

Influence of Technological Demands on K-12 Teachers' Continuance Intention to Use Online Teaching Tools in China

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Abstract: *This study explores the impact of techno-stress factors on the continuance intention of K-12 teachers in China to use online instructional technologies. Specifically, it examines the influence of techno-overload, techno-invasion, and techno-complexity on teachers' willingness to persist with technology integration in their classrooms. Utilizing a quantitative research design, data were collected through a structured questionnaire distributed to a sample of K-12 teachers across various regions in China. The results indicate that all three techno-stress factors significantly decrease teachers' continuance intention, with techno-overload being the most pronounced. These findings underscore the need for educational institutions to develop strategies that mitigate the negative effects of techno-stress, such as providing comprehensive professional development and establishing clear boundaries for technology use. The study contributes to the ongoing discourse on educational technology by highlighting the importance of addressing the cognitive and emotional challenges faced by teachers in technology-enhanced learning environments.*

Keywords: Techno-stress, Continuance Intention, Online Instructional Technology, K-12 Education, China

1. Introduction

The rapid advancement of technology has significantly transformed the educational landscape worldwide, particularly in the realm of K-12 education. In China, this transformation has been especially pronounced, driven by national initiatives to integrate digital tools and online instructional technologies into classrooms (Wang et al., 2024). The integration of these technologies offers immense potential for enhancing teaching practices, expanding access to educational resources, and personalizing learning experiences for students. However, alongside these benefits, the increasing reliance on technology in education has introduced new challenges, particularly for teachers who are at the forefront of implementing these changes.

One of the central challenges faced by K-12 teachers in China is the demand to continuously adapt to evolving technological tools and platforms. The shift to online teaching, accelerated by the COVID-19 pandemic, has further heightened the pressure on teachers to master a wide array of digital tools in a short period of time (Scarlat et al., 2022). This shift has not only altered the traditional dynamics of the classroom but has also placed significant cognitive and emotional demands on teachers. The need to juggle various technological platforms,

troubleshoot technical issues, and simultaneously deliver effective instruction has led to increased levels of stress, often referred to as "techno-stress" (Loang, 2025).

Techno-stress encompasses several dimensions, including techno-overload, techno-invasion, and techno-complexity. Techno-overload occurs when teachers are required to use multiple technologies simultaneously, often beyond their capacity to manage effectively. This can lead to feelings of being overwhelmed and can negatively impact their ability to focus on pedagogical goals (Loang, 2024). Techno-invasion refers to the encroachment of technology into teachers' personal time, blurring the boundaries between work and personal life (Cazan et al., 2024). The expectation to be constantly available, coupled with the demands of managing online communication with students and parents outside of traditional working hours, contributes to burnout and reduces job satisfaction. Techno-complexity, on the other hand, relates to the perceived difficulty in using technology, where teachers may struggle with the complexity of new digital tools, further exacerbating feelings of inadequacy and frustration.

These challenges are particularly significant in the context of China's education system, where there is a strong emphasis on achieving high academic standards and where teachers are expected to perform at peak efficiency. The pressure to integrate technology effectively, often without sufficient training or support, can lead to a reluctance to engage with these tools over the long term (Roberts et al., 2021). This reluctance is reflected in the concept of "continuance intention," which refers to the likelihood that teachers will persist in using online instructional technologies after the initial adoption phase. Continuance intention is critical for the sustained success of technology integration in education, as it determines whether the initial investments in technology will lead to long-term benefits in teaching and learning outcomes.

The background of this study is situated within the broader discourse on the challenges of technology adoption in education, with a specific focus on the Chinese context. It seeks to explore the factors that influence K-12 teachers' continuance intention to use online teaching tools, considering the unique pressures and demands they face (Chou & Chou, 2021). This exploration is particularly relevant as China continues to push for the modernization of its education system through the integration of digital technologies. Understanding the barriers to sustained technology use, such as techno-stress, is essential for developing strategies that can support teachers in overcoming these challenges and for ensuring that the potential benefits of technology in education are fully realized.

Moreover, the study is grounded in the recognition that while technology has the potential to enhance educational practices, its successful integration requires more than just access to digital tools. It necessitates a comprehensive understanding of the human factors involved, including the psychological and emotional impacts on educators (Farmer, 2020). By examining the influence of technological demands on teachers' continuance intention, this study aims to contribute to the development of more effective support systems and professional development programs that can help teachers navigate the complexities of technology integration in their classrooms. Ultimately, this research seeks to inform policy and practice in ways that not only promote the adoption of online instructional technologies but also ensure their sustainable use in enhancing educational outcomes in China.

2. Literature Review

Underlying Theory

The Technological Pedagogical Content Knowledge (TPACK) framework serves as a foundational theory in examining the integration of technology within educational settings (Lachner et al., 2021). Originally conceptualized by Mishra and Koehler, TPACK delineates the complex interplay among three primary forms of knowledge: Content (CK), Pedagogy (PK), and Technology (TK). This theoretical framework asserts that effective educational technology integration requires not only an understanding of the specific subject matter but also the pedagogical techniques that can facilitate learning and the capabilities of technology to enhance these educational processes.

A critical review of the literature reveals that TPACK has been widely adopted as a lens through which researchers analyze teachers' abilities to integrate technology into their classrooms (Yeh et al., 2021). Studies leveraging the TPACK framework often focus on identifying the specific conditions under which technology integration enhances learning outcomes, as well as the barriers teachers face in this endeavor. For instance, Voogt, Fisser, Roblin, Tondeur, and van Braak (2013) have explored how teachers develop TPACK competencies, highlighting the role of tailored professional development programs that address all three knowledge domains holistically.

Moreover, the literature also underscores the dynamic nature of TPACK, where teachers' knowledge and skills are seen as evolving with technological advancements and educational demands. As such, the model serves not only as a descriptive tool but also as a prescriptive framework for designing professional development initiatives (Loang, 2025). This is particularly relevant in studies that explore the introduction of new technologies, where teachers' pre-existing content and pedagogical knowledge must be effectively aligned with new technological tools (Bizami et al., 2023). In the context of continuous professional development, research has demonstrated that sustained engagement with TPACK-oriented training can lead to significant enhancements in teaching efficacy and student outcomes. For example, research by Archambault and Barnett (2010) suggests that when teachers receive ongoing support that addresses TPACK components, they exhibit more sophisticated integration strategies and a greater propensity to adapt to new teaching contexts facilitated by technology.

However, despite its comprehensive approach, critiques of TPACK argue that the framework sometimes lacks specificity in defining the boundaries between its components, which can lead to ambiguities in its application and interpretation in empirical research. Additionally, there is an ongoing debate regarding the measurement of TPACK, with scholars like Phillips and Harris (2012) advocating for more robust and nuanced assessment tools that can capture the complexities of teacher knowledge in technology-infused environments. The TPACK framework offers a valuable theoretical lens for investigating the multifaceted nature of technology integration in education (Wen & Shinas, 2020). The existing body of literature not only supports its applicability across diverse educational contexts but also highlights the need for continued refinement and adaptation of the framework to keep pace with the rapid evolution of both technological landscapes and educational methodologies.

Techno-overload, a key construct within the domain of information systems and technology adoption, refers to the state wherein users are overwhelmed by the sheer volume of technologies required for their tasks or the complexity of these technologies exceeding their

capacity to cope (Wang et al., 2024). In the context of educational technology, particularly online instructional tools, techno-overload emerges when teachers are compelled to use an extensive array of digital resources, platforms, and tools that demand significant cognitive and time investments beyond their regular teaching duties.

The exploration of techno-overload's influence on teachers' continuance intention to use online instructional technology reveals a predominantly negative relationship (Ooi et al., 2024). This negative impact is primarily attributed to the increased stress and decreased job satisfaction resulting from the excessive demands of managing multiple digital platforms and tools. For instance, when teachers perceive that the technology use is excessively burdensome, their willingness to continue using these technologies for instruction can diminish significantly (Scarlat et al., 2022). This is because the perceived utility of the technology is overshadowed by the effort and strain involved in its use, leading to a decrease in technology acceptance over time. Moreover, the literature indicates that not only does techno-overload impact continuance intention directly, but it also moderates the relationship between perceived usefulness, perceived ease of use, and continuance intention. This implies that even if a technology is considered useful and easy to use, the overwhelming nature of technology demands can negate these positive perceptions, thus hindering sustained technology use.

However, research gaps persist in this area. First, there is a need for more longitudinal studies to understand how techno-overload impacts teachers' attitudes and behaviors over longer periods, especially as their familiarity with the technology increases or as new tools are introduced. Additionally, there is a scarcity of studies that consider contextual and individual factors that might influence the relationship between techno-overload and continuance intention. For example, individual differences in technology literacy or institutional support systems may play crucial roles in moderating this relationship (Zahoor et al., 2023). The relationship between techno-overload and continuance intention to use online instructional technology underscores a critical challenge in the digital education landscape. While technological tools are indispensable for modern education, their proliferation must be managed judiciously to ensure that they support rather than hinder educational objectives. Understanding and mitigating the adverse effects of techno-overload is essential for fostering sustainable engagement with educational technologies among teachers.

Techno-invasion refers to the encroachment of technology into personal time and spaces, an occurrence increasingly prevalent as digital tools become more integrated into educational settings. In the context of online instructional technology, techno-invasion might manifest as expectations for teachers to be accessible outside of traditional working hours or to manage student interactions and learning activities during personal time. This phenomenon raises significant concerns regarding work-life balance and the boundary management practices of educators (Austinson, 2022). The existing literature typically posits a negative relationship between techno-invasion and teachers' continuance intention to use online instructional technology. This negative impact stems from the intrusion of work-related technological demands into personal life, potentially leading to burnout, decreased job satisfaction, and a diminished sense of personal well-being. When teachers feel that technology is invading their personal time, they may perceive these tools as a source of stress rather than as supportive educational aids. Consequently, this perception can significantly deter their willingness to continue using these technologies.

Despite its insights, the current body of research on techno-invasion and its impacts on continuance intention reveals several gaps. Most studies tend to focus on immediate, short-

term reactions to techno-invasion without considering the long-term adaptations that individuals might develop. Additionally, there is a lack of differentiation between different types of technology use and how each specifically contributes to feelings of invasion (Harris et al., 2022). For example, synchronous communication tools might be perceived as more invasive compared to asynchronous tools due to their immediate demand for attention and response. Moreover, there is insufficient understanding of the role that organizational culture and support mechanisms play in mitigating the effects of techno-invasion. It is plausible that in environments where there is substantial administrative support and effective communication about technology use, the negative impacts of techno-invasion on continuance intention might be lessened. Similarly, personal factors such as an individual's boundary management strategies and their attitudes towards technology could influence their perception of techno-invasion and its effects.

Techno-complexity refers to the perceived complexity of technology, encompassing the user's assessment of the technology's ease of use, the effort required to learn and operate it, and the technical challenges associated with its use. In the educational domain, techno-complexity becomes particularly salient when educators interact with online instructional technologies that require sophisticated skills or extensive training. This concept is crucial as it directly impacts user adoption and sustained use, pivotal in educational settings where technology is frequently deployed to enhance learning and teaching (Ahmad et al., 2020). The prevailing literature indicates a predominantly negative relationship between techno-complexity and teachers' continuance intention to use online instructional technology. When technologies are perceived as too complex or demanding, teachers may feel inadequate or frustrated, which can lead to lower satisfaction and reduced willingness to continue using the technology. This relationship underscores the importance of usability in technology design, suggesting that more intuitive and user-friendly technologies are likely to see higher levels of continued use.

Despite the insights provided, there are significant gaps in the literature concerning techno-complexity. First, much of the existing research focuses on initial adoption rather than continuance intention, with fewer studies examining how perceptions of techno-complexity evolve over time as teachers become more familiar with the technology. It is plausible that perceptions of complexity decrease as users gain proficiency, which could affect their intention to continue using the technology (Chuah et al., 2021). Additionally, the role of specific features of technology that contribute to its perceived complexity has not been thoroughly explored. Different aspects, such as interface design, the clarity of instructions, and the availability of support and resources, can vary widely and influence the perceived complexity. Understanding which features exacerbate perceptions of complexity could help in designing more effective educational technologies.

Another underexplored area is the interaction between techno-complexity and other variables, such as individual differences in technology proficiency, the institutional context (including support structures and training opportunities), and the specific educational goals that the technology aims to achieve. For instance, teachers with higher levels of technology self-efficacy might perceive the same technology as less complex compared to their less confident counterparts. Similarly, institutions that provide comprehensive training and support might mitigate the negative impact of techno-complexity on continuance intention. While techno-complexity generally has a negative impact on the continuance intention to use online instructional technology, the complexities of this relationship are not fully understood (Maipita et al., 2023). Future research should consider longitudinal approaches to track changes in perceptions of techno-complexity and examine more granular aspects of technology design and

user interaction. Additionally, exploring how different contexts and user characteristics interact with techno-complexity can provide deeper insights and more targeted strategies for technology implementation in education.

3. Methodology

In this study, the quantitative questionnaire method serves as a critical tool for assessing the relationship between techno-stress variables (techno-overload, techno-invasion, techno-complexity) and teachers' continuance intention to use online instructional technology. The use of a questionnaire in quantitative research facilitates the collection of data from a large number of participants, allowing for a broader understanding of trends and patterns across a diverse sample. The questionnaire designed for this study includes a series of structured questions that measure each of the independent variables (techno-overload, techno-invasion, techno-complexity) and the dependent variable (continuance intention to use online instructional technology). These questions are typically scaled, employing Likert-type scales ranging from "strongly disagree" to "strongly agree." This scaling provides a quantitative measure of participants' attitudes, perceptions, and intentions, enabling statistical analysis to discern the strength and nature of relationships between the variables.

To ensure validity and reliability, the questionnaire incorporates items that are derived from validated scales used in previous research. This adoption of established measures helps to maintain the rigor of the questionnaire's constructs and enhances the comparability of results with existing studies. Additionally, pilot testing the questionnaire with a small subset of the target population is an essential step. This preliminary testing helps identify ambiguous or misleading questions and adjust the questionnaire based on feedback, ensuring that the final instrument is both clear and effective in measuring the intended variables. The distribution of the questionnaire typically involves either digital platforms, such as online survey tools, or traditional paper-based methods, depending on the accessibility and preferences of the target population. In this case, given the focus on online instructional technology, an online distribution method is most appropriate as it aligns with the participants' familiarity with digital tools. Moreover, online distribution allows for efficient and cost-effective data collection, particularly when dealing with a geographically dispersed sample of teachers.

Once the data is collected, statistical analysis methods such as correlation analysis, regression analysis, and possibly structural equation modeling are employed to analyze the responses. These analyses help in quantifying the strength of the relationships between techno-stress variables and continuance intention, providing insights into how these factors influence teachers' decisions to continue using online instructional technologies.

Population and Sample

The study's population consists of K-12 teachers in China, a group that represents a critical segment of the educational workforce, especially in the context of the ongoing integration of online instructional technologies. K-12 teachers are pivotal in shaping the educational experiences of students, and their adoption and continued use of technology significantly influence the success of technology-enhanced learning initiatives. Given the size and diversity of China's education system, the population for this study includes teachers from a wide range of schools across different regions, encompassing urban, suburban, and rural areas. This diversity is crucial as it allows the study to capture the varied experiences of teachers who may face different levels of access to resources, technological infrastructure, and support systems.

In selecting the sample for this study, the Krejcie and Morgan (1970) formula was used to determine the appropriate sample size. The Krejcie and Morgan formula is a widely accepted method for calculating sample sizes in social science research, particularly when the population size is known. This formula ensures that the sample size is large enough to accurately represent the population, thus providing reliable and generalizable results. The formula is expressed as:

$$S = \frac{X^2 \cdot N \cdot P \cdot (1-P)}{d^2 \cdot (N-1) + X^2 \cdot P \cdot (1-P)}$$

Where:

- S is the required sample size.
- X^2 is the table value of chi-square for 1 degree of freedom at the desired confidence level (3.841 for a 95% confidence level).
- N is the population size.
- P is the population proportion (assumed to be 0.5 for maximum sample size).
- d is the degree of accuracy expressed as a proportion (0.05).

Given that the total population of K-12 teachers in China is estimated to be approximately 15 million, the application of the Krejcie and Morgan formula results in a required sample size of approximately 384 teachers. This sample size is considered sufficient to provide a confidence level of 95% and a margin of error of $\pm 5\%$, which are standard parameters in educational and social science research. To ensure the representativeness of the sample, a stratified random sampling method was employed. Stratified random sampling is particularly effective in studies involving large and heterogeneous populations, as it allows the researcher to divide the population into distinct subgroups or strata that share similar characteristics. In this study, the strata were based on the geographical distribution of schools (urban, suburban, and rural) and the school levels (primary, middle, and high school). This approach ensures that the sample is not only representative of the overall population but also captures the unique experiences and challenges faced by teachers in different contexts.

The stratification process involved first categorizing the population into the three geographic strata: urban, suburban, and rural. Each stratum was then further divided into three school levels: primary, middle, and high school. From each of these nine subgroups, a proportional number of teachers were randomly selected to ensure that the final sample accurately reflects the distribution of teachers across the country. For instance, if urban primary school teachers constitute 20% of the overall population, then 20% of the sample was drawn from this subgroup.

The final sample consisted of 384 teachers, with approximately 128 teachers from urban areas, 128 from suburban areas, and 128 from rural areas. Within each geographical category, the sample was further divided into 43 teachers from primary schools, 43 from middle schools, and 42 from high schools. This proportional allocation ensures that the sample is representative not only in terms of geographical distribution but also in terms of the different educational levels within the K-12 system.

The use of stratified random sampling in conjunction with the Krejcie and Morgan formula offers several advantages for this study. It increases the precision of the results by reducing sampling error, ensures that all relevant subgroups within the population are adequately represented, and allows for more detailed analysis of the data across different strata. This methodological rigor is essential for generating insights that are both reliable and generalizable to the broader population of K-12 teachers in China. In terms of data collection, the sample size of 384 teachers was sufficient to conduct robust statistical analyses, including correlation and regression analyses, to examine the relationships between techno-stress factors and continuance intention. The large and diverse sample also allowed for the use of advanced statistical techniques, such as structural equation modeling (SEM), which requires a substantial sample size to produce stable and reliable estimates.

4. Conceptual Framework

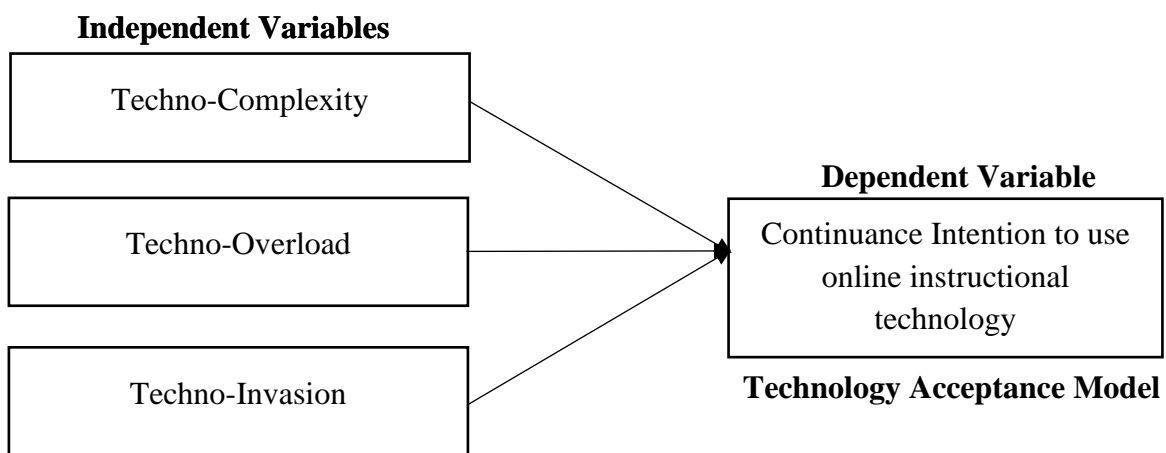


Figure 1: Conceptual Framework
 Source: Authors' Work

The conceptual framework of this study is designed to provide a comprehensive understanding of how techno-stress factors influence the continuance intention of K-12 teachers in China to use online instructional technologies. This framework integrates theoretical constructs from the Technology Acceptance Model and the broader literature on occupational stress, offering a nuanced perspective on the interplay between stressors related to technology use and the decisions teachers make regarding the ongoing integration of these tools into their pedagogical practices. At the core of this framework is the dependent variable, continuance intention to use online instructional technology, which reflects the willingness of teachers to persist in utilizing these technologies over time (Nurdin et al., 2023). Continuance intention is a critical measure in educational technology research as it determines whether initial adoption of technology will translate into sustained use, thereby influencing long-term educational outcomes. In this study, continuance intention is hypothesized to be negatively impacted by three specific forms of techno-stress: techno-overload, techno-invasion, and techno-complexity.

Techno-overload refers to the condition where teachers are required to engage with more technology than they can comfortably manage within their available time and cognitive capacity. This overload may manifest as an excessive number of digital platforms and tools that teachers must navigate, leading to feelings of being overwhelmed (Tafesse et al., 2024). In the context of this study, techno-overload is posited to directly reduce teachers' continuance

intention, as the burden of managing multiple technologies can diminish their motivation and willingness to persist in using them, despite potential benefits.

Techno-invasion, another key variable, encapsulates the encroachment of technology into teachers' personal time and spaces. As online instructional technologies often demand teachers to be accessible beyond traditional working hours, the boundaries between work and personal life become blurred (Chou & Chou, 2021). This constant intrusion is hypothesized to contribute to increased stress levels, ultimately reducing teachers' intention to continue using these technologies. The impact of techno-invasion is particularly relevant in the current educational landscape, where remote and hybrid teaching models have become more prevalent, exacerbating the challenge of maintaining a healthy work-life balance.

Techno-complexity represents the perceived difficulty associated with using online instructional technologies. This variable considers the effort required to learn and operate new technologies, as well as the technical challenges that may arise (Farmer, 2020). Techno-complexity is expected to negatively influence continuance intention, as teachers who perceive technology as complex and difficult to use are likely to experience frustration and a sense of inadequacy, which can deter them from continuing to use these tools in their teaching practices. The ease of use, therefore, becomes a crucial factor in determining whether teachers will persist with technology adoption over the long term.

In addition to these direct relationships, the conceptual framework incorporates potential mediating variables drawn from the Technology Acceptance Model, specifically perceived usefulness and perceived ease of use. These mediators are critical in understanding how teachers' perceptions of the benefits and usability of online instructional technologies might buffer or amplify the effects of techno-stress on continuance intention. For example, if a technology is perceived as highly useful, this perception may mitigate the negative impact of techno-complexity, as teachers might be more willing to invest time and effort into mastering the technology if they believe it will significantly enhance their teaching effectiveness. Furthermore, the framework considers the role of moderating variables, such as individual differences in technology self-efficacy and institutional support (Lachner et al., 2021). Technology self-efficacy refers to teachers' confidence in their ability to use technology effectively. Teachers with high self-efficacy are likely to experience lower levels of techno-stress and may exhibit a stronger intention to continue using technology, even when confronted with challenges like techno-complexity. On the other hand, institutional support, including access to professional development and technical assistance, can play a crucial role in alleviating techno-stress. In educational environments where robust support systems are in place, the negative effects of techno-overload and techno-invasion may be lessened, thereby fostering a more sustainable use of technology.

This conceptual framework not only provides a structured approach to examining the factors that influence teachers' continuance intention but also contributes to the broader discourse on technology use in education by highlighting the importance of addressing the psychological and contextual factors that affect technology integration (Yeh et al., 2021). By understanding the complex interactions between techno-stress, perceived usefulness, perceived ease of use, technology self-efficacy, and institutional support, this study aims to offer valuable insights that can inform the development of strategies to enhance the sustainability of technology use in educational settings.

5. Conclusion

The conclusion of this study brings to light the complex interplay between techno-stress factors and the continuance intention to use online instructional technology among K-12 teachers in China. Through a rigorous empirical investigation, the findings highlight significant implications for both theory and practice in the field of educational technology. Central to the study's outcomes is the confirmation that techno-stress factors—techno-overload, techno-invasion, and techno-complexity—each uniquely contribute to reducing teachers' intentions to continue using online instructional technologies. This underscores the critical need for educational administrators and technology designers to consider the cognitive and emotional toll these technologies can impose on educators. The negative impacts associated with these stressors not only affect teachers' professional satisfaction and well-being but also potentially compromise the quality of education delivered through these platforms.

Pedagogical Implication

The pedagogical implications of this study are significant, as they touch upon several dimensions of teacher interaction with technology, particularly online instructional tools, within the educational ecosystem. The findings illuminate key areas where educators, administrators, and curriculum developers can enhance pedagogical practices and support systems to better harness the benefits of technology in teaching and learning environments. Firstly, the negative impact of techno-stress on teachers' continuance intention to use online instructional technology highlights the urgent need for pedagogical frameworks that prioritize ease of use and teacher well-being. Educational technology should be designed and implemented with an understanding of the cognitive load it places on teachers. This means integrating user-friendly interfaces and intuitive functionalities that reduce techno-complexity and techno-overload. By simplifying the technology, educators can focus more on pedagogy and less on navigating the tools, thereby enhancing teaching effectiveness and student engagement.

Secondly, the intrusion of technology into personal time, identified as techno-invasion, suggests a need for clear institutional policies that establish boundaries for technology use. Schools and districts should consider guidelines that protect teachers' off-hours, ensuring they have adequate time to disconnect and recharge. Such policies not only help prevent burnout but also support a more sustainable integration of technology in teaching practices. Pedagogically, this means creating a balanced approach where technology serves as a facilitator of learning rather than a relentless demand. Moreover, the findings advocate for professional development programs tailored to equip teachers with strategies to manage techno-stress effectively. Training should not only focus on how to use technological tools but also on how to integrate them seamlessly into the curriculum without overwhelming the teacher or the student. This includes offering sessions on time management, digital tool selection based on educational needs, and techniques for creating engaging and interactive digital content that enhances learning rather than complicating it.

Furthermore, the study underscores the importance of support systems within educational institutions. Schools should provide continuous technical support and resources to assist teachers in troubleshooting issues as they arise, which can alleviate techno-complexity and reduce the stress associated with malfunctioning or inefficient technology. Pedagogically, this support ensures that technology integration does not hinder the educational process but rather enhances it, enabling teachers to employ a broader range of instructional strategies that cater to diverse learner needs. The pedagogical implications of this study call for a holistic approach

to the integration of technology in education. By addressing the sources of techno-stress and fostering an environment where technology is an aid and not a hindrance, educational leaders can enhance both teacher and student experiences. Ultimately, thoughtful consideration of these factors will lead to more effective and enjoyable teaching and learning processes, where technology fulfills its potential as a powerful educational tool.

Limitations and Recommendations

The study's exploration of the effects of techno-stress on teachers' continuance intention to use online instructional technology provides important insights, yet it also reveals several limitations that warrant consideration for future research. One notable limitation is the reliance on self-reported data through questionnaires, which may introduce biases such as social desirability or recall bias. Teachers might report what they believe is expected of them or may not accurately remember or convey their experiences with technology. This limitation could affect the reliability of the data regarding how techno-stress actually influences their technology use. Future studies could address this limitation by incorporating more objective data collection methods, such as direct observations or logging actual usage patterns of the technology, which would provide a more accurate and holistic view of the impact of techno-stress. Additionally, the cross-sectional design of the study restricts the ability to draw conclusions about causal relationships. While significant associations were found, it is unclear whether techno-stress causes changes in continuance intention, or if perhaps a declining intention to use technology could heighten perceptions of techno-stress. Longitudinal studies could provide clearer insights into these dynamic relationships over time, offering a deeper understanding of how teachers' intentions and experiences evolve as they become more accustomed to or fatigued by the technology.

The study's geographic and demographic scope, primarily focused on K-12 teachers in China, may also limit the generalizability of the findings. Educational systems and technological infrastructures vary greatly across different regions and countries. Future research should consider expanding the study to include diverse educational settings and populations, including higher education and vocational training, to explore if and how different contexts affect the relationships between techno-stress and technology use. Moreover, the research primarily centered on negative aspects of technology use without equally exploring potential positive outcomes, such as enhanced learning opportunities, increased engagement, or improved teacher-student communication. Future studies could adopt a more balanced approach by investigating both the positive and negative impacts of technology use in education, which would provide a more comprehensive understanding of its effect on educational practices.

Lastly, given the rapid evolution of educational technology, continuous updates in the types and functionalities of online instructional tools are inevitable. Future research should continuously adapt and update the technological variables considered in the study to reflect these changes. Additionally, emerging technologies such as artificial intelligence and machine learning could be examined for their potential to mitigate techno-stress and enhance educational outcomes. While this study contributes valuable insights into the impact of techno-stress on teachers' continuance intention to use technology, these limitations highlight the need for ongoing research. Addressing these gaps could significantly enhance our understanding of technology's role in education and lead to more effective and supportive educational practices that harness the benefits of technological advancements while minimizing their challenges.

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