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BRIDGING THE DIVIDE: MARGINALIZED PRE-SERVICE TEACHERS' TECHNOLOGY OWNERSHIP AND SKILL ACQUISITION

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ABSTRACT

Aim/Purpose	Despite increasing access to technology, persistent disparities in digital competence and self-efficacy remain among marginalized pre-service teachers, often exacerbated by systemic inequities and the digital divide. This research explores the gap in knowledge of the lived experiences of marginalized pre-service teachers' (PST) prior access to technology and their current perceptions about educational technology integration.
Background	Grounded in Sociocultural Theory and the Theory of Planned Behavior, this study seeks to answer how marginalized pre-service teachers perceive prior and current technology ownership and related skill acquisition, what beliefs and intentions they have for future classroom technology integration, and what systemic disparities historically have served as barriers to acquiring digital tools and skills.
Methodology	Through critical narrative analyses, interviews and focus groups were conducted, and artifact reflections were collected from those who identify as Black, Indigenous, and other people of color (BIPOC) at a Historically Black College or University (HBCU) in the mid-Atlantic United States (East Coast).
Contribution	This study advances knowledge about technology ownership and instructional technology integration of marginalized PST efforts and addresses societal prob-

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	lems like the digital divide. By amplifying marginalized voices, it challenges assumptions about "digital natives" and calls for systemic shifts to prepare marginalized pre-service teachers for technology-rich educational environments.
Findings	The findings suggest a self-taught means of digital skills acquisition, a high technology-use self-efficacy with an instructor-centric technology yet balanced approach to technology integration.
Recommendations for Practitioners	Participants' verbal and written responses lacked explicit identification of their digital literacy skills or aspirations for future students. Therefore, more opportunities for in-depth, meaningful, and advanced skills acquisition are needed. Teacher education programs must explicitly develop critical digital literacies to foster transformative, equity-driven pedagogy.
Recommendations for Researchers	Researchers are recommended to examine this research further through the lens of the Cultural History Activity Theory using technology as a tool to explore the complexities and contradictions of skills acquisition.
Impact on Society	Research on the digital divide at HBCUs shows that while technology ownership is less of an issue, digital skills acquisition remains a crucial topic. This is especially important for pre-service teachers and future learners.
Future Research	Future research could explore real-time thought development through verbalizations and compare the academic experience with class ranking to understand perception shifts.
Keywords	BIPOC students, intended use of technology, digital divide, digital literacy, pre-service teachers, technology ownership, marginalized

INTRODUCTION

Across educational settings, a persistent problem continues to arise among many pre-service teachers and novice K-12 educators with low self-efficacy related to planning and executing purposeful technology-integrated lessons in their teaching practices (Aslan, 2020). This is evidenced by their hesitancy and lack of confidence in preparing technology-enhanced lessons, citing the lack of practice in the educational technology-focused methods courses (Birisci & Kul, 2019). Additionally, evidence suggests that technology is often underused or poorly used in classroom settings (Birisci & Kul, 2019), implying that lived experiences with technology may affect future implementation plans.

The underuse of technology may also be impacted by the United States' consistent problem with the digital divide and those most affected. Extant studies have found that determinants of the digital divide mainly relate to sociodemographic and socioeconomic identifiers, such as income, age, education level, ethnicity, and urbanization level (Lythreatis et al., 2022). Because access to technology and digital skills in educational settings is important, it is also critical that lived experiences from a variety of pre-service teachers' backgrounds be considered to improve technology integration efforts and address persistent issues caused by the digital divide, such as access to acquiring digital skills.

To date, extensive research exists on technology integration self-efficacy among pre-service teachers (Birisci & Kul, 2019; Scherer et al., 2017). However, most of this research is conducted at predominantly white institutions in the United States and/or higher education institutions outside of the United States, with participants often not representative of students of color. Much of this research is also quantitative, using a variety of technology-based survey tools for data collection (Huang et al., 2011; Jia et al., 2017; Kim et al., 2009; Korucu-Kis & Ozmen, 2019; Sun et al., 2016).

Using critical narrative analysis, the purpose of this research is to explore the gap in knowledge of the lived experiences of marginalized pre-service teachers' prior access – and "beyond access" (Van Dijk, 2017) – to technology and their current perceptions about educational technology integration by answering the following questions: (1) How do marginalized pre-service teachers perceive prior and current technology ownership and related skill acquisition? (2) What beliefs and intentions do marginalized pre-service teachers have for future classroom technology integration?

By applying a critical lens, narrative analysis further serves an emancipatory purpose by helping those frequently socially marginalized describe the meaning of an experience as they construct narratives about their lives (Marshall et al., 2022). The findings imply addressing societal problems like the digital divide. To ground this exploration, this literature review examines theoretical foundations and empirical studies on pre-service teacher self-efficacy with technology integration, the digital divide, and technology at HBCUs.

LITERATURE REVIEW

BACKGROUND

The American Community Survey (Mejía, 2024) reports that, as of 2021, there has been a steady rise in computers with internet access in households since 2013, with at least 95% of households having at least one type of computer. However, despite these growths, many identified as marginalized groups in America continue to have lower levels of technology ownership (Vogels, 2021). Historically, marginalized groups are defined as those who "experience social, economic and/or political exclusion or discrimination based on characteristics such as race, ethnicity, gender, sexual orientation, socioeconomic status, disability or religion" (The American College of Trust and Estate Counsel, 2025). For the purpose of this article, the marginalized groups in question are pre-service teachers who identify as Black, Indigenous, or a Person of Color. Additionally, while this study focuses on marginalized college-aged students, their past experiences with technology are important to note, as this contributes to their overall narratives and influences their current self-efficacy related to technology integration in educational spaces. As pre-service teachers, promoting engagement in positionality and reflexivity about how it relates to current situations in their educational journeys is important.

Regarding preparation practices, Nelson and Hawk (2020) mention that early technology integration and pedagogy instruction for pre-service teachers increase the chances of more robust in-service implementation. The effective use of technology in classrooms cannot wait to be learned once pre-service teachers transition to the classroom (Nelson & Hawk, 2020). Undergirding these findings are the concepts of digital literacy, which speak to digital literacy as a measurement of technology integration self-efficacy (Aslan, 2020) and authentic learning tasks, which allow for increased opportunities for improving technology integration self-efficacy (Ebersole, 2019). The most influential motivating factor impacting technology adoption is a pre-service teacher's attitude toward technology (K. Li et al., 2016).

PRE-SERVICE TEACHER SELF-EFFICACY WITH TECHNOLOGY INTEGRATION

A teacher candidate, or pre-service teacher, is an individual enrolled in a teacher preparation program, undergoing formal education and hands-on training to develop the pedagogical knowledge, skills, and competencies necessary for becoming a certified educator. One of the many critical skills of today's pre-service teachers is that of technology integration and their self-efficacy surrounding it. At a core level, Christensen and Knezek (2016) define technology self-efficacy as confidence in one's competence with technology, and it is an influencing factor for the effectiveness of teaching with technology (Hoy et al., 2009). Self-efficacy, though not synonymous with perception, does play a role in perception by signifying the individual's assessment of external social influences (Bandura, 1977), thus making these findings useful for this review. Of the wealth of technology integration self-efficacy research (Akay & Incik, 2017; Aslan, 2020; Birisci & Kul, 2019; Caner & Aydin, 2021; Ebersole, 2019; Tekin & Gündeğer, 2021), relevant findings indicate that there are several significant factors and predictors of technology integration self-efficacy. Birisci and Kul (2019) found the most important predictor of students' self-efficacy beliefs is linked to their achievement within their own experiences. In contrast, Aslan's (2020) survey data found significant differences in self-efficacy levels of those owning computers and having internet access. Perceived comfort level with computer technology was also a significant predictor of self-efficacy beliefs about technology integration (Caner & Aydin, 2021). Additional research studies examining similar topics have focused on the relationship between technology ownership and technology competence and/or acceptance (Aypay et al., 2012). Sadaf et al. (2012) also researched behavioral factors that influence the intent to use technology in future classroom experiences. Collectively, these findings underscore the critical role that access to technology, prior digital experiences, and comfort with digital tools play in shaping pre-service teachers' self-efficacy beliefs and future intentions for technology integration in educational settings.

As a critical educational setting, Ebersole (2019) states that teacher education programs should create a more robust approach to technology integration, fostering more innovative, authentic, and embedded approaches to technology integration instruction. Similarly, Akay and Incik (2017) and K. Li et al. (2016) indicate that the use of educational technologies contributes to developing information and communication technology (ICT) skills, which results in an overall positive attitude toward technology integration.

While highly informative, the bulk of the existing research is conducted at predominantly white institutions within the United States or at institutions outside of the United States. While these findings help document trends, the voices of marginalized American students (specifically pre-service teachers) seem to be missing from the data, especially qualitatively. This study seeks to contribute to remedying that lack of knowledge.

Digital Divide

The term digital divide refers to the gap between people who have adequate access to ICT and people who have poor or no access to ICT (Lythreatis et al., 2022). The different forms of digital gaps can intensify societal inequalities as they can either restrict or improve citizens' social and economic capital as well as their abilities to participate in society. The digital divide has been described as a critical topic for social justice in the twenty-first century, and some scholars have considered it a source of poverty using the term "digital poverty" (Lythreatis et al., 2022).

Historically, early descriptions of the digital divide refer to physical access to devices. It has since grown to include needed skills and uses for technology (Van Dijk, 2017). The term "deepening divide" refers to the idea that the problem of digital inequity does not end after physical access has been attained but starts when the use of digital media is incorporated into daily life (Van Dijk, 2017). Sessoms et al. (2021) mention that simply having physical access to technology does not equate to digital literacy. Thanks to the massive innovations over the past few years, the digital divide now includes "the pace of innovation, diverse digital media culture and platforms, location of and connectivity to internet access" (Sessoms et al., 2021, p. 40). It is also important to note that there are many false perceptions of current students, often referred to as "digital natives," having a heightened level of digital skills and knowledge. However, Becking and Grady (2019) posit that those with material access still struggle with effective academic use.

Therefore, the digital divide significantly impairs marginalized pre-service teachers' self-efficacy in technology integration, further influencing their intentions for future classroom use. Limited access to digital resources and inequitable exposure to technology-based pedagogical training exacerbate disparities in digital competence, leaving these educators less confident in their ability to integrate technology effectively (Van Dijk, 2017). This lack of self-efficacy can result in reduced motivation to adopt innovative digital tools in their future classrooms, perpetuating educational inequities for the students they will teach. Without intentional intervention, such as structured technology training that considers their lived experiences, marginalized pre-service teachers risk entering the profession with constrained digital teaching capabilities, reinforcing systemic barriers in education.

Each of these perspectives provides a foundation of technology integration self-efficacy predictors and influences as situated in the reality of the disparities in technology ownership and skills acquisition as they are related to the digital divide.

Technology Access at HBCUs

Historically Black Colleges and Universities (HBCUs) are defined as "institutions that were originally founded to educate students of African American descent" (Oxford University Press, n.d.). The need for these institutions stretches beyond the scope of this writing but underscores a deep history of inequities that has long been a mainstay in American culture. Due to general and systematic oppression, those in marginalized communities (which include those who have been excluded from the mainstream because of their race, economic status, gender, or ability), institutions such as HBCUs, have attempted to create opportunities to educate despite political opposition. For those who defied the dominant power structure, achieving goals like equal funding, staffing, and access often proved challenging, ultimately impacting students.

Due to such barriers, historically, studies have shown that marginalized students are less likely to be technologically literate (Berry, 2021; Miah & Omar, 2011; Snipes et al., 2006). This issue becomes exacerbated when access to technology falls victim to institutional digital divides, referring to gaps between institutions with access to the latest technology and those without (Davis, 2009). This gap is especially problematic across HBCUs (Miah & Omar, 2011). The effective use of technology at HBCUs in preparing students for career readiness is critical for the success rate of students (Snipes et al., 2006). The National Skills Coalition (2020) presented data findings that workers of color were disproportionately affected by gaps in digital skills, citing over half of the Black and Latinx entry-level workers having limited to no digital skills. The findings can be tied back to the digital divide and findings from the Pew Center (Vogels, 2021) research regarding racial disparities in technology ownership. This includes marginalized pre-service teachers who are enrolled at an HBCU, much like the target group of this study.

Concerns about HBCUs being up to par with technology are well-documented (Berry, 2021; Miah & Omar, 2011; Snipes et al., 2006). Due to a variety of factors, including disproportionate funding sources, private vs. public institutions, etc., HBCUs have historically had minimal resources and infrastructure to support students at a robust level (Snipes et al., 2006). Findings also cite a lack of training for available technology resources, leaving yet another deficit in skill attainment.

Furthermore, researchers have long stated that how students are exposed to technology in educational settings tends to differ across demographics, as marginalized students from lower socioeconomic backgrounds are more likely to experience drill and practice teaching approaches, whereas their counterparts from more affluent backgrounds use technology to implement higher-order thinking skills in their formative years (Buzzetto-More & Sweat-Guy, 2006; Dolan, 2016; Hohlfeld et al., 2017). These findings, however, are not meant to depict HBCUs and their students as a monolith. While they are primarily minority-serving institutions, students come from various backgrounds and experiences. Despite varying circumstances, many students are highly active in digital media culture despite the lack of traditional ownership (Weinzimmer & Bergdahl, 2018). Therefore, physical access to technology and "beyond access" (Van Dijk, 2017), or skill acquisition, must be explored to move beyond statistical data and learn the complexities of an individual's experiences.

It should also be mentioned that, since the 2020 COVID-19 pandemic, many institutions have done what they can to ensure students remain connected by providing technology resources more broadly. O'Leary and June (2023) state that of the $58.4 billion from the Higher Education Emergency Relief Fund between 2020-2022, $1 billion was spent on distance learning technologies at public colleges and universities. These technologies included cameras, computers, and software that went largely to the students. Therefore, it is reasonable to believe that physical access to technology has improved. However, related digital literacy skill acquisition may remain a concern as it is often overlooked as necessary instruction for today's "digital natives."

This research, anchored by Sociocultural Theory and the Theory of Planned Behavior, contextualizes issues by understanding how marginalized pre-service teachers' lived experiences with technology integration shaped their digital skills acquisition. Critical Narrative Analysis is the qualitative analysis lens used.

THEORETICAL FRAMEWORKS

Based on Vygotsky's (1986) foundational research on human learning and cognitive development, the Sociocultural Theory explores the influence the world has on an individual's cognitive development. At its core, learning is viewed as both socially and culturally situated in the context of daily life and work (Whipp et al., 2005). Furthermore, List (2019) introduces the idea of viewing the sociocultural theory through the lens of digital literacy. Digital literacy is defined as an interrelated set of skills or competencies necessary for success in the Digital Age (e.g., assembling information; reading and understanding multimedia and hypermedia texts; finding and critically evaluating information; and working collaboratively to communicate information) (List, 2019). Therefore, sociocultural perspectives view digital literacy as being connected to students' meaningful participation in a variety of online communities (List, 2019). Considering both, List (2019) also suggests that the skills and learning associated with digital literacy and sociocultural perspectives provide an understanding of knowledge acquisition and possible predictors of self-efficacy.

Additionally, the Theory of Planned Behavior (TPB) serves as an underlying theoretical framework for this study. Broadly speaking, the TPB focuses on implementing a cognitive approach to explaining the link between beliefs and attitudes (Ajzen, 1991) by systematically investigating factors affecting behavioral choices (Sungur-Gul & Ates, 2021). At its core, TPB includes three factors: attitudes, subjective norms, and perceived behavioral control. These factors influence behavioral intention, which later influences actual behavior (see Figure 1).

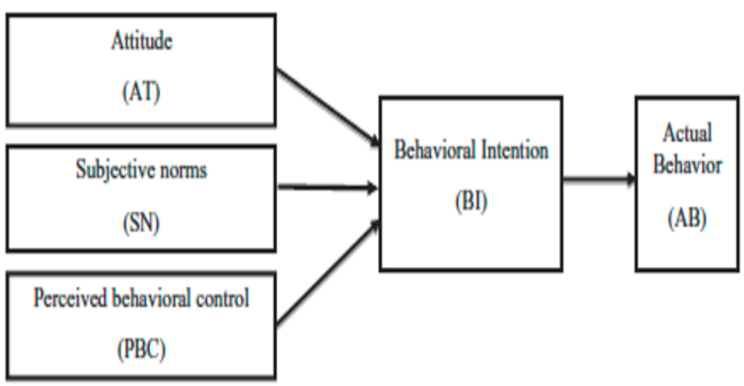

Figure 1. Model of the Theory of Planned Behavior (Ajzen, 1991)

The use of TPB with teacher candidates in research is beginning to expand but remains limited mainly to the attitudes toward technology beliefs, motivation, and mobile learning readiness (Sungur-Gul & Ates, 2021). Attitude toward behavior refers to an individual's disposition and is the best predictor of pre-service teachers' intention in planned behavior (Teo et al., 2017). Behavioral intention (BI) refers to an individual's intention to perform a particular behavior. BI refers to the intention of pre-service teachers to integrate technology in future classrooms. According to TPB, the more pre-service teachers are exposed to technology (through ownership and in learning), the more expectations and pressures they feel regarding the likelihood of integration (Hou et al., 2022). For this research, the areas of focus for the framework are attitude and behavioral intention, as these areas best align with relationships between technology ownership, perceptions, and intentions for future use. Subjective norms and perceived behavioral control are outside of the scope of this research, as is actual behavior. This study explores the relationship between technology ownership, perceptions, and intentions of technology integration. It should also be noted that several other models and frameworks address relationships between technology integration efforts and intentions, such as the Technology Acceptance Model (TAM). However, the choice to use TPB for this research is supported by Cheng (2019), who cites that the TPB "considers social influences on technology adoption and use, which should not be overlooked if e-learning involves interpersonal interactions" (p. 33). This choice would be most appropriate given the sociocultural focus on technology ownership, digital skills acquisition, and intended future use.

Critical Narrative Analysis Studies

The qualitative research genre for this study takes a critical narrative analysis approach. According to Marshall et al. (2022), this approach "seeks to describe the meaning of experiences for those who frequently are socially marginalized or oppressed as they construct stories about their lives" (p. 26). Selecting this method of analysis addresses the limited research conducted at HBCUs to date exploring technology and teacher candidates' attitudes toward implementation. When framed by critical theory, narrative analysis also serves an emancipatory purpose (Marshall et al., 2022). This approach allows authentic stories of historically marginalized communities to be voiced, which may, in turn, increase understanding of the direct outcomes of the lack of access caused by the digital divide. Alone, narrative pedagogy allows a holistic approach to presenting experiences full of complexity and richness (Webster & Mertova, 2007). With a critical lens, narratives can counteract sweeping assumptions and stereotypes of oppressed groups.

There are many spaces within the context of educational systems in which inequitable practices exist, making it difficult to create a truly inclusive learning experience. Driven by a society that is keenly focused on classifying students based solely on numerical data, using a critical lens to prioritize the voices of those often oppressed is a means to learn and improve by linking learning to social change (Caruthers & Friend, 2014). Critical pedagogy further allows voice to be advocacy, which can further be positioned by the researcher, in collaboration with the participants, to attempt to dismantle issues of power and privilege (Marshall et al., 2022).

Therein, the social phenomena of technology self-efficacy, the digital divide, and any existing relationships through storytelling are primary reasons for pursuing the critical narrative analysis approach. For example, Kellam et al. (2015) conducted research to implement narrative analysis with engineering education students to gather the story behind the pre- and post-quantitative data. Sonday et al. (2020) employed narrative analysis to better understand the experiences of occupational therapists during professional role transitions. Participants' narratives are important, not only to study the phenomenon but also because they are constructed and situated in social and institutional realms while being analyzed apart from issues of power. This concept allows individuals to engage in sensemaking and bring the micro (personal) and macro (society) situations into place (Souto-Manning, 2014). Critical narrative analysis offers valuable insights for understanding the construction of knowledge within a societal context.

The overview of these key scholarly works has highlighted theoretical foundations, methodologies, societal issues, and background context to situate the purpose of this research. The literature has also showcased various applications of critical narrative analysis and the importance of giving voice to marginalized communities, especially from students in education preparation programs at HBCUs – voices that are currently absent from the body of existing research. These works create a foundation for uncovering the complexities of narratives and their implications for society. The literature reviewed in this study underscores the significance of critical narrative analysis in deepening our understanding of narratives, in general, and their role in shaping a better understanding of our social world. It further provides considerations for social critique and potential transformation of technology access practices and the lessening of the digital divide.

METHODS

RESEARCH DESIGN

The decision to conduct qualitative research with a critical narrative analysis approach speaks to the limited research conducted at HBCUs exploring technology and teacher candidates' feelings toward implementation (Marshall et al., 2022). This approach allows authentic stories of historically marginalized communities to be voiced, which may, in turn, increase understanding of the direct outcomes of the lack of access caused by the digital divide. This study purports to investigate (1) marginalized pre-service teachers' perceptions of technology ownership and skill acquisition and (2) the beliefs and intentions marginalized pre-service teachers have related to classroom integration.

CONTEXT & PARTICIPANTS

The participants in this study consisted of those who identify as Black, Indigenous, or People of Color (BIPOC) undergraduate students enrolled in an education/teacher preparation program at an HBCU located in the mid-Atlantic region of the United States. The mid-Atlantic region refers to the northeastern section of the country stretching from the southern border of the New England states to the northern border of North Carolina (including the District of Columbia) (Shvili, 2021). Falling within this region, the research site is a well-established, four-year, public, urban institution founded in the 1930s. The institution has 95% minority enrollment, and the ratio of those identifying as female to male is 2:1. (Demographics for otherwise identifying individuals are unavailable currently.) Additionally, 95% of students receive financial assistance of some sort. Although this research is based on an HBCU campus, it does not indicate a homogenous group. To ensure the sample reflected diversity, participants were selected using the purposive sampling technique (Leedy & Ormrod, 2019), seeking to reflect the population based on the classification, gender, and ethnicity of enrolled students at the time of data collection. This population allows for variance in stories and experiences shared within a marginalized community.

Sixteen student participants completed this study (Table 1). Three participants completed a 1:1 in-depth interview, and 13 were a part of the focus group. The participants were all classified as education majors or minors. Six participants identified as male, and 10 participants identified as female, all ranging from sophomores to seniors. Participants were recruited using a formal invitation email sent to those students in the School of Education who fit the above criteria. The email included a flyer outlining the details of the study. Chosen participants were notified by email, and interviews were scheduled using a digital scheduling system. Participants were incentivized to participate in the study by having the option to be entered in a drawing for a $25 eGift Card. All participants in the study are referred to using pseudonyms.

Table 1. Research participant demographics

	Sample size		
Academic programs	**Male**	**Female**	**Total (*n*)**
Elementary Education (K-6)	2	6	8
Secondary Education (6-12; various concentrations)	2	1	3
Physical Education (K-12)	1	1	2
Music Education (K-12)	1	1	2
Total	6	10	16

Data Collection

To allow multimodal responses, data were collected in two primary forms: interviews and artifact observation. Selected participants engaged in one thirty-minute semi-structured interview, and others engaged in a focus group interview during the fall semester. The artifact consisted of a written response/reflection following 1:1 and group interviews. All aspects of data collection were conducted using an encrypted device that provided password-protected platforms visible only to the participants and the researcher.

Instruments

Semi-structured interviews. Phenomenological interviews are grounded in exploring the ways we understand our lived experiences and develop a worldview by focusing on the deep, lived meaning that events have for individuals (Marshall et al., 2022). The purpose of the 1:1 in-depth interview was to provide an opportunity for the students to share their experiences with technology ownership and digital skills acquisition first-hand. The initial interview questions were ontological and open-ended to establish an understanding of each participant's background by exploring the technology ownership experiences (Table 2). The remaining questions focused on gaining an understanding of their digital skills acquisition experiences and thoughts/feelings about future integrations. The initial in-depth interview lasted approximately 20 minutes, and the questions took both the overall project's thematic research question and dynamic dimensions (of the interview questions) into consideration (Kvale & Brinkmann, 2009).

Table 2. InVivo and focused coding categories and descriptions

Major Categories	Descriptions
RQ1: About the pre-service teacher	
Autodidactic digital skills acquisition	Self-taught; "Figured it out"; Mimicry/Apprenticeship; "I don't remember being taught"
High technology use self-efficacy	High-level of comfort; "comfortable to a point"; "more comfortable as a user"; "I'm comfortable with it…but it can be frustrating."

Major Categories	Descriptions
RQ2: About the pre-service teachers' future students/teaching endeavors	
Instructor-centric technology use	Using the technology for self-organization and productivity; "I don't want to confuse my kids with technology; "I wouldn't feel comfortable just giving [future students] a computer"; "I would show a video or PowerPoint to keep students engaged"; "A lot of teaching I would rather do on paper."
Balanced approach to future technology integration	[Future] students do not need to use technology all the time; desire for future students to be well-rounded; "Using tech for hands-on lessons is okay but not just to sit on a computer all day"; "I wouldn't want to focus solely on paper or solely on technology"; "I don't want [future students to get reliant on being able to learn only if there's technology in front of them … they should actually get the human experience."

Note. The major categories and descriptions (derived from codes) are based on all participants' interview responses.

Focus group interview. A focus group was conducted to gain further insight into participants' experiences in a more socially-oriented environment. This style of interview also allows flexibility in exploring unanticipated issues as they arise in discussion more naturally than in a 1:1 interview (Marshall et al., 2022). The questions explored in the in-depth interview were slightly adjusted to accommodate the group format but maintained the same focus on the progression of the lived experiences of previous technology ownership, experience with digital skills acquisition, and thoughts on anticipated use in future classrooms. The focus group session lasted approximately 30 minutes.

Open-ended written response (artifact observation). Following both the 1:1 in-depth and the focus group interviews, participants were asked to complete one culminating open-ended question-based reflection. Responses were gathered via Google Forms. The purpose of collecting written responses is to gather documentation as a data reference point to be critically examined, as it reflects the participants' interests and perspectives (Saldaña, 2021). Subscribing to the theory that what we create embodies who we are, gathering participants' written responses may also give insight into cultural representations and embedded actions (Saldaña, 2021).

Data Analysis

Data was analyzed using processes that are phenomenological to align with participants' narratives of their lived experiences. Both in-depth and focus group interviews were transcribed using Otter.ai, with a subsequent manual review of what was captured to improve accuracy. The transcripts were then analyzed five to six times to determine initial concepts and specific codes. The first cycle of coding followed the InVivo method to prioritize and honor the participants' voices (Saldaña, 2021). The second cycle of coding followed the focused coding method to determine the most frequent or significant categories (Saldaña, 2021). This option was determined to be the best since it aligns with the line of questions answered by the participants, which is reflected in the emerging themes (Table 2). Additionally, the open-ended, written responses were coded following the values coding method (Figure 2) as it reflects participants' worldviews through their values (principles, moral codes, and norms), attitudes (the way we think about things and selves), and beliefs (includes values, attitudes and personal knowledge and experiences, opinions, assumptions, and biases) (Saldaña, 2021). The second cycle of coding followed the pattern coding method to group and "condense categories, themes or concepts" (Saldaña, 2021, p. 322). These methods of analysis were complemented by field notes and analytical memos.

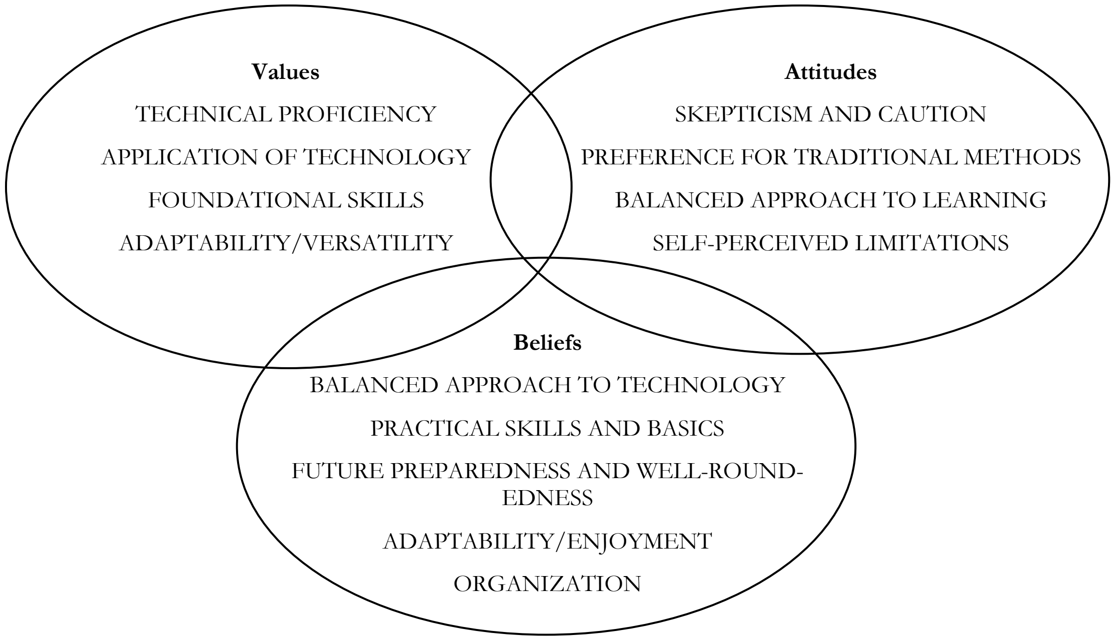

Figure 2. Values coding

Note. Major categories and descriptions (derived from codes) based on all participants' written responses.

Trustworthiness

In considering the trustworthiness of this research project, attempts were made to crystallize the data as much as possible by gathering data from multiple sources, through more than one method, and by viewing results through multiple lenses (Marshall et al., 2022). Integrating code mapping after the first cycle of coding, referred to by Saldaña (2021), also increases the credibility and trustworthiness of the data. Lastly, the transactional validity approach was used by incorporating written reflections from participants (Marshall et al., 2022).

RESULTS

Using qualitative analysis, several rounds of coding were conducted, producing codes and themes from the pattern of responses. Coded data formed two categories aligned with RQ1 – (1) autodidactic digital skills acquisition and (2) high technology use self-efficacy; and two categories that aligned with RQ2 – (3) instructor-centric technology use and (4) a balanced approach to future technology integration (see Table 2).

RQ1: MARGINALIZED PRE-SERVICE TEACHERS' PERCEPTIONS OF PRIOR AND CURRENT TECHNOLOGY OWNERSHIP AND RELATED SKILL ACQUISITION

Autodidactic digital skills acquisition

Autodidactism is self-education without professional supervision (Khan et al., 2021). When asked about technology education, teacher candidates often taught themselves on their devices or observed others, sharing responses like "We knew how to use Safari" or "It came natural." Shandra, a senior with a math education minor, learned from her mother and teachers. She recalled observing her mother use technology at home and mimicking her movements in the classroom. This demonstrates how autodidactism contributes to technological literacy, as individuals often acquire skills through observation, imitation, and hands-on exploration.

High technology-use self-efficacy & digital skills identification

Students show high confidence in their digital literacy skills, as confirmed by their perceptions. Nearly all students mention comfort in using technology for themselves and in future classrooms. Shandra says, “I’m very comfortable. I use it daily.” Rome, a Junior Physical Education major, says, “I’m comfortable with it. I could confidently use it in lessons.” The Pew Research Center’s 2018 (Anderson & Jiang, 2018) statistics show that nearly all students reported having access to some form of technology in their formative years, including phones, game systems, and tablets. Early technology ownership contributes to higher confidence and comfort from experiences (List, 2019). This suggests that early exposure to technology enhances digital literacy and fosters a strong sense of confidence in integrating technology into future academic and professional endeavors.

RQ2: Beliefs and Intentions of Marginalized Pre-Service Teachers for Using Technology in Future Classrooms

Instructor-centric use

When asked how participants envision technology use in future classrooms, many saw it as a teacher-centric activity rather than a student-centered one. Alaysia mentioned using technology for entertainment but preferred teaching with pen and paper. She also cited plans to teach younger students and prefers technology for the organization. Gina, a music education major, believes keeping technology for herself is ideal to avoid distractions for learners. She also thinks music education is better taught on paper. These examples show that pre-service teachers see technology as a tool for organization and instruction, not as a primary medium for student engagement.

Balanced approach to future technology integration

Unexpectedly, future classroom technology integration intentions express caution about excessive technology use. Participants expressed concerns about students becoming overly reliant on technology. Maria, a sophomore elementary education major, worries about forcing students to use technology and confusing them. Tim, a sophomore secondary education major, shares similar concerns, wanting students to learn beyond technology. Other participants emphasized the importance of teaching with pencil and paper. Ayanna, a physical education major, intends to reduce technology use in P.E. and increase it in health-focused lessons. While recognizing technology’s value, these pre-service teachers prioritize a balance between digital tools and traditional teaching methods for deeper learning and human interaction.

Discussion

Key results highlight marginalized, HBCU pre-service teachers’ confident, self-taught approach to acquiring digital skills, contrasting with a cautious, mainly instructor-centric approach to digital integrations. Billett (2013) describes this self-acquisition as mimetic learning, using observations and senses to respond, comprehend, and evaluate actions – a common basis for learning. Promoting technology-enhanced learning through mimesis is ideal for university students who prefer gradual, scaffolded engagement, allowing for progressive learning through experiences. The shared experiences of the pre-service teachers in this survey confirm this theory as a natural and positive learning experience in gaining technology use skills.

While most participants mentioned learning from others, only a couple explicitly mentioned any specific skills taught during their K-12 years. Alaysia, a sophomore elementary education major, mentioned taking a computer literacy class during her freshman year in college but also cited, “That didn’t really teach me much, but [because] my dad is a gamer, and I learned more from him.” This is an interesting mention regarding the value placed on meaningful, authentic learning experiences that tie back to the importance of building learning opportunities that support authentic learning for improving technology integration self-efficacy (Ebersole, 2019).

This parental influence is an example that can be tied back to the Theory of Planned Behavior. Influence and attitude toward the usefulness of the technology and behavioral intention to integrate the technology reflect an individual's tendency to engage in a particular behavior. In educational settings, a teacher's attitude toward technology is a key factor in determining the effectiveness of its use in the classroom. Research consistently shows that perceived usefulness and perceived ease of use strongly shape these attitudes. Path analysis studies have confirmed that both factors significantly influence pre-service teachers' attitudes toward using computers (Cheng, 2019).

Building upon this connection between attitudes and behavioral intentions, it is also critical to examine how pre-service teachers conceptualize specific digital skills they believe are essential for future learners. Few students identified specific skills they deemed important to share with future students. Most shared general responsibilities, such as "skills to learn through technology and in person," "knowing the technology," and "knowledge and experience." A couple of students answered more specifically, citing "how to properly use the internet" and "skills like word processing, spreadsheets, presentations, keyboarding, internet use, and communications." However, it's unclear if students can identify digital literacy skills. Evidence of sociocultural approaches to learning technology skills was more clearly identified, but any skills mentioned were surface-level and general, like findings from List (2019) and Dinsmore and Alexander (2012, 2016). Further exploration is needed to help learners identify mastered skills and those they deem beneficial to pass on.

Recognizing digital skills for specific purposes may shift the focus from instructor-centered to student-centered technology integration for engagement. Wu and Huang (2007) compared teacher-centered and student-centered technology-enhanced learning experiences. While achievement was similar, student-centered environments had higher emotional engagement. This could lead to shaping learning experiences and allowing students to engage in various activities. While some perspectives lean away from robust technology integration, many early teacher preparation students who intend to use teacher-centered technology also have a different perspective about using technology in the classroom, which is more student-centered and balanced.

For this reason, students who reported frequent and confident technology use in their formative years, such as daily use of phones, tablets, and game systems, demonstrate higher digital literacy skills and greater comfort levels, as confirmed by both self-reports and national data (Anderson & Jiang, 2018; List, 2019). These foundational experiences are essential, as research on pre-service teachers' technology integration self-efficacy underscores that prior digital experiences, technology ownership, and perceived comfort with digital tools are among the strongest predictors of future instructional technology practices (Aslan, 2020; Birisci & Kul, 2019; Caner & Aydin, 2021). These marginalized pre-service teachers' beliefs and experiences play a crucial role in shaping their intentions for technology use in the classroom, influencing both their confidence and willingness to integrate digital tools effectively. Those who perceive technology as a valuable, transformative tool for learning are more likely to explore innovative instructional strategies, incorporating digital resources to enhance student engagement and understanding (Feng et al., 2014). Conversely, pre-service teachers with more rigid or skeptical beliefs about technology may struggle to see its pedagogical benefits, leading to minimal or ineffective integration (Howard et al., 2021). These beliefs, often shaped by prior experiences, institutional support, and digital competence, ultimately impact their future instructional practices and the digital learning opportunities they will later provide to their students.

Lastly, most of these students were in later high school or early college years during the COVID-19 pandemic, which increased technology integration to continue their education. Due to the connection between attitude and behavioral intention, as outlined in the Theory of Planned Behavior, these experiences likely influenced their planned future technology integration behaviors. For instance, Ayanna disliked video conferencing during COVID-19, and technology didn't seem to help. Freddie, a junior music education major, preferred a hybrid approach based on a positive experience during COVID-19 using the learning management system, which he wants to use in his future classroom while maintaining a balance of non-digital instruction. Sungur-Gul and Ates' (2021) study found that attitudes and subjective norms increase technology adoption intentions. The TPB may explain why students exhibit self-taught learning tendencies but lean toward instructor-centered technology integration because their attitudes and perceived control influence their intentions. Integrating TPB strengthens the argument that prior experiences shape future teaching behaviors, which is consistent with findings in this study about the intended future use of technology in classrooms. Understanding this connection is particularly salient when examining the experiences of marginalized pre-service teachers, for whom historical inequities in technology access may have shaped distinct trajectories of digital competence development and self-efficacy beliefs, influencing their future intentions for classroom technology integration.

Marginalized pre-service teachers, especially those at HBCUs, face systemic and structural barriers to equitable access to technological resources and skill development. These inequities, stemming from historical underfunding, limited infrastructure, and societal disparities, affect their experiences with digital tools during formative education. Consequently, they may enter teacher preparation programs with varying levels of digital skills and self-efficacy about technology integration. Understanding these factors is crucial for fully appreciating the digital competence trajectories of pre-service teachers from historically underserved communities.

IMPLICATIONS

The findings in this research offer several implications for technology ownership and instructional technology integration efforts. First, owning technology early seems to be the key to a higher level of comfort with technology overall. Z. Li et al. (2022) find that the earlier an individual accesses information communication technology (e.g., smartphone, Internet, PC), the higher their level of technology-use integration. While this study did not inquire about a specific age, participants clearly stated that they used technology from an early age, which allowed them to become comfortable with personal use.

Second, the sociocultural perspective suggests that the approach to basic technology skills acquisition seemingly occurs naturally in this connected society, and more opportunities should be created for in-depth, meaningful, deeper-level skills acquisition. While our social connectivity may have shifted over the last few years, networking is more upfront than ever, allowing for more equitable opportunities for skills acquisition (Ünlüsoy et al., 2021). However, based on participants' verbal and written responses, explicitly naming digital literacy skills that they either possess or would like to foster in their future students was lacking. While they indicated how they can execute several skills based on their experiences, are these the correct skills for academic and career success? Are the skills mastered and identified to transfer to future professional settings? According to the National Association of Colleges and Employers (NACE), their 2020 career readiness technology competency states that graduates should "understand and leverage technologies ethically to enhance efficiencies, complete tasks, and accomplish goals" (*What is Career Readiness?, 2025)* While broad in its statement, some sample behaviors include quickly adapting to new or unfamiliar technologies, manipulating information or constructing ideas, and identifying the appropriate technology for completing specific tasks. This is where the importance of understanding technology and pedagogy comes together. There is value in conceptualizing the development of digital literacy and skills in a sociocultural context (List, 2019).

Lastly, in viewing the findings from a critical narrative lens, this study intended to amplify the voices of those often left out of the research. With much of the existing research having been conducted at majority-serving institutions or institutions outside of the United States, it is crucial to ensure the inclusion of those attending minority-serving institutions such as HBCUs. The data collected was purposely done qualitatively to share stories of marginalized pre-service teachers, their technology ownership journey, and their intended future use. Because many of the findings are consistent with existing research, there is a level of counter-storytelling at play in this research, which Ellison and Solomon (2019) define as a method of storytelling that "aims to cast doubt on the validity of accepted premises or myths, especially ones held by the majority" (p. 224). To bring attention to the perspectives of marginalized pre-service teachers regarding their technology ownership, skills acquisition, and integration intentions, these stories and experiences are no longer "silenced by the assumptions of others."

Additionally, including the context of an HBCU, this research may address issues of the digital divide more broadly, as findings indicate the early definition of the digital divide, referring to the "haves and have-nots" of technology ownership, may not be as relevant as the issue of digital skills acquisition. While it appears that marginalized families may be "moving beyond the digital divide era" (Ellison & Solomon, 2019, p. 228) in some respects, attention should still be focused on digital literacy, especially on its impact on teacher candidates and future learners.

Limitations and Directions of Future Research

This research is not without its constraints. First, Nelson and Hawk (2020) address self-reporting data and how it has been historically criticized for being overused. Therefore, following their suggestion, which is to increase the observation frequency, future iterations of this research may occur more than once throughout the semester rather than all at once to monitor consistency and changes in responses. Another limitation is the small sample size. A larger sample size may help generalize findings and validate the instruments used. Lastly, researcher bias is a concern, but to limit this, efforts were made to build time for cross-checking, participant review, searches for negative instances, and writing analytic memos regarding insight, as outlined in the Marshall et al. (2022) text.

While there are several complexities within the context of this research, there is room for improvement and further examination of similar research questions. First, due to time constraints with data collection, a think-aloud protocol was initially to be a part of this research. The think-aloud protocol is used to gather verbalizations around productive thinking and as a means of understanding thought development (Alhejaili et al., 2022; Wolcott & Lobczowski, 2021). In future iterations, this may provide valuable insight into real-time thought processes and skills employed while learning a new technology or digital skill. Next, comparative data based on academic experience as well as class ranking over time would provide an interesting perspective to determine if academic experiences shift perceptions. Last, Marshall et al. (2022) refer to crystallizing qualitative research by using a variety of theories, and therefore, there is value in (re)examining this research through the lens of the Cultural-Historical Activity Theory (CHAT) using technology as a tool to explore the complexities and contradictions of skills acquisition. Exploring how individuals engage in activities with others using tools (technology) mediated by cultural norms to achieve shared goals may foster further understanding of this research.

Conclusion

This research offers a nuanced and critical understanding of how marginalized pre-service teachers' epistemic beliefs, lived experiences, and technology ownership histories shape their digital competence and intentions for future educational technology integration. Drawing from Sociocultural Theory and the Theory of Planned Behavior and employing a critical narrative analysis approach, this study illuminates the intricate interplay between early access, self-taught learning practices, and cautious, instructor-centered approaches to digital integration. Participants' narratives reveal that while early exposure to technology fosters comfort with personal digital use, systemic inequities, such as disparities in digital literacy instruction, continue to impact their confidence and pedagogical intentions. Notably, this research challenges deficit-oriented assumptions about marginalized learners by showcasing their agency, critical thinking, and commitment to balancing technology use with human-centered instructional practices. Furthermore, the findings emphasize the need to conceptualize digital competence beyond mere technical proficiency, recognizing it as a sociocultural practice that requires intentional development in teacher preparation programs. To truly address the legacies of the digital divide and foster equitable digital futures, teacher education must prioritize marginalized voices, provide meaningful, scaffolded opportunities for critical digital skill development, and explicitly connect digital literacy to culturally responsive pedagogy. By amplifying these often-silenced narratives, this study advocates for a transformative reimagining of digital competence as both a pedagogical imperative and a tool for social transformation.

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