IMPACT OF TECHNOSTRESS ON PRE-SERVICE TEACHERS' PERCEPTIONS OF TECHNOLOGY INTEGRATION IN CLASSROOM TEACHING

by

Lateefat Oluwatomisin Sanni

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DEDICATION

To myself, for staying the course even when it wasn't easy, and to Allah, whose mercy guided me through every step. To my parents, who taught me perseverance and faith, and to my husband, whose support and patience strengthened me along the way.

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ABSTRACT

This study examines the impact of technostress among pre-service teachers and how it shapes their confidence and willingness to use technology in classroom teaching. As digital tools become more central in teacher preparation programs, many pre-service teachers face challenges related to learning new systems, managing multiple platforms, and meeting technology-based expectations during coursework and practicum experiences. Understanding these pressures is essential because early experiences with technology often shape how future teachers approach technology integration once they enter the profession.

A mixed-methods design was used to investigate this issue. Quantitative data were collected from 133 pre-service teachers through a survey measuring technostress sources, its impact on teaching, coping strategies, and institutional support. Exploratory factor analysis was conducted to validate the structure of the adapted technostress survey, followed by correlation and regression analyses to assess how the different dimensions of technostress relate to teaching confidence and perceptions of technology use. Qualitative data from semi-structured interviews were also gathered to provide deeper insight into participants' experiences, especially their reflections on stress, adaptation, and support during practicum.

The findings showed that technostress was present at moderate levels and came mainly from feelings of overload, complexity, and insecurity when working with digital tools. Higher levels of technostress were associated with lower confidence in using technology and a reduced belief that technology was useful for teaching. However, strong institutional support such as mentorship, hands-on guidance, opportunities to practice, and access to helpful resources helped reduce the negative effects of technostress. Interview participants described feeling overwhelmed at the beginning of their practicum but reported gaining confidence as they received feedback, collaborated with peers, and became more familiar with the technology required in real classroom settings.

The study concludes that technostress is not only a barrier but also an experience that can support growth when pre-service teachers receive adequate guidance. By offering structured training, practical opportunities to build digital skills, and consistent mentorship, teacher education programs can help future teachers develop the confidence needed for technology-rich classrooms. Recommendations for improving teacher preparation and suggestions for future research are provided.

CHAPTER ONE

INTRODUCTION

Background of the Study

Information and communication technology (ICT) has been extensively embraced by higher education institutions globally as a catalyst for improving knowledge acquisition, productivity, and educational quality (Fahadi & Khan, 2022; Moreira-Fontán et al., 2019; Schettino et al., 2022). ICT has swiftly revolutionized course delivery and significantly altered student learning and instructor teaching through its incorporation into educational practices with diverse educational technologies (Bedenlier et al., 2020; Chen et al., 2022; Zhang et al., 2023). The COVID-19 pandemic compelled educators globally to abruptly transition to online instruction, imposing heightened technical proficiency demands on those instructions and presenting significant challenges for educators (Chou & Chou, 2021; MacIntyre et al., 2020; Shirish et al., 2021; Teng & Wu, 2021). Given what was learned from this abrupt transition, technological competency is strongly advised, particularly with the incorporation of technology into the educational framework (Mokh et al., 2021). Technological competency enables educators to proficiently employ technological resources that enhance student engagement, support diverse learning needs, and prepare students for a technology-driven world. However, the reliance on technology means that teachers must not only know how to use the digital tools, but to integrate this technological knowledge with pedagogy to enhance the quality of student (Niess, 2005). Digital literacy is one essential dimension of technological knowledge. Digital literacy should be addressed in teacher education since developing technological proficiency

encourages confidence with digital tools and resources (Burrows et.al., 2021). Effectively supporting this digital transformation requires teacher educators to cultivate pre-service teachers' perceptions, attitudes, digital readiness, resilience, and overall capacity for technology integration.

Notwithstanding the increasing use of technology, there are significant challenges to widespread implementation (Bai & Lo, 2018; Hamutoglu, 2021; Nagel, 2013), as the incorporation of digital technologies into pedagogy is not an individual activity (Castro-Guzmán, 2021). They include but not are limited to availability and access to technology (Pelgrum, 2001), teacher attitudes and readiness (Inan and Lowther, 2010), and school policy regarding technology (Tondeur et al. 2008). Further, researcher have found that technology can adversely affect organizational behavior and induce psychological stress. This stress is often referred to as 'technostress,' which has been extensively studied (Tarafdar et al., 2007). Technostress adversely affects work performance and satisfaction, as evidenced by psychological assessments of technostress levels (Upadhyaya, 2021). Furthermore, research has shown additional behavioral consequences of technostress, such as burnout (Mahapatra & Pati, 2018). Such implications for physical health result in elevated blood pressure, headaches, abdominal discomfort, and frustration. At this juncture, technological competency is strongly advised, particularly with the incorporation of technology into the educational framework (Mokh et al., 2021).

Problem Statement

The importance of the role technology can play in education has become increasingly more clear, with digital literacy and technological competency playing a critical role in modern teaching practices (Ertmer & Ottenbreit-Leftwich, 2010; Mokh et al., 2021; Niess, 2005; Burrows et al.,

2021). Despite the widespread adoption of technology, pre-service teachers often encounter significant challenges including technostress, which can negatively influence their attitudes towards using technology in the classroom (Tarafdar et al., 2007; Qi et al., 2019). Consequently, the motivation for studying the impact of technostress on pre-service teachers' perceptions of technology integration in classroom teaching stems from a desire to address the often-overlooked burden of technostress in teacher preparation programs. As the emphasis on digital competency grows, understanding and mitigating the barriers caused by technostress is crucial for preparing future educators to embrace technology in ways that enhance, rather than hinder, their teaching efficacy. Technostress arises from factors like information overload, technical issues, and balancing new digital tools with traditional teaching methods (Mokh et al., 2021; Nang et al., 2022; Siddiqui et al., 2023). Technostress, characterized by feelings of overwhelm and frustration due to technological demands, has been linked to negative outcomes such as burnout, job dissatisfaction, and decreased motivation (Mahapatra & Pati, 2018; Upadhyaya, 2021; Estrada-Muñoz et al., 2020; Aktan & Toraman, 2022).

Understanding how technostress impacts pre-service teachers' perceptions during their preparation and practicum experiences is critical, as these formative stages directly could have long-term implications on their willingness and ability to integrate technology effectively into their future classrooms. Therefore, examining how technostress influences pre-service teachers' perceptions and attitudes toward incorporate technology into their practicum teaching can provide teacher educators with important insights on how to better prepare and support pre-service teachers. Ultimately, these insights can help teacher educators better support pre-service teachers in overcoming technostress and fostering positive perceptions and attitudes towards

technology integration, eventually enhancing their readiness to utilize technology effectively in their professional careers.

Purpose of the Study

The purpose of this mixed methods study is to identify the factors that contribute to technostress among pre-service teachers during their preparation and practicum experiences, and to examine how these factors influence their perceptions and attitudes towards technology integration in the classroom teaching. By combining quantitative data on technostress factors with qualitative data on pre-service teachers' experiences, this study aims to provide a comprehensive understanding of how technostress shapes pre-service teachers' readiness for effective technology integration.

Research Questions

1. What are the factors that contribute to technostress among pre-service teachers toward technology integration during their preparation and practicum experiences?
2. How do these factors of technostress influence pre-service teachers' perceptions and attitudes toward technology integration in their practicum classrooms?
3. How does qualitative data from pre-service teachers' interviews explain the results from the quantitative phase of the study that focused on measuring technostress? (Mixed-Methods).

Significance of the Study

The impact of technostress on educators is multifaceted and potentially far-reaching, with the consequences such as burnout, decreased job satisfaction, and diminished motivation (Aktan & Toraman, 2022). Moreover, the mental and emotional toll of technostress can result in anxiety and depression among teachers (Estrada-Muñoz et al., 2020). For pre-service teachers, these challenges emerge not only during coursework but also in practicum classrooms, where they are expected to apply digital tools in real teaching contexts while still developing their professional careers. At this formative stage, the effects of technostress may shape their confidence, attitudes, and long-term willingness to effectively integrate technology in their future classrooms.

This study is significant because it addresses a critical gap in understanding of how technostress influences pre-service teachers during their preparation and practicum experiences. By investigating these early encounters, the study highlights potential barriers to technology integration before they become deep-rooted in in-service practice. The findings can inform the design of teacher education curricula by emphasizing not only digital skill development but also strategies for coping with technostress, fostering resilience, and cultivating positive attitudes toward technology use. In addition, results from this study may guide policy and institutional practice by encouraging teacher preparation programs to provide sustained, context-based training, mentoring, and technical support that align with the realities of practicum classrooms.

Finally, the significance of this study lies in its potential to shape both curriculum and policy in ways that better prepare pre-service teachers to manage the challenges of technology integration. By strengthening support systems in teacher education programs, institutions can ensure that pre-service teachers enter the profession not only digitally competent but also

confident and motivated to use technology effectively, thereby contributing to more innovative and resilient teaching practices in the digital age.

Theoretical Framework

This study is grounded in the Technology Acceptance Model (TAM) (Davis, 1989) and the Transactional Model of Stress and Coping (Lazarus & Folkman, 1984). The TAM provides a framework for understanding how users come to accept and use technology, considering factors such as perceived usefulness and ease of use. The Transactional Model of Stress and Coping offers insights into how individuals appraise and cope with stressors, which in this context are related to technology use in education. By combining these theoretical perspectives, we aim to explore how technostress influences pre-service teachers' perceptions of technology integration, and how these perceptions, in turn, affect their intentions to use technology in their future teaching practices. The dimensions of this theoretical framework will be addressed in depth in Chapter 2 of this thesis.

Research Design Overview

This study adopts a mixed methods explanatory sequential design (Mills & Gay, 2019) to examine how technostress affects pre-service teachers' perceptions of technology integration. The research begins with a quantitative phase using a survey adapted from the Technostress Creator Scale (Tarafdar et al., 2007) and the Technology Acceptance Model (Davis, 1989) to identify key technostress factors and their influence on pre-service teachers' perceptions. Following this, a qualitative phase involves semi-structured interviews with selected participants from the survey pool to explore their experiences and coping strategies. This design denoted

as QUAN → qual prioritizes quantitative data while using qualitative insights to deepen understanding. Together, finding from each phase will be combined and ultimately provide a comprehensive view of technostress and its impact on technology integration in teacher education.

Assumptions

Pre-service teachers have varying levels of familiarity with and ease in using technology, and technostress is a quantifiable phenomenon that can be accurately evaluated by self-report measures. Participants are expected to provide truthful and precise responses during both the quantitative and qualitative phases of the study. Moreover, the anticipated standards for technology integration in teacher education programs are expected to reflect the requirements that pre-service teachers will face in actual classroom settings.

Implications

The findings of this study may have numerous implications on various stakeholders. The findings may guide curriculum development and the implementation of technology in teacher education programs. Policymakers could utilize the data to inform decisions on technology deployment and to set teacher preparation requirements that minimize technostress. Educational institutions should leverage these findings to enhance support systems for both pre-service and in-service educators. Furthermore, educational technology developers ought to capitalize on insights about technostress factors to design better user-friendly and helpful educational technologies.

Limitation and Delimitations

This study has certain limitations that must be acknowledged when interpreting the results. The study exclusively targets pre-service teachers to comprehend their initial professional perceptions of technostress, excluding in-service teachers. The geographic scope is confined to pre-service teachers at a land-grant university in the Northern Rockies, potentially impacting the generalizability of the findings to other locations or institutions. The study also records perceptions at a particular moment, failing to consider possible long-term shifts in views or the changing technological environment. Finally, although the study investigates generic educational technology, it may not comprehensively address stress associated with specialized technologies employed in certain topic domains.

This study aims at clarifying technostress in pre-service teacher education by examining the specified research questions within the established framework, while considering the stated assumptions, implications, and delimitations. This knowledge is essential for formulating solutions to assist pre-service teachers in reducing technostress, developing a positive attitude towards technology integration, and eventually improving their preparedness to proficiently employ technology in their future professional careers.

Positionality Statement

As a second-year MSc student in Curriculum & Instruction with a focus on Learning, Design, and Technology, I am deeply invested in how technology can improve educational practices. My rural background and experiences with educational settings where technology support is often limited have shaped my understanding of the challenges pre-service teachers

face. These perspectives drive my interest in exploring technostress to help future educators navigate the digital demands they will encounter in their careers. Through my research, I hope to contribute insights that could lead to stronger support systems for pre-service teachers.

As a graduate researcher and teaching assistant working closely with pre-service teachers, I occupy an insider–outsider position within this study. My involvement in supporting instructional activities and observing pre-service teachers' use of educational technologies allows me to empathize with their challenges and learning processes. At the same time, my role as a researcher requires maintaining analytical distance and objectivity. This dual perspective strengthens the study by combining informed insight with thoughtful reflection, ensuring that interpretations remain grounded in participants' authentic experiences rather than personal bias.

Keywords: Technostress, Pre-service Teachers, Technology Integration, Perceptions

Definitions of Some Terms

Technostress: A form of stress experienced when individuals struggle to adapt to or manage new digital technologies in educational settings.

Impact: The force of impression of one thing on another, a significant or major effect.

Pre-service Teachers: Students enrolled in teacher education programs who are being trained but are not yet fully certified to teach.

Technology Integration: The purposeful use of digital tools and resources to enhance teaching and learning in the classroom.

Perceptions: Pre-service teachers' beliefs, attitudes, or viewpoints about using technology in educational practices.

CHAPTER TWO

REVIEW OF LITERATURE

Introduction

The integration of Information and Communication Technology (ICT) in education has transformed teaching and learning paradigms globally, offering innovative tools and platforms that enhance instructional delivery and student engagement. As educational institutions increasingly adopt digital technologies, the role of teachers as facilitators of technology-rich learning environments becomes critically important (Haleem, et al. 2022). Pre-service teachers, who represent the future teaching workforce, are expected not only to master content knowledge but also to develop competencies in effectively integrating ICT into their pedagogical practices. However, the rapid pace of technological advancement, coupled with the complex demands of educational settings, can induce significant stress among these emerging professionals (Oladosu, et al. 2020).

Stress related to technology use, commonly referred to as technostress, has become an emerging concern in educational research. Technostress is defined as the negative psychological and physiological responses experienced when individuals face challenges in adapting to new technologies (La Fleur & Dlamini, 2022). For pre-service teachers, technostress may arise from multiple sources, including inadequate digital skills, overwhelming technological demands, and lack of institutional support (Upadhyaya, 2021). This stress can adversely affect their attitudes, perceptions, and ultimately their willingness to integrate technology into classroom teaching effectively.

Understanding the impact of technostress on pre-service teachers is vital because it may shape their confidence, motivation, and readiness to employ ICT tools in instructional settings. The complexities associated with technology adoption, combined with the pressures of teacher preparation programs, make pre-service teachers particularly vulnerable to technostress. Therefore, a thorough examination of existing literature on ICT in education, stress and coping in educational contexts, and specifically the phenomenon of technostress among pre-service teachers is essential, especially as such review may provide a foundation for exploring how technostress influences their perceptions and attitudes toward technology integration, with implications for teacher education practice.

Understanding Technostress in the Educational Context

The concept of technostress in recent time has gained significant concern in educational research (Khlaif et al. 2023; Kumar, 2024; Saleem, Chikhaoui & Malik 2024), particularly as digital technologies become more embedded in teaching and learning processes. For pre-service teachers, technostress poses a unique challenge, potentially undermining their confidence, pedagogical engagement, and willingness to integrate technology into future classroom practice. The term technostress was first introduced by Brod (1982), who defined it as a modern disease of adaptation caused by an inability to cope with new computer technologies in a healthy manner. The author's early conceptualization situated technostress within a psychological and physiological framework, viewing it as a maladaptive response to the rapid technological changes that were beginning to permeate the workplace. Since then, the construct has evolved significantly, particularly through the works of Tarafdar et al. (2007), Kaltenegger et al. (2023) and Alvarez-Risco et al. (2021) who conceptualize technostress in terms of specific dimensions

or technostress creators that describe how technology can generate pressure, anxiety, or emotional exhaustion.

Researchers such as Bondanini et al. (2020), Oladosu, et al. (2020), and Pothuganti (2024) emphasize that technostress is not simply about exposure to technology, but rather about the stressful experiences that arise from interacting with technological systems, especially when there is a mismatch between the user's capacity and the demands of the technology. This reframing has been influential in shifting the focus of technostress research from a medicalized notion (Brod,1984; Bondanini et al. 2020) to a more socio-technical understanding that accounts for individual, organizational, and contextual factors (Ragu-Nathan, et al, 2008; Pothuganti, 2024; Khlaif, et al. 2023). A robust understanding of technostress requires attention to its multidimensional nature.

Tarafdar et al. (2007) propose a multidimensional framework for understanding technostress, identifying five core dimensions that are particularly salient within educational settings, especially for pre-service teachers. The first dimension, techno-overload, arises when individuals are required to work at an accelerated pace or for extended periods due to the increasing demands of technology. In the context of teacher education, this may manifest as the pressure on pre-service teachers to juggle numerous digital tasks, such as lesson planning, content creation, and online collaboration, often within limited timeframes during practicum or coursework. The second dimension, techno-invasion, describes the breakdown of boundaries between personal and professional domains due to ubiquitous connectivity. Pre-service teachers may experience this as an expectation to remain constantly available via institutional

communication platforms, thereby diminishing opportunities for rest and reflection and contributing to burnout.

The third dimension, as proposed by Tarafdar et al. (2007) is the techno-complexity, which pertains to the perception that digital tools and platforms are difficult to understand or operate, demanding substantial effort to acquire proficiency. For many pre-service teachers, this complexity becomes apparent when navigating advanced learning management systems or integrating unfamiliar educational technologies into their instructional planning, often without sufficient training or technical support. Techno-insecurity, the fourth dimension, captures the anxiety linked to one's perceived inadequacy with technology and the fear of being outperformed by more digitally competent peers. Such insecurity is particularly acute for pre-service teachers, who may feel underprepared and judged on their digital proficiency in a performance-driven training environment.

Finally, techno-uncertainty (Tarafdar et al. 2007) reflects the stress generated by the continual evolution and unpredictability of digital technologies, including frequent software updates, interface changes, and the lack of consistent standards across platforms. This constant flux can disrupt pedagogical routines, elevate cognitive demands, and impair the ability of pre-service teachers to plan and deliver technology-integrated instruction effectively (Tarafdar et al. 2007). As Upadhyaya (2021) contends, these dimensions collectively highlight the complex and layered nature of technostress, underscoring its potential to undermine the confidence, engagement, and technological readiness of pre-service teachers.

Unlike corporate or administrative environments where technology is often deployed to enhance productivity and streamline operations, educational settings, particularly those involving

teacher training, emphasize pedagogical outcomes, learner engagement, and professional identity formation (Ajani & Govender, 2023). The introduction of digital tools in such contexts requires not just technical proficiency but also a pedagogical adaptation, wherein educators must align technological functionalities with curricular goals and student needs. Hülshoff, et al. (2025) argue that pre-service teachers, often lacking prior exposure to educational technology in formal contexts, may encounter a steep learning curve. Moreover, their experiences with digital tools are mediated through the institutional structures of colleges of education, universities, or teaching practice centers, many of which may have limited infrastructure, inconsistent policies on technology integration, or insufficient technical support systems (Birch & Sankey, 2008).

This institutional and experiential gap highlights a critical difference between pre-service and in-service teachers. Kwee (2021) assert that unlike in-service teachers, pre-service teachers are rarely decision-makers in their learning environments, making them more vulnerable to feelings of powerlessness when facing technological challenges. Furthermore, the performance-oriented nature of teacher training programs can magnify technostress, as pre-service teachers are evaluated on their ability to use and integrate digital tools effectively, often without commensurate scaffolding (Ekeh & Hadebe-Ndlovu, 2025). These conditions compound the emotional and psychological pressures associated with learning to teach in digitally enhanced environments.

Adding to this complexity is the broader trend of digitalization in education. As Timotheou et al. (2023) observe that the increasing digitalization of education, accelerated further by the COVID-19 pandemic, has intensified the push toward integrating technology into teacher preparation programs. This shift toward digital transformation is evident in the adoption

of online learning platforms, virtual classrooms, video-based lesson observations, and the requirement for digital teaching portfolios. While these changes offer opportunities for innovation and flexibility, they also pose heightened demands on pre-service teachers who may not be fully prepared for such transitions (Mhlanga, 2024). Thus, introducing a paradox to teacher education program, while intended to empower and modernize teacher preparation, it may also become a source of disempowerment if not implemented with sensitivity to learners' psychological and contextual realities.

Factors Contributing to Technostress among Pre-Service Teachers

Technostress does not arise in isolation; rather, it is the product of multiple conditions that converge to shape how pre-service teachers experience and respond to technology. Researchers such as Nagy and Dringó-Horváth (2024), and Siddiqui, et al. (2022) posit that for pre-service teachers, technostress is shaped by a range of individual, institutional, and technological factors. These factors interact in complex ways to influence the cognitive, emotional, and behavioral responses of pre-service teachers to digital tools and environments. Individual-level variables play a critical role in shaping the susceptibility of pre-service teachers to technostress. Among these, digital literacy and ICT competence are foundational (Getenet et al. 2024). Dolezal et al (2025) argue that pre-service teachers who lack prior exposure to or experience with educational technologies often face challenges in navigating digital learning environments, leading to heightened anxiety and reduced confidence. When digital competence is low, even basic tasks such as uploading assignments, using learning management systems, or integrating multimedia resources can become sources of stress and frustration.

Closely related to these issues are attitudinal and psychological factors, including beliefs about technology, levels of anxiety, and resistance to change (Noriega Del Valle et al, 2024). Research such as the works of Tsai et al. (2020) and Zhu et al. (2024) show that individuals who harbor negative perceptions of digital tools, that is, viewing them as disruptive, overly complex, or impersonal, are more likely to experience stress when required to use them. Andrianatos and Morelli (2024) posit that technology-related anxieties can also stem from fear of failure, embarrassment, or judgment from peers and instructors, particularly when digital competence becomes a visible component of assessment or classroom performance. Moreover, self-efficacy and intrinsic motivation are central to how pre-service teachers engage with technology (Raphael & Mtebe, 2022). Bandura's (1997) theory of self-efficacy and supported by Honicke et al. (2023) suggest that individuals with strong beliefs in their ability to perform technology-related tasks are more likely to persevere through challenges and adopt innovative practices. Conversely, low self-efficacy can exacerbate feelings of incompetence and helplessness in the face of technical obstacles. In this way, the internal psychological landscape of pre-service teachers significantly conditions their vulnerability to technostress.

In the institutional context, it can either mitigate or amplify technostress through the structures, expectations, and supports embedded in teacher education programs. A prominent institutional contributor is the lack of adequate technical infrastructure or support systems (Khlaif, et al. 2023). Johnson et al. (2016) stress that when pre-service teachers encounter unreliable internet connectivity, outdated hardware, or inconsistent access to educational software, their capacity to engage meaningfully with technology is undermined. Compounding this is the absence of prompt and reliable technical assistance, which leaves students to navigate

digital hurdles alone, often increasing their cognitive and emotional burden (Cardullo et al. 2021).

Another significant institutional factor is the curricular and performance pressure exerted on pre-service teachers to demonstrate proficiency in technology use without corresponding scaffolding or training. For instance, teacher training curricula may emphasize the importance of ICT integration but fail to provide systematic instruction or hands-on experiences that model best practices (Mhlongo et al. 2023). In such environments, teachers and supervisors may expect high levels of technological competence without acknowledging the novice status of pre-service teachers (Sánchez & Salinas, 2008). England et al. (2019) argue that this may create a misalignment between expectations and preparedness, leading to performance anxiety and diminished motivation. Furthermore, Khlaif, et al. (2023) stress that lack of pedagogical modeling in teacher preparation programs also exacerbate technostress. For example, when teacher educators do not demonstrate effective and meaningful uses of technology in their own instructional practice, pre-service teachers are left without concrete examples or guidance. This omission not only limits opportunities for observational and experiential learning, but also signals a disjunction between theory and practice, contributing to uncertainty and diminished confidence in future technology use.

Beyond the individual and institutional factors, the design and characteristics of the technologies themselves can also serve as significant stress-inducing agents. Bondanini et al. (2020), and Pandita and Kiran (2023) stress that one major issue is the complexity and frequent updating of digital tools. Pre-service teachers often find themselves required to use platforms or software that are not intuitive, lack user-friendly interfaces, or undergo continuous changes that

necessitate re-learning (Buabeng-Andoh, 2025). This sense of unpredictability and cognitive overload contributes to frustration, disorientation, and time inefficiencies, particularly when updates interfere with established workflows or learning plans.

Other critical technological factor contributing to technostress among pre-service teachers is the design and usability of digital interfaces. Hertzum and Hornbæk (2023) emphasize that poorly designed systems, characterized by cluttered layouts, disorganized features, and unclear instructions, significantly impair usability. Such interface issues create cognitive friction that hampers task execution and adds to the mental load of users. In educational contexts, pre-service teachers often encounter multiple platforms, from learning management systems to interactive teaching tools, where inefficient design impedes their ability to navigate tasks efficiently, thereby increasing frustration and stress levels.

In addition to design-related barriers, inadequate training on digital tools significantly exacerbates technostress. Abedi et al. (2024) highlight that both insufficient initial orientation and the absence of continuous professional development opportunities leave pre-service teachers unprepared to engage effectively with educational technologies. This lack of preparedness diminishes their confidence and hinders the development of essential digital pedagogical competencies. Without systematic training that aligns with the technological demands of the classroom, pre-service teachers are more likely to experience anxiety, decreased motivation, and resistance toward technology integration (Johnson et al. 2016). Thus, both the technical design of digital tools and the support structures for skill acquisition are central to understanding and addressing technostress in teacher education.

Perceptions and Attitudes towards Technology Integration

As classrooms continue to evolve in response to rapid digitalization, understanding how pre-service teachers perceive and adapt to technology has become increasingly important. Bitar and Davidovich (2024) posit that the integration of digital technology into teacher training programs has become a foundational expectation in 21st-century pedagogical preparation. However, pre-service teachers' perceptions and attitudes toward technology integration are not formed in a vacuum. They are profoundly shaped by their psychological experiences with technology, among which technostress plays a significant role (Siddiqui et al. 2022). Technostress, characterized by cognitive overload, emotional exhaustion, and anxiety induced by technology use, can negatively influence pre-service teachers' willingness, readiness, and confidence in employing digital tools for instructional purposes (Yang et al. 2025). When pre-service teachers perceive technology as burdensome or intimidating, their openness to digital integration may diminish, undermining both their learning experiences and future instructional practices.

Technology Acceptance Model (TAM)

To understand how and why pre-service teachers adopt or resist digital tools, it is useful to ground the discussion in a theoretical framework. One of the most widely applied models in educational technology research is the Technology Acceptance Model (TAM), developed by Davis (1989). This framework offers a foundational lens through which to examine pre-service teachers' perceptions and attitudes toward educational technology integration. At its core, TAM identifies perceived usefulness and perceived ease of use as the two primary determinants

influencing an individual's intention to adopt and use technology (Venkatesh et al. 2003). These constructs are deeply psychological and experiential, making them particularly sensitive to contextual stressors such as technostress (Shroff et al. 2011). For pre-service teachers, their perceptions of whether a technological tool will enhance their teaching effectiveness (usefulness) and whether it is simple and intuitive to operate (ease of use) are key to shaping positive or negative attitudes toward integration in classroom practice.

Although TAM emphasizes the positive determinants of technology use, these perceptions are not immune to disruption. Building on this framework, recent research highlights the ways technostress can distort these key perceptions. Saleem et al. (2024) argue that technostress introduces significant cognitive and emotional barriers that directly distort these perceptions. When pre-service teachers encounter digital tools that are perceived as overly complex, unintuitive, or requiring disproportionate mental effort, their perceived ease of use diminishes sharply (Tarafdar et al. 2015). Moreover, the emotional toll associated with navigating such challenges, especially the frustration, anxiety, or fear of failure, can overshadow any perceived benefits, thereby undermining perceived usefulness. This alignment between technostress and TAM suggests that negative emotional experiences with technology can erode both belief in its efficacy and confidence in one's ability to use it (Liţan 2025). Consequently, even in contexts where learning technology is accessible and promoted institutionally, technostress acts as a hidden deterrent to meaningful adoption and sustained use (Khlaif et al. 2023). Furthermore, the implications of this misalignment extend beyond individual attitudes to affect broader pedagogical engagement and readiness. Pre-service teachers influenced by technostress are more likely to adopt a risk-averse stance toward innovation, often favoring

traditional methods over technology-driven ones. Gabbiadini et al. (2023) argue that this hesitancy not only limits their growth within teacher preparation programs but also weakens the intended outcomes of ICT-integration policies.

While the Technology Acceptance Model explains perceptions of usefulness and ease of use, it does not fully capture the role of personal beliefs in shaping technology adoption. In tandem with TAM, Raphael and Mtebe (2022) posit that Bandura (1977) concept of self-efficacy offers critical insights into how technostress affects pre-service teachers' confidence in their ability to use technology effectively. Low self-efficacy, particularly in relation to ICT, is often a direct consequence of persistent exposure to stress-inducing digital environments (Lee (2021). When pre-service teachers consistently face technological challenges without adequate support, their belief in their competence diminishes, fostering avoidance behaviors, reduced engagement with digital tools, and resistance to innovation in instructional design. Consequently, fostering technology self-efficacy is central to building digital resilience, defined as the ability to adapt to, manage, and recover from technological challenges in learning and teaching environments (Sun et al. 2022).

Beyond self-efficacy, another important psychological dimension in technology adoption is teachers' readiness to innovate. Moreover, studies such as the study of Li and Wang (2024) and Frei-Landau et al. (2022) show that innovation readiness, the degree to which individuals are prepared and motivated to adopt novel teaching approaches, is closely tied to emotional responses to technology use. Technostress, by creating fear, frustration, and uncertainty, impairs innovative attitudes among pre-service teachers, leading to conservative instructional choices and limited experimentation with emerging educational technologies (Wang et al. 2023). This

may have long-term implications, as early negative experiences with technology may translate into low digital integration throughout a teacher's career.

In addition to models such as TAM and self-efficacy, frameworks that capture the interplay between knowledge domains are also central to understanding technology adoption in teacher education. Furthermore, to support technology integration in pre-service teacher education, many scholars advocate for the application of the TPACK framework, which highlights the intersection of technology, pedagogy, and content knowledge as essential for effective teaching with technology (Koehler & Mishra, 2009). While TPACK provides a valuable lens for curriculum design and instructional planning, technostress may hinder the development of TPACK competencies. For example, pre-service teachers overwhelmed by technological complexity may fail to appreciate how digital tools can enhance subject-specific pedagogy. In such cases, stress limits their ability to explore and internalize the dynamic relationship between content, pedagogy, and technology.

Impacts of Technostress on Future Technology Integration

As the demand for digitally competent educators grows, the formative experiences of pre-service teachers with technology play a decisive role in shaping their long-term instructional practices. For pre-service teachers, who are expected to develop digital competence alongside mastering pedagogical content knowledge, the experience of technostress represents a significant psychological barrier that can shape their future orientation toward technology use in educational contexts (Dolezal et al. 2025). The Transactional Model of Stress and Coping (TMSC) developed by Lazarus and Folkman (1984), emerged from the field of health psychology to explain how individuals evaluate and respond to stressors. It has been widely used in occupational and

educational research to examine both adaptive and maladaptive coping processes. Within teacher education, TMSC provides a lens for understanding how pre-service teachers appraise technological demands as either threats or challenges and how their coping responses influence emotional well-being and teaching performance. The model provides a useful lens through which to understand the dynamics of technostress, emphasizing that stress arises not simply from the presence of external demands, such as unfamiliar digital platforms or software, but from an individual's cognitive appraisal of those demands and their perceived capacity to cope. When pre-service teachers perceive technology-related tasks as threatening or beyond their capabilities, and when institutional support is insufficient, they are more likely to experience technostress. This stress, if unresolved, not only hinders immediate learning outcomes but may also foster maladaptive coping strategies such as avoidance or resignation, thereby reducing their long-term engagement with digital tools.

From this viewpoint, the implications of this transactional process are profound for teacher preparation and future classroom practices. As Wang et al. (2024) observe, pre-service teachers encountering steep technological learning curves or poorly supported digital transitions often respond with disengagement and resistance, responses that, according to the transactional model, are rooted in a misalignment between perceived demands and coping resources. Over time, these initial stress responses can solidify into persistent negative attitudes toward learning technologies. Empirical studies by Hamlaoui (2021) and Sarva et al. (2023) support this view, indicating that adverse early encounters with ICT in teacher training programs correlate with diminished confidence and reduced adoption rates of technology in future classrooms. Thus, the technostress experienced during the formative stages of teacher education does not merely

disrupt training, it can leave enduring cognitive and emotional imprints that shape teachers' professional identities and constrain the broader goals of digital integration in education.

Addressing the impact of technostress requires not only identifying its causes but also exploring ways to mitigate its effects in teacher preparation programs. To counteract these negative outcomes, Kaveh et al. (2023) suggest that teacher education programs must recognize the importance of the stress-appraisal-coping cycle described in the transactional model. By creating learning environments that buffer pre-service teachers from overwhelming digital demands, through scaffolding, mentorship, and access to user-friendly technologies, educators can foster more adaptive appraisals and healthier coping strategies. In turn, this approach can reduce technostress and promote a more positive, sustained engagement with technology, better aligning teacher preparation with the evolving demands of 21st-century education.

Beyond reducing stress, it is equally important to consider how technostress shapes the quality of learning and pedagogical development among pre-service teachers. High levels of stress can impair cognitive functioning, reduce reflective practice, and limit the assimilation of pedagogical strategies that involve digital tools (Saleem et al. 2024). Rusznyak and Bertram (2021) posit that pre-service teachers under stress may prioritize task completion over conceptual understanding, leading to superficial engagement with the pedagogical affordances of technology. Strydom et al. (2021) claim that this shallow learning approach undermines pre-service teachers' ability to plan and deliver ICT-supported lessons effectively. Moreover, when lesson planning is influenced by fear or uncertainty related to technology use, there is a tendency to revert to traditional, non-digital methods that feel safer and more predictable (Eguia et al. 2025). The long-term consequence is a teaching workforce that is less equipped and less

motivated to embrace digital innovation, thereby stalling progress toward 21st-century learning goals.

The influence of technostress extends even further, reaching into the emotional and behavioral domains that shape teachers' long-term relationship with technology. Buenadicha-Mateos et al. (2022) assert that in addition to cognitive impacts, technostress has pronounced emotional and behavioral consequences, such as burnout, frustration, and avoidance. Emotional exhaustion resulting from constant technological demands can erode motivation, leading pre-service teachers to associate technology use with anxiety rather than empowerment (Upadhyaya, 2021). The psychological burden is further intensified when digital tools are integrated without consideration for the users' digital literacy levels, leading to feelings of incompetence and self-doubt (West et al. 2023). This emotional toll can foster a self-protective mindset characterized by risk aversion, where pre-service teachers avoid experimentation or innovation with digital tools. Over time, such attitudes not only diminish individual teaching quality but also weaken systemic efforts to promote digitally enriched learning environments.

To better explain these varied outcomes, the Transactional Model of Stress and Coping (TMSC) (Lazarus & Folkman, 1984) offers a useful framework for understanding how pre-service teachers evaluate and respond to technological challenges. The model conceptualizes stress as a dynamic interplay between the individual and their environment, in which cognitive appraisals, that is, how a person interprets a stressor, and coping responses mediate the outcome (Biggs et al. 2017). In this framework, Pothuganti (2024) stress that technostress is not merely a response to technological complexity or overload, but a consequence of how pre-service teachers appraise these technological demands and the coping resources they can deploy. When pre-

service teachers interpret digital challenges as threats rather than manageable tasks, and when coping resources are insufficient, the likelihood of maladaptive responses, such as avoidance, burnout, or resistance to technology, increases substantially.

Within this model, coping strategies and resilience-building interventions are, therefore, essential mechanisms for altering the appraisal process through which pre-service teachers interpret technology-related stressors. Chen et al (2024) suggest that the cognitive appraisal theory emphasize that stress arises not only from external demands but also from the individual's perception of their capacity to cope with those demands. Sisto et al. (2019) believe that by introducing targeted interventions, teacher education programs can shift this appraisal process from one of threat to one of challenge and growth. In this regard, resilience is not merely a personal trait, but a dynamic capacity that can be cultivated through deliberate pedagogical and institutional practices designed to strengthen adaptive outcomes. As noted by VenkataLakshmi et al. (2024), teacher education programs that integrate training in stress management techniques, digital self-efficacy, and reflective digital pedagogy provide a structured pathway for enhancing resilience in the digital learning environment. Stress management training equips pre-service teachers with relaxation, mindfulness, and time-management skills that reduce cognitive overload (Taylor, et al. 2021). Similarly, García-Martín et al. (2023) and Mangubat et al. (2025) opine that digital self-efficacy, defined as confidence in one's ability to use digital tools effectively, empowers teachers to approach unfamiliar technologies with a problem-solving mindset. Reflective digital pedagogy, on the other hand, encourages critical reflection on teaching practices and the role of technology, thereby transforming digital challenges into

opportunities for professional growth and pedagogical innovation (Novoa-Echaurren, et al. 2025).

These approaches can be further clarified by distinguishing between problem-focused and emotion-focused coping strategies, both of which serve complementary roles in managing technostress. Schoenmakers et al. (2015) describe problem-focused coping involves actively seeking solutions, whether through peer collaboration, troubleshooting, or consulting digital resources, while emotion-focused coping helps pre-service teachers manage the frustration and anxiety that may arise from technological setbacks (Ahmed et al. 2022). The balanced application of both forms of coping enables teachers to sustain motivation and persistence, which are critical for long-term integration of technology into teaching practice. Without these mechanisms, technological stressors risk eroding confidence, reinforcing avoidance behaviors, and impeding digital competence development.

A practical scenario helps to illustrates how these resilience-building mechanisms function in real-world teacher education contexts. When a pre-service teacher encounters a malfunctioning learning management system, their coping response is mediated by their level of digital self-efficacy and resilience training. One with strong coping resources may experiment with alternative platforms, consult peers or supervisors, or apply insights from past experiences to resolve the issue (Sánchez-Jiménez et al. 2025). This adaptive orientation transforms the challenge into a learning opportunity, reinforcing both technical skills and emotional resilience. Conversely, a teacher lacking these coping strategies may withdraw or disengage, perceiving the setback as confirmation of their inadequacy (Dagani et al. 2023). Thus, the intentional cultivation of coping and resilience-building interventions not only addresses immediate stressors but also

lays the foundation for sustainable professional development in increasingly digitalized educational contexts.

Finally, the successful cultivation of resilience depends not only on individual efforts but also on the broader institutional structures that frame teacher education. The creation of communities of practice, where pre-service teachers collaborate, share challenges, and learn from each other's experiences, can normalize the learning curve associated with technology use. Similarly, mentorship support from digitally fluent instructors and iterative training experiences that allow for trial, error, feedback, and reflection, serve to build both mastery and confidence. These supportive ecosystems can reduce the likelihood that initial negative appraisals of technological demands solidify into chronic technostress. In essence, the Transactional Model underscores that by equipping pre-service teachers with both psychological and pedagogical coping mechanisms, educational institutions can transform technology from a source of stress into a domain of professional empowerment and innovation.

Empirical Studies on the Impact of Technostress on Pre-Service Teachers' Perceptions of Technology Integration in Classroom Teaching

Over the past decade, empirical research has increasingly sought to understand how technostress influences pre-service teachers' ability to integrate technology into their classroom practices. This body of work highlights both the risks posed by technostress and the potential for institutional and pedagogical strategies to mitigate its effects.

In recent years, empirical research has increasingly examined the relationship between technostress and pre-service teachers' capacity to integrate digital tools into teaching. While digital competence is now considered essential for effective pedagogy, technostress has emerged

as a barrier, manifesting through anxiety, overload, and reduced self-efficacy in technology-rich environments. These negative responses not only undermine confidence in digital teaching but also discourage experimentation with innovative practices. To address these challenges, scholars have investigated the sources, consequences, and potential mitigation strategies for technostress, producing a growing body of evidence that underscores its multifaceted impact on teacher education.

A key contribution to this literature is the work of Khlaif et al. (2022), who provide an important starting point by examining how technostress develops and evolves in professional contexts. Their qualitative study highlights how inadequate institutional support and tensions surrounding professional identity contribute to heightened stress, while peer collaboration and open educational resources act as buffers. These findings establish the dual nature of technostress, shaped by both institutional shortcomings and social support structures. Building on this, Yang et al. (2025) extend the inquiry through a systematic review of 54 studies, revealing technostress as a global phenomenon with regional disparities, particularly an underrepresentation of North American contexts. By identifying technological, organizational, and individual factors as sources of technostress, Yang et al. confirm and broaden the themes identified by Khlaif et al., while emphasizing the long-term psychological, professional, and pedagogical costs of unaddressed technostress.

Moving from general patterns to specific mechanisms, Wang and Zhao (2023) provide empirical evidence on how distinct stressors affect technology adoption. Using structural equation modeling, they demonstrate how five core technostress creators, techno-complexity, techno-overload, techno-invasion, techno-insecurity, and techno-uncertainty, differentially shape

teachers' ICT attitudes and adoption intentions. Their finding that some stressors, such as techno-overload and techno-uncertainty, may stimulate proactive engagement, nuances the more negative portrayals reported by Khlaif et al. (2022) and Yang et al. (2025). This context-dependent interpretation is echoed in Boyer-Davis et al. (2023), who show that technostress, particularly techno-insecurity, erodes faculty motivation to teach online, even across diverse disciplinary contexts. Together, these studies illustrate that while some forms of technostress may drive adaptive responses, others consistently undermine motivation and adoption, underscoring the importance of identifying context-specific intervention points.

The COVID-19 pandemic provided an especially revealing context for observing how institutional factors moderate technostress. Wang et al. (2023) demonstrated that high levels of technostress among Chinese primary school teachers were directly associated with work–family conflict and health issues, but also that school support mitigated these negative outcomes. These findings directly connect to Khlaif et al.'s (2022) emphasis on peer and institutional infrastructures, suggesting that systemic support functions as a critical buffer regardless of context. Complementing this, Liu (2019) highlights how technostress unfolds under mandatory adoption policies. Despite stressors, teachers reported high job satisfaction when supported by documentation, technical assistance, and collaborative practices. Importantly, Liu identifies variation across teaching levels and tenure, pointing to the differentiated experiences of technostress.

Taken together, these empirical studies collectively demonstrate a clear progression from identifying the sources of technostress to examining its nuanced effects on teachers' attitudes and motivation, and ultimately to highlighting the moderating role of institutional and policy

frameworks. Across diverse contexts, evidence consistently shows that technostress, emerging from techno-overload, complexity, insecurity, invasion, and uncertainty, undermines pre-service teachers' perceptions of ease of use and usefulness of educational technologies, thereby reducing confidence, increasing anxiety, and fostering resistance to digital pedagogy. These findings resonate with the TAM, which emphasizes how psychological strain disrupts the cognitive and affective foundations of technology acceptance. At the same time, studies reveal that institutional support, peer collaboration, and differentiated interventions can buffer these negative effects, underscoring the need for tailored resilience-building strategies that acknowledge the multifaceted nature of technostress while promoting sustainable technology integration in teacher education.

Extending beyond immediate perceptions, reviewed empirical studies highlight that the presence of technostress during teacher training often results in lower engagement with digital tools, reduced willingness to experiment with ICT in instructional planning, and long-term skepticism toward technology's role in enhancing learning outcomes. This pattern is especially pronounced when pre-service teachers lack adequate training, institutional support, or exposure to user-friendly and pedagogically relevant technologies. However, empirical findings also emphasize the potential for intervention: programs that integrate digital literacy development, scaffolded technology training, and psychosocial support can mitigate technostress and foster positive dispositions toward technology use. Summarily, the empirical literature makes it clear that technostress is not a peripheral issue but a central concern in shaping how pre-service teachers approach the integration of technology in education. Addressing it systematically

through evidence-based strategies is essential not only for improving teacher readiness, but also for ensuring sustainable and meaningful technology integration in future classrooms.

Conclusion

The integration of digital technologies into educational settings has emerged as a central focus in the 21st century, with digital literacy and technological competence considered essential skills for effective teaching and learning. As teacher preparation programs increasingly emphasize technology-enhanced pedagogy, pre-service teachers are expected not only to understand and use a range of digital tools, but also to develop the confidence and pedagogical strategies necessary to apply these tools meaningfully in classroom contexts. However, empirical studies consistently indicate that despite access to technological resources, pre-service teachers often struggle with the psychological and cognitive demands that accompany digital integration, manifesting as technostress. Among pre-service teachers, this condition is triggered by a variety of factors, including information overload, complex digital interfaces, frequent platform updates, and the pressure to multitask using unfamiliar tools during practicum and coursework. Empirical studies and literature review link technostress to significant negative outcomes, including emotional exhaustion, decreased motivation, job dissatisfaction, and cognitive disengagement. These effects can severely hinder pre-service teachers' ability to form positive attitudes towards technology, a key predictor of future technology integration in professional teaching settings.

Empirical evidence further suggests that pre-service teachers' perceptions of technology are shaped by both their affective experiences and the contextual supports provided during training. For ecample, Raphael and Mtebe (2022) found that high levels of technostress correlate with decreased self-efficacy in using technology, leading to avoidance behaviors and reduced

experimentation with digital instructional methods. Similarly, Hülshoff et al. (2025) observe that pre-service teachers experiencing technostress reported lower perceived usefulness and ease of use of learning technologies, two core constructs in the TAM, thereby negatively influencing their technology adoption decisions. This is particularly concerning because early experiences with digital tools in teacher education programs can shape long-term attitudes, pedagogical preferences, and instructional habits.

Despite the growing body of literature, a critical gap remains in understanding how technostress influences technology-related perceptions specifically among pre-service teachers, especially through mixed-method approaches that integrate both quantitative and qualitative insights. Most empirical studies have concentrated on in-service teachers or have adopted a narrow focus on either technostress or technology integration, often overlooking the critical interplay between these variables in early-career educators. These gaps highlight the need for contextually grounded and methodologically rigorous investigations into how technostress shapes pre-service teachers' readiness to adopt and implement digital innovations in classroom practice.

Given this background, the current research is justified by a need to explore the empirical relationship between technostress and pre-service teachers' perceptions of technology integration. The literature suggests that addressing technostress at the pre-service level is critical, as it not only affects the immediate quality of teacher training but also has long-term implications for professional identity, teaching confidence, and willingness to embrace innovation. By investigating how different dimensions of technostress affect attitudes toward educational technology, this study aims to generate actionable insights for teacher educators. These findings

could inform the design of more supportive learning environments, targeted digital literacy interventions, and proactive coping strategies to enhance pre-service teachers' technological readiness. Ultimately, the goal is to foster a generation of educators who are not only proficient in using technology but also resilient and adaptive in the face of evolving digital demands.

CHAPTER THREE

METHODOLOGY

Introduction

This study investigates the impact of technostress on pre-service teachers' perceptions of technology integration in classroom teaching. As digital tools become increasingly embedded in educational practices, pre-service teachers must develop the skills and attitudes necessary for effective technology use. However, the rapid integration of educational technology can lead to technostress, a form of stress caused by the inability to cope with technological demands, which may negatively influence teachers' perceptions and attitudes towards technology integration in the classroom.

This chapter outlines the methodology employed in examining the impact of technostress on pre-service teachers' perceptions of technology integration in classroom teaching. The study adopts a mixed methods approach, specifically an explanatory sequential design (Mills & Gay, 2019) to explore the contributing factors to technostress and how they influence the perceptions and attitudes of pre-service teachers. This research design allows the researcher to first gather and analyze quantitative data to identify patterns and relationships, followed by qualitative inquiry to provide explanations and contextual insights. The integration of both data strands strengthens the study's capacity to capture the complexity of technostress and its impact on pre-service teachers. The methodology is presented in several sections: research design, population and sampling procedures, instruments and data collection methods, data analysis techniques,

validity and reliability of the instruments, and ethical considerations. Each section explains the methodological choices made to ensure the study's thoroughness with its objectives.

The specific research questions guiding this study are as follows:

1. What are the factors that contribute to technostress among pre-service teachers toward technology integration during their preparation and practicum experiences?
2. How do these factors of technostress influence pre-service teachers' perceptions and attitudes toward technology integration in their practicum classrooms?
3. How does qualitative data from pre-service teachers' interviews explain the results from the quantitative phase of the study that focused on measuring technostress? (Mixed-Methods).

Research Design

This study uses an explanatory sequential mixed methods design (QUAN → qual), where the research begins with the collection and analysis of quantitative data, followed by a qualitative phase that builds on the quantitative results (Creswell, 2014; McMillan & Schumacher, 2010). Mills and Gay (2019) assert that "mixed methods research designs entail the collection, analysis, and integration of quantitative and qualitative research methodologies to comprehend a research issue" (p.430). Roberts (2010) elucidates the significance of mixed-method research, stating that it offers a comprehensive examination of the study topic by addressing both the what and the why.

This methodology was selected for its capacity to provide a more thorough comprehension of the topic that was being examined (McMillan & Schumacher, 2010, p. 401). McMillan and Schumacher (2010) assert that the explanatory sequential strategy is frequently

utilized when there is a distinct necessity for quantitative data gathering, although further qualitative analysis is essential for explaining the quantitative results (p. 401). This study's sequential strategy has two interconnected phases that promote data integration (Creswell, 2015; McMillan & Schumacher, 2010).

The rationale for using this design is to gain a comprehensive understanding of technostress by first identifying patterns and relationships through quantitative data, followed by qualitative exploration to understand the context of these results. The quantitative phase involves the use of a structured survey to assess the levels and dimensions of technostress and its association with attitudes toward technology integration. The qualitative phase involves semi-structured interviews designed to explore the lived experiences, perceptions, and coping mechanisms of a subset of participants from the initial phase. The mixed methods design allows the researcher to triangulate findings and strengthen the overall validity and reliability of the study (Creswell, 2014).

Quantitative Phase of the Study

In the preliminary phase of the explanatory sequential design, quantitative data is collected and analyzed (Creswell, 2015). Quantitative research emphasizes objectivity, measurement, and statistical analysis, making it well-suited for uncovering relationships among variables in a structured and replicable manner (Creswell, 2014; Mills & Gay, 2019). Watson (2015) claimed that in quantitative research, patterns and correlations among variables may be discovered by measurement, analysis, and conclusion which is deductive in nature. They further said that the unique aspect of quantitative research is “test[ing] theories by formulating hypotheses and applying statistical analyses” (Watson, 2015, p. 2).

Quantitative data often comprises responses restricted to predefined choices, frequently seen in survey instruments (Creswell, 2014). The quantitative data for this study were collected using a hybrid approach that included both online and paper-based (physical) survey administration. An online version of the survey was distributed via "Qualtrics" to reach a wider sample of pre-service teachers, while printed copies were administered in-person during classes for participants who preferred a physical format. This dual-mode distribution enhanced participation and accessibility, ensuring that a more representative sample was obtained for analysis. The results of the quantitative study provide findings that require additional explanation in the next phase.

Qualitative Phase of the Study

Following the quantitative analysis, the qualitative phase is designed to deepen and contextualize the understanding of technostress among pre-service teachers. This phase focuses on gathering rich, descriptive data that reveal how pre-service teachers interpret, experience, and respond to the demands of integrating technology into their teacher preparation activities (Creswell, 2014; Kuckartz, 2014). A qualitative method enables comprehension of a phenomena via the lived experiences of some individuals (Mohajan, 2018). Researchers typically gather qualitative data using approaches like as observation, artifact analysis, or interviews (Creswell, 2015). In the interview process, it is standard practice to make use of open-ended questions that lack preconceived answers (Creswell, 2014). This study highlights that participant lacked sufficient time for extensive interviews owing to constrained educational hours.

Semi-structured individual interviews are a valuable qualitative data collection method, particularly when the research seeks to understand participants' lived experiences, perceptions,

and contextual insights in depth (Creswell, 2014; Patton, 2002). In this study, semi-structured interviews are used to explore how pre-service teachers experience and cope with technostress during their teacher preparation and practicum. The interview protocol will include open-ended questions that explore personal experiences with digital tools, sources of stress, perceived institutional support, and coping strategies. This approach aligns with the recommendations of Creswell (2014) and Patton (2002), who emphasize the importance of open-ended inquiry in eliciting individual meaning-making and variation in experience.

Population

The study population comprises pre-service teachers enrolled in teacher education programs at a land-grant university in the Northern Rockies. This study targeted over one hundred pre-service teachers across multiple disciplines, including science, mathematics, humanities, and social sciences.

Sample Size/Sampling Techniques

Quantitative Phase

The sample size determined the number of participants and was influenced by the research design. Saunders, Waterfield, and Kingstone (2018) discovered that statistical metrics can ascertain the sample size in quantitative research. Dworkin (2012) and Mason (2010) claim that a study's sample must be representative to enable statistical analysis, deduce accurate results, and formulate appropriate inferences.

A total of 133 pre-service teachers participated in the survey. The participants were drawn from different academic levels and specializations, providing a diverse representation of the

teacher education program. The inclusion criteria required participants to be currently enrolled in a teacher preparation course and have had exposure to classroom technology either through practicum or coursework. The broad representation ensured that the study captured a wide range of technostress experiences related to educational technology use.

In this study, the researcher decided to use a non-probability sampling method known as convenience sampling to obtain participants. This strategy is favored when, for reasons of accessibility, the participants are available to the researcher for a certain timeframe (Farrokhi & Mahmoudi-Hamidabad, 2012). While this approach provided access to enough respondents within the study period, it also presents limitations. Convenience sampling may result in overrepresentation of certain disciplines and underrepresentation of others, which could influence the patterns observed in the data. Consequently, the findings of this phase should be interpreted with caution regarding their generalizability to the broader population of pre-service teachers.

Qualitative Phase

Lune and Berg (2017) stressed that to facilitate in-depth analysis, which is a crucial aspect of qualitative research, it is recommended to have a small sample size in qualitative inquiry. Creswell (1998) states that a range of "five to 25" participants is suitable for qualitative research (p.64). Morse (1994) asserted "at least six" (p. 225). In this study, a sample consisting of six (6) participants was used.

The researcher employed a purposive sampling strategy to properly select participants for the qualitative study. This approach allowed for an in-depth exploration of diverse experiences with technostress and technology integration. The objective was to acquire an even sample,

defined as a sample in which the units exhibit equal or very equivalent characteristics (Creswell & Clark, 2011), and to guarantee that adequate information on the topic is supplied (Etikan et al., 2016). However, as with all purposive sampling, the findings cannot claim to represent the experiences of all pre-service teachers. The small size and intentional selection may have improved certain perspectives while excluding others, which could affect transferability to broader contexts. Acknowledging this limitation ensures transparency while also emphasizing the depth and richness of insights obtained.

Instrumentation

Technostress Survey- Factors Contributing to Technostress Among Pre-Service Teachers Questionnaires

In this study, a structured survey questionnaire was developed by adapting items from two established sources: the Technostress Creator Scale (Tarafdar et al., 2007) and constructs from the Technology Acceptance Model (TAM) (Davis, 1989). The survey was designed to measure the extent and impact of technostress among pre-service teachers, as well as their attitudes toward integrating technology into classroom teaching. The questionnaire contains twenty (20) items.

Participants responded to items on a 4-point Likert scale ranging from Strongly Disagree (1) to Strongly Agree (4). The survey was validated through expert review by two faculty members specializing in educational technology, and a pilot test was conducted with a small group of pre-service teachers to ensure clarity and reliability. The final survey was administered in both online and paper-based formats, enabling broader participation regardless of internet access.

Semi-Structured Interview

Semi-structured interviews were conducted with a purposive sample of survey participants. In a semi-structured interview, the researcher formulates a series of questions to facilitate dialogue (Polit & Beck, 2008). The open-ended format of the questions allowed the respondents to respond freely. Semi-structured interviews employ a predetermined set of questions that the researcher closely follows to facilitate the engagement (Banner, 2010). The selected instrument afforded the researcher the liberty to elicit open and genuine replies within the context of an established set of questions that stimulated the discourse. The study participants were posed questions that facilitated their disclosure of their lived experiences and views of technostress. The interview protocol was developed after analyzing the survey results to explore themes that emerged in the quantitative phase. The questions were designed to gain deeper insight into pre-service teachers' personal experiences with technostress, including the sources of stress, how they coped, and their perceptions of institutional support during their teacher training.

Before the interview, participants received a permission form and were told about the confidentiality of their anonymity. They were also apprised of the ability to withdraw from the research at any moment. It was underscored that participation was not obligatory nor subject to penalties for non-participation. To maintain secrecy, actual identities were substituted with code names. A compilation of 12 semi-structured questions was employed to direct the interviews.

The interview guide covered the following: "experiences with integrating technology in practicum and coursework", "specific situations or tools that caused stress or anxiety", "how technostress influenced teaching performance and planning", "access to training, mentorship, or technical assistance", and "suggestions for reducing technostress among future educators". The

interview format allowed for a consistent line of questioning while providing flexibility to probe further based on participant responses. Interviews were conducted in person individually.

Data Collection

Quantitative Phase

Data were collected using the Technostress Survey, which was administered through both online and physical formats to enhance accessibility and participation. The online version was created using Qualtrics and distributed to pre-service teachers. To accommodate participants with limited internet access or personal preference for paper-based surveys, printed copies were distributed and collected during scheduled class sessions.

Participants were first presented with an informed consent form, outlining the purpose of the study, the voluntary nature of participation, and confidentiality measures. Only those who agreed to the terms proceeded with the survey. Completion of the survey took approximately 10 minutes, and participants were encouraged to respond honestly and independently. The use of questionnaires has several advantages, one of which is its ability to maintain uniformity. All participants in the research provide replies to a same set of questions. The approach is cost effective and prevents investigator bias. Furthermore, it affords students the time to reflect and articulate their answers in their own language.

A data collection period of three weeks was designated. 133 pre-service teachers responded, resulting in a response rate of 88.6%. Response with incomplete responses were eliminated. The remaining responses totaled 133 compiled into a secure database for quantitative analysis.

Qualitative Phase

This research was performed using a semi-structured in-person interview. Semi-structured interviews were performed, recorded, and transcribed verbatim. In semi-structured interviews, the researcher formulates a series of questions to facilitate dialogue (Polit & Beck, 2008). On the day of each interview, the researcher started by collecting the signed consent form from the participant. The participant was subsequently advised that actual names would not be utilized; instead, codes would substitute each participant's name. This information was only available to the researcher, who also communicated to the participants that there would be no repercussions for non-participation and that they could withdraw from the study at any time. A comprehensive verbal explanation of technostress was provided to the individual.

During the 30-35minute individual interview, each participant was asked a series of 12 questions, open-ended questions including follow-up questions aimed at elucidating their own experiences with technostress. The interviews were captured using an audio recording device. In total, 6 semi-structured interviews were conducted, providing a rich qualitative dataset for thematic analysis.

Validity and Reliability

Quantitative Instruments

Creswell and Plano Clark (2011) emphasized the significance of utilizing existing instruments by highlighting the necessity of recognizing cases where these instruments have been historically applied with notable validity and reliability. The term "content validity" denotes the extent to which a questionnaire's items adequately cover every aspect of potential questions within a particular domain of knowledge (Creswell & Plano Clark, 2011). Ihantola et al. (2011)

emphasized the important significance of internal validity in mixed methods research. It measures the extent to which a study accurately and dependably addresses the research question or hypothesis using a combination of qualitative and quantitative data collection and analysis techniques, while also minimizing sources of bias, mistake, or confounding variables (Ihantola et al., 2011).

Content validity refers to the extent to which the questionnaire items accurately reflect the general behavior of the sample (Heale & Twycross, 2015). Various forms of reliability and validity exist for quantitative instruments. Reliability types encompass internal consistency, test-retest, intra-rater, and inter-rater reliability. Internal consistency among these categories indicates that all questions in the questionnaire aim to evaluate the same construct (Watson, 2015). Content validity was established by consulting two faculty experts in educational technology and teacher education at the Department of Education, Montana State University, Bozeman who reviewed the survey items for clarity, relevance, and alignment with the study's objectives and theoretical framework. Based on their feedback, minor revisions were made to improve the wording and coverage of key constructs such as technostress sources, coping strategies, and perceptions of technology integration.

The reliability of the research was portrayed in many ways. In quantitative research, reliability was when the study can be replicated with consistency (Leung, 2015). Vaske, Beaman, and Sponarski (2017) found that reliability for questionnaires was seen when the items measure the same construct or are correlated. Vaske et al. (2017) also found that a Cronbach's alpha of .90 or higher was excellent, and if the range was between .89 to .70, then it was acceptable or good. To maintain reliability, a researcher would strive to achieve values within this acceptable range.

The questionnaire's reliability was evaluated in two distinct trials (Ragu-Nathan et al., 2008; Tarafdar et al., 2007;). In the 2007 investigation, Tarafdar et al. reported reliability values over 0.80 for each technostress generator, indicating an accurate alpha measure. In the 2008 study, Ragu-Nathan et al. reported reliability scores around the 0.80 alpha measure, indicating good or acceptable reliability measures. Cronbach's Alpha is the most dependable measure for internal consistency (Heale & Twycross, 2015, p.2). The outcome varies from 0 to 1. Research indicates that a Cronbach Alpha score of 0.7 or above is deemed appropriate (Heale & Twycross, 2015). This study employed Cronbach's Alpha to assess the internal consistency of the utilized instruments.

The author computed the internal consistency coefficient for each dimension using statistical package (STATA) version 18.5 software. In this study, the Cronbach's Alpha coefficient values are 0.81, 0.85, 0.32, and 0.76 respectively, for the technostress sources, impact of technostress on teaching, coping strategies, and perceptions of institutional support in the questionnaire. In addition, the internal consistency result of the coping strategies was found to be low, indicating unacceptable internal reliability (George & Mallery, 2003). Upon further examination using item-test analysis, it was revealed that the three items: seeking help from mentor teachers/ colleagues, taking breaks from technology use, and relying on institutional resources, showed weak inter-item correlations and failed to measure a unified construct. As a result, it was suggested that the coping strategies subscale (the three items) be removed from the inferential analysis to improve the reliability and validity of the overall model. However, due to their conceptual relevance, these items were retained as stand-alone exploratory variables and analyzed descriptively in chapter 4. This approach allows for reporting trends in specific

behaviors among pre-service teachers without overextending statistical claims. Any observed patterns will be discussed in a narrative manner in chapter 5, with appropriate caution about their statistical limitations. This strategy ensures transparency while still preserving the richness of the participant responses.

Qualitative Instruments

In the qualitative phase, efforts were made to ensure the trustworthiness of the data using Lincoln and Guba's (1985) four criteria: credibility, transferability, dependability, and confirmability. To be seen as credible, a researcher's findings must be reliable and plausible (Lincoln & Guba, 1985; Polit & Beck, 2006). To establish trustworthiness, the researcher endeavored to maintain an actual representation of the respondents' experiences throughout data collection and analysis. To prevent any misunderstanding of data, the researcher conducted member checks. Carlson (2010) posits that a researcher may request elaboration and clarification on certain themes or patterns that have arisen from the data.

To establish credibility, the researcher conducted member checking by sharing transcribed interviews with participants for review. Participants were asked to verify the accuracy of the transcripts and were invited to clarify or expand on their responses. This process helped confirm that the recorded data accurately reflected participants' intended meaning. To enhance the transferability of the study findings, the researcher supported the study using thick, rich description in documenting participant backgrounds, experiences, and the study context. Detailed descriptions allowed readers to determine the relevance of findings to similar educational settings or populations.

A procedure of peer review was done to validate the reliability of the study results. The possibility of having one's research evaluated by colleagues, peers, and academics was received with enthusiasm. The researcher utilized the comments and observations to refine the study design and strengthen the arguments addressing the critiques received. An audit trail was utilized to ensure the confirmability of the narrative data.

Administration of Instruments

Quantitative

The Technostress Survey was administered to pre-service teachers using a hybrid distribution method that included both online and paper-based formats. Prior to distribution, the survey instrument and study procedures received ethical approval from the Institutional Review Board (IRB) on March 27, 2025. Participants were recruited through academic mailing lists, and course announcements. The online version of the survey was conducted using Qualtrics and shared via university email lists and learning management systems. For the paper-based version, printed copies were distributed during scheduled in-person classes for participants who preferred a physical copy.

The participants were informed about the consent waiver at the start of the study, explaining the purpose of the study, the voluntary nature of participation, and the confidentiality of their responses. The Participant's Bill of Rights, as mandated by the IRB regulations. Only participants who agreed to the terms were allowed to proceed. The survey remained open for a total of three weeks, with constant reminder to encourage participation. Completed paper surveys were collected securely stored until data entry. A total of 150 (one-hundred and fifty) surveys were sent to pre-service teachers within department, with 133 (one-hundred and thirty-three)

questionnaires being successfully recovered for statistical analysis. This indicated a response rate of 88.6%.

Qualitative

Following the completion of the quantitative phase, semi-structured interviews were conducted with a purposive sample of participants who had previously indicated their willingness to participate in follow-up interviews. Participants were individually invited to schedule a one-on-one session. Prior to each interview, participants were provided with a second informed consent form, specific to the qualitative phase. This form explained the purpose of the interview, assured confidentiality, and requested permission to audio-record the session. Only those who granted consent proceeded with the interview. The interviews were conducted either in person. Each interview lasted approximately 30 to 35 minutes. The interviewer followed a consistent semi-structured guide, allowing for open-ended responses and probing where necessary to explore key themes in greater depth.

Data Analysis Procedure

Quantitative

In this study, quantitative data were evaluated using the Statistical Package (STATA) to address the first research question. Participants were asked questions related to their experiences with technostress, their perceptions and attitudes toward technology integration, and the coping strategies and institutional support available to them during their teacher preparation. The responses were analyzed to assess the frequency, intensity, and impact of technostress among pre-service teachers. The various choices made by participants were noted and individually

acknowledged. Descriptive statistics, including frequency distributions, percentages, means, and standard deviations, were employed to summarize participant demographics and overall trends in technostress levels and attitudes. These descriptive results provided foundational insights into the prevalence of different technostress factors, which were further explored through inferential analyses in the subsequent stages of the study.

Qualitative

Thematic analysis approach was conducted to analyze the data and allowed the themes to come from the teachers who have lived experience with technostress while using technology in teaching in middle school settings. Thematic analysis is a type of qualitative data analysis that offers an extensive view of variation, along with details that include basic, interruptive, and qualitative content analysis (Drisko & Maschi, 2016). Using thematic analysis enables researchers to analyze data by creating themes and subthemes (Creswell, 2014).

The cell phone was utilized throughout interviews as a recording resource and then securely kept on a laptop. The taped interviews were transcribed verbatim for analysis. To ensure clarity, the researcher meticulously reviewed the interviews by repeatedly listening to them. Following careful transcription, the subsequent phase was coding, which entailed categorizing analogous sentences or designating specific codes to the highlighted sentences. The procedure entails recognizing certain phrases or sentences within the text and assigning them with codes or labels to signify their significance. The sentences were visually differentiated by being highlighted in various hues based on certain codes. Each code signifies a thought or emotion articulated in the specified segment of the text. I meticulously examined the transcripts of each interview many times, painstakingly finding and annotating any relevant information that arose

in connection with the discussion. Phrases and words corresponding to a certain code were also highlighted. Supplementary codes were incorporated into the analysis upon further examination of the text.

The participants' transcripts were carefully analyzed many times to achieve a thorough comprehension of the data and to enhance the study in accordance with the relevant construct. The repeated examination and analysis of participant transcripts facilitated the understanding of the data and guided the research toward relevant constructs. Before coding, the transcripts were examined to discern differences and similarities in the data. Narrations were employed to clarify and establish the fundamental concepts that pertain to the research question. The qualitative analysis ultimately finished by detailing the thematic patterns and connections relevant to the study. The discovery of theme connections and patterns was essential in enhancing the interpretive process and strengthening the thorough analysis of the study findings.

Ethical Considerations

The researcher made utmost effort to uphold the highest levels of confidentiality to comply with the ethical principles established throughout the IRB procedure. All contacts with each participant were conducted professionally, and all protections were explicitly conveyed. All obtained study data was secured by encryption on a flash drive accessible solely by the researcher.

To prevent a conflict of interest, the researcher did not receive any funding from the institution for this work. The study was done with complete authorization obtained from the institutional management (IRB). Furthermore, the researcher maintained no affiliation with the study participants. Participants were required to sign the Informed Consent Agreement and

verbally affirm their agreement to participate in the study. The Informed Consent Agreement included specifics on the research, the required time commitment, contact information for inquiries, and the obligations of each participant.

Summary

This explanatory sequential mixed method study first conducted a survey to determine the degree to which technostress is experienced by pre-service teachers and to identify the factors contributing to it during their technology integration training. The quantitative data were gathered using a structured questionnaire, which was administered through both online and paper-based formats to ensure wide participation among pre-service teachers at a land-grant university in the Northern Rockies. This was done in response to a gap in the existing literature regarding how technostress influences the attitudes and readiness of pre-service teachers to use technology in the classroom. Additionally, data on how pre-service teachers perceive and respond to technostress were obtained using semi-structured individual interviews, which explored their lived experiences, coping strategies, and perceptions of institutional support. The qualitative data provided valuable insight into the emotional and practical challenges associated with classroom technology use, complementing the statistical findings and offering a more holistic understanding of technostress in teacher education.

CHAPTER FOUR

RESULTS

Introduction

This chapter presents the results of the data analysis conducted to answer the study's three research questions. Those research questions focused on technostress among pre-service teachers and its impact on their perceptions and attitudes toward technology integration during preparation and practicum experiences. The study employed a mixed methods design, integrating both quantitative and qualitative approaches to provide a comprehensive understanding of how technostress shapes pre-service teachers' readiness for technology-enhanced instruction.

The first research question explored the factors that contribute to technostress among pre-service teachers. This was addressed using quantitative data collected through a structured survey instrument, which included items grouped under key dimensions such as sources of technostress, perceived impact, coping strategies, and support systems. Descriptive and inferential statistical analyses were performed to determine patterns, relationships, and intensity of technostress factors among participants.

The second research question examined how these technostress-related factors influence pre-service teachers' perceptions and attitudes toward technology integration in their practicum classroom. This part of the analysis involves qualitative data (interview responses), allowing for exploration of the relationship between technostress and pre-service teachers' perceptions and attitude toward technology integration. The third research question focused on the integration of quantitative and qualitative data to gain understanding of how technostress shapes pre-service

teachers' perspectives on technology integration. The mixed methods analysis allowed for comparison and triangulation of findings, offering depth to the interpretation.

Phase I: Quantitative

Descriptive statistics were conducted using Stata (Version 18.0) to summarize participant demographics and relevant background characteristics. The sample consisted of 133 pre-service teachers enrolled in various education specialization programs. Descriptive statistics for participant demographics and technology-related variables are provided in Table 4.1.

A large majority of the respondents were female (n = 107, 80.5%), while 25 participants (18.8%) identified as male. One participant (0.8%) identified as "Other." Regarding their year of study, the most represented group were junior-level students (n = 55, 41.4%), followed by sophomores (n = 48, 36.1%), seniors (n = 17, 12.8%), and freshmen (n = 13, 9.8%). Over half of the students (n = 68, 51.1%) were enrolled in Elementary Education programs. Other areas of specialization included Humanities (n = 23, 17.3%), Mathematics Education (n = 10, 7.5%), Social Science (n = 10, 7.5%), Science Education (n = 7, 5.3%), Agriculture Education (n = 5, 3.8%), Art Education (n = 4, 3.0%), Early Childhood Education (n = 4, 3.0%), and Technology Education (n = 2, 1.5%). When asked about how frequently they use technology, most participants indicated that they use technology daily (n = 96, 72.2%). Others reported using it several times a week (n = 31, 23.3%). Only a few participants indicated that they used technology rarely (n = 4, 3.0%) or once a week (n = 2, 1.5%).

Participants also reported on the types of technology tools they most used. The most frequently reported tools included virtual learning environments (e.g., Google Classroom, Edmodo) used by approximately 22.6% of participants (n ≈ 30), and presentation tools (e.g.,

PowerPoint, Canva), reported by roughly 21.1% (n ≈ 28). Other tools such as Learning Management Systems (e.g., Moodle, Blackboard) and Class Dojo were mentioned but appeared less frequently. Many participants listed combinations of tools, reflecting diverse approaches to technology use in their teacher preparation experiences.

Table 4.1: Demographic Characteristics of Respondents (N=133)

	n	Percent
Gender		
Female	107	80.5
Male	25	18.8
Other	1	0.8
Year of Study		
Freshman	13	9.8
Sophomore	48	36.1
Junior	55	41.4
Senior	17	12.8

Specialization		
Elementary Education	68	51.1
Humanities	23	17.3
Mathematics Education	10	7.5
Social Science	10	7.5
Science Education	7	5.3
Agriculture Education	5	3.8
Art Education	4	3.0
Early Childhood	4	3.0
Technology Education	2	1.5
Frequency of Tech Use		
Daily	96	72.2
Several times a week	31	23.3
Rarely	4	3.0
Once a week	2	1.5
Tech Tools Mostly Used		
Virtual Learning Env.	~30	~22.6
Presentation Tools	~28	~21.1
LMS	~13	~9.8
Others (e.g. Class Dojo)	~2	~1.5
Mixed/Combined Tools	~60	~45

Technostress

This section presents the results related to pre-service teachers' experiences of technostress. In this study, technostress is defined as the tension and strain that arise when individuals interact with educational technologies that challenge their skills, time, or resources. Examining the overall patterns of technostress provides essential context for understanding how these experiences influence teaching confidence and attitudes toward technology integration. In addition to demographic information, descriptive statistics were computed for four composite variables measuring different dimensions of technostress: technostress sources, impact of technostress on teaching, coping strategies, and perceptions of institutional support. These composite scores were derived by averaging responses to multiple items on a 4-point Likert scale, with higher scores indicating stronger agreement or more frequent experiences in each respective category.

As shown in Table 4.2 below, the mean score for technostress sources was 2.37 (SD = 0.46), indicating a moderate level of perceived stress due to the number, complexity, or evolving nature of digital tools used in teacher preparation. The impact of technostress on teaching had a mean score of 2.30 (SD = 0.55), suggesting that participants experienced some degree of negative influence on their teaching effectiveness, motivation, and planning due to technology-related stressors. Participants reported slightly higher scores on coping strategies (M = 2.75, SD = 0.50), indicating moderate-to-high frequency of using mechanisms such as mentoring, taking breaks, or accessing resources to manage technostress. Similarly, the mean score for perceptions of institutional support was 2.67 (SD = 0.54), reflecting a generally positive view of the support systems (e.g., training, technical help) available to them.

Table 4.2: Descriptive Statistics for students' responses on the Technostress Survey

Variable	n	Mean	SD
Technostress Sources	133	2.37	.46
Impact of Technostress on Teaching	133	2.30	.55
Perceptions of Institutional Support	133	2.67	.54
I seek help from mentor teachers/colleagues (CST1)	133	2.93	.75
I take breaks from technology (CST2)	133	2.99	.79
I rely on institutional resources (CST3)	133	2.32	.75

Stepwise Reliability Analysis

The study examined the internal consistency reliability of each technostress-related factor, and the overall constructs derived from the survey instrument. Vaske et al. (2017) found that a Cronbach's alpha of .90 or higher was excellent, and if the range was between .89 to .70, then it was acceptable or good. To maintain reliability, a researcher would strive to achieve values within this acceptable range. Cronbach's Coefficient Alphas were calculated to assess the degree of consistency within each group of related items. Full results from the stepwise reliability analysis are presented in Table 4.3.

The Technostress Sources scale, comprising eight items (TS1–TS8), demonstrated good internal consistency with a Cronbach's alpha of .809, indicating strong interrelatedness among items related to feeling overwhelmed, anxious, or underprepared due to digital tool usage.

The Impact of Technostress on Teaching scale (ITT1–ITT6) showed even stronger reliability, with a Cronbach's alpha of .860, suggesting high internal consistency among items measuring how technostress influences teaching performance, planning, creativity, and effectiveness. The Perceived Institutional Support scale (PIS1–PIS3) also met acceptable reliability standards, with an alpha of .759, indicating consistent responses related to training, access to help, and overall institutional backing for technology use.

However, the Coping Strategies scale (CST1–CST3) showed a low internal consistency with a Cronbach's alpha of .316. The internal consistency result of the coping strategies was found to be low, indicating unacceptable internal reliability (George & Mallery, 2003). Upon further examination using item-test analysis, it was revealed that the three items: seeking help from colleagues, taking breaks from technology use, and relying on institutional resources, showed weak inter-item correlations and failed to measure a unified construct. As a result, it was suggested that these three items be removed from the inferential analysis to improve the reliability and validity of the overall model.

Table 4.3: Reliability Coefficients for adapted Technostress Survey

Scale	Number of Items	Cronbach's Alpha (α)
Technostress Sources (TS)	8	.809
Impact of Technostress on Teaching (ITT)	6	.860
Coping Strategies (CST)	3	.316
Perceived Institutional Support (PIS)	3	.759

Correlation Analysis

To examine the relationship between key technostress variables, a Pearson correlation analysis was conducted among three composite variables: technostress sources, impact of technostress on teaching, and perceived institutional support. The variable for coping strategies (CST) was excluded from this analysis due to poor internal consistency. As revealed in the stepwise reliability analysis (see Section 4.3), the Cronbach's alpha for the coping strategies scale (CST1–CST3) was .316, which falls below the minimum acceptable threshold of .60 as suggested George & Mallery (2003). Therefore, the variable was considered unreliable for inferential interpretation and was removed to preserve the validity of the correlation results.

The results of the correlation analysis are presented in Table 4.4 below. There was a significant positive correlation between technostress sources and technostress impact on teaching ($r = .648$, $p < .001$). This suggests that as pre-service teachers experience more stress from digital tools and platforms, they also report a greater negative impact on their instructional motivation, focus, and creativity. A significant negative correlation was observed between technostress sources and perceived institutional support ($r = –.298$, $p < .001$). This indicates that greater institutional support is associated with lower perceived technostress. However, the correlation between technostress impact and institutional support was negative but not statistically significant ($r = –.121$, $p = .164$). These findings imply that while institutional support may reduce perceived technostress, it does not directly mitigate its influence on teaching effectiveness.

The negative correlation indicates that higher levels of perceived institutional support are associated with lower technostress. In practical terms, when pre-service teachers feel adequately trained, mentored, and supported, their sense of overwhelm and anxiety regarding technology

decreases. This shows that institutional support plays an important role in reducing teacher' stress from using technology.

Table 4.4: Correlations Between Technostress Variables (N = 133)

Variable	Technostress Sources	Technostress Impact	Institutional Support
Technostress Sources (TS)	1.00		
Technostress Impact (IT)	.648 (.000)	1.00	
Institutional Support	-.298 (.0005)	-.121 (.164)	1.00

Note: $p < .05$*, *$p < .01$. Coping strategies variable was excluded from analysis due to low reliability (Cronbach's $\alpha = .316$)

Multiple Regression

Table 4.5 below shows the multiple regression analysis results, including the unstandardized coefficients (B, standard error), t-values, p-values, R-squared, which assess the overall model's significance. The results indicate that the model significantly explains the variance in technostress sources among pre-service teachers.

The regression model yielded an R^2 value of 0.53, meaning that approximately 52.8% of the variance in technostress sources is accounted for by the combined effects of the predictors: frequency of technology use, technostress impact, and perceived institutional support. According to Cohen (1988), this represents a large effect size, indicating a strong explanatory model. Among the predictors, the impact of technostress on teaching showed the strongest and most significant contribution to the model ($B = 0.511$, $p < 0.001$), suggesting that increased perceived

impact of technostress is associated with higher reported technostress sources. Perceived institutional support was also a significant predictor ($B = –0.197$, $p < 0.001$), indicating that higher levels of institutional support are associated with reduced technostress among pre-service teachers.

Although the frequency of technology use remained positively associated with technostress sources ($B = 0.508$), it did not reach statistical significance in this final model. Additionally, none of the specialization categories significantly predicted technostress sources. The F-statistic was statistically significant, confirming the overall relevance of the predictors to the regression model. Furthermore, diagnostic tests confirmed the validity of the model: the Breusch–Pagan / Cook–Weisberg test for heteroskedasticity was non-significant ($\chi^2 = 2.07$, $p = 0.1506$), and the mean VIF of 2.44 indicated no serious multicollinearity issues among the predictor variables.

The Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC) are model-fit indices used to assess the relative quality of regression models. Lower AIC and BIC values indicate a better model fit while accounting for model complexity. In this study, both AIC and BIC values favored Model 3, suggesting that it provides the best overall fit among the tested models while balancing explanatory power and simplicity.

Table 4.5: Regression model Predicting Technostress Sources

Variables	Model 1 (n=133)	Model 2 (n=133)	Model 3 (n=133)
Humanities	0.267 (0.88)	0.186 (0.79)	0.221 (0.98)
Mathematics Education	-0.474 (-1.34)	-0.282 (-1.03)	-0.253 (-0.96)
Social Science	-0.146 (-0.70)	-0.101 (-0.62)	-0.0871 (-0.56)

Science Education	-0.226 (-1.00)	-0.217 (-1.25)	-0.213 (-1.28)
Agriculture Education	-0.215 (-0.85)	-0.0869 (-0.44)	-0.00609 (-0.03)
Art Education	-0.0284 (-0.11)	-0.00162 (-0.01)	0.0564 (0.28)
Early Childhood	0.0955 (0.38)	0.0355 (0.18)	0.00258 (0.01)
Technology Education	-0.444 (-1.17)	-0.511 (-1.74)	-0.478 (-1.70)
Once a week	0.843 (2.35)	0.589 (2.12)	0.508 (1.90)
Rarely	0.450 (1.63)	0.148 (0.68)	0.160 (0.77)
Several times a week	0.156 (1.55)	0.0383 (0.49)	-0.0346 (-0.44)
Technostress Impact (t_impact)		0.523 (9.10)	0.511 (9.25)
Perceived Inst. Support (t_support)			-0.197 (-3.42)
Const	2.44 (12.00)	1.246 (6.08)	1.802 (7.07)
R-square	.1236	.4814	.5278
Adj. R-square	.0439	.4295	.4762
AIC	178.2579	110.4814	100.0055
BIC	212.9421	148.0559	140.4703

Note: *p<0.05, ** p<0.01, *** p<0.001

Exploratory Factor Analysis

To explore the underlying structure of the technostress construct, a factor analysis was conducted on 17 items spanning three subscales: Technostress Sources (TS1–TS8), Impact of Technostress on Teaching (ITT1–ITT6), and Perceived Institutional Support (PIS1–PIS3). The

principal factor method with orthogonal (varimax) rotation was employed. The sample consisted of 133 observations. Table 4.6 below shows the communalities (amount of variance in each item explained by the extracted factors) ranged from 0.291 (TS8) to 0.755 (ITT2), with an average extraction value of 0.470. Items with communalities above 0.40 are considered adequately represented by the factor solution (Costello & Osborne, 2005). Most items met this criterion, except TS8, which had a slightly lower communality (0.291), suggesting it may be a weaker contributor to the overall construct.

Table 4.6: Communalities of Technostress variables

Variables	Communality
TS1	.5006
TS2	.4255
TS3	.5344
TS4	.5303
TS5	.5697
TS6	.5592
TS7	.5634
TS8	.2910
ITT1	.6185
ITT2	.7550
ITT3	.6388
ITT4	.5839
ITT5	.4464

ITT6	.5100
PIS1	.4535
PIS2	.5995
PIS3	.5698

A total of 17 items were initially included in the Exploratory Factor Analysis (EFA), and 14 items successfully loaded onto three distinct factors representing technostress sources, impact on teaching, and perceived institutional support. Three items (TS6, TS7, and TS8) showed relatively low communalities (<.40), suggesting that they contributed less to the overall factor structure. However, these items were retained for theoretical completeness, as they conceptually align with the technostress framework proposed by Tarafdar et al. (2007) and capture meaningful aspects of pre-service teachers' stress experiences with technology.

Initial extraction using principal factors yielded 9 factors with eigenvalues greater than 0, collectively explaining 114.4% of the variance. However, parallel analysis (PA) was conducted to determine the appropriate number of factors to retain. According to PA, the first three factors had eigenvalues exceeding the PA criterion, supporting the retention of three factors. Looking at the Scree plot (Fig. 1) below, it shows that only three factors (towards the left of the elbow) are kept, and it explains a significant amount of variance.

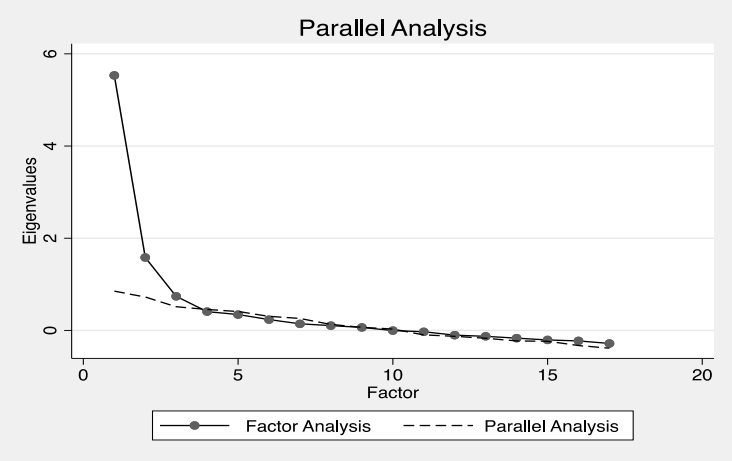

Figure 1: Parallel analysis suggesting a three-factor model

The rotated factor solution yielded a three-factor structure corresponding to the constructs measured in the survey: Technostress Sources (TS), Impact of Technostress on Teaching (ITT), and Perceived Institutional Support (PIS). These three components together accounted for approximately 89.5% of the total item variance, with the first component contributing 46%, the second 23%, and the third 21%. Wille (1996) suggests that a measuring instrument possesses construct validity if all measures constituting the instrument significantly load onto the same common component. (page 25). The rotating factor loadings in this research corroborate the theoretical framework of the instrument.

Factor one was defined by strong loadings from all six items measuring the Impact of Technostress on Teaching (e.g., ITT1 = 0.76, ITT2 = 0.79, ITT3 = 0.68). These items related to the emotional and instructional disruptions caused by technostress and were thus labeled “Impact of Technostress”. Factor two contained items TS1–TS7 from the Technostress Sources subscale with moderate to high factor loadings (e.g., TS5 = 0.63, TS1 = 0.61, TS2 = 0.52). These items

addressed the various demands and challenges pre-service teachers encounter in navigating digital platforms. This component was named “Technostress Sources”.

Factor three was characterized by strong loadings from the three items in the Perceived Institutional Support subscale (PIS1 = 0.63, PIS2 = 0.73, PIS3 = 0.72). These items reflected perceptions of how much support pre-service teachers receive from their institutions regarding technology use. The component was labeled “Perceived Institutional Support”. The clear loading patterns with minimal cross-loadings confirm that the items loaded distinctly on their respective factors, reinforcing the construct validity of the instrument. Factor loadings for the technostress components are reported in Table 4.7 below.

Table 4.7: Rotated structure for the Technostress survey with factor loadings

Variables	Factor 1	Factor 2	Factor 3
TS1		.6112	
TS2		.5190	
TS3		.4000	
TS4		.4314	
TS5		.6274	
ITT1	.7587		
ITT2	.7873		
ITT3	.6794		
ITT4	.5945		
ITT5	.5954		
ITT6	.6056		

PIS1	.6296
PIS2	.7304
PIS3	.7222

Phase II: Qualitative

Following the quantitative analyses, which identified significant relationships among technostress sources, teaching impact, and institutional support, the study proceeded to the qualitative phase to gain deeper insight into these findings. The qualitative interviews were designed to explain and expand upon the statistical results, providing a richer understanding of how and why pre-service teachers experience technostress during their preparation and practicum experiences. This phase sought to capture participants' lived experiences and coping responses to technology-related stressors, as well as their perceptions of institutional support and motivation for integrating technology in classroom settings.

How Technostress Factors Influences Pre-service Teachers' Perceptions and Attitudes toward technology integration in their practicum classrooms

This section presents the views of participants on how various factors of technostress influence their perceptions and attitudes toward technology integration in their practicum classrooms. The findings highlight how pre-service teachers experience, interpret, and respond to the technology-related pressures during their preparation and practicum. Participants described a range of experiences that reveal the sources of technostress that arise from tool overload, the impact of these stressors on teaching confidence, engagement, and instructional approaches,

and the institutional supports and coping mechanisms that help them adapt to and overcome technology-related challenges. Their perspectives provide a deeper understanding of how technostress shapes teachers' readiness, motivation, and developing attitudes toward technology-enhanced instruction.

Theme 1: Sources of Technostress- Overload, Learning Curve, and Uncertainty

Pre-service teachers described technostress as a recurring tension that stemmed from the increasing expectations placed on them to incorporate technology in their preparation and practicum classrooms. Although most participants valued the potential of digital tools, they expressed that the sheer volume of available technologies and the speed at which new platforms were introduced often led to feelings of overload and confusion. As Participant (B) explained that "There's a mountain of it, you could pick from so many tools that I don't even know where to start". Similarly, Participant (D) remarked that "It's overwhelming because there's always a new thing, new updates, new expectations, and you're supposed to know them right away".

This sense of being swamped by information was intensified by the expectation to appear competent before mentors and peers. Participant (A) admitted that "It's hard to stay calm when your mentor is watching and you're still figuring it out", while Participant (F) added, "When you're juggling planning, teaching, and technology, it's easy to feel like you're never doing enough". Furthermore, participants highlighted that their stress did not arise solely from the number of tools but also from the steep learning curve associated with mastering them. Many were comfortable with technology in their personal lives but found its pedagogical application to be far more complex. Participant (C) explained, "I'm good with phones and computers, but teaching with tech is different, you have to think about how students will use it too". In a similar

vein, Participant (D) reflected, “I don’t always know how to connect what I learn in class with what actually happens in schools”. The gap between learning about technology theoretically and applying it practically was a source of anxiety for several participants. Participant (F) captured this disconnect well: “We talk a lot about technology in class, but we don’t get to practice it much in real classrooms”.

However, the uncertainty surrounding the reliability of technology was perhaps the most consistent source of stress. Many participants expressed fear of technology malfunctioning during lessons, which could disrupt learning and damage their credibility. Participant (A) described such moments vividly: “When a video doesn’t play, I just freeze for a second because all the kids are looking at me”. Similarly, Participant (E) shared, “The Wi-Fi goes out and suddenly your whole lesson plan falls apart”. Others confessed that these moments affected their self-confidence. Participant (C) noted, “It’s embarrassing because everyone expects you to have it together”, while Participant (F) added, “You want to look confident in front of your students, but the tech can make you feel the opposite”.

At the same time, participants demonstrated resilience in how they managed these stressors. They often described adapting quickly or reframing challenges as learning opportunities. According to Participant (C), “When things go down and I can’t figure it out, you just have to pivot and take a different route”. Likewise, Participant (A) shared, “It’s stressful, but that’s how I learn. I mess up once, and next time I know exactly what to do”. Through these reflections, technostress appeared not only as a barrier but also as a catalyst for growth, an experience that tested their flexibility while strengthening their problem-solving skills.

Theme 2: Impact of Technostress on Teaching- Confidence, Engagement, and Growth

Technostress also shaped how pre-service teachers perceived their teaching performance, confidence, and interactions with students. Several participants acknowledged that stress occasionally disrupted their classroom rhythm or diminished their confidence. “When tech fails, it just throws you off, you lose your rhythm and it’s hard to get the students back” said Participant (E). Similarly, Participant (D) reflected, “If I’m stressed about the technology, I can’t focus on the content, and that makes me feel like I’m not teaching well”. These disruptions often led teachers to rely on methods they already trusted. Participant (B) further added that “I tend to stick to what I already know works rather than trying something new in front of the class”, and Participant (F) admitted, “Even though I want to use interactive tools, sometimes I skip them because I can’t risk it crashing”.

Furthermore, participants emphasized that the mental load of managing multiple technological tasks, such as troubleshooting, instructing, and monitoring students was emotionally draining. Participant (C) described, “It’s exhausting trying to teach and fix things at the same time”, while Participant (D) added, “There’s so much to remember, lesson plans, standards, the tech part and it wears you out”. This emotional strain often blurred the line between excitement and fatigue, revealing how technostress operates both cognitively and emotionally.

However, despite these frustrations, many participants identified moments of empowerment that emerged from overcoming technical challenges. Participant (D) explained, “It’s stressful at first, but once you figure it out, it actually makes life easier”. Similarly, Participant (A) shared, “It’s stressful, but that’s how I learn. I mess up once, and next

time I know exactly what to do". These reflections suggest that technostress is not purely negative but part of an iterative learning process through which pre-service teachers develop competence and confidence.

Moreover, participants consistently acknowledged that technology had a transformative effect on student engagement, which in turn motivated them to persist. Participant (D) noted, "Even when it's stressful, I keep using it because the kids love it, it gets them excited". Likewise, Participant (B) observed, "It's amazing how technology can make learning fun, and that makes me want to keep improving". At the same time, several participants described this renewed sense of purpose as a turning point in their teaching development. Participant (C) commented, "I feel like stress comes from caring, it means I want to do better and not just play it safe". In this way, stress evolved from a constraint into a driving force for self-improvement and reflective practice.

These reports illustrate how technostress can temporarily undermine teaching performance but also inspire resilience and professional growth. The participants' experiences reveal a delicate balance between discomfort and development, suggesting that what begins as a challenge can, with time and experience, foster a deeper commitment to meaningful technology integration.

Theme 3: Institutional Support and Coping Mechanisms-
Guidance, Mentorship, and Adaptation

Across interviews, participants emphasized that effective support from their teacher education programs, mentor teachers, and peers was central to managing technostress. While most valued the emphasis placed on technology in their coursework, they felt that practical guidance was often insufficient. Participant (F) said that "We learned about technology in class,

but not really how to use it when something goes wrong". Equally, Participant (A) shared, "If we could actually try the tools during our courses, not just talk about them, we'd feel more ready". Others expressed frustration with the assumption that all pre-service teachers were already tech-savvy. Participant (D) explained, "There's this assumption that we already know how to use everything, but no one really teaches us". In addition, Participant (B) pointed out that the gap between theory and practice persisted: "I think the school means well, but there's a difference between telling us to use tech and showing us how".

Furthermore, participants who received mentorship and peer support reported feeling significantly more confident when facing technological difficulties. "My mentor teacher helps me when things go wrong, and that makes a big difference" as reported by Participant (C). Participant (E) also noted the value of collaboration: "We all learn together, sometimes classmates or other teachers have the best tips". Likewise, Participant (F) mentioned, "Just hearing that other pre-service teachers have the same problems makes it less stressful". These relationships provided both technical help and emotional reassurance, showing that shared experiences can normalize technostress and foster collective problem-solving.

However, in situations where formal support was limited, participants relied on self-directed coping strategies to manage stress. Many emphasized flexibility and humor as essential tools for maintaining composure. Participant (D) recalled, "If it doesn't work, I just make a joke out of it. It lightens the mood". Similarly, Participant (B) said, "I'm learning to take a deep breath and remind myself it's not the end of the world". Others turned to brief mental breaks or self-talk. "When I feel overwhelmed, I step away from the screen for a bit, then come back fresh" said by Participant (A).

At the same time, pre-service teachers encountered external stressors such as unreliable infrastructure and outdated devices, yet they still demonstrated adaptability. Participant (E) shared, “The Wi-Fi goes out at the worst times, but I’ve learned to always have a backup plan”. Participant (D) added, “We share devices sometimes, so it’s a constant game of adapting to what’s available”. Similarly, Participant (C) expressed optimism even in the face of setbacks: “Even when the system crashes, I try to focus on what I can still do with the students”.

These narratives emphasize that institutional and interpersonal support systems play a crucial role in alleviating technostress. While participants desired more structured training opportunities, they also demonstrate significant personal agency through persistence and collaboration. Their stories reveal that pre-service teachers cope not only through formal instruction but also through mentorship, shared experience, and self-reflection.

CHAPTER FIVE

DISCUSSION AND CONCLUSION

Introduction

This chapter discusses the findings from the mixed-methods study, Impact of Technostress on Pre-Service Teachers' Perceptions of Technology Integration in Classroom Teaching. The study examined how factors of technostress influence pre-service teachers' perceptions and attitudes toward technology integration during their preparation and practicum experiences. Using the Technology Acceptance Model (Davis, 1989) and the Transactional Model of Stress and Coping (Lazarus & Folkman, 1984) as guiding frameworks, the discussion integrates quantitative trends and qualitative narratives to explain how technostress emerges, how it affects instructional decisions and confidence, and which supports enable adaptive responses in authentic school contexts. The chapter addresses the three research questions that structured the inquiry and engages two reflective questions central to teacher preparation: (1) whether pre-service teachers should possess a minimum level of technology acceptance, and (2) whether technostress should be systematically measured among pre-service teachers to improve program support.

Discussion of Results

RQ 1: What are the factors that contribute to technostress among pre-service teachers toward technology integration during their preparation and practicum experiences?

The results revealed that pre-service teachers experienced moderate levels of technostress, reflecting that while technology integration is a normal part of teacher preparation,

it continues to generate notable cognitive and emotional strain. The most prominent stressors included techno-overload, techno-complexity, and techno-insecurity, which describe the tension teachers experience when dealing with too many digital tools, complex systems, or uncertainty about technical competence. These findings are consistent with the framework developed by Tarafdar et al. (2007), which identifies such factors as central to the experience of technostress. Similar patterns have been observed in teacher education, where rapid technological change and inconsistent digital preparation amplify stress and anxiety related to classroom technology use (Mahapatra & Pati, 2018; Estrada-Muñoz et al., 2020).

A strong relationship emerged between technostress sources and their impact on teaching, showing that as teachers encounter more technology-related demands, their confidence and instructional flow tend to decrease. This finding aligns with Upadhyaya (2021), who observed that high levels of digital strain reduce teachers' self-efficacy and focus on pedagogical tasks. For pre-service teachers, the challenge lies not in using technology itself but in maintaining instructional quality while managing technical disruptions (Mahapatra & Pati, 2018; Upadhyaya, 2021). When teachers must split attention between lesson delivery and troubleshooting, the cognitive load increases, and their perceived teaching effectiveness declines (Tarafdar et al., 2015; Estrada-Muñoz et al., 2020). Thus, technostress can directly interfere with how pre-service teachers plan, implement, and evaluate technology-supported instruction (Bedenlier et al., 2020; Chen et al., 2022).

The study also revealed a clear inverse relationship between institutional support and technostress, suggesting that structured guidance, mentorship, and training significantly reduce stress levels. This corroborates findings by Al-Fudail and Mellar (2008) and Ertmer and

Ottenbreit-Leftwich (2010), who emphasized the importance of organizational and cultural support in shaping teachers' digital readiness. Teacher preparation programs that provide ongoing modeling, feedback, and peer collaboration enable pre-service teachers to develop confidence in their digital skills and mitigate anxiety related to technology use. Overall, the quantitative findings demonstrate that technostress among pre-service teachers is less a product of individual resistance and more a reflection of environmental and institutional conditions. When adequate support is present, technostress decreases, and technology integration becomes a smoother, more empowering part of professional learning

RQ 2: How do these factors of technostress influence pre-service teachers' perceptions and attitudes toward technology integration in their practicum classrooms?

The findings show that pre-service teachers' technostress arises from a combination of external demands and internal expectations. Participants described how the rapid influx of new tools, platforms, and updates led to confusion and cognitive overload. This mirrors existing research indicating that techno-overload and techno-complexity are the most prevalent stressors in education settings (Tarafdar et al., 2007). Another contributing factor was the pressure to perform competently under observation. During practicum placements, many pre-service teachers felt anxious about potential technology failures, particularly in front of mentor teachers or students. This aligns with earlier studies showing that performance anxiety is closely tied to feelings of techno-insecurity (Al-Fudail & Mellar, 2008).

However, technostress was not solely linked to external factors. Participants explained that a lack of authentic, hands-on preparation amplified their uncertainty. Courses that emphasized theoretical discussions of digital tools without practical demonstrations left them

feeling underprepared. Similar findings have been reported in research showing that inadequate modeling and limited time for guided practice significantly increase technology-related stress among pre-service teachers (Ertmer & Ottenbreit-Leftwich, 2010).

Furthermore, the findings reveal that technostress shaped pre-service teachers' attitudes toward technology in two phases, an initial stage of frustration followed by gradual adaptation and confidence-building. Early in their practicum experiences, many reported hesitation and self-doubt, often reverting to traditional methods when faced with technological challenges. This cautious behavior aligns with the Technology Acceptance Model (Davis, 1989), which suggests that perceived difficulty and anxiety reduce both perceived usefulness and actual adoption. However, as teachers gained more experience and witnessed students' engagement with technology, they began to reappraise these challenges. Guided practice, mentor feedback, and repeated success with digital tools allowed stress to transform into motivation and confidence. This adaptive process reflects the Transactional Model of Stress and Coping (Lazarus & Folkman, 1984), which explains how individuals learn to reinterpret stressors as opportunities for growth once effective coping strategies develop. Eventually, these findings suggest that while technostress can initially constrain pre-service teachers' willingness to integrate technology, it can later serve as a catalyst for professional learning, enhancing both pedagogical and technological confidence through reflection, practice, and support.

RQ 3: How does qualitative data from pre-service teachers' interviews explain the results from the quantitative phase of the study that focused on measuring technostress? (Mixed Method).

The integration of quantitative and qualitative data in this study provides a holistic understanding of how technostress shapes pre-service teachers' perceptions and attitudes toward

technology integration in their practicum classrooms. This mixed-methods approach moves beyond statistical relationships, enriching the interpretation of findings with lived experiences, motivations, and contextual influences that explain how pre-service teachers navigate digital demands. The combined analysis reveals that technostress is a complex and evolving construct, initially manifesting as frustration and anxiety, yet capable of fostering resilience and professional growth when adequate institutional and social supports are in place. This duality reflects the literature's call for a comprehensive understanding of the human factors underlying teachers' experiences with technology (Tarafdar et al., 2015; Mahapatra & Pati, 2018).

Quantitative analysis, in alignment with existing research, indicated that pre-service teachers experienced moderate levels of technostress, driven primarily by techno-overload, techno-complexity, and techno-insecurity. These results align with findings from Upadhyaya (2021) and Estrada-Muñoz et al. (2020), which showed that frequent exposure to multiple technological tools and insufficient preparation heighten stress levels among teachers. The quantitative data also demonstrated that institutional support had a negative relationship with technostress, suggesting that consistent training, mentorship, and digital resources reduce the perceived strain of technology integration. This trend parallels broader educational findings that emphasize the importance of organizational readiness and leadership in shaping positive technology experiences (Al-Fudail & Mellar, 2008; Ertmer & Ottenbreit-Leftwich, 2010).

Building upon these numerical patterns, the qualitative findings offered insight into why these relationships exist. Participants' narratives reflected the same patterns observed in the quantitative data, acknowledging the tension between high expectations and limited preparedness. Many described moments of uncertainty and embarrassment when technology

malfunctioned during observed lessons, echoing the measured relationship between technostress and diminished teaching confidence. However, qualitative insights also revealed that with consistent exposure, mentorship, and peer collaboration, pre-service teachers gradually reinterpreted technostress as an opportunity for learning and improvement. This adaptive transformation supports the Transactional Model of Stress and Coping (Lazarus & Folkman, 1984), illustrating how individuals reappraise stressors as challenges rather than threats when equipped with effective coping strategies.

The integration of both data strands highlights that technostress among pre-service teachers is not static but rather situational and developmental. Quantitative findings established its prevalence and correlational structure, while qualitative narratives revealed its psychological and pedagogical dimensions. Both strands converge on the notion that technostress and technology acceptance coexist on a continuum, stress initially impedes confidence but eventually enhances competence through practice and reflection. This finding aligns with the Technology Acceptance Model (Davis, 1989), which suggests that perceived usefulness and ease of use increase as individuals gain familiarity and mastery over technology. Furthermore, the complementary data reinforce that institutional support remains the critical mediator in this relationship, echoing prior studies emphasizing the role of mentorship and community in sustaining teacher motivation (Moreira-Fontán et al., 2019; Chen et al., 2022).

The challenges identified in both datasets, such as inconsistent mentorship, lack of hands-on training, and unreliable technological infrastructure mirror broader issues found in teacher education research (Ertmer & Ottenbreit-Leftwich, 2010; Bedenlier et al., 2020). Addressing these barriers through targeted professional development and collaborative learning

environments is essential to transform technostress into a developmental resource rather than a deterrent. The integrated findings, therefore, highlight that pre-service teachers' ability to thrive in technology-enhanced classrooms depends not solely on personal proficiency but on contextual supports that enable reflective, adaptive learning. In this way, the study contributes to the literature by demonstrating that technostress, when appropriately managed, can serve as a catalyst for sustained technological engagement and pedagogical innovation in teacher preparation programs.

Summary of Findings

The findings from this study revealed that pre-service teachers experience moderate levels of technostress as they navigate technology integration during their preparation and practicum phases. Quantitatively, the most common sources of stress included techno-overload, techno-complexity, and techno-insecurity (Tarafdar et al., 2007, 2015) reflecting the difficulty of managing multiple digital tools while maintaining instructional performance. However, institutional support served as a protective factor, those who perceived higher levels of mentorship, hands-on guidance, and access to resources reported lower stress and greater willingness to use technology (Pelgrum, 2001; Tondeur et al., 2008).

Qualitative findings provided context for these relationships. Participants described feeling overwhelmed by competing technological expectations but also acknowledged that consistent practice and collaboration helped them adapt. Many expressed that stress was highest at the beginning of their practicum and gradually declined as they gained confidence through real-world experience. Mentorship, peer support, and self-directed coping emerged as key enablers of this transformation.

When both phases were integrated, the results suggested that technostress is not inherently negative. It can act as a temporary developmental challenge, disruptive at first, yet capable of fostering resilience and professional growth when accompanied by institutional and emotional support. Overall, these results indicate that technostress functions as both a barrier and a catalyst within the process of technology integration.

Reflective Questions

During my thesis defense, one of my committee members posed reflective questions that encouraged me to think about the broader implication of the study. In response, this section includes two reflection questions designed to extend the discussion beyond the empirical findings. These questions prompt deeper thinking about how technostress measurement and technology acceptance can inform teacher education practices and policy development.

Is there a minimum level of technology acceptance that pre-service teachers should have?

The findings from this study suggest that a minimum threshold of technology acceptance is essential for pre-service teachers to function effectively in today's classrooms. This does not mean expecting full mastery of every emerging tool but ensuring that teachers reach a foundational level of digital confidence, the ability to navigate essential platforms, troubleshoot basic issues, and apply technology to enhance learning outcomes. According to the Technology Acceptance Model (Davis, 1989), technology use is determined by perceived usefulness and ease of use; both factors increase when teachers feel adequately supported and competent. The results indicate that without reaching this baseline, technostress is likely to escalate, leading to avoidance and reduced instructional innovation. Therefore, teacher education programs should

intentionally foster acceptance through guided modeling, scaffolded exposure, and reflective practice, ensuring that pre-service teachers develop both the skill and mindset necessary to engage meaningfully with technology.

Should we measure technostress among pre-service teachers?

Yes, systematically measuring technostress among pre-service teachers could be important for designing effective interventions and promoting well-being in technology-rich preparation programs. As Tarafdar et al. (2019) argue, consistent measurement of technostress helps identify stressors that impede performance and mental health in digital environments. Quantitative results of this study demonstrated that technostress significantly influences teaching confidence, while qualitative findings showed that it also shapes emotional and behavioral responses to technology use. Drawing on the Transactional Model of Stress and Coping (Lazarus & Folkman, 1984), technostress measurement can serve as both a diagnostic and developmental tool, helping educators identify when stress is becoming maladaptive and where additional resources are needed. When complemented by reflective assessments, these measures can guide program coordinators to provide targeted mentorship, training, and mental health support. Measuring technostress, therefore, is not merely about identifying difficulties but about informing continuous program improvement to sustain teacher confidence, adaptability, and engagement with technology.

Contributions to the Literature

This study contributes to the growing body of research on technostress by offering an integrated perspective that links emotional, cognitive, and contextual dimensions of teachers'

experiences with technology. While previous studies have explored technostress among in-service educators (Tarafdar et al., 2007; Mahapatra & Pati, 2018; Upadhyaya, 2021), limited attention has been given to pre-service teachers, whose formative experiences with technology shape their future classroom practices. By examining how technostress affects pre-service teachers' perceptions and attitudes toward technology integration, this study extends existing literature beyond workplace settings to teacher education contexts.

The findings corroborate earlier research emphasizing that techno-overload, techno-complexity, and techno-insecurity are consistent predictors of technostress (Tarafdar et al., 2015; Estrada-Muñoz et al., 2020). However, this study further demonstrates that technostress is not inherently detrimental; rather, it operates as a developmental phenomenon that can promote self-efficacy and reflective growth when supported by mentorship and guided practice. This aligns with recent literature arguing that controlled exposure to technological challenges enhances resilience and confidence among teachers (Moreira-Fontán et al., 2019; Chen et al., 2022).

Moreover, the mixed-methods design enriched the understanding of how institutional support functions as a moderating factor in reducing technostress and fostering technology acceptance. Previous studies have documented the role of school-level leadership in shaping digital adoption (Ertmer & Ottenbreit-Leftwich, 2010; Al-Fudail & Mellar, 2008), yet few have provided evidence of this relationship within teacher education programs. This study fills that gap, illustrating that supportive mentorship, scaffolded digital experiences, and collaborative learning opportunities are critical in transforming stress into adaptive learning. Consequently, it contributes to the literature by reframing technostress as both a risk factor and a growth mechanism, contingent upon the surrounding institutional environment.

Contributions to Professional Practice

The results of this study hold practical implications for teacher education programs, particularly in developing strategies that prepare pre-service teachers for technology-rich classrooms. First, the study underscores the importance of intentional digital scaffolding, ensuring that exposure to technology is gradual, contextualized, and supported by hands-on modeling. Teacher educators can mitigate stress by embedding authentic technology experiences throughout coursework and practicum placements, rather than isolating them in single technology-focused classes.

Second, findings highlight the critical role of mentorship and peer collaboration in reducing technostress and enhancing technology acceptance. Institutions should prioritize mentor-teacher training that includes not only technological competence but also emotional and cognitive support strategies. Regular reflective discussions and peer-learning sessions can normalize stress as part of the learning process, fostering collective problem-solving and confidence among pre-service teachers.

Third, the study emphasizes the value of institutional support systems, including stable technological infrastructure, ongoing workshops, and responsive IT assistance as essential components of successful technology integration. These supports align with the literature suggesting that institutional readiness and culture are as vital as individual skill development (Ertmer & Ottenbreit-Leftwich, 2010; Bedenlier et al., 2020). These recommendations encourage programs to view technostress not as a problem to eliminate, but as a signal for where greater pedagogical and emotional supports are needed.

Reflexivity Statement

As the researcher, I approached this study with an awareness of my dual identity as both a technology integration advocate and a scholar of teacher preparation. Having experienced the pressures of adopting new digital tools firsthand, I remained mindful of potential bias toward viewing technology as inherently beneficial. To minimize this influence, I employed methodological rigor, triangulating quantitative and qualitative data, seeking peer feedback, and allowing participants' voices to drive thematic interpretation. I also reflected on how my own familiarity with educational technology may have shaped interview dynamics, ensuring that empathy did not compromise objectivity. This process reinforced my understanding that technostress, while challenging, is an integral aspect of learning and professional development that must be navigated rather than avoided.

Conclusion

In conclusion, the results of this study highlight that pre-service teachers generally demonstrate openness toward technology integration, though this process is accompanied by notable levels of technostress. The findings revealed that while digital tools enhance engagement and instructional potential, they also introduce cognitive and emotional demands that affect teachers' confidence and focus. When adequately supported through mentorship, hands-on practice, and institutional resources, these challenges evolve into opportunities for professional growth and deeper pedagogical understanding.

However, the stressors identified such as overload, complexity, and limited practical preparation, emphasize the continuing need for structured guidance and consistent institutional

support in teacher education programs. Addressing these challenges through improved training, access to digital resources will be critical to reducing technostress and promoting sustainable digital competence. By fostering balanced approaches to technology integration, pre-service teachers can transform stress into resilience, using technology not only as a tool for instruction but also as a pathway for innovation, reflection, and long-term professional development.

Implications of Findings

The findings of this study present an encouraging outlook for the future of teacher preparation and educational technology integration. Despite the challenges associated with technostress, pre-service teachers demonstrated openness and adaptability toward using technology as a central component of their instructional practice. This willingness signifies a growing readiness among emerging educators to modify pedagogical approaches in response to evolving technological and instructional landscapes. With appropriate institutional support, technology integration holds the potential to enrich learning environments, offering interactive, engaging, and differentiated experiences that foster student participation and understanding.

The study's results emphasize that technostress should not be viewed solely as a negative outcome but as a transitional phase that can enhance professional growth when effectively managed. When pre-service teachers receive structured digital training, mentorship, and reflective opportunities, they are better equipped to transform initial anxiety into confidence and competence. This has significant implications for teacher education programs, which must prioritize hands-on practice, peer collaboration, and ongoing digital literacy development as core components of professional preparation. By aligning training with real-world applications,

programs can help future teachers balance technological demands with instructional quality, improving their resilience and readiness for classrooms.

Nonetheless, the challenges identified such as technological overload, inconsistent infrastructure, and limited exposure to authentic teaching applications highlight areas requiring immediate attention. Institutions must ensure access to adequate resources, consistent training opportunities, and responsive technical support to promote equitable and sustainable technology integration. Furthermore, educational policymakers can leverage these findings to design evidence-based interventions that address digital stress, build teacher efficacy, and create supportive ecosystems for technology use. Through strategic investment in professional development and resource allocation, teacher education programs can cultivate an environment in which technology serves as both a catalyst for learning and a tool for empowering educators to meet diverse student needs effectively.

Limitations

The present investigation on technostress and pre-service teachers' perceptions of technology integration is subject to several limitations that should be acknowledged. These limitations include potential sampling bias, constraints on generalizability, reliance on self-reported data, inherent subjectivity in qualitative interpretation, temporal impact, and limited consideration of external contextual factors. The study was conducted with a relatively small sample of pre-service teachers from one teacher education program, which may not fully represent the broader population of pre-service teachers in different regions or institutional contexts. Consequently, the findings should be interpreted with caution when generalizing to

other settings or educational systems, particularly those with different technological infrastructures or support structures.

The reliance on self-reported survey data and interview responses introduces the possibility of social desirability bias, as participants may have provided responses that align with perceived expectations of technological competence. Similarly, qualitative analysis involves interpretive judgment, and while efforts were made to ensure validity through triangulation and systematic coding, a degree of subjectivity is inherent in the process. The temporal context of the study also presents a limitation, given the rapid evolution of educational technologies and the continuous shift in digital learning environments. Attitudes, levels of technostress, and coping strategies observed at the time of data collection may differ in future cohorts of pre-service teachers exposed to new tools and instructional technologies.

Another limitation pertains to the absence of longitudinal data. This study provides a view of technostress experiences at a single point in time, without tracking how perceptions and stress levels evolve as pre-service teachers progress into professional teaching roles. A longitudinal design would offer deeper insights into the long-term effects of technostress and the sustainability of coping mechanisms developed during teacher training. Furthermore, institutional and contextual variables such as local education policies and institutional expectations toward technology were not explored in depth. These factors may significantly shape how technostress manifests and how teachers respond to it. Recognizing these limitations is essential for interpreting the findings within context and for guiding future research aimed at expanding the scope and temporal depth of investigations into technostress and technology integration in teacher education.

Recommendations for Future Research

Based on the findings and limitations of this study, several recommendations are proposed to guide future research on technostress and pre-service teachers' experiences with technology integration. These recommendations are as follows:

1. Investigate how institutional and regional contexts influence pre-service teachers' experiences of technostress, since factors such as access to resources, institutional practices, and local policies may affect their readiness to integrate technology.
2. Analyze the impact of larger and more diverse samples of pre-service teachers to understand how technostress varies across different demographic backgrounds, subject areas, and levels of technology experience.
3. Conduct longitudinal research to track changes in technostress, coping strategies, and technology acceptance over time, providing insight into how early experiences influence future teaching confidence and practices.
4. Utilize multiple data sources beyond self-reported surveys, such as classroom observations, digital performance analytics, or physiological indicators, to gain a more accurate and holistic understanding of technostress.
5. Explore how institutional and policy-related factors shape technostress and technology integration, identifying systemic influences that support or hinder teachers' digital engagement.
6. Examine the effects of targeted intervention programs, such as mentorship, reflective training, or digital wellness initiatives, to determine effective strategies for reducing technostress and improving technology self-efficacy among pre-service teachers.

7. Future validation of the adapted Technostress Survey through confirmatory factor analysis and cross-institutional replication to improve its reliability and generalizability across teacher education program.

Recommendations for Practice

1. Improve technology infrastructure and support in teacher education programs to ensure reliable internet access, updated hardware, and consistent technical assistance. This will help reduce frustration and limit the effects of technostress on pre-service teachers.
2. Design and implement professional development programs that help teacher educators and mentors understand and address technostress. These programs should focus on practical strategies for integrating technology, managing digital workload, and building confidence in technology use.
3. Create collaborative networks and online communities for pre-service teachers, mentors, and instructors to share resources, teaching ideas, and coping strategies related to technology use. These communities can promote peer learning and emotional support.
4. Include reflective technology practice in teacher education courses to help pre-service teachers identify sources of stress, evaluate their experiences, and develop personal strategies for managing technostress during classroom practice.
5. Work with policymakers to develop guidelines and policies that support digital well-being and equitable access to technology in teacher education programs. Policies should ensure that all pre-service teachers have access to the resources and training needed for confident and effective technology integration.

Conclusion

Overall, this study contributes to a growing understanding of technostress as both a challenge and an opportunity in teacher preparation. By integrating quantitative and qualitative findings, it highlights that pre-service teachers' digital experiences are shaped not only by technological tools but by the training, mentorship, and institutional support surrounding them. The results highlight the need for teacher education programs to adopt proactive approaches that transform stress into growth, helping future teachers develop the confidence and adaptability required for technology-rich classrooms. As digital learning continues to evolve, ongoing research and reflective practice will remain essential in preparing educators who are both technologically skilled and emotionally resilient.

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APPENDICES

APPENDIX A

CONSENT FORM

Title: Impact of Technostress on Pre-Service Teachers' Perceptions of Technology Integration in Classroom Teaching

Purpose of Study: The purpose of this study is to examine how technostress influences pre-service teachers' perceptions and attitudes toward technology integration in classroom teaching. Specifically, the study seeks to identify the factors that contribute to technostress during teacher preparation and practicum experiences, and to explore how these factors shape pre-service teachers' confidence, readiness, and motivation to use technology effectively in the classroom.

Survey Methods: You are invited to participate in this study because your opinions and experiences are valuable in understanding how technology affects teachers in training. Participation involves completing a short survey that will take approximately 10–15 minutes to finish. The survey includes both open-ended and closed-response questions designed to measure the sources and impact of technostress, perceptions of technology integration, coping strategies, and the role of institutional support. The study is being conducted with pre-service teachers enrolled in teacher education programs at a land-grant university in the Northern Rockies. Selected participants will also be invited for a semi-structured interview to discuss their experiences in greater depth.

Audio Recording: Please check one of the following options regarding your consent for audio recording during the interview:

- I consent to being audio-recorded during the interview.
- I do not consent to being audio-recorded during the interview.

Confidentiality: All responses will remain strictly confidential. Your name will not appear on any reports, and your identity will not be connected to your responses. Survey and interview data will be stored securely in a password-protected cloud file accessible only to the researcher. Survey responses will remain anonymous.

Risk: There are no known risks or discomforts associated with participating in this study.

Benefits: While there may be no direct benefits to you, participating in this study may provide an opportunity to reflect on your experiences with technology integration. Additionally, the findings may contribute to improving teacher education programs by identifying ways to better support pre-service teachers in managing technostress and integrating technology effectively.

Withdrawal from the Study: Your participation is entirely voluntary. You may choose not to participate or to withdraw at any time without any negative consequences. If you choose not to complete the survey, there will be no penalty.

Use of Information: The information collected will be used solely for research purposes to fulfill the requirements of the master's thesis in Curriculum and Instruction at Montana State University. The results may also be used in future conference presentations or journal publications, but your identity will always remain anonymous.

The individuals you may contact about this study are:

Principal Investigator: Lateefat Sanni, lateefatsanni@montana.edu

Advisor: Nick Lux, Nicholas.lux@montana.edu

MSU Bozeman Institutional Review Board Compliance Office (MSUIRB), irb@montana.edu

Sign: _____ Date: _____

APPENDIX B

TECHNOSTRESS AMONG PRE-SERVICE TEACHERS' QUESTIONNAIRE

Phase I: Quantiative

SECTION A: Demographic Information

Instruction: Please, provide the following demographic information. Please ensure accuracy while filling out the demographic information. Your cooperation in providing this information is highly appreciated, as it will help us draw meaningful insights from our research.

Gender: Male ☐ Female ☐ Other ☐ Prefer not to say ☐

Current Year of Study: _____

Degree Program: _____

Field of Specialization:

Science Education ☐

Mathematics Education ☐

Humanities and Social Sciences ☐

Other (please specify): _____

Section 2: Technology Usage in Education

How frequently do you use technology for educational purposes (e.g., teaching preparation, lesson planning)?

Daily ☐

Several times a week ☐

Once a week ☐

Rarely ☐

Never ☐

Which types of technology tools do you use most often in your teaching preparation or coursework? (Select all that apply)

Learning Management Systems (e.g., Moodle, Blackboard).

Virtual Learning Environments (e.g., Google Classroom, Microsoft Teams)

Presentation tools (e.g., PowerPoint, Google Slides)

Video conferencing tools (e.g., Zoom, MS Teams)

Digital content creation tools (e.g., Canva, Prezi)

Other (please specify): _____

SECTION B: Technostress Constructs

Instructions: Kindly use the following scale to indicate your level of agreement or disagreement with the statements provided where "SA" is "Strongly Agree", "A" is "Agree", "D" is "Disagree", and "SD" is "Strongly Disagree".

For each statement, choose the response that best reflects your opinion. There is no right or wrong answer. Please, consider each statement carefully before selecting your response.

S/N	ITEMS	SA	A	D	SD
Technostress Sources					
1	I feel overwhelmed by the number of digital tools I need to manage while planning and delivering classroom instruction during my teacher training.				
2	I find the digital tools required in my teacher preparation program to be overly complex.				

3	As a pre-service teacher, I find it time-consuming and demanding to learn how to use new educational technologies.				
4	The fast-paced evolution of educational technologies makes me anxious about my ability to adapt as a pre-service teacher.				
5	I experience anxiety about my ability to use technology to enhance student learning in my practicum teaching.				
6	I feel less confident in delivering lessons that involve technology due to technostress.				
7	The demands of technology use in my teacher training disrupt my ability to maintain a work-life balance.				
8	I feel uncertain about which educational technologies are most effective for student engagement and learning.				
	Impact of Technostress on Teaching				
9	Feeling stressed about technology makes me less motivated to include it in my teaching.				
10	Experiencing technostress hinders my ability to focus on instructional planning and the effective use of classroom technology.				
11	The stress I associate with technology use makes me reluctant to try out new educational tools in my teaching.				

12	Technostress makes it difficult for me to adapt technology tools for diverse student needs.				
13	Stress caused by technology limits my creativity in designing classroom activities.				
14	Technostress negatively impacts my effectiveness as a teacher during practicum.				
	Coping Strategies for Technostress				
15	I seek help from mentor teachers or colleagues when I experience difficulties with classroom technology.				
16	I take breaks from technology use to reduce feelings of stress or fatigue.				
17	I rely on institutional resources to help manage technology-related stress.				
	Perceptions of Institutional Support				
18	My institution provides adequate support and resources for learning new technologies.				
19	I receive enough training on how to effectively integrate technology into my teaching practicum.				
20	Technical support is readily available when I encounter issues with classroom technology.				

APPENDIX C

SEMI-INTERVIEW FOR PRE-SERVICE TEACHERS

Phase II: Qualitative Interview for Pre-Service Teachers

How would you describe the role of technology in your preparation as a teacher?

Follow-up: Do you feel this role has increased or decreased your stress levels?

How comfortable do you feel using technology in your practicum classroom?

Follow-up: Are there specific classroom technologies or instructional tasks that make you feel more stressed?

What are the primary sources of stress you experience when using technology in your practicum classroom?

Follow-up: Can you give specific examples of tools or instructional expectations that increase your stress??

Do you experience uncertainty about the effectiveness of technology in your practicum classroom?

Follow-up: How does this uncertainty affect your motivation to integrate new educational technologies??

In what ways do you feel technostress affect your motivation to integrate technology in your practicum classroom as a pre-service teacher?

Follow-up: How does this affect your ability to complete classroom tasks?

Do you feel your teacher education program provides adequate support for learning new educational technologies?

Follow-up: What additional resources or training would help you feel more confident using technology for both learning and teaching?