had a building principal and colleagues who nurtured my curiosity about adopting innovative teaching practices and encouraged me to explore the ways in which social constructivist uses of technology in the classroom might support and motivate all learners to engage in active, social learning. This fostered my passion for TEL and my belief that, given certain conditions, preservice and novice teachers have the capacity to facilitate pedagogical change in largely traditional, teacher-centered K-12 environments. In the present study, I sought
to suspend these personal beliefs as much as possible to focus solely on sharing the experiences of the participant partners and to identify lessons to be learned from their experiences so that teacher educators and others who are responsible for supporting preservice and novice teachers might learn how to cultivate their capacity and opportunity to use TEL and step into their power as change agents in their school environments.
CHAPTER FOUR

RESULTS

To contribute to the literature (Ottenbreit-Leftwich, Liao et al., 2018; Tondeur et al., 2017), the purpose of this study was to provide a rich description of the unique development and evolution of preservice teachers’ intention to use and actual use of TEL during student teaching and first-year teaching. The study also aimed to provide lessons for application from this rich description.

In Chapter Three, I outlined the study’s design, participants, settings, methods, analysis, and my positionality. I noted that I would remain flexible and adaptive regarding the use of an embedded single-case design, given that the participants in this study were all placed (Spring 2021) and employed (Fall 2021) in different school buildings. Throughout data collection and analysis, I conferred with my chair to discuss the appropriateness of the study design. After all data were analyzed, we determined that the embedded single-case design was warranted, given that, despite the different school placements, the program of study that bounded the case proved to have a significant influence on each of the participants, who served as sub-units of analysis within the case, defined as a shared cohort that have participated in and graduated from the same program of study in the college of education at a mid-size public teaching university in the southeastern United States.

For this reason, Chapter Four begins with a rich description of the single case bounded by time and experience (i.e., graduates of the same program of study in a college of education). Next, rich, thick descriptions of each participant partner’s teaching contexts during the study are provided. Finally, salient themes are identified. In Chapter Four, I have made every effort to
center the voices of the participant partners. Therefore, the findings described in this chapter will be further situated within the larger body of empirical and theoretical literature in Chapter 5.

**The Case**

I collected information about the perceptions and experiences of four participant partners in a shared cohort participating in and graduating from the same program of study in the college of education at a mid-size public teaching university in the southeastern United States. Each of the participants referenced their program of study in the college of education throughout the study and noted the significance of the program in influencing their ideas about, intention to use TEL, and actual use of TEL. For example, all four participants stated that during the courses in their program of study, the Middle Level Education program, was the first time they ever felt they had learned about or used TEL as a student and were exposed to student-centered TEL practices. In all four of his interviews, Don cited several courses and instructors throughout the program of study who he perceived as prominent users of TEL and influencers of his own ideas about and uses of TEL during student teaching and first-year teaching. Similarly, Brooke, Rae, and Hazel included many of the same faculty members in their own interviews as influencing their ideas about, intention to use, and actual use of TEL. For example, Brooke stated that she felt encouraged and inspired by middle level program faculty “actively using it [TEL] and encouraging us to also use it.” Hazel noted, “technology-enabled learning became more important the further along I went through the Middle Level program. So as a student, the more exposure I had to the use of technology in education, the more important it became to me.”

All the participants also discussed the significance of taking a stand-alone educational technology course in the first semester after full admittance to their program of study. Brooke
stated, “The technology class that we took... was really kind of the first time I learned about technology in a way that I could actually apply to my future classroom.” Similarly, Hazel described how the technology course impacted her ideas about teaching and learning: “For me, that was a big eye-opening experience because I didn’t really have the tool belt, right? Knowing all the different things that I could do with technology in the classroom... And I’ve used what I learned in that class in all of the lessons that I’ve written since.” Hazel reiterated the value and impact of the technology course on her intention to use and actual use of TEL across all of her interviews, even at the end of her first semester of first-year teaching. Rae expressed a similar sentiment about this course “opening doors to more technology” that she uses now. Like Hazel and Rae, Don cited the stand-alone technology course as a pivotal experience that allowed him to build his knowledge of a wide variety of technology resources that made TEL possible. He also described the value of the physical environment in which the course is taught, a mobile learning classroom with modular furniture, multiple Apple TVs, and display screens, in helping him envision learning in a new way: “… Seeing the, all the different ways we can use technology to create a learning environment, it really opened my eyes up.” Notably, Hazel, Brooke, and Don all completed the stand-alone technology course with the same instructor in the same course section. While Rae had a different instructor for this course, all of the stand-alone technology course instructors work together closely to ensure consistency across course sections.

While each participant discussed the impact of the stand-alone technology course they were required to take as part of their program of study, it is notable that they all also emphasized the value of seeing TEL used across their program of study in courses like Education as a Profession, Diverse Learners in Inclusive Settings, Introduction to Middle Level Education,
Advanced Middle Level Strategies, Classroom Assessment, and Theory and Practice of Classroom Management. Don also cited the effective use of TEL in his content-area specific math courses. This signifies that the program of study does provide the robust program-deep and program-wide use of TEL that are in alignment with its mission and vision statements.

Participants also made it clear that they felt this would have been their experience, regardless of the shift to online learning that was necessitated by the COVID-19 pandemic. For example, Brooke stated, “[TEL] didn't happen in college until I got into the education program...even before COVID, our classes were intentional about at least sprinkling a little bit of technology-enabled learning and, like, resources we could use in our future classrooms...My experience was learning about a new tool and then learning how to use it and how it would actually be beneficial to me in my classroom."

As noted in Chapter Three, the final semester of coursework completed by each participant partner consisted of courses that were offered either fully online or in a hybrid format, given the COVID-19 pandemic. However, all four participants noted that this online pivot due to COVID had a positive impact on their TEL perceptions. Watching faculty pivot their instruction to virtual platforms while also maintaining an engaging learning environment caused the participants to see TEL as “vital” and “necessary” to learning. Brooke noted, “we learned so much that we wouldn’t have learned otherwise because we were using technology all the time and learning about those [TEL] resources.” This shared experience also encouraged participants that all teachers could successfully use TEL. As Hazel stated, “they [program faculty] all can figure out how to do it, so I can figure it out, too... This [TEL] is something that’s accessible to all of us.” In the last semester of their shared program of study, the four participants were each
placed in a local public middle school to complete their student teaching. Each of those placements, as well as the participants’ first-year teaching sites of employment, are described in the following sections.

Hazel’s Teaching Contexts

Hazel completed her student teaching at MS 1, a large (e.g., 9,000+ students) suburban public middle school serving grades 5-7. She was assigned to a 5th grade math classroom and had a supportive mentor teacher, per her own analysis: “My mentor is amazing. She’s really sweet and helpful. I did, like, a virtual escape room with the kids one time, and she got so excited...She’s really sweet and helpful.” While Hazel shared examples of her use of TEL during student teaching, Hazel’s mentor teacher preferred a more traditional, direct instruction approach, often neglecting technology. Hazel noted: “When they come into class, they sit down, and they get out the workbooks, and they just work problems with the teacher the whole time. So, she works it on a document camera, and then they work problems.” Thus, Hazel said she and her mentor teacher were on “different wavelengths” pedagogically. Additionally, Hazel was not able to collaborate with other teachers in the building to design and facilitate TEL: “There’s not a lot of teachers, at least in my part of the hallway, um, who use a lot of technology. And so, I didn’t have a whole lot of opportunity for collaboration. It was just, like, whatever I come up with.”

Her teacher’s approach to technology appeared to be reflective of the school’s culture and approach to technology use, given Hazel’s inability to identify any teachers she had observed or talked to in the building who were using TEL. TEL was not valued by the school as evidenced by Hazel’s experience with her mentor when planning lessons for the students in her placement:
“Because my mentor is not as involved with using technology to teach, I don’t think she fully appreciated how meaningful it can be. She was never disrespectful or anything and unsupportive, but it was less of, ‘Oh, that’s such an engaging tool’ or ‘That really, you know, encourages critical thinking.’ It was more, ‘Oh, that is so cute. I think the kids would really like it.’ […] I was like, ‘Oh, this would really aid in their learning,’ but I just got, ‘Oh, that’s cute.’” Thus, Hazel felt that she was inhibited in her use of TEL in this school placement.

In the Fall 2021 semester, Hazel was hired to teach 6th grade math at School 1, which serves 5th and 6th grade students. School 1 is located in a relatively affluent suburban community. Of the four participants, Hazel’s school serves the lowest number of students from low-income households (26%). In contrast to her student teaching placement at MS 1, School 1 was highly supportive of TEL practices and innovative teaching practices in general, per Hazel’s assessment. Hazel believed this was largely due to her principal. “I love [my principal] …I could do whatever I wanted, and she would be fine with it. Even if it didn’t work, you know? She is okay with me trying literally whatever. And that freedom is really nice.” Having a principal who actively encouraged innovative teaching practices created a larger culture of innovation in the school environment. For example, Hazel shared how her principal had encouraged her PLC to write a grant to fund new student iPads for their math classrooms as an addition to their school-issued Chromebooks. Additionally, School 1 had access to a wide variety of resources that can support TEL. In addition to being 1:1 with Chromebooks, Hazel noted, “I am really blessed that [the district] bought a license to almost everything. And so I have a lot of freedom there.” Some of the apps she mentioned included the Google Suite (e.g., Drive, Docs, Slides, Sheets, Classroom), Nearpod, EdPuzzle, and other interactive apps for student use. The school also had a
dedicated Makerspace and additional technology resources to support STEM lessons, including robotics. All teachers in the building had access to these resources and to instructional facilitators with whom teachers could schedule time to co-teach lessons with these resources.

Additionally, Hazel was a part of a collaborative professional learning community (PLC) with the other 6th grade math teachers. PLCs that analyze student data and collaboratively plan instruction are part of a statewide education initiative in the state where this study took place (DESE, n.d.b). “My PLC is really good about meeting, and we share a lot of things.” At the beginning of her first year of teaching, she noted that “everything feels very formal” in the PLC, which sometimes made her feel intimidated to speak up and share her ideas. However, by the time we conducted her last interview in November, she expressed more confidence exchanging ideas with her colleagues. “We make a lot of things together and share a lot of things…We’re in it together.” Hazel shared that she contributed to the PLC as much as she learned from the other two 6th grade math teachers, who she described as “veteran” teachers.

Brooke’s Teaching Contexts

Brooke completed her student teaching at MS 2, a large (e.g., 9,000+ students), diverse (e.g., 68% BIPOC students) middle school in a suburban school district. Brooke described her perceptions of her 5th and 6th grade science student teaching placement in detail during her interviews. At the beginning of the Spring 2021 semester, Brooke stated that she loved her student teaching placement school. However, after just a few weeks in her placement, her ideas about classroom technology use had shifted because “everything is on the computer” due to the COVID-19 pandemic. During the Spring 2021 semester, this school had students learning both in-person and virtually; however, in-person instruction had to remain socially distant and the use
of handouts and shared supplies was discouraged. Therefore, many teachers in the school primarily used the students’ Chromebooks to provide resources and instructional materials.

Despite the need to move instruction online and almost a year into the COVID-19 pandemic, teachers at MS 2 were unfamiliar with tools that could be used to support TEL. Instead, according to Brooke, they were relying on passive consumption of videos and digital worksheet completion. Brooke had a negative view of this use of technology. She said, “walking into [MS 2] my first week, literally the classes were silent... So, I was really discouraged my first week... If you would’ve asked me that first week when they [students] were just staring at their computers, I would have said, ‘No, get the computers away. No more technology.’” Essentially, Brooke noted that she did not perceive these passive uses of technology in her student teaching placement to be examples of TEL. In her April 2021 interview, she stated: “They are still using it [technology] to just push out busy work that would have been just paper and pencil...no teacher/student interaction, no student-to-student interaction.”

Despite this, Brooke’s mentor teacher was positive and open-minded toward the use of TEL and loved it when Brooke used TEL in the lessons she created and taught, according to Brooke’s assessment. Brooke posited that the teachers in the building just had not been exposed to the same technology resources and possibilities that she had learned about in her program of study. Toward the end of her student teaching semester, she stated, “I think that they’ve never seen how technology-enabled learning should actually be done in an engaging way that is actually pushing the students to create their own learning and to extend their own learning.” Similarly, the students were often unfamiliar with the tools she used to facilitate TEL (e.g., Nearpod), which required her to teach them “how to use the platform that you’re using.”
However, she stated that “it’s so exciting for them [students] to be able to use it, and they enjoy using it.” While her student teaching placement and the faculty there were not prohibitive to her use of TEL, Brooke also did not feel that they actively promoted or modeled its use either.

After graduation, Brooke was hired at School 4 to teach 9th grade Physical Science. While Brooke graduated with a degree in Middle Level Education, she was hired at a junior high school that serves 8th and 9th grades. Brooke’s school had the least diverse student population (7.9% BIPOC students) and was located in a suburban community. During the Fall 2021 semester, School 4 was in its first semester of a 1:1 initiative with Chromebooks. Having student taught in a district with an established 1:1 technology program, Brooke felt that School 4 was “behind in a way, just because they’re just now getting their Chromebooks, and they’re just now, um, kind of testing out the waters with them.” The newness of the technology initiative was also evident in the instructional resources shared with Brooke at the start of the school year, which were largely teacher-centered in nature and focused on lecture-based strategies: “…there’s a packet for each unit, like, filling in notes, and that’s just, that’s not my style.” Because the technology hardware was so new to the district, it seemed that TEL practices had not had time to take hold with the faculty at the school.

In contrast to Brooke’s previous K-12 experiences in a larger district, School 4 did not have a dedicated instructional facilitator to support teachers’ professional learning and instructional planning. Rather, the principal acted as both the building administrator and the instructional facilitator. These dual roles made it challenging for him to actively fulfill both roles, according to Brooke: “The principal acts as the instructional facilitator, which is an interesting dynamic because, I mean, he’s never talked to me about science before, so I don’t know how
that’s supposed to work?” Even though School 4 did not have a dedicated, full-time instructional facilitator, teachers in the school collaborated with one another to provide professional learning during specific times in the week called, “Whatever I Need (WIN)” time. According to Brooke, these hour-long professional development sessions were designed to support teachers’ use of their new Chromebooks. While optional, Brooke found them helpful in supporting her own use of TEL in her classroom. “I’ve attended those and just, kind of like, soaked up how they use [various technologies]. And so, um, that has really helped me because I’ve seen those [tools] in other capacities, but not necessarily in a classroom every day.” Just as in her student teaching experience, School 4’s culture seemed to neither prohibit nor advance the use of TEL in the classroom.

**Don’s Teaching Contexts**

Like Brooke, Don was also placed at MS 2 for student teaching. He was placed in a 6th grade math classroom. In his initial interview in February 2021, he described his mentor teacher as “definitely amazing.” Don and his mentor teacher were both significantly younger than the majority of the teachers in the building, and Don stated that, together, they tried to provide students with a “new generation-type education,” which he aligned with TEL. Don’s mentor teacher was already using a lot of technology to support instruction in her classroom, and Don stated that this aligned well with his ideas about how teaching and learning should look. When asked whether he felt there was an exchange of ideas between him and his mentor teacher, Don replied, “yes, most definitely,” and provided examples of how he and his mentor both shared ideas with one another about how to use technology in their lessons.
However, his mentor teacher’s classroom and her support for TEL were a “different atmosphere” from the rest of the school, which he described as a “‘Here’s the work, do it’ type of situation.” Like Brooke, Don noted that most of the technology use he observed in other classrooms at MS 2 was teacher-directed and passive in nature, and he did not align this kind of technology usage with TEL. Don stated, “It’s just not engaging, and it’s not, um, active, or I don’t think it’s active learning.” Like both Brooke and Hazel, Don seemed to suggest that while no one at his student teaching placement was discouraging or forbidding his use of TEL, they also (outside of his mentor teacher) were not actively promoting or supporting more student-centered TEL practices. Don also highlighted the presence of barriers to TEL that were related to infrastructure. He highlighted issues related to unreliable Wi-Fi as particularly frustrating when trying to facilitate TEL; however, he consistently expressed in his interviews that this was a barrier worth working to overcome, especially given how positively his students responded to TEL: “They’re great. They stay on top of, on topic. If I’m teaching, they’re all eyes on me. They’re engaged. They’re listening. They’re participating. It’s great!”

In the Fall 2021 semester, Don was hired to teach 7th and 8th grade math and science at School 2, which is located in a small, rural school district. School 2 is a Title 1 school, serving grades 7-12, with a high population of students from low-income households (85%). Given the small size of the school, Don was immediately assigned to multiple roles as a first-year teacher. In addition to teaching two subjects (math and science) in two grade levels (7th and 8th grades), Don was also asked to serve as the Science Lead for the school, putting him in a teacher leadership position. He also served as the Junior Class Sponsor. Don shared that his school had experienced high rates of teacher turnover in recent years; therefore, the school faculty had a
high concentration of new teachers. According to Don, every teacher on his hallway was a first-year teacher, and only four of the school’s teachers (20%) were “veteran” teachers with “20 or more years” of experience. The principal at School 2 was also a first-year principal. This created an environment of strong collaboration among the teaching faculty: “We all lean on each other. We all help each other.” It also created space for the kind of instructional freedom that is conducive to TEL. Don stated that his role as Science Lead allowed him to engage in TEL as often as he wanted and also encourage other teachers to do the same: “I’m open to do whatever I want to do [pedagogically] …whenever I want to do it. Um, it helps that I’m the Science Lead. So I can especially do whatever I want to do. And so, exploring different things, different projects, different, uh, activities, it’s just, it’s there. I have no [curricular] restrictions.”

While Don felt the school administration was supportive of the use of TEL, and that he could teach how he saw fit in his own classroom, he was also keenly aware of students’ home lives outside of school. School 2 was also in its first semester of 1:1 Chromebook adoption during the Fall 2021 semester. However, access to devices alone was not enough to ensure his students had full access to technology-related resources outside of school. Due to the rural location of the school, reliable Wi-Fi was not a guarantee within the school building. Additionally, the high poverty nature of the student population meant that many students also did not have access to Wi-Fi at home and may not consistently have electricity at home to charge their devices before coming to school. Because of these factors, Don felt it was necessary to keep TEL use in the school building, rather than asking students to complete any technology-enhanced instruction outside of school.
Rae’s Teaching Contexts

Rae was placed at MS 3 to complete her student teaching in a 5th grade science classroom. Of the three schools where participants were placed in the Spring 2021 semester, MS 3 is the largest (i.e., 744 students in grades 5-7). Like MS 1 and MS 2, this suburban middle school also serves a highly diverse student population (i.e., 49.6% BIPOC students, 54% low-income students). Rae provided insight into the school environment during her interviews in February and April 2021. Like Don, Rae noted that slow Wi-Fi, “slower than dial up,” presented a barrier to the use of TEL. However, like Don, she also felt it was a barrier worth working to overcome. Rae noted that at the start of the Spring 2021 semester, “none of the science teachers in the school knew technology.” Like the other three participants, when she first arrived at MS 3, most of the technology use Rae saw was passive and consumptive: “So when I first came, they watched a lot of videos and just answered assessments. Questions, videos, questions, videos, questions.” However, her experience differed slightly in that the team of teachers she worked with during student teaching were highly supportive of and open to her use of TEL. She was welcomed by them as a full member of their science content area team: “All the science teachers in the school have, like, they support each other... anything that I’ve brought that’s been new with technology, they share it with each other, and they’re always like, ‘Wow! That’s cool!’”

While I largely did not interact with school personnel at any of the three student teaching placements during this study, the one exception was an interaction with Rae’s mentor teacher during my virtual observation of her teaching. Her mentor teacher made a point of saying hello to me on the Zoom call before the lesson began and telling me what a wonderful job Rae was doing in her student teaching. I asked Rae about her mentor teacher’s enthusiasm, and she
emphasized that her mentor teacher was highly supportive, encouraging, and open-minded, even though her mentor’s use of TEL was limited. Rae’s mentor teacher created a lot of space for her to grow through experimenting with a variety of TEL strategies throughout her student teaching semester. While the MS 3 faculty at large were not using TEL regularly, Rae was placed in a classroom where she had the freedom to use TEL in her lessons as she saw fit.

Rae was hired as a first-year teacher in the same district where she completed her student teaching. However, rather than being assigned to a middle school, she was assigned to teach 8th grade science at School 3, a junior high that serves 8th and 9th graders. School 3 is the only junior high in the district; it serves a large (1,500+ students), diverse (51% low income; 46.6% BIPOC) population of students. This suburban school district is 1:1 with Chromebooks; however, as is true in other schools in the study, the presence of technology hardware was not necessarily indicative of a school culture that valued TEL or a technology infrastructure that facilitated the use of TEL. In her September 2021 interview, Rae stated that she could not use any of the teacher-assigned technology (e.g., laptop, Smartboard, etc.) in her classroom because her teacher-assigned computer had not been properly set up. She could not connect to the Smartboard or access resources to facilitate TEL for students because her device would not reliably stay connected to the Wi-Fi (“My Wi-Fi goes out every 15 minutes…Sometimes I get 40 minutes.”). In our final interview in November 2021, she stated that IT would finally be fixing her laptop “14 weeks into school,” indicating that she had been battling these issues all semester.

Curricular restrictions at School 3 were also inhibitive to the use of TEL. For example, Rae stated, “So you can teach the way you want to teach it, but there are a lot of restrictions on how you can actually teach it… I wanted to do a project. And if it’s longer than two days…So
you can do two days, but once you go into that third day, you have to get a project request, and you have to get that confirmed [by administration]. They don’t want the students to present anything in class because that’s taking up [instructional] time.” This policy felt intimidating to Rae, who asserted that she could not plan for student-centered TEL because it might take more than two days to facilitate. She felt this policy, along with a lack of engagement among her PLC (“One of them, it’s really whatever’s easiest. If it’s something easy, then we’re going to do that.”) and technology infrastructure issues, made it challenging to use TEL in her classroom. While my request to conduct a virtual observation of Rae’s teaching was granted during her student teaching semester (Spring 2021), the district did not grant that request in the Fall 2021 semester. Therefore, I was unable to pair a teaching observation with Rae’s interviews during the second phase of data collection.

**Introduction to Themes**

The purpose of this study was to provide a rich description and explore the unique development and evolution of preservice teachers’ intention to use and actual use of TEL during student teaching and first-year teaching. I also sought to identify lessons that can be learned from preservice teachers who have completed a TEL-rich program of teacher preparation and are entering the field to test their TEL intentions in their teaching actions. All data were collected from interviews, observation field notes, teaching artifacts (e.g., lesson plan documents and lesson resources), and written philosophy of education statements from four participant partners, who represented sub-units of analysis within the embedded single case (i.e., a shared cohort that participated in and graduated from the same program of study). Findings were combined, which led to the identification of patterns and development of themes and sub-themes. There were four
primary research questions for this study. Table 5 provides the alignment among the research questions, themes, and sub-themes. The following sections discuss the themes and sub-themes in detail.

Table 5

*Alignment of research questions, themes and sub-themes*

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<thead>
<tr>
<th>Research Question</th>
<th>Themes &amp; Sub-themes</th>
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<tr>
<td><strong>RQ1:</strong> How do preservice teachers describe technology-enabled learning? How do they describe their current technology-enabled learning beliefs and behaviors?</td>
<td>Describing technology-enabled learning (ATT) TEL is occurring when</td>
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<td>• Technology-enabled learning is a transformative agent.</td>
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<td>o Technology-enabled learning empowers and engages.</td>
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<td>o Technology-enabled learning is student-centered.</td>
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<td>TEL is not occurring when</td>
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<td>• Technology can be an oppressive agent.</td>
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<td>o Technology is often used for consumption and compliance.</td>
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<td>o Technology use is often teacher-centered.</td>
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<td><strong>RQ2:</strong> How do preservice teachers describe their technology-enabled learning experiences? How do preservice teachers perceive these experiences influence their technology-enabled learning intentions and behaviors during student teaching?</td>
<td>Explaining intention to use and actual use of TEL (INT &amp; USE)</td>
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<td><strong>RQ3:</strong> How do first-year teachers describe their technology-enabled learning experiences? How do first-year teachers perceive these experiences influenced their technology-enabled learning intentions and behaviors in their classrooms?</td>
<td>Describing Actual TEL use during instruction</td>
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<td><strong>RQ4:</strong> How, if at all, do teachers’ intention to use and actual use of technology-enabled learning evolve during student teaching and first-year teaching semesters?</td>
<td>Shifting from idealistic to realistic thinking about TEL</td>
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<td>• Shifting responsibilities influence TEL thinking and use.</td>
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<td>• Time and experience influence TEL thinking and use.</td>
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Affective factors influence TEL thinking, intention, and use.

This study was informed by Ajzen’s (1985; 1991) Theory of Planned Behavior (TPB). Thus, connections to theory are described throughout the discussion of themes. Figure 3 also demonstrates how the themes and sub-themes identified within the data align with and extend the constructs of Ajzen’s TPB.

Figure 3

Alignment of theory, themes, and sub-themes
Describing Technology-enabled Learning

First, this study sought to determine how preservice teachers describe TEL and their TEL beliefs and behaviors. In each of their interviews, participants were asked to define technology-enabled learning. The definitions they provided in their first (February 2021) and last (November 2021) interviews are provided in Table 6.

Table 6
Participants’ definitions of TEL

<table>
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<tr>
<th>Participant</th>
<th>TEL Definition from Interview 1 (Feb. 2021)</th>
<th>TEL Definition from Interview 4 (Nov. 2021)</th>
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<tr>
<td>Hazel</td>
<td>“I think technology-enabled learning is using technology to teach students in a way that can’t be done without the technology. So, it’s either extending it. So, it’s bringing the world into the classroom or it could be just enhancing the process… the students create things that they couldn’t without the technology.”</td>
<td>“Technology-enabled learning is using technology in instruction in a way to where students are able to connect what they’re learning to some sort of outside thing. Something relevant to where they can apply their knowledge. Um, I really like tools that are interactive and can meet kids where they are and take them where they need to be, that sort of differentiation as well. But the big idea for me is being able to make the learning more relevant with the use of technology.”</td>
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<tr>
<td>Brooke</td>
<td>“They’re using technology to engage and create an interactive learning environment.”</td>
<td>“It is the use of technology to enhance the learning that happens in the classroom while also engaging the students.”</td>
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<tr>
<td>Don</td>
<td>“Using technology, like in the classroom in order to do discovery learning or cooperative learning where the kids are using…any type of technology device.”</td>
<td>“Students using, in an active setting, engaged in a lesson using technology to actually learn and do discovery learning on their own, whether that’s teacher-paced or student-paced.”</td>
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<tr>
<td>Rae</td>
<td>“The use of technology to learn”</td>
<td>“The use of technology in teaching and learn”</td>
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</table>

Hazel provided a well-articulated definition of TEL that was consistent with her peers. Her focus on “extending” learning and making learning relevant was something she reiterated
throughout each of her interviews and was evident in the examples of TEL use that she described. Her focus on students creating and being interactive was also illustrated through observations of her teaching. Brooke and Don both talked about active, interactive, and engaging learning, and Don’s definition also included pedagogical elements, such as “discovery learning” and “cooperative learning.” He also noted that TEL “is all about how you use the tools. So it doesn’t matter if you have 1,001 tools in your room. It’s how you use them in your classroom. That’s what matters.” All four participants echoed the sentiment that TEL is about how technology is used rather than what technologies are used. However, Rae’s definition was significantly broader and less detailed than any of the other participants’ definitions. When she described technology use in her interviews, her descriptions of use also demonstrated a much broader range of use. This could be attributed to the broader, less nuanced definition of TEL from which she was working. Notably, each of the four participants remained fairly consistent in their definitions of TEL from the start of the study to their final interviews in November 2021, indicating that their ideas about TEL, while evolving, remained rooted in their initial definitions. Their consistency speaks to the significance of their program of study in firmly planting ideas about TEL early and reinforcing them across their program both horizontally and vertically.

In addition to constructing and providing their own definitions of TEL, all four participants provided robust descriptions, including both examples and non-examples, of TEL and of their TEL beliefs and behaviors. Their descriptions of TEL consistently included the primary theme of technology-enabled learning as a transformative agent. This theme, then, included two sub-themes: (1) technology-enabled learning engages and empowers; and (2) technology-enabled learning is student-centered.
Technology-enabled learning is a transformative agent

All four participants stated in their philosophy of education statements that they wanted to create “equitable learning environments.” Don, Brooke, and Hazel specifically cited TEL as a means by which to achieve these more equitable environments. While Rae’s philosophy of education statement did not address TEL directly, she expressed a focus on providing students an “equitable and valuable education,” and this focus was evident in how she talked about TEL as a transformative agent in the classroom space. For example, she discussed the use of virtual reality tools to allow students to visit other places that they might not ever have the opportunity to visit in real life:

Because some people never leave where they're from… They don't go on trips to other, you know, other states, other countries. And then you have kids who do… They go to Europe, you know, and then they're all in this classroom with each other. But if one child hasn't experienced something and the other child has, then it's like the one who's never experienced anything. The only thing that they can go on is what's around them or the, or what they see on TV… And I think [virtual reality] really gives them like, to be able to see it for themselves, even if it's not in person, but you know, it could be a country like some people, Africa, for instance, the continent or whatever. When people think of Africa a lot, they believe, they think of just like, you know, dry desert, you know, it's poor and stuff, but then you have these countries in Africa that are beautiful. And if a person never sees that, then they're always going to go on, "Oh well it's, there's nothing there. It's poor," and stuff like that. So just to be able to do that virtual field trip or that virtual
reality of anything, it's like," Oh, if I wouldn't have seen that and get that, just, you know, kind of 3D feeling of it, then I would have always thought that it was going to be this.”

Not only does Rae note the transformative ability of TEL to provide immersive experiences that would not be possible without the technology, but she also describes the ability of TEL to disrupt biases by providing students with authentic experiences that they may not otherwise be able to access. In their interviews, Don and Brooke also described TEL as a tool that could be used to give students access to otherwise unattainable experiences, whether it was visiting a location through virtual reality or engaging with simulations of atoms and molecules through a virtual lab.

All four participants also described the transformative power of TEL to meet students where they are and provide them with multimodal, flexible instruction that was not possible without the technology. For example, Hazel stated that student-centered TEL is “more equitable for the kids. Using technology is so much easier to give them multiple means to respond and to receive information. And so that in and of itself opens up the doors for a lot of kids to comprehend and then represent what they understand.” Similarly, Don stated that TEL “makes everything equitable for all my students and accessible.” He went on to describe the use of text-to-speech features, student-paced instruction, and differentiated assignments that are all more possible and more streamlined through the use of TEL.

In his philosophy of education, Don stated that “helping students to develop a clear understanding of their unique attributes and individual potential” was a primary goal of his use of TEL. In his April 2021 interview, Don talked about “penetrating change through the walls” of the school so that TEL could transform not just his instruction, but also the teaching practices of
other faculty in the building. He felt that because students “love TEL,” they would tell other teachers about it and demand different teaching practices in more traditional classrooms, thus transforming the learning culture of the school.

**Technology-enabled learning empowers and engages.** All four participants described TEL as a way to empower and engage their students in each of their four interviews. During her student teaching, Rae described a student who often fell asleep during class. However, when she introduced a choice board activity in which students chose the TEL activities they wanted to complete to demonstrate their understanding of concepts, “he was up the whole time, and he was so excited about it. It was just like, ‘I get to teach them something!’” Seeing a student this engaged in instruction was a highly motivating experience for Rae: “Now I use more [TEL] resources. And the more resources I use, I could see the, you know, I could just see the kids – they’re learning more.” All four participants described student engagement as one of their primary considerations in planning instruction and one of their most consistent motivating factors in choosing to use TEL in their classrooms during both student teaching and first-year teaching. Don stated, “You have to include the engagement part of it, too. They have to be engaged in the lesson…We’ve got to *do* something with the technology as well.” He described one student’s reaction to TEL as completely transforming his classroom behaviors from disengaged and disruptive to engaged and motivated to learn: “I don't have to stand over him. I don't have to be by him. He's engaged in the lesson. Not only is he answering the questions in the Nearpod, but he's got his binder out at the same time, taking notes.”
Hazel also described the importance of TEL to empower her students to make choices in their learning and be more self-directed. She stated that TEL “is vital” because “I really like choice.”

If I wanted to give different choices, it’s hard to do that without using [TEL]…I like to do a lot of inquiry and a lot of discussion and critical thinking, and all of those things you can do without technology…but adding that tool onto there …I can give them more freedom. I kind of think of a rubber band. Like, they can go wherever they need to go. And if I give them all they need up front, then they can do what they need to do to get to where I want them to go…[TEL] lets me do that.”

Brooke also described how much she valued the way TEL empowered students to take the lead in their learning, “If we can allow them to increase that autonomy through the lessons that we teach, then we're not only preparing them for our class, but also for the real world.” When making instructional decisions in her classroom, Brooke stated that “how much freedom it [the technology] gives a student” was a primary consideration for her. “I like for them to be able to explore…Which is why I really like those simulations is you can move it around, and you can... It's very interactive for them. And I like for them to be interactive… When they have that individual access to [TEL], then that's just engaging them even more.”

Technology-enabled learning is student-centered. When asked whether they thought technology use should be teacher-centered or student-centered, Don, Brooke, and Hazel chose student-centered in each of their four interviews. Rae consistently responded that students should be the ones using technology during instruction, but teachers have the responsibility to model, facilitate, and provide clear instructions for successful student-centered TEL. All four of the
participants attributed their ideas about TEL to their own experiences as learners in the college of education, where they all stated that they experienced TEL for the first time. This finding highlighted the importance of embedding TEL across the teacher preparation program, even in preservice teachers’ earliest coursework. For example, Don described his experiences in his college of education classes: “I felt as if, like, the information that I learned, I retained. I retained more…[TEL] helped me to be in charge of my own learning.” Hazel also described the impact of her learning experiences on her ideas about student-centered TEL: “I think the more that I've learned about, you know, child development and the learning process, um, it became more clear to me that it's really not about me as a teacher at all. So for things to be teacher-centered, doesn't make sense, at least to me, right? […] I should be serving the people I’m teaching.”

In their interviews, the participants described their role in the classroom as that of facilitator: “I think the teacher’s role is like a facilitator… uh, watching the students…making sure all the students are on task…making sure they are going toward the objectives and goals that I have set for the class.” They reiterated this belief in their philosophy of education statements, in which each participant referred to themselves as a facilitator of the learning process, particularly with regard to students’ use of technology to learn. This belief that TEL is student-centered was also evident in observations of their teaching during both student teaching and first-year teaching. In all of my observations, the participants were facilitating instruction in the ways they claimed to value during interviews. Their students were actively engaged in TEL while they moved among students, guiding and facilitating the lesson. For example, in her October 2021 observation, Hazel facilitated a guided inquiry for her 6th grade math students in which students had to interpret words and images by formulating numeric expressions. Students worked at tables
in small groups and collaboratively employed a variety of resources (e.g., Chromebooks, personal whiteboards, calculators) to solve a series of problems. Students engaged in discussion about each problem and entered their answers into a Google Form with response validation that only allowed them to move forward in the learning challenge if they entered correct responses. Hazel moved among the groups, providing assistance and encouragement, as students worked together to problem solve and achieve the lesson goals. As the study participants began their first year of teaching, they maintained these beliefs that TEL should be “student-centered. 100%” through interactive and collaborative exploration of content and student-paced lessons. Don emphasized that students should be “the driver of their own learning” in his September 2021 interview. Brooke echoed this sentiment about TEL: “…so as student-centered, if they're actually getting to participate in it, then they feel like they can, I guess, take ownership of their learning.”

**Technology can be an oppressive agent**

During their interviews, the participants often contrasted their descriptions of TEL with non-examples of TEL that they categorized as ineffective uses of technology. These non-examples consistently included the primary theme of technology as an oppressive agent. This theme, then, included two sub-themes: (1) technology is often used for consumption and compliance; and (2) technology use is often teacher-centered.

Don and Rae expressed that they didn’t want the use of technology to become an additional weight or barrier to students who were already facing other challenges in their lives. They both completed their student teaching and were employed as first-year teachers at schools with high percentages of low-income students (over 50%). During student teaching, Rae witnessed school-wide policies that exacerbated already existing inequities among students:
Some students don’t have power at home… And so it’s like they come to school, and the Chromebooks are not charged. And they [the school] have a thing where if you borrow a charger so many times, you have to go to detention every day that you [aren’t prepared] … What do you do when they don’t want to go borrow a charger because they don’t want to have to sit out their only time they get to play? Or they can’t charge their Chromebooks, or they don’t have internet?

Rae saw this policy as oppressive to students, causing the technology to become more of a burden to them than a tool for learning. Don also described how he had not fully considered the barriers his students might face outside of school and how that might impact his instructional choices in the classroom: “Another thing I didn’t think about was charging the Chromebooks… Some families are making the decision: ‘Do we eat or do we pay the light bill?’… availability of Wi-Fi at home. That’s another bill that they don’t necessarily have to have at home.” In addition to considering inequities outside of the classroom, all four participants also noted ways in which they observed technology being used for consumption and compliance in their student teaching placements and schools of employment.

**Technology is often used for consumption and compliance.** All four participants expressed strong negative attitudes toward technology as a tool for consumption and compliance. This is something they felt they observed often in their student teaching placements. For example, Rae described her early student teaching observations: “When I first came, they watched a lot of videos and just answered assessments. Questions, videos, questions, videos, questions. And I told her [mentor teacher], ‘I can’t do that because I can’t learn that way.’” She did not believe these uses of technology were effective, nor is that what she observed in the
classroom: “I don’t think that’s the best way to use technology for instruction…And what you find often is sleeping.”

Brooke agreed that technology “can’t just be something that we’re using…as an excuse to not have engaging lessons. I feel like maybe that’s what’s being done is that the kids, ‘Oh, the kids have a computer. That should keep them quiet,’” and that is “not fair to anyone.” Her frustration with seeing technology used for passive consumption and compliant, quiet behavior was palpable in her February and April interviews:

If we’re just going to have these kids sit here all day and just passively consume everything, they’re not learning anything. They’re not actually, like it is going in one ear and out the other, and they are getting the grade they need to move on. And I just don’t think that’s what education is about.

Don, too, described passive, consumptive practices of technology as the predominate mode of technology use he saw in his student teaching placement: “I’m not going to add another period of ya’ll just sitting behind a laptop, working…I’m walking down the hall, and I see these kids…look at a screen all day. Because it’s not engaging, and it’s not, um, active, or I don’t think it’s active learning.” Similarly, Hazel stated, “I don't want compliance with just behavior. I don't want kids just to be doing what they're... or, look like they're doing what they're supposed to be doing, so it's easier for me. Um, because they don't learn that way.”

Brooke similarly described the use of student device management software by her mentor teacher through a compliance-focused lens: “It was very like…a power struggle. Like, ‘I'm going to exit out of your games.’ Um, and like, I feel like that obviously affected the rapport.” She felt
this kept her mentor teacher from engaging with the students in their learning because she was so focused on using the technology as a tool for compliance, rather than engagement.

In their Fall 2021 interviews, all of the participants mentioned in some way or another that students “hate their Chromebooks” or are “burned out” on technology when it was used to passively consume information through videos or complete digital worksheets that simply replicated paper and pencil busy work in a digital format. They were quick to point out that students were tired of passive uses of technology to consume information, as they had described in their Spring 2021 interviews. They did not align this with TEL.

**Technology use is often teacher-centered.** All four participants questioned the effectiveness of teacher-centered uses of technology for engaging students. For example, Brooke described observing teachers during her student teaching semester: “Some teachers definitely use it [technology] in a teacher-centered way, and I can see how the students are not very engaged.” Additionally, Rae questioned whether teacher-centered uses of technology effectively developed students’ academic skills: “Am I teaching them if I’m telling them what do to, like exactly? If I give them every single step and show them where to place every piece of information, what are they really learning?” Brooke reiterated this belief during her first year of teaching and linked it to digital citizenship skills as well: “If it’s teacher-centered, then they’re just kind of being directed, do this, do that, do this, kind of thing. And it’s not as beneficial. They’re not gaining those 21st century skills that might be more beneficial for them…problem solving, collaboration, communication.”

The participants attributed the teacher-centered use of technology to different factors. Rae, Hazel, and Brooke all inferred that more established teachers may not have had the same
access to technology-related professional development, causing them to continue using teacher-centered pedagogical strategies, rather than shifting toward student-centered TEL: “So it’s like the technology is there. They have it. But I don’t think a lot of the teachers that are teaching right now that have been teaching for years know about the new technology and new websites.” The participants also often aligned teacher-centered technology use with efficiency. Brooke defined efficiency in this way: “Efficiency is more along the lines of you’re using technology because it’s the fastest, quickest way to do it, but that doesn’t necessarily mean that it’s going to be an engaging way of doing it… [Some teachers] just use it as a way to push out busy work that would have been just paper and pencil.” This was another way of discussing the belief that more veteran teachers had not shifted their pedagogical approaches just because the technology was present.

Finally, some of the participants indicated that teacher-centered approaches could indicate a lack of high expectations for students or a lack of trust in students to use the technology appropriately. Brooke stated that teacher-centered uses of technology “almost conveys the message of, ‘Oh, well I don't trust you to use something like that. I don't trust you to do something that's that complex.’” Brooke, Don, and Rae shared examples of their schools prohibiting or blocking certain technologies or taking students’ devices away if they were not used as the teacher had instructed. They argued that this exacerbated the problem. If students were not engaged in TEL, then they could not learn to use the technology appropriately or productively to learn.

…like the students maybe feel defeated like, "Oh, well that would be cool if I could use that. Because that might help me better understand." And so I feel like if the teacher is
using technology] and then not allowing the students use it, I feel like that could just make a divide between even the rapport, like the relationship, like of the teacher.

Ultimately, the participants all expressed that teacher-centered, consumption-focused technology use was the predominate mode of technology use they saw, both in their student teaching placements and in their schools of employment. They expressed negative views of technology embedded in the learning process as an oppressive agent and believed it was counterintuitive to TEL, specifically technology as a transformative agent.

**Explaining intention to use and actual use of TEL**

During each of their four interviews, participants were asked to describe who and what influenced their intention to use and their actual use of TEL. Philosophy of education statements were also analyzed for evidence of influences related to TEL intention and use. This data fell into three sub-themes: (1) Significant individuals influence TEL intention and use; (2) Significant experiences influence TEL intention and use; and (3) School-based factors influence TEL intention and use.

*Significant individuals influence TEL intention and use*

All four of the participants could identify significant individuals who influenced their intention to use and actual use of TEL. This aligned with Ajzen’s (1985) construct of subjective norm, which is informed by what a person believes others think about a particular behavior, in this case, TEL. All four participants cited college of education faculty as playing a pivotal role in the development of their intention to use TEL and in developing the knowledge and skills that informed their use of TEL. Across all four of their interviews, each participant stated that “a lot”
or “all” of their college of education instructors influenced their ideas about and uses of TEL. Brooke stated,

Learning from such great people in the college of ed and learning how to use, not just use the resources, but use them well and use them in an engaging way…We experienced technology-enabled learning in the middle level program a lot. Um, I think about [classroom management instructor] … He used it really well. Um, and I think because he not only was using it, but as he was using it, he was also teaching us how to use it… I didn't really realize it then, but he was teaching us about those tools that we would be using as teachers.

Rae, Don, and Hazel also provided multiple examples of how they had experienced engaging TEL modeled by college of education faculty in their program of study and how those learning experiences were transferrable to and influenced their teaching practices with their own students.

During student teaching, some participants, like Rae and Don, had highly supportive mentor teachers who also encouraged their use of TEL. For example, Rae recounted how open her mentor was to new ways of teaching, like TEL, which caused Rae to place a great value on what she had learned about TEL: “My mentor teacher always says, ‘We’re always learning.’ Someone is always teaching us something. And if I could teach a seasoned teacher something, then I’m like, ‘That’s valuable. What I learned [in my program of study] was valuable.’” However, Hazel did not have a mentor teacher who expressed interest in TEL. This did not seem to inhibit her use of TEL during student teaching, though; rather, it seemed to create extra motivation within Hazel to demonstrate the effectiveness of TEL as a pedagogical approach. She sought support in her practice from other significant individuals.
All four participants named their current students, both in student teaching and in first-year teaching, as individuals who greatly influenced their intention to use and use of TEL. For example, Don stated that his students “are encouraging me to use that technology in the classroom…Just seeing them engaged in the lesson and answering questions. They're able to think critically about things.” Brooke also cited student engagement as a significant influence on her use of TEL: “Just the joy, I guess, that the students have and, like, how engaged they are when I do find an intentional way to use technology really motivates me to want to continue to find ways for them to use it.” All four participants described TEL as beneficial to their students in each of their interviews, and stated that “what’s best for students” influenced their use of TEL.

Interestingly, the four participants in this study also cited each other as significant individuals, who influenced one another’s intention to use and use of TEL as they developed their own community of support. During student teaching, Rae shared that the four participants “exchange ideas with each other a lot, and I’m so grateful to have that group of people who are doing what I’m doing and willing to share, you know, their knowledge as well as take mine.” Hazel shared a similar experience of support and encouragement within this group, particularly in light of her experience in a student teaching placement where TEL was not valued: “It's nice to kind of have this outside community to maybe compensate for that lack of collaboration that I have at this school.” While this might have been expected while the participants were student teaching, Brooke and Hazel both discussed the members of their cohort as significant individuals during their September 2021 and November 2021 interviews, well into their first year of teaching. Brooke talked to Hazel “every day” after school and saw Rae at new teacher trainings for their districts. She stated that Don was “hard to reach,” but that she still felt encouraged by
her former cohort-mates, even a semester out of school. “I think it's nice to know other people who are in the same boat as you and kind of share the struggles...and the good things!”

In their novice experiences, all four participants could name at least one colleague or administrator they felt influenced their intention to use and use of TEL. Don and Brooke both had the unique experience of being first-year teachers who worked alongside a large concentration of other first-year teachers. They both named their other first-year teaching colleagues as influential in their use of TEL. For example, Don stated “that little web of all of us together … especially since all of us are first-year teachers…really can influence my use of technology in the classroom.” Essentially, Don and Brooke were replicating the community of support they built with their cohort as student teachers with the other novice teachers in their buildings during their first year. While Hazel worked on a team with two other more veteran teachers, she, too, felt her teaching colleagues encouraged her use of TEL in her own classroom and were willing to use TEL resources she created in their own classrooms. The primary significant individual that Hazel identified as a first-year teacher was her principal, who she stated was very supportive of TEL.

**Significant experiences influence TEL intention and use**

Each participant also named significant experiences that influenced their TEL intention and use. These educational experiences included the stand-alone educational technology course they took as part of their program of study, the final block of courses they took fully online due to the COVID-19 pandemic, and their student teaching semester. These significant experiences included some of the individuals discussed in the previous section, like college of education faculty; therefore, this theme aligns with subjective norm. However, the experiences they named
also served to increase their self-efficacy and sense of control over their ability to use TEL. Thus, this theme also aligns with Ajzen’s (1985) construct of perceived behavioral control (PBC) and demonstrates how both self-efficacy and perceived controllability contribute to PBC, as was theorized by Ajzen (2002).

The four participants all named their experiences in their educational technology course as a significant contributor to their intention to use and use of TEL. For example, Hazel described “seeing, first, that the technology class is not the scariest thing in the world, and that normal people, like myself, can find ways to use technology that is beneficial to the students.” The participants named the focus on both pedagogy and technology in that course as helpful in developing their ideas about and confidence using TEL. Further, the alignment of TEL with the college of education’s vision and mission were influential to the participants: “It being such a priority in the college of ed has really encouraged me and given me motivation to use it [TEL] to the best of my ability.” Additionally, all of the participants described positive TEL experiences across their college of education courses as influential to intention to use TEL:

… my experiences in the middle level program, they were … very positive experiences with technology. And, so, I think that showed me that if that was helpful for us as college students, then it was definitely going to be a practice that would be helpful for, you know, middle schoolers and junior high kids. I think those positive experiences really just encouraged me to want to put forth that extra work to do the technology, so that the students could, um, see the benefits of that.

This group of participants also had the unique experience of taking their final block of courses prior to student teaching fully online, due to the COVID-19 pandemic. They all
described this as a significant experience that influenced their intention to use and use of TEL. Hazel, Brooke, and Rae all stated that learning online and seeing their instructors teach online showed them what was possible with TEL.

I guess it was a semester -- that we were fully online, showed me, um, different tools… that fall, I think it was, when we were... It wasn't survival. It was, "Okay. Well, we've had some time to figure things out. How can we make this work?" Um, was really beneficial…And I honestly, I probably could have Googled, but would I have known what to Google had that not happened?"

Don also stated that “having that experience with where we were forced to go online and on Zoom and learning through those different avenues really shaped my ideas of a technology-based classroom.” Rae also expressed that she was “thankful” for the experience of learning online during the pandemic because “certain things that we’ve learned just in the past two semesters of being in college during the pandemic… these teachers don’t know about because they just don’t have, have never needed to have that experience.” The participants all felt that this unique learning experience shaped the value they put on TEL and the ways they used it in their teaching.

Finally, all four participants named their student teaching semester as a significant experience that influenced their intention to use and use of TEL, primarily because they were teaching in a hybrid environment with students joining class both in-person and virtually at the same time. For each participant, the challenge of providing meaningful learning for all students, regardless of where they were learning was an issue of equity:

During [student teaching], when we were at the schools, um, just finding ways to enhance the learning for not only the students that were in the classroom, but also the, the virtual
students, um, technology-enabled learning really helped that because you were always focused on how can I engage both, both sets of students, um, but still allow them to get the same content?

Navigating this challenge pushed the participants to use TEL: “If anything, they [TEL beliefs] grew stronger. Because I was pushed to go, in a way, away from the traditional school teaching methods of whiteboard and marker … And I was able to go and venture out and try different things.”

*School-based factors influence TEL intention and use*

Finally, all of the participants named school-based factors as influences on their TEL intention and use. Each of the participants stated that they had control over how they taught in their classrooms, including control over whether they chose to use TEL, indicating a strong sense of perceived behavioral control. However, further discussion demonstrated that their pedagogical freedom varied, based on student teaching placements, and later, on the schools where they were employed. This seemed to indicate that their perceived controllability was linked more to their strong sense of TEL self-efficacy, which they built throughout their program of study through connections to significant individuals and experiences, rather than on their ability to control their school environments. For example, as first-year teachers, Brooke, Don, and Hazel all stated they “could do anything that [they] wanted to do in [the] classroom” and “You can teach however you want to teach.” Hazel, though, was the only participant whose administration actively supported her use of TEL. Brooke’s school did not have a set curriculum nor an instructional facilitator, which left her feeling like she was “starting from scratch” during her September interview.
While Rae initially stated that she had control over her use of TEL in her classroom, she acknowledged that her control was “limited” and “restricted” by district-wide policies that felt prohibitive to the use of TEL: “There’s a lot of things that I want to do that I can’t do because I don’t have access to that.” In addition to only having access to certain tools to support TEL, Rae also described a district policy that required teachers to submit a “project request form” for any instruction that would span more than two days. Rae struggled with this restrictive policy related to project-based learning that she felt impeded her use of TEL. “That’s why I said I’m never going to do a project that’s over three days…There were other things I wanted to do…that would have taken too many days.” This policy was in place in the same district where all four participants completed student teaching. In the Spring 2021 semester, Hazel also noted restrictive policies in this district regarding which tools she could use to facilitate TEL, stating that the district was trying “to put a damper on my dreams.” This challenged her to “find a way to do the same thing with the tools that students are already used to…I would say it’s been somewhat restrictive about the tools that I can use, but I’ve just had to be a little more creative and see, well, how can I achieve the same goal with maybe something that’s just a little different?” While Rae’s intention to use TEL seemed dampened by the policies of the district, Hazel seemed to see these policies as a challenge to be overcome.

Finally, all four participants, but particularly Rae and Don, noted infrastructure issues and access to reliable Wi-Fi as school-based factors that influenced their intention and use of TEL. They described problems with Wi-Fi in both student teaching: “The [Wi-Fi] outages…internet will slow up by 6th or 7th period. Some students can’t log in” and first-year teaching: “I haven’t been using a lot of technology because I have a lot of technical issue with my laptop.” As a first-
year teacher, Rae described how “my internet goes out every 15 minutes,” making it almost impossible for her to successfully and smoothly facilitate any TEL activities. This left her frustrated and “never” wanting to try to facilitate that activity again.

Don experienced slow Wi-Fi during my observation of his teaching in March 2021. He seemed undaunted by this and calmly facilitated the lesson, despite the issue, telling his students: “I do see the tech problems. The internet’s going very, very slow. Just give it time to load.”

While Rae expressed frustration and discouragement when faced with these school-based barriers to TEL, Don seemed undaunted, both during my observations of his teaching and in his interviews: “Even with the school Wi-Fi [issues], we can…if we have to go down to the auditorium and have class, we’re going to have to do that. We can move and do it that way. I think… these [challenges] have a way around.”

While participants largely felt that school-based factors were beyond their control, they also actively sought solutions to factors they found inhibiting to their use of TEL, signaling their high TEL self-efficacy, which contributed to their perceived behavioral control and often helped them seek solutions to overcome any lack of perceived controllability. All four participants’ words and actions exhibited a strong intention to use TEL, regardless of the learning culture of their school sites. Their strong positive attitudes, paired with high PBC, in many cases, overrode school-based factors that could have hindered their use of TEL. This is exemplified in Don’s statement that “there may be some lack of control, but there’s a way to find control.”

**Describing Actual TEL use during instruction**

The four participants provided many, varied descriptions of lessons they taught that incorporated TEL both as student teachers and as first-year teachers. The participants’ lesson
descriptions and observations of the participants’ teaching were analyzed and coded for qualities that the participants aligned with TEL. Those codes were then collapsed into three sub-themes: (1) TEL use is flexible, differentiated, and personalized; (2) TEL use is relevant and authentic; and (3) TEL use is collaborative. It is important to note that the participant partners were never provided with an operational definition of TEL during this study. They were simply asked to define and describe it as they saw fit. Thus, the exact words they used throughout their interviews, while not identical to those in the operational definition of TEL, are certainly aligned, just as their observations yielded actual uses of TEL that aligned with their personal definitions and descriptions as well as the definition of TEL derived from the literature. Therefore, the participant definitions and descriptions are included along with elements of the operational definition in Table 7 to demonstrate their alignment, despite slight differences in wording.

Table 7

Alignment of TEL descriptions, actual uses, and theoretical attributes

<table>
<thead>
<tr>
<th>Participant definitions of TEL</th>
<th>Participant descriptions and researcher observations of actual TEL use</th>
<th>Theoretical alignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology-enabled learning is a transformative agent.</td>
<td>TEL use is flexible, differentiated, and personalized. TEL use is relevant and authentic. TEL use is collaborative.</td>
<td>TEL is the student-centered use of technology as a cognitive tool to communicate, collaborate, develop critical thinking skills, and solve authentic problems (Ertmer &amp; Ottenbreit-Leftwich, 2012; Jonassen, 1994; Jonassen, 2005; Nelson &amp; Hawk, 2020).</td>
</tr>
<tr>
<td>Technology-enabled learning empowers and engages.</td>
<td>TEL use is relevant and authentic. TEL use is collaborative.</td>
<td>TEL is used to communicate, collaborate, develop critical thinking skills, and solve authentic problems (Ertmer &amp; Ottenbreit-Leftwich, 2012; Jonassen, 2005; Nelson &amp; Hawk, 2020).</td>
</tr>
</tbody>
</table>
Technology-enabled learning is student-centered. TEL use is flexible, differentiated, and personalized. TEL use is relevant and authentic. TEL is student-centered (Ertmer & Ottenbreit-Leftwich, 2012; Jonassen, 1994; 2005).

**TEL use is flexible, differentiated, and personalized**

All four participants described ways that TEL made differentiation more subtle, particularly for students with Individualized Education Plans (IEPs) and 504 accommodations.

Don described the value of student-paced instruction:

> Because now that allows me to let them, if I'm on a student-paced, they can go through it at their own speed. If they have questions about something, they can come to me about it. While also I'm helping the students on Zoom. It allows me just to, instead of that teacher role at the front of the class, on the whiteboard, I can be in more of a facilitator role. I can move around the classroom and help those IEP kids, help the 504 kids. And just challenge the ones that's already got it, help the ones that don't, that need a little pushing.

Personalized pacing was used and discussed by multiple participants. Rae, Brooke, and Don all described facilitating engagement with interactive virtual labs in their science classrooms (see Appendices G and H). Hazel also emphasized how collaborative, small group TEL allowed her to differentiate the pace of instruction. Students could move at their own pace and receive guidance from the technology and from her as the facilitator moving around the room. For example, during an observation, I watched her use a student-paced Pear Deck activity to facilitate a math lesson about multiplying fractions by whole numbers. This allowed students to
move through the content and practice at their own personalized pace along with a partner to support critical thinking.

Uses and descriptions of TEL also demonstrated that TEL is flexible, differentiated, and personalized in that students have multiple ways to demonstrate what they have learned through varied formative and summative assessments. For example, Rae gave students a variety of options for creating infographics that matched their comfort level with technology. Don also provided multiple ways for students to respond to interactive elements of his lessons (e.g., audio, video, text-based response). He stated that “having that differentiation of the way they can answer the questions, that’s more student-centered to me.” Brooke, too, valued multiple means of student expression because it “gives them the, um, the autonomy to be able to explore and, um, interact with [the content] kind of at their own pace.” All of the strategies the participants employed and described were designed to center the learning needs of their students. Thus, this sub-theme aligns with the idea of TEL as a student-centered strategy.

**TEL use is relevant and authentic**

All four participants also used TEL in ways that provided students with a relevant and authentic context for content-area instruction, in alignment with the idea of TEL as empowering, engaging, and transformational. They all felt this increased student engagement in the learning process and was a key element of TEL. I analyzed lesson artifacts (e.g., lesson plans and activity materials) and observed lessons in which students were “scientists,” “engineers,” and “detectives,” solving problems collaboratively as a way to explore new content or apply recently learned skills. Rae, Brooke, and Faith liked to employ “digital escape rooms” and “digital scavenger hunts” as forms of guided inquiry and content exploration (see Appendix I).
example, Rae taught a vocabulary lesson in which students “started off as engineers. The first slide was a vocabulary investigation. It’s up to you to solve all the clues and uh, save Earth…It was sort of a scavenger hunt. So hunting, you know, for the clues.” In one of Brooke’s observations, she facilitated a virtual “escape room” in which students had to solve problems to unlock clues by exploring resources embedded in a Google Site. Ultimately, students used the information they gathered to creatively design a visual in which they compared the parts of a cell to the parts of a middle school. During her first year of teaching, Hazel noticed that her students were “really into the game Clue,” so she designed a Google Site modeled after Clue in which students solved problems to uncover clues and solve a mystery. In her November 2021 interview Hazel stated, “My first thing is just real-world application…If we can bring in technology and connect those [math] skills to something that they would either use in the real world or to situations that make sense in their lives, they’re able to create a deeper understanding of what it is they’re doing.” Don’s use of TEL was rooted in his desire to create a sense of belonging in his students: “Finding content that’s relevant…We have a lot of Black students at [MS 2]. How can I make them feel included within the class as well?”

All of these uses of TEL were rooted in providing students with a relevant and authentic context that motivated students to actively engage in learning. This is also something that each participant stated they valued in their philosophy of education statement. For example, Don’s philosophy is rooted in providing an “authentic educational experience.” Hazel’s philosophy stated that TEL helps students “think critically to solve problems, effectively communicate through different mediums, and utilize creativity to achieve goals” while also helping them “construct their learning through authentically experiencing the issues at hand.” Brooke, too,
used her philosophy statement to describe her “belief in the power of technology to enhance education” by facilitating “authentic and meaningful connections between [students’] education and the world around them.”

**TEL use is collaborative**

Collaboration was also deemed a key attribute of TEL by each of the participants, which aligns directly with the operational definition of TEL and the participants’ judgment that TEL is student-centered, empowering, and engaging. In every observation conducted during this study and in the TEL artifacts provided by the participants, students were working with partners or small groups while Rae, Hazel, Don, and Brooke facilitated the lesson activities. Not only did students collaborate in small group configurations, but they also collaborated virtually by contributing their ideas to discussion boards in real-time using a variety of tools. For example, during student teaching, Rae used Jamboard to facilitate an inquiry activity about star brightness. Students inferred the meaning of content-related terms and then worked with a partner to identify actual definitions. Their answers were curated onto a collaborative discussion board in real time. Hazel also stated that collaboration was a “big thing” for her during student teaching because she had both in-person and virtual students. All four participants discussed the importance of creating “the same learning experience” for all students, regardless of where they were learning. For example, Hazel would use student-paced Nearpods and Pear Decks so that she could partner an in-person student with a virtual student. This allowed them to collaborate even as they were in different physical spaces. She stated that TEL provides “a way to create community, even though we’re not all together.”

**Shifting from idealistic to realistic thinking about TEL**
In their Fall 2021 interviews, each of the participants described ways in which their thinking about TEL had become more “realistic” once they were faced with the responsibilities of first-year teaching. Hazel summed up this theme concisely: “There’s less idealism maybe and more reality” when it comes to using TEL in first-year teaching. This theme of shifting from idealist to realistic thinking about TEL presented itself in three sub-themes: (1) Shifting responsibilities influence TEL thinking and use; (2) Time and experience influence TEL thinking and use; and (3) Affective factors influence TEL thinking, intention, and use.

**Shifting responsibilities influence TEL thinking and use**

While all of the participants said that their ideas about and intentions to use TEL had remained consistent throughout the year that this study took place, the increased demands on their time that came with first-year teaching created an implementation dip when it came to use of TEL. In their September interviews, the participants expressed a general sense of being overwhelmed with all of their responsibilities. Brooke shared:

> I still feel the same way [about TEL]. Like I still think that it's beneficial, and it's necessary in the classroom. Um, I had more time [in student teaching] to make it the sole focus of all of my lessons. Now I don't necessarily have that time, but I still feel the same way about it. And I still think that it's extremely beneficial. I just... The time factor is not there for me.

Don, Rae, and Hazel also noted time as a significant factor in their shifting thinking and use regarding TEL. Hazel and Brooke discussed how student teachers are really only responsible for planning 3-4 lessons for university supervisor observations, which is a much lower volume of instructional planning than what they were experiencing as first-year teachers. Additionally,
experiencing TEL across the curriculum in their program of study caused them to graduate with an “anything is possible” mentality. Don stated, “I had this whole vision in my head of how it was going to be… Scale it back, [Don], scale it back.” Similarly, Hazel shared:

Through [the college of education], I had, and this isn't a bad thing, but this kind of utopian view that anything is always possible at all times. Um, and that's not actually how things are. It's like, "I can do whatever I want, you know, there's freedom." And yes, some of those things are true. Um, but actually being in the classroom and having all of those responsibilities as a teacher, I've tried to become more efficient with my time.

While student teaching “definitely strengthened” Rae’s ideas about TEL, she noted that being the only teacher in the room made managing students’ off-task behaviors more challenging: “You have to put in the same amount of work… walking around the class, making sure they’re doing that [TEL].” Hazel echoed this thinking: “One thing that I’ve noticed is it’s so different going from having someone with you at all times to just, ‘Oh, here’s your [class]room, go for it.’ Um, to where I actually, I have to be intentional at all times, and I don’t get reminders to be intentional, like I used to.”

In addition to teaching full-time as first-year teachers, all four participants were also enrolled in courses in online graduate programs. Three were enrolled in a Digital Age Teaching and Learning Masters program, and one was enrolled in a School Leadership and Administration Masters program. The dual responsibilities of full-time teacher and part-time graduate student ensured that they were all very busy, and these expanding responsibilities caused a dip in their actual use of TEL early in the Fall 2021 semester. In their September 2021 interviews, Hazel, Brooke, and Don said, to varying degrees, that they were not using TEL to the extent and
capacity that they wanted. Brooke summed up this disconnect between intention and use of TEL early in the Fall semester: “I'm still using technology. I just don't know if it's, I'm using it to the capacity that I would want to.” However, by their November interviews, they could provide multiple examples of how they were using TEL. They sounded more comfortable and confident both in the way they interacted with their PLCs to advocate for broader use of TEL and in how they planned instruction that centered TEL with more consistency in their own classrooms.

**Time and experience influence TEL thinking and use**

In their final interviews during first-year teaching, the participants were all able to share multiple examples of their use of TEL, and Don, Hazel, and Brooke each demonstrated the use of TEL in their October observations. They all expressed ways that time and experience had helped them to continue growing in their use of TEL. For example, Don stated: “You learn as you go; you make mistakes, you fix them later and now you know better… if [the lesson] goes bad, we learned something. If it goes good, it’s better now.” Don’s philosophy of education statement also illustrated this growth mindset as he described his “love and passion for lifelong learning.” Brooke shared a similar reflection in her final interview:

> My experiences so far as a teacher have been positive. And so that, like I was saying earlier, motivates me to want to do it. There’s been the negative experiences, like, not necessarily that they were bad, but maybe an application didn’t necessarily work for a certain group of students… I’ve learned to use it in a different way.

These “monitor and adjust” moments seemed to strengthen their resolve to use TEL and demonstrated their high self-efficacy toward TEL and toward teaching in general. Hazel and Brooke both told stories in their September interviews of attempting to assimilate into the
pedagogical culture of their schools and use more teacher-directed approaches; however, they quickly realized that it did not work for them or for their students. They pivoted back to more student-centered TEL methods and reported feeling more comfortable in the facilitator role and experiencing higher engagement from their students.

Rae experienced the most significant school-based barriers to TEL use as a first-year teacher. Even still, in her final interview, Rae stated strong positive attitudes toward TEL: “I think it’s necessary! It’s something we, we definitely need…Being intentional about it [is important]. So knowing exactly when you’re going to use it, why you’re going to use it, and if it’s the best thing to do in that moment, for that lesson.” She was in an environment in which she had to be ready to defend her pedagogical decisions to administration, particularly in relation to the time more student-centered models of instruction take. Don was in a school environment where Wi-Fi reliability was not guaranteed, yet he also expressed renewed enthusiasm and strong intention to use TEL in his final interview: “Through the barriers, I still 100% believe technology in the classroom should happen. 100%. Engaged and active classrooms through technology.”

**Affective factors influence TEL thinking, intention, and use**

An over-arching theme that emerged from the data was the powerful influence of affective factors within the participant partners. The Universal Design for Learning (UDL) guidelines state that the affective networks of learning address interest, effort and persistence, and self-regulation (CAST, 2018). Therefore, “affective factors” in this theme refer to the participants’ sustained persistence, self-efficacy, self-regulation, and motivation to use TEL, even as their thinking about TEL shifted from idealistic to realistic. These affective factors have also been referred to as mechanisms of human agency in the literature (Stephen et al., 2020).
Each of these participants actively chose to persist in their intention to use and use of TEL, even when faced with significant barriers to TEL in their school sites. Essentially, when the school culture and infrastructure were not conducive to TEL, the participants leaned into their strong TEL self-efficacy and self-regulation strategies as a means of persisting in the use of TEL, which they felt was highly beneficial to student learning (Bandura, 1977; Zimmerman, 2000). While self-efficacy is an antecedent of PBC within Ajzen’s (1985; 1991) Theory of Planned Behavior, the presence of these strongly held attitudes and beliefs, addressed throughout all the preceding themes, warrants additional discussion.

Zimmerman (2000) noted that learners with high self-efficacy tend to take on “difficult and challenging tasks” that others may seek to avoid (p. 86). This was certainly true of the participants in this study, who sought solutions to all the barriers they faced in using TEL as student teachers and first-year teachers. For example, Don constantly problem-solved his way through infrastructure issues like charging devices and accessing reliable Wi-Fi. He provided flexible seating arrangements, so students could charge their devices and shifted to student-paced TEL activities when necessary, allowing students to move out into the hallway if there were no more outlets in the classroom. While Don persisted through significant infrastructure issues, Hazel and Rae persisted in the face of pedagogical constraints in the district where they student taught. Hazel worked to find tools to support TEL that would fit within the allowances of the district’s technology policies: “I know about these different tools that can do different things, and I like what they can do. And I’m trying to find a way to do the same thing [TEL] with the tools that students are already used to.” Rae, who felt she had the least supportive PLC as a first-year teacher, persisted in seeking further learning resources to support her use of TEL. She said she
regularly asked herself, “What can I do to advance myself, like advance my knowledge with technology? [...] “Technically, I’m still a student. I’m still learning.” This self-identification as a lifelong learner was present in each of the four participants’ philosophy of education statements as well.

High self-efficacy equips learners “with a sense of agency to motivate their learning through use of such self-regulatory processes as goal setting, self-monitoring, self-evaluation, and strategy use” (Zimmerman, 2000, p. 87). The participants’ self-efficacy did not seem to waver as they navigated the process of shifting from idealistic to realistic thinking about TEL; they self-regulated by adapting their strategies for using TEL to fit the constraints of their teaching environment, both as student teachers and first-year teachers. Their development of an informal community of practice (Lave & Wenger, 1991) can be seen as an example of a co-regulation strategy they employed to sustain their TEL thinking, intention, and use (Stephen et al., 2020). All four of the participants actively participated in this community of practice and valued one another as a source of sustained intention to use TEL. Brooke described how “[Hazel and Don and Rae], I think they are doing a great job at using [TEL]. I think that, um, just seeing what they have to do and seeing their…hearing their ideas about how to use certain technology has been beneficial to me.” Rae also emphasized how the community they formed helped shape her thinking about TEL and encouraged her to use TEL in her own teaching: “We have a group chat. And we’re like, ‘Hey, what, um, what app are you using to do this? Or what program are you using to do that?’ And some of the programs, I don’t know. So I’m like, ‘Okay, you know, I’m going to try that out.’” Even a full semester into their first year of teaching, Brooke stated that they still “definitely bounce ideas off of each other…we still do communicate and stuff and
talk about school,” indicating the sustained value and use of this community as a tool for self- and co-regulation to support their persistence in using TEL.

While self-efficacy and self-regulation were likely inherent learning traits in these individuals to some extent, strategies for building their self-efficacy and autonomy were also built into their program of study and supported their sense of agency in overcoming barriers to TEL use in their school placements and schools of employment. For example, Brooke described how the college of education faculty modeled the use of TEL across her coursework, including the process of troubleshooting issues when the lesson did not go as planned. Seeing her instructors’ persistence with TEL encouraged her that she, too, could be persistent in her use of TEL, even when the technology did not work as expected. Hazel saw her college of education instructors’ use of TEL as a constant opportunity to shape her own pedagogical beliefs and uses of TEL: “If I had a professor who did something that I knew kept me better engaged, [I thought] ‘Oh, that’s something I should do later on.’”

Additionally, the participants’ motivation to use TEL seemed rooted in their value for equity. For example, Don and Rae explicitly stated their concerns about students’ access to the hardware and infrastructure that is necessary for TEL to occur and sought solutions to address the inequities of access that they noticed at their school sites. Rae also called out oppressive school policies that made technology feel more like a “weight” around students than a supportive tool for learning. All four participants described TEL as a means of facilitating more equitable instruction that provided every student with opportunities to be successful, whether that was using multi-modal resources, creating engaging, relevant lesson contexts, or implementing accessibility features like text-to-speech. They also contrasted TEL with the use of technology
more generally for passive consumption and even as a tool of oppression, in alignment with previous research that has highlighted the need for justice and equity in educators’ approaches to using educational technology (Tshuma, 2021). These participants were deeply motivated by a desire to ensure their instruction was “equitable and accessible.”

**Summary**

While the participants in this study were all placed for student teaching and employed as first-year teachers in different schools, they shared a powerful common experience in their shared program of study that influenced their intention to use and actual use of TEL, both during student teaching and first-year teaching. This was documented through the triangulation of data from interview transcripts, direct observation field notes, teaching artifacts, and philosophy of education statements. Each of the participants expressed strong positive attitudinal beliefs about TEL as a student-centered, transformative agent with the ability to empower and engage their students, and they contrasted this with their beliefs about more widespread uses of technology that they observed. These teacher-centered uses of technology focused on consumption and compliance and in some ways served as an oppressive agent with the potential to deepen existing inequities their students were experiencing.

Even when faced with school-based barriers like unsupportive colleagues or administrators or unreliable technology infrastructure in the school building, the participants’ self-efficacy and positive attitudes toward TEL outweighed any loss of control they felt over their ability to use TEL, and the compensated for these barriers by adopting self-regulation strategies to support their use of TEL. This helped them actively seek solutions to the problems that they faced. Additionally, their deeply held positive attitudes outweighed any negative
attitudes they encountered from others. While increasing responsibilities shifted participants’ TEL thinking from idealistic to realistic, they consistently expressed that TEL is an important pedagogical practice for providing instruction that is flexible, differentiated, personalized, authentic, relevant, and collaborative.
CHAPTER FIVE

DISCUSSION AND CONCLUSIONS

The purpose of this qualitative, embedded single case study was to provide a rich description and explore the unique development and evolution of preservice teachers’ intention to use and actual use of technology-enabled learning (TEL) during student teaching and first-year teaching. The study also aimed to provide lessons that can be learned from preservice teachers who have completed a TEL-rich program of teacher preparation and are entering the field to test their TEL intentions in their teaching actions. Four participant partners volunteered to engage in this study. I conducted four interviews with each of them, at the beginning (February 2021) and conclusion (April 2021) of their student teaching semester and at the beginning (September 2021) and mid-point (November 2021) of their first year of teaching, to describe how, if at all, their TEL beliefs and behaviors evolved during this time of significant transition. I also conducted observations of their teaching and collected field notes, lesson plans, and teaching artifacts as well as philosophy of education statements to explore how they described TEL and their TEL beliefs and behaviors. These data sources represented the full variety of evidence in the case (Yin, 2018) and allowed me to triangulate the data collected.

The data collected from interviews, observations, and artifacts were analyzed in two cycles of analysis, an initial cycle that employed a priori codes derived from Ajzen’s (1985) Theory of Planned Behavior and a second cycle of open, inductive coding to identify themes that might extend the theory. The resulting themes were reported in Chapter Four. Chapter Five will begin with a summary and discussion of the results in relation to the existing literature and
theory. Implications, limitations, and recommendations regarding how these results can inform practice and future research are also provided.

**Discussion of the Findings**

The empirical significance of this study lies in its ability to illuminate how the participants’ descriptions of, intentions to use, and actual uses of TEL developed and evolved throughout their experiences as student teachers and first year in-service teachers. Analyses of teaching artifacts they have categorized as examples of TEL, observations of the participants’ teaching, and participants’ responses to interview questions all yielded observable data which, in turn, supported the empirical value of the study (Yin, 2018). Overall, this study sought to fill the gap in the literature that explored the intention to use and actual use of TEL among preservice teachers specifically as they navigated their transition into the K-12 classroom as student teachers and first-year teachers.

In this study, participants’ descriptions and uses of TEL largely aligned with the operational definition of TEL. Using the literature, TEL is defined as the student-centered use of technology as a cognitive tool to communicate, collaborate, develop critical thinking skills, and solve authentic problems (Ertmer & Ottenbreit-Leftwich, 2012; Jonassen, 1994; Jonassen, 2005; Nelson & Hawk, 2020). While this definition was not provided to the participants, they cited many of the same attributes of TEL when asked to define and describe it. For example, three of the four participants consistently stated that TEL is a student-centered practice in every interview. Collaboration, critical thinking, communication among learners, and particularly the facilitation of TEL with a relevant and authentic context were key elements of TEL, according to
the participants. Additionally, their uses of TEL aligned with this definition, demonstrating a strong alignment between the participant partners’ beliefs and behaviors.

The participants in this study perceived TEL as a transformative agent to empower and engage students. They sharply contrasted their perceptions of TEL with the more predominate uses of technology they observed during student teaching and first-year teaching as an oppressive agent for consumption and compliance. These findings diverged from Heath and Segal’s (2021) findings, which stated that preservice teachers often reinforce oppressive norms of “‘good’ behavior as quiet and compliant through their uses of technology with K-12 students (p. 7). In fact, the participant partners in the present study actively rejected those uses of technology in favor of student-centered TEL to empower and engage their students. The participants in Heath and Segal’s (2021) study were in their first semester in their teacher preparation program. The difference in time and experience may account for the different results in these two studies. Additionally, this study’s findings differed from Rafalow’s (2018) findings in that the participants with the highest rates of low-income students and students of color also expressed the most consistent concerns regarding equity, in terms of access to resources and to high-quality TEL. In Chapter One, I asserted that TEL is an issue of equity (Blackburn & Hewitt, 2020; Heath & Segal, 2021; Mills & Herring Watson, 2021; Liu et al., 2019); the participants confirmed this assertion in their TEL beliefs and behaviors as well.

Ajzen’s (1985; 1991) Theory of Planned Behavior did serve as an appropriate lens through which to examine the body of evidence. The results of this study cohere with previous TPB research that has found attitude to be one of the most significant predictors of intention to integrate educational technology among preservice and in-service teachers (Cullen & Greene,
Similarly, scholars have cited administrators, college of education and K-12 faculty, K-12 students, and mentor teachers as individuals with the potential to influence preservice and in-service teachers’ subjective norms regarding educational technology (Gretter & Yadav, 2018; Teo et al., 2016). The participants in this study acknowledged the positive influence of some of these stakeholders, particularly their college of education instructors and their current students, as having strong positive influences on their intention to use and actual use of TEL.

However, these study findings diverged slightly from theory, in that, negative ideas from others (i.e., negative subjective norms) did not negatively impact the participants’ normative beliefs about TEL. Rather, the negative or neutral TEL beliefs of others, like mentor teachers and administrators, seemed to further strengthen the participants’ resolve to use TEL, demonstrating their high self-efficacy and belief in the positive impact of TEL on student learning. While this finding does diverge slightly from previous findings regarding subjective norms, it does align with scholarly critiques of this particular construct in previous quantitative literature, which has stated that subjective norm is often the weakest predictor of intention and outweighed by attitudes and perceived behavioral control (Armitage & Conner, 2001; Blue, 1995; Gretter & Yadav, 2018; Teo & van Schaik, 2012; Teo et al., 2016). Teo et al. (2016) argued that years of experience might account for more deeply held beliefs about educational technology among teacher populations. This was not true in the present study. Participants’ proximity to their experiences in their program of study seemed to be a major source of motivation to overcome organizational pressure to adhere to more teacher-centered direct instruction approaches in their
schools of first-year employment. This demonstrates the powerful significance of an intentionally designed program of study to influence pre-service and novice teachers’ attitudes toward TEL and TEL self-efficacy as a means of overcoming negative subjective norms they may encounter in K-12 school cultures.

As stated in the literature review, Ajzen (2002) aligned the construct of perceived behavioral control with both self-efficacy and perceived controllability. These study findings confirmed that both internal factors contributing to self-efficacy and external factors contributing to perceived controllability influenced the participants’ intention to use and actual use of TEL. While Bandura’s (1977) four sources of self-efficacy were not the theoretical focus of this study, participants named performance accomplishments (e.g., successful use of TEL in the field as student teachers and first-year teachers), vicarious experiences (e.g., college of education instructor modeling of TEL), verbal persuasion (e.g., college of education coursework and cohort encouragement), and emotional arousal (e.g., positive feedback from instructors, peers, and students) as factors that impacted their confidence that they could successfully use TEL in the field with their own students. This coheres with previous research that argues high self-efficacy can support preservice and novice teachers’ confidence in their ability to integrate technology in their teaching (Ottenbreit-Leftwich, Glazewski et al., 2018). As has been acknowledged in previous research (e.g., (Ottenbreit-Leftwich, Liao et al., 2018; Stein et al., 2020; Tondeur et al., 2017), external factors also impacted TEL intention; this fell under the sub-theme School-based factors impact TEL intention and use.

As has been found in previous studies (Brenner & Brill, 2016; Stein et al., 2020), lack of planning time initially presented a barrier to the use of TEL; however, as the study participants
reached the mid-point of their first year of teaching, they seemed to “reprioritize” their planning to more intentionally include TEL. This study coheres with previous research that found preservice and novice teachers’ positive attitudes, high self-efficacy, and perceived control over their teaching actions and environment do predict and correlate with intention (Gurer & Akkaya, 2021; Joo et al., 2018; Nelson & Hawk, 2020; Pozas & Letzel, 2021). These study findings also confirm the findings of Brenner and Brill (2016), who found that novice teachers felt their school environments created barriers to meaningful technology use, including lack of planning time and lack of access to resources. While Hazel had access to a variety of high-quality technology tools to use in her school, Rae and Don both struggled with unreliable technology infrastructure. Additionally, Rae felt challenged to use TEL in the face of restrictive pedagogical policies in her district. Her experience aligns with findings from Stein et al. (2020) who identified insufficient administrative support as a barrier to TEL.

In their studies with novice teachers, Ottenbreit-Leftwich, Liao et al. (2018) and Tondeur et al. (2017) found that their participants’ uses of technology were often heavily influenced by their teaching environment and dominated by teacher-centered practices. Additionally, Tondeur et al., (2017) noted the “praxis shock” (p. 158) that can occur when preservice teachers enter the field as novice teachers. That shock certainly occurred for these participants, as evidenced by the sense of overwhelm they expressed in their September 2021 interviews, just one month into their first year of teaching. However, the four participants in the case all persisted in their intention to use TEL and actual use of TEL, even in the face of barriers, rather than falling back on more teacher-centered pedagogical practices. They often cited one another as a key “support system” for their TEL intention and use. When they lacked support in
their own school buildings, they sought that support for their TEL beliefs within their cohort, who they knew shared their TEL beliefs, would encourage their TEL use, and would help troubleshoot any barriers they perceived as inhibiting their TEL use. They also expressed a strong growth mindset (Dweck & Yeager, 2019). In their interviews, they linked their intention to use TEL to their continued growth and development as educators and found ways to seek control over school-based factors as a means of more effectively using TEL in their classrooms. Again, this was largely motivated by their current students. Each of the participants described that they felt TEL was “vital,” “necessary,” and “best for students.”

This study extends previous findings from Herring Watson and Rockinson-Szapkiw (2021) which stated that TEL intention is lowest during preservice teachers’ student teaching semester, as the case study provides robust descriptions of the stresses and pressures that preservice teachers face during student teaching. One major factor that could impact intention to use and use of TEL is the support (or lack thereof) from the mentor teacher. Previous research has established the impact of mentor teachers on preservice teachers’ conceptions of teaching and technology integration in the classroom (Nelson & Hawk, 2020; Orland-Barak & Wang, 2021). In the present study, the presence of a highly supportive, growth-minded mentor teacher served to support TEL intention and use. However, as demonstrated by participants like Hazel, some preservice teachers’ positive attitudes toward TEL and high TEL self-efficacy may allow them to persist in their use of TEL, regardless of the mentor teacher’s lack of support for these pedagogical practices.

Finally, the study findings cannot be discussed without acknowledging the impact of the COVID-19 pandemic. When the pandemic occurred during the 2020 and 2021 academic years,
schools were no longer able to delay the adoption of technology for learning. As schools have pivoted and transitioned through multiple phases of the pandemic, teachers and students have been forced to adopt technologies, whether or not they were ready to do so (Howard et al., 2020; Starkey et al., 2021). However, the pandemic highlighted vast inequities in our educational systems. Even two decades after Ertmer (1999) published her foundational work regarding first- and second-order barriers to technology adoption, first-order barriers like access to Wi-Fi and limited bandwidth are persistent obstacles to the use of TEL in educational settings (Bauer et al., 2020; Chandra et al., 2020; Stelitano et al., 2020). These first-order barriers were present for all participants during student teaching and for both Don and Rae as first-year teachers. However, all the participants were persistent and creative in overcoming first-order barriers to TEL use. They expressed a strong altruistic motivation to do “what’s best” for students. This could be connected to their belief that TEL should center the needs of the students they teach and seems highly connected to the affective factors (e.g., self-efficacy, self-regulation, value for equity, and growth mindset) that seemed to propel them forward in their TEL beliefs and behaviors during this study.

John Gaus (1947), in Reflections on Public Administration, discussed the concept of “catastrophe as an opportunity for change.” This is potentially a broader way to address the impact of COVID-19 on the teaching practices of the participants. Because the pandemic created such upheaval within the pedagogical practices employed by all teachers, preservice teachers were forced to view this catastrophe as an opportunity for pedagogical and technological change. This helps to explain some of their comments about the necessity of TEL, given their
experiences teaching through a pandemic during which some students could only access the classroom space via technology.

**Suggestions to Improve Practice**

The findings of this study, while not generalizable, provide a foundation for suggestions to improve practice in supporting the development of intention to use and actual use of TEL among preservice and novice teachers. Many scholars (Buss et al., 2015; Buss, Foulger, & Su, 2021; Tondeur et al., 2012; Voithofer & Nelson, 2021) have advocated for a program-deep and program-wide approach to teaching and modeling TEL in teacher preparation programs. These study findings cohere with previous research that advocates for this approach. All of the participants felt strongly that their participation in their shared program of study played a pivotal role in shaping their definitions of TEL as a transformative agent, their descriptions of how TEL looks during instruction, their high TEL self-efficacy, and their strong positive attitudes toward TEL. This messaging was consistent across their interviews and in member checking focus groups to confirm the study’s results in both September and December 2021.

Therefore, teacher preparation programs seeking to develop preservice teachers’ intention to use and actual use of technology could consider a program of study TEL audit, in which they analyze the curriculum in their course sequence to identify opportunities to learn about and practice using TEL across pedagogy-related coursework. Additionally, all four participants named their educational technology course as a primary factor in sparking their interest in TEL. While previous research and trends in teacher education have moved away from employing a stand-alone educational technology course (Buss et al., 2015), it is possible that these courses are often situated too early in the program of study, and students do not yet have the necessary
pedagogical beliefs to pair with the technology they learn about in these courses. Teacher preparation programs should consider where, if at all, in the course sequence educational technology courses are located and situate them near courses in which students learn about and employ student-centered pedagogies.

As novice teachers, the participant partners described a lack of time to plan and facilitate TEL and unsupportive administrators and colleagues as significant barriers to the use of TEL. This aligned with previous study findings (Brenner & Brill, 2016; Stein et al., 2020). Facilitators of novice teacher training and mentoring during the induction period (e.g., the first three years of teaching) should work to create spaces that encourage open dialogue about pedagogy and empower novice teachers to share their knowledge and expertise with more veteran faculty members, rather than feeling pressure to assimilate to the pedagogical culture of the school. Hazel initially described her PLC as “formal” in a way that inhibited her from fully engaging in professional learning and dialogue with her colleagues about TEL. Empowering novice teachers as full members of their school-based professional communities might encourage them to maintain their intention to use TEL, even as they enter school cultures that may or may not fully appreciate the value of innovative teaching practices like TEL.

Finally, all of the participants named each other as a “support system” for their intention to use and use of TEL during both student teaching and first-year teaching. They formed a kind of informal community of practice (CoP) (Lave & Wenger, 1991) that they maintained without any encouragement or prompting. However, this CoP was highly effective in supporting their TEL intention and use, even in the face of significant barriers. Teacher preparation programs and school district personnel who support novice teachers during the induction period should work to
intentionally cultivate similar CoPs to serve as support systems among preservice student teachers and in-service novice teachers as they navigate this critical transition into the field. As all four of the participants, particularly Brooke and Don, noted, choosing to engage in a CoP with other preservice and novice teachers helped them to maintain their intention to use TEL and sparked ideas for actually using TEL during instruction.

Recommendations for Future Research

Future research could further explore some of the emerging themes identified in this study. For example, participants’ formation of a CoP was an unexpected and interesting finding. Future studies might explore the impact of an intentionally designed and developed virtual CoP in which preservice and novice teachers engage throughout their student teaching and first year of teaching, a time when they may feel isolated from their college of education and program of study cohort. This might buoy their TEL intention and use as they navigate the stresses and demands of this specific and significant transition time in their professional careers.

Additionally, further research should be conducted on the role of subjective norm in influencing intention and use. These study participants saw others’ negative attitudes toward TEL as a challenge to be overcome, rather than assimilating to more traditional pedagogical strategies. This finding diverged from the theoretical understandings of the construct of subjective norm. Qualitative methods could be used to replicate this study design and determine whether this finding was unique to these specific participant partners or is present across a broader sample of preservice teachers.

It is possible that these participants are unique and that their self-efficacy, self-regulation strategies, persistence, value for equity, and growth mindset were inherent to the kind of person
who would volunteer to participate in the present study; this finding remains significant and additional study to determine whether these results could be replicated with different participants who have participated in technology-rich teacher preparation programs is warranted. Finally, this study’s findings highlighted the strong positive impact of the participants’ program of study; additional study might focus on program review, using both qualitative and quantitative methods, to highlight specific attributes within a TEL-rich program of study that most influence TEL intention and use.

**Limitations**

While this study resulted in several key findings, it is not without limitations. First, this study employed a small sample size. The study could be extended or replicated with a larger sample to confirm the study results. However, the rich description provided in this study creates the opportunity for transferability, particularly to teacher education scholars seeking to examine their program practices regarding TEL and those who mentor and support student teachers and first-year teachers. Additionally, all of the participant partners in this study were teaching in STEM (i.e., science, technology, engineering, and math) content areas. While this was not intentional, future studies may seek to actively recruit participants teaching in other content areas, as the use of technology in those courses may look and feel different in some cases.

While no effort was made to recruit participants with any particular views or skills related to TEL, the subject of the study may have held interest for students who hold particularly strong beliefs about TEL; therefore, the beliefs and behaviors of these study participants cannot be perceived as representative of the larger population of preservice and novice teachers, rather their experiences within the case, bounded by time and experience, can provide information about the
unique challenges faced by preservice and novice teachers as they enter the K-12 field of education after graduating from a TEL-rich program of teacher preparation.

While multiple data sources were used for triangulation, interviews are a form of self-report, and participants may have provided what they perceived as desirable responses to interview questions (Savin-Baden & Major, 2013). Additionally, participants were asked to select dates for their direct observations when they knew they would be using TEL. If direct observations had been scheduled at random, results could have been different. Due to the pandemic, all qualitative data were collected virtually. While there is certainly precedence for this (Archibald et al., 2019), I was not able to be a physically present participant during direct observations or interviews; therefore, there were likely data that were not observed for the study.

Conclusion

The findings for this study are important as they provide much needed insight into the TEL beliefs, intentions, and actions of preservice and novice teachers during student teaching and first-year teaching, a significant time of transition during their entry to the profession. There is a paucity of literature regarding TEL in general, and specifically regarding preservice and novice teachers’ use of TEL as they enter the field; therefore, this study fills a significant gap in the empirical literature. Additionally, a common critique of TPB literature is that intention is not action (Cheon et al., 2012; Cullen & Greene, 2011; Li et al., 2016; Sadaf et al., 2012). This study addresses that critique by describing how the participants’ intentions led to and informed their use of TEL upon entering their K-12 classrooms, both during student teaching and first-year teaching.
As such, this study provides insight into the importance of strong positive attitudes toward TEL and high TEL self-efficacy in boosting preservice and novice teachers’ feelings of control in their classrooms, which contribute to their intention to use and use of TEL, even in the face of significance challenges, such as lagging technology infrastructure and unsupportive organizational policies. This case study can provide insight into how colleges of education and novice teacher induction programs might support preservice and novice teachers by creating opportunities to build TEL self-efficacy and by intentionally building communities of practice focused on the adoption of student-centered pedagogical practices like TEL. With the growing ubiquity of 1:1 technology initiatives in K-12 schools, how technology is used to engage and empower students and transform learning cultures in more important than ever. This study highlights the persistence and tenacity of the participant partners and the value of a TEL-rich program of study in cultivating their intention and use of TEL, despite the challenges they faced.
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APPENDIX A

Interview Protocol #1

TEL Case Study Semi-Structured Interview Protocol – Spring 2021

Opening Question(s): How’s your week going? How are things going this semester?

Introduction script:

Thank you for your willingness to participate in this interview about your perceptions and uses of technology-enabled learning. Our conversation will last about 30-40 minutes. Anything reported from the interview will be done with pseudonyms to protect your confidentiality. I know you’ve already signed and returned your informed consent form, but I want to ask again if it is okay for me to record this interview for research purposes.

During this interview, you will be asked several questions about your perceptions and uses of technology-enabled learning. You are not required to answer any of them. If you would like to skip a question, just say so. Additionally, if you don’t understand a question, feel free to ask for clarification. Do you have any questions or concerns before we begin the interview?

Okay! Let’s get started.

As I said before, today, we’re going to talk about how you perceive and use technology-enabled learning. Let’s start with constructing a definition of technology-enabled learning.

RQ1: How do preservice teachers describe technology-enabled learning? How do they describe their current technology-enabled learning beliefs and behaviors?

1. How would you define technology-enabled learning?

2. Do you think technology use should be student-centered or teacher-centered?

3. Tell me about how you developed this opinion.
RQ2: How do preservice teachers describe their technology-enabled learning experiences?
How do preservice teachers perceive these experiences influenced their technology-enabled learning intentions and behaviors during student teaching? [Spring 2021 Interviews]

RQ3: How do first-year teachers describe their technology-enabled learning experiences?
How do first-year teachers perceive these experiences influenced their technology-enabled learning intentions and behaviors in their classrooms? [Fall 2021 Interviews]

4. How have your ideas about technology-enabled learning developed while you’ve been in the middle level program?
   • While you’ve been student teaching? [Spring 2021]
   • As a first-year teacher? [Fall 2021]

5. What experiences with technology have you had during the COVID-19 pandemic? How, if at all, did these experiences influence your ideas about technology-enabled learning? Have they changed?

6. Tell me about experiences you’ve had as a student that have shaped your ideas about technology-enabled learning.

Follow-up questions:

7. Describe a time you experienced technology-enabled learning as a student.
   • What did you think about that lesson?

8. What do you think about technology-enabled learning as a classroom practice?

9. How have your experiences shaped your ideas about technology-enabled learning?

10. Who has most influenced your ideas about technology-enabled learning?

RQ4: How, if at all, do teachers’ intention to use and actual use of technology-enabled learning evolve during student teaching and first-year teaching semesters?
11. Tell me about a time you used technology-enabled learning in a lesson you created.

**Follow-up questions:**

12. How did you use your learning experiences to decide how you would use technology-enabled learning in that lesson?

13. What people have influenced your use of technology-enabled learning?

14. What courses/learning experiences have influenced your use of technology-enabled learning?

15. What considerations are you taking into account when deciding how to use technology-enabled learning in your lessons during student teaching/first-year teaching?

**General Probes:**

- So what I’m hearing you say is... Is that correct?
- Could you tell me more about that?
- Describe that a bit more for me.
- Tell me a little more about that idea.
APPENDIX B

Interview Protocol #2

TEL Case Study Semi-Structured Interview Protocol – Fall 2021

Interview Protocol

TEL Case Study Semi-Structured Interview Protocol

Opening Question(s): How’s your week going? How are things going this semester?

Introduction script:

Thank you for your willingness to participate in this interview about your perceptions and uses of technology-enabled learning. Our conversation will last about 30-40 minutes. Anything reported from the interview will be done with pseudonyms to protect your confidentiality. I know you’ve already signed and returned your informed consent form, but I want to ask again if it is okay for me to record this interview for research purposes.

During this interview, you will be asked several questions about your perceptions and uses of technology-enabled learning. You are not required to answer any of them. If you would like to skip a question, just say so. Additionally, if you don’t understand a question, feel free to ask for clarification. Do you have any questions or concerns before we begin the interview?

Okay! Let’s get started.

As I said before, today, we’re going to talk about how you perceive and use technology-enabled learning. Let’s start with constructing a definition of technology-enabled learning.

RQ1: How do preservice teachers describe technology-enabled learning? How do they describe their current technology-enabled learning beliefs and behaviors?

1. How would you define technology-enabled learning?

2. Do you think technology use should be student-centered or teacher-centered?

   • Describe an example of technology usage that fits your idea of student-centered (or teacher-centered) usage.

3. Tell me about how you developed this opinion.
RQ2: How do preservice teachers describe their technology-enabled learning experiences?

How do preservice teachers perceive these experiences influenced their technology-enabled learning intentions and behaviors during student teaching? [Spring 2021 Interviews]

RQ3: How do first-year teachers describe their technology-enabled learning experiences?

How do first-year teachers perceive these experiences influenced their technology-enabled learning intentions and behaviors in their classrooms? [Fall 2021 Interviews]

4. How have your ideas about technology-enabled learning developed while you’ve been in the middle level program?

   • While you’ve been student teaching? [Spring 2021]
   • As a first-year teacher? [Fall 2021]

   • Can you describe technology-enabled learning you’ve seen or you yourself have developed that matches the development you’ve described?

5. What experiences with technology have you had during the COVID-19 pandemic? How, if at all, did these experiences influence have your ideas about technology-enabled learning? Have they changed?

6. Tell me about experiences you’ve had as a student that have shaped your ideas about technology-enabled learning.

   • [Fall 2021] Tell me about experiences you’ve had as a new teacher of record that have shaped your ideas about TEL.

Follow-up questions:

7. Describe a time you experienced technology-enabled learning as a student.

   • What did you think about that lesson?

8. What do you think about technology-enabled learning as a classroom practice?
9. How have your experiences shaped your ideas about technology-enabled learning?

10. Who has most influenced, and who continues to influence, your ideas about technology-enabled learning?

RQ4: How, if at all, do teachers’ intentions to use and actual use of technology-enabled learning evolve during student teaching and first-year teaching semesters?

11. Tell me about a time you used technology-enabled learning in a lesson you created.

Follow-up questions:

12. How did you use your learning experiences to decide how you would use technology-enabled learning in that lesson?
   - How did your students respond to your use of TEL in that lesson?

13. What people have influenced, and currently influence, your use of technology-enabled learning?

14. What courses/learning experiences have influenced your use of technology-enabled learning?

15. What considerations are you taking into account when deciding how to use technology-enabled learning in your lessons during student teaching/first-year teaching?
   - Describe which of these considerations you feel like you can control and which feel beyond your control.

General Probes:

- So what I’m hearing you say is... is that correct?
- Could you tell me more about that?
- Describe that a bit more for me.
- Tell me a little more about that idea.
APPENDIX C

Observation Protocol Template

Observation Field Notes – TEL Case Study

Researcher: Jessica Herring
Place: Zoom – The lesson is taking place at [list school and grade level classroom]
Purpose: To observe how the preservice teacher candidate (student intern) or first-year teacher uses technology-enabled learning during a lesson.
Date/Time:
Case Study Participant:
Other participants present (how many and what kind):
Subject/Topic of the Lesson:
[brackets indicate Observer Comment – OC]

Setting Description:

<table>
<thead>
<tr>
<th>Activity:</th>
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<tbody>
<tr>
<td>Teacher behavior</td>
</tr>
<tr>
<td>Student behavior</td>
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<tr>
<td>Use of Technology</td>
</tr>
<tr>
<td>Documents/Artifacts</td>
</tr>
<tr>
<td>Other Field Notes</td>
</tr>
</tbody>
</table>

[insert diagram of the classroom, as is visible on the Zoom call, below]
APPENDIX D

Study Site IRB Approval

IRB Approval Memorandum

To: Jessica Herring Watson, Donna Wake, Ed.D., Amanda Rockins-Szankiew, Ed.D.

From: Research Compliance Office

Date: December 11, 2020

Subject: Expedited Review of IRB # 20-239

Title: Describing Preservice Teachers’ Perceptions and Uses of Technology-enabled Learning During Internship & Early Career Teaching

Your request to conduct the above titled research with human subjects was reviewed by a member of the Institutional Review Board (IRB). The research as presented in your application meets the requirements of expedited research and is in compliance with the federal regulations for protecting the rights and welfare of human subjects and the policies and procedures of the University of Central Arkansas. Your application was approved on December 11, 2020.

You have approval to conduct the research as described in your application from the date of this memo until a final report is submitted to the office of Research Compliance. Any changes to the original proposal must be submitted for approval prior to implementation. Promptly inform the Research Compliance Office of any adverse or unexpected reactions or harm incurred by subjects as a result of participating in this research.

Approval to conduct this research is approved from the date of this memo until a final report is submitted to the office of Research Compliance closing the research study.

Once the research is completed, please send a completed Final Report form to us.

If you have any questions, contact our office at 852-7460 or researchcompliance@uca.edu.
APPENDIX E

University of Memphis IRB Approval

IRB #: PRO-FY2021-205
Title: (University of Central Arkansas) Describing Preservice Teachers' Perceptions and Use of Technology-enabled Learning During Internship & Early Career Teaching
Creation Date: 12-10-2020
End Date:
Status: Approved
Principal Investigator: Jessica Hering
Review Board: University of Memphis
Sponsor:

Study History

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<th>Decision</th>
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Key Study Contacts

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<th>Role</th>
<th>Contact</th>
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</thead>
<tbody>
<tr>
<td>Amanda Rockinson-Szaplar</td>
<td>Co-Principal Investigator</td>
<td><a href="mailto:rocksnapr@memphis.edu">rocksnapr@memphis.edu</a></td>
</tr>
<tr>
<td>Member Jessica Hering</td>
<td>Principal Investigator</td>
<td><a href="mailto:jhring3@memphis.edu">jhring3@memphis.edu</a></td>
</tr>
<tr>
<td>Member Jessica Hering</td>
<td>Primary Contact</td>
<td><a href="mailto:jhring3@memphis.edu">jhring3@memphis.edu</a></td>
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</table>
APPENDIX F

Participant Recruitment Email and Informed Consent

University of Central Arkansas Mail - Request for Study Participation - Spring/Fall 2021

Jessica Herring <jherring@uca.edu>

Request for Study Participation - Spring/Fall 2021

Jessica Herring <jherring@uca.edu>  Fri, Dec 18, 2020 at 1:16 PM

Greetings!

I hope you’re enjoying a restful winter break! As you may know, in addition to my work as a clinical instructor in the College of Education, I am also a doctoral student at the University of Memphis. I am emailing to request your participation in a research study for my dissertation. The purpose of this qualitative case study is to describe the perceptions and uses of technology-enabled learning among preservice and early career teachers during internship and early career teaching. Your participation would involve four 30-minute interviews (two in the spring and two in the fall) and two observations of your classroom teaching (one in the spring and one in the fall) during the Spring and Fall 2021 semesters. These interviews and observations would be scheduled at your convenience. While I cannot provide direct compensation for your participation in this study, I can provide continued support and mentorship in this year of transition from student teaching to your first year of teaching.

If you are interested in participating in this study, please read and sign the informed consent document that is attached to this email and return it to me at your earliest convenience. If you have questions about the study or would like more information about your participation before you commit, please feel free to reply to this email. I’m happy to discuss your participation in more detail.

Thank you in advance for your consideration! I hope to have the opportunity to collaborate with you on this research project.

Regards,

Jessica Herring Watson
Clinical Instructor I
Department of Teaching & Learning
University of Central Arkansas

[Attached file: updatedQUALinformedconsent.pdf, 1425K]

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INFORMED CONSENT AGREEMENT

University of Central Arkansas
Informed Consent Agreement

Describing Preservice Teachers' Perceptions and Uses of Technology-enabled Learning During Internship & Early Career Teaching

You are being asked to participate in a research study. Before you give your consent to volunteer, it is important you read the following information and ask as many questions as necessary to be sure you understand what you will be asked to do.

Investigators:
Jessica Herring Watson, MSE
Clinical Instructor I
University of Central Arkansas
Dept. of Teaching & Learning

Amanda Rockinson-Szapkiw, EdD, PhD
Associate Professor
University of Memphis
Dept. of Instruction & Curriculum Leadership

Donna Wake, EdD
Associate Professor
University of Central Arkansas
Dept. of Teaching & Learning

Purpose of the Research:
The purpose of this qualitative case study is to describe the influence of preservice teachers’ previous learning experiences on their perceptions and uses of technology-enabled learning during student teaching and early career teaching semesters. The data from this research will be used to inform teacher education curriculum development to further support the use of technology-enabled learning among preservice and early career inservice teachers.

Procedures:
If you volunteer to participate in this study, you will be asked to participate in a series of interviews and classroom observations during your Internship II semester and first semester of in-service teaching.

Your participation will take approximately 30 minutes to one hour of your time on 5-6 occasions throughout the Spring and Fall 2021 semesters.

Audio and/or video recordings will be made during interviews and observations to allow for more accurate transcribing and memo-writing. Recordings will only be available to the research team and will stored on a password-protected computer in an encrypted cloud drive.
Potential Risks or Discomforts
There are no foreseeable risks associated with the study beyond what is experienced in everyday life. You may choose to stop participating, either temporarily or permanently, in this research study at any time by informing the research team of your desire to withdraw from the study.

Potential Benefits of the Research
You may or may not benefit from participating in this research. Participating has no known direct benefits to you. We do believe that this study will provide teachers with valuable information for further instructional technology program development, designed to increase positive perceptions and uses of technology-enabled learning.

Confidentiality and Data Storage
We promise to protect your privacy and security of your personal information as best we can. Although you need to know about some limits to this promise. Measures we will take include:
- Participant responses will be kept confidential.
- Participant responses will use pseudonyms to protect participants’ names.
- Individuals and organizations that monitor this research may be permitted access to inspect the research records. This monitoring may include access to your information. These individuals and organizations include:
  - The research team
  - Institutional Review Board
The records of this study will be on a password protected computer and password protected and encrypted cloud drive. Access to data will be restricted to the research team. We will completely destroy all data files using a data-shredding program such as Digital File Shredder or FileBoss in accordance with Federal guidelines for keeping data.

Audio and/or video recordings will be made during interviews and observations to allow for more accurate transcribing and memo-writing. Recordings will only be available to the research team and will stored on a password-protected computer in an encrypted cloud drive.

Participation and Withdrawal
Your participation in this research study is voluntary. You may refuse to participate without penalty. If you decide to participate, you are free to stop at any time without penalty by just stopping and/or telling the investigator. To withdraw from the study after data collection has been completed, contact the investigator by email at jherring@uca.edu, and your data may be removed from the final research report.

Questions about the Research
If you have any questions about the research, please ask them now. If you have questions later, you may contact Jessica Herring Watson at jherring@uca.edu

This research project has been reviewed and approved by the Institutional Review Board for the Protection of Human Subjects at the University of Central Arkansas. If you believe there is an infringement upon your rights as a research subject, you may contact the Research Compliance Coordinator at (501) 450-3451.

Subject's Agreement
I have read the information provided above. My signature below indicates my voluntary agreement to participate in this research study. Individually identifying information, such as my name, will not be published in connection with this study. All results and all recordings from this study will be disguised by a fake name and this name will be used on all of the research records. Audio/video recordings will be destroyed at the conclusion of the study as indicated above.
Please return one copy of this consent form and keep one copy for your records.

Signature of Research Subject

Date

Signature of Investigator (optional)

Date
APPENDIX G

Star Brightness Inquiry Activity – Actual Use of TEL

CER Question

John, Avery Kate, and Tyler are having a discussion about the apparent brightness of stars. John claims that Betelgeuse is the brightest star because it is red and is 520 light years away. Avery Kate disagrees with John and claims that Spica is the brightest star because it is the hottest star (25,000 degrees!) Tyler disagrees with both of them and claims that the sun is the brightest star since it is 8 light minutes away. Who is correct? Which star will appear the brightest star from Earth?

<table>
<thead>
<tr>
<th>Star's Name</th>
<th>Temperature</th>
<th>Color</th>
<th>Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Betelgeuse</td>
<td>3000</td>
<td>Red</td>
<td>520 light years</td>
</tr>
<tr>
<td>Spica</td>
<td>25000</td>
<td>Blue</td>
<td>220 light years</td>
</tr>
<tr>
<td>Sun</td>
<td>6000</td>
<td>Yellow</td>
<td>8 light minutes</td>
</tr>
</tbody>
</table>

Data Source: https://www.slideshare.net/Astima2016/the-earth-the-beyondoptx-physics
List 3 pieces of evidence to support our claim.

1. 
2. 
3. 

Give Reasons why or how the data supports our claim (explain).
APPENDIX H

PhET Build an Atom Lab – Actual Use of TEL
5. Build these atoms according to the information given. Then draw the Electrons and fill in the other missing information.

Drag the Electrons to the diagrams

**Beryllium**
- Atomic Number
- Mass number
- Net Charge: +1
- Check one: Stable
  - Unstable

**Carbon**
- Atomic Number
- Mass number: 12
- Net Charge: 0
- Check one: Stable
  - Unstable

**Hydrogen**
- Atomic Number
- Mass number: 3
- Net Charge: 0
- Check one: Stable
  - Unstable

**Neon**
- Atomic Number
- Mass number: 16
- Net Charge: 0
- Check one: Stable
  - Unstable

**Nitrogen**
- Atomic Number
- Mass number
- Net Charge: -1
- Check one: Stable
  - Unstable

**Fluorine**
- Atomic Number
- Mass number
- Net Charge
- Check one: Stable
  - Unstable
Part Two: Symbol

1. Select “Symbol”
2. Check the stable/unstable button
3. Build these Atoms. Fill in the missing information.
Part Three: The Game

1. Select “Game”

2. Play all 4 games and record your best score.

Note:
Fill in your score information. You could also show your score screen to your teacher or take a screen shot of your score.
APPENDIX I

Digital Escape Room – Actual Use of TEL

Cells & their Organelles Escape Room

Directions
Today, you are going to explore how the organelles in cells relate to a school:
1. Below, you will find a series of doors. Click on them in this order:
   1. Brick Wall
   2. Counselor’s Office
   3. Keel Office
   4. Ms. Jordan’s Office
   5. Cafeteria
   6. Mr. Lujan’s Storage Closet
2. Once you click on the door, you will be led to a GOOGLE FORM.
3. Each slide will have a clue. Solve it if you can, use any resources that we have created the past few weeks.
4. At the bottom of this page, you will find a Google Form.
5. After solving each clue, write your answer in the corresponding box on the Google Form.
6. Follow the directions to how you should format your answers. If you are correct, it will let you move on. If not, try again.
7. Below you are the right answers, what if on your worksheet.
8. Repeat for all 6 doors.
9. Once you have filled out the entire worksheet, come to the office. You can see if your middle is correct by typing it into the Google Form. It will let you know if you are correct.
10. Happy escaping!