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Embracing the Future: An Investigation into Teacher Educators' Acceptance of Generative AI in Educators Preparation Programs

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Abstract

This study explored teacher educators' acceptance and perceptions of using generative artificial intelligence (GenAI) in their practices, particularly with preservice teachers. Guided by the Technology Acceptance Model Plus Plus (TAM++), this study utilized a comprehensive survey methodology to investigate perceived usefulness (PU), perceived ease of use (PEU), attitudes toward using GenAI, and GenAI frequency of use. Emerging literature underscores the necessity of integrating GenAI into teacher education, highlighted by reflections from the National Technology Leadership Summit (NTLS). The study used an 18-item survey that included a Likert scale and open-ended questions. Preliminary findings indicate excellent reliability and validity for the TAM++ instrument. Fifty-three teacher educators from across the US responded to the survey. Results showed that teacher educators perceived the usefulness of GenAI significantly higher than the perceived usefulness of their preservice teachers. At the same time, there was no difference in the ease of use factor. We calculated a difference in the score between GenAI orientation and GenAI concern, which revealed a bimodal distribution, with 30.02% of teachers showing more concern than positive orientation. Finally, a stepwise regression predicting the frequency of GenAI use showed only one predictor AI Orientation was significant $F(2,52)=46.80$ $p<.001$ $R2=.479$. As GenAI continues to evolve, it is imperative that educational stakeholders critically assess and address the concerns of teacher educators to foster an environment that supports effective and beneficial integration of AI technologies. Ensuring that teacher educators are well-informed and consider ethical and pragmatic elements of GenAI will be crucial in maximizing its potential benefits in teacher education. Future research should continue to explore these

dynamics as GenAI becomes increasingly embedded in educational contexts, with a focus on developing strategies to enhance acceptance and optimize instructional outcomes.

Keywords: e-learning; artificial intelligence; TAM, teacher education; educator preparation programs.

Introduction

Since the launch of ChatGPT in November 2022, the awareness that artificial intelligence (AI) technologies are reshaping the world in profound ways has come to the fore. The advent of Generative AI (GenAI) launched a hype cycle around potential impacts on teaching and learning while raising ethical concerns and challenges.

Because GenAI technologies are still new in teacher education, it is not yet clear how fast and how deeply teacher educators will integrate GenAI. Moreover, researchers do not know much about how teacher educators prepare their preservice teachers (PSTs) for integrating GenAI into their future classrooms. Guided by the Technology Acceptance Model (TAM), we developed a survey to examine teacher educators' perceptions and acceptance of GenAI technologies in the United States in Spring 2024. The researchers asked,

1) How do teacher educators accept using GenAI?

2) How do teacher educators perceive using GenAI with preservice teachers?

Theoretical Framework

The researchers rooted the work in the Technology Acceptance Model (Davis, 1989, 1993), which is a common framework for understanding users' potential acceptance or rejection of any given technology. There are four basic constructs in TAM (Davis, 1989): *perceived usefulness, perceived ease of use, attitude toward using,* and *actual system use*, in which the *attitude* of a user toward the system is a determinant of whether the user will use or reject the system. *Perceived usefulness* (PU) refers to the degree to which an individual believes that using a particular system would enhance his job performance, and *perceived ease of use* (PEU) is the degree to which an individual believes that using a particular system would be free of physical and mental effort (Davis, 1986). According to TAM, PU and PEU jointly determine attitude (A).

With its broad applications, TAM has developed into many different versions, such as TAM++, a term used to refer to the studies that extend the original TAM by adding constructs (Granić & Marangunić, 2019). In this current study, the researchers employed TAM++ to guide the study, develop the survey items, and analyze the survey results to explore teacher educators' perceptions and acceptance of GenAI in teaching and working with PSTs.

Literature Review

GenAI use in education has been reported in multiple educational contexts, such as early childhood (Su & Yang, 2023; Yang et al., 2023), elementary (Ng et al., 2022), high school (Ng et al., 2023), and higher education (Bradley et al., 2024; Ivanov et al., 2024; Shoffner, 2023; Yusuf et al., 2024). These studies proposed frameworks for AI literacy (Ng et al., 2023), highlighted the power and agency of teachers in applying GenAI (Shoffner, 2023), and shared concerns about the use of GenAI in education (Yusuf et al., 2024). For example, Trust et al. (2023) listed the potential use of ChatGPT to support teaching, student assessment, teacher-parent-student communication, and personalized learning. Meanwhile, the risks of using ChatGPT included the credibility of its output (sometimes referred to as hallucinations), protecting personal data, widening the digital divide, and privileging AI-generated text that has established biases because it is trained in English and incorporated existing cultural, racial, and gender stereotypes and untruths (Rettberg, 2023).

Teacher Educators and GenAI

Literature on teacher educators' perceptions and use of GenAI is burgeoning. Authors have analyzed trends for AI's usage in assessment, tutoring, and learning (Crompton & Burke, 2023), and edited symposia on what AI means for English Language and Arts Education (Shoffner, 2023). Similarly, as ELA teacher educators, Behizadeh and colleagues (2023) shared their reflections on the promise and perils of GenAI. Frambaugh-Kritzer and Petroelje (2024) conducted a self-study and selected Pi.ai to compare AI and human feedback. Their results demonstrated that AI tools could complement human critical friends but not replace them. Bradley et al. (2024) believed that educators in higher education should broaden their view of AI and consider the equity issues aroused by the integration of GenAI. By challenging and redefining these dominant paradigms, educators can envision AI as a more integrated and supportive element of the broader educational landscape.

Educational studies have used the TAM framework to examine teacher educators' acceptance of various technologies, including different digital tools and e-learning contexts (e.g., Bower et al., 2020; Fathema et al., 2015; Granić & Marangunić, 2019; Scherer et al., 2019; Siyam, 2019; Yuen et al., 2008). However, studies about teacher educators' perceptions of using GenAI under the TAM framework are still limited.

Darayseh (2023) used TAM to examine science classroom teachers' acceptance of GenAI in Abu Dhabi. The results of the study revealed that science teachers had a high level of acceptance of these technologies. Their perceived ease of use positively impacted their perceived usefulness and attitude toward using GenAI in their classrooms. In a more recent study with PSTs in an elementary literacy course, Yang & Appleget (2024) found that the prior experiences with GenAI did not guarantee their intentions for using the chatbots in the future but the higher the PSTs rated their experience, the higher chances that they would use GenAI in their classrooms.

Given the lack of published research, this study explored teacher educators' attitudes toward and concerns about using GenAI in the context of teacher education and preparation

programs in higher institutions. The current study answered the call of Behizadeh et al. (2023) for in-depth exploration and more concrete data to interrogate what GenAI learning means and what the role of teacher educators is in the age of GenAI technologies. The results of the current study will contribute to the literature on teacher educators' acceptance of GenAI within the framework of TAM++.

Methodology

This study began when the first two authors came together to explore issues of GenAI. Their joint interest in how GenAI may impact literacy teaching and learning, in general, led to collaborations on the current study. The purpose of the present research project was to discern teacher educators' acceptance of employing GenAI in teaching and teacher preparation.

Survey Development

Together, the researchers developed a survey with 5-point Likert scale questions and two open-ended questions based on the domains of TAM++. The 18-item survey collected the respondents' demographic, institutional, and teaching experiences as well as their perceived ease of use, perceived usefulness, attitude towards using GenAI, and actual use of GenAI in teaching and teacher preparation. The survey was a combination of a 5-point Likert scale (1-strongly disagree, 2-disagree, 3-neutral, 4-agree, and 5-strongly agree), multiple-choice, and open-ended questions. Each researcher secured IRB approval following their institutional guidelines.

The survey went through an iterative process. In phase one, the researchers met via Zoom conferencing to discuss and create initial survey questions. During the virtual meetings, the researchers aligned the survey items to the domains of TAM++ and research questions. The researchers then used Qualtrics for ease of distribution and analysis. In phase two, the two researchers triangulated the items to reach an agreement to make sure they validly fit the theoretical framework. To further establish validity the researchers conducted a pilot survey with five instructors in teacher education in three different higher institutions. They provided additional input on the clarity of the survey items and the ease of completing the survey. The researchers discussed comments received from the pilot study and in some cases, they made changes to improve the survey questions.

In phase three, the survey via a listserv of teacher education associations beginning in March 2024, such as the Literacy Research Association. A call was emailed through TERSG through the Literacy Research Association. The recruitment information was posted on various study groups on Facebook to expand the response rates. In addition, the researchers distributed hard copies of the survey at the conference of the American Educational Research Association (AERA) and the American Association of Colleges for Teacher Education (AACTE). Consistent with snowball sampling procedures (Coffey & Atkinson,

1996) faculty and graduate student participants were encouraged to share the survey link with colleagues that met the survey requirement.

Participants

Fifty-three participants from 19 States in the United States completed the survey, with all items answered as data points. Of the participants 81.1% were from public 4-year universities, 16.7% were from private 4-year institutions and one was from a graduate-only institution. Rank distribution included 30.2% as Assistant professors, 24.5% as associate professors, and 22.6% as full professors. The remaining were lecturers or instructors 15.1% and graduate teaching assistants 7.5%. Areas of teacher preparation included 72.1% Elementary, 41% Secondary, 39.3% Early childhood education, 18% Special Education, and 11.5% other. The total far exceeds 100% since many teacher educators taught in multiple preparation programs. The median years of experience teaching in K12 systems was 9.5 years, while the median experience in teacher education was 8.5 years. Only one of the respondents taught an educational technology class during the year before completing the survey.

Respondents were 75.5% female, 20.8% male, and 3.8% preferred not to disclose. Racial self-identification included 71.7% white, 18.9% Asian American, 3.8% Black, 3.8% Hispanic, and 1.9% preferred not to disclose.

Results

Table 1 reports descriptive statistics for each subscale of the TAM++. Internal consistency values for the five subscales were within the accepted range except for Perceived Ease of Use of GenAI for Pre-service Teachers. The low reliability of Perceived Ease of Use of GenAI for Pre-service Teachers may result from a ceiling problem visible in the lower SD for this measure.

	Mean	SD	Reliability
Perceived Usefulness of GenAI	3.8	.8	.93
Perceived Usefulness of GenAI for PSTs	3.6	.8	.88
Perceived Ease of Use of GenAI	3.5	.8	.90
Perceived Ease of Use of GenAI for PSTs	3.5	.5	.62
Attitudes toward Using GenAI	3.6	.8	.83
Concerns about Using GenAI	2.8	.8	.79

Table 1: Descriptive Statistics for Five Subscales of TAM++

The correlations showed that the perceived ease of use of Generative AI for instructors and their students was only moderately correlated with other measures. These measures were not significantly associated with frequency of use, showing that ease of use is not a critical factor for this specific technology.

Next, the researchers examined the effect of participants' attitudes toward using Generative AI based on the TAM++ model on the frequency of use in their professional practice. The dependent variable (Generative AI use frequency) was regressed on the TAM attitude constructs, including concerns about AI using a stepwise regression procedure appropriate for a new domain without previous research. One variable emerged as the sole predictor, Attitudes toward using AI, $F(1, 52)=38.43$, $p<.001$, which indicates that the factor under study has a significant relationship to Generative AI use frequency. Moreover, the R2=.425 depicts that the model explains 42.5% of the variance in Generative AI use frequency. The coefficients were further assessed to ascertain the influence of attitudes toward using Generative AI tools on the criterion variable (GenAI use frequency). The results revealed that attitudes toward using Generative AI tools significantly and positively impacted the frequency of GenAI use ($B=.939$, $t=6.20$, $p<.001$).

Variable	**1**	**2**	**3**	**4**	**5**	**6**
1 Perceived Usefulness	1					
2 Perceived Usefulness for PSTs	.79**	1				
3 Perceived Ease of Use	.15	.21	1			
4 Perceived Ease of Use for PSTs	.27*	.27*	.45**	1		
5 Attitudes toward Using	.79**	.72**	.37**	.32*	1	
6 Concerns toward Using	-.58**	-.62**	-.39**	-.24	-.72**	1
7 Usage Frequency	.60**	.58**	.25	.15	.65**	-.44**

Note. *p < .05, **p < .01

Table2: Correlations of TAM++ Components

The researchers then examined the differences between three pairs of constructs. The first was the evaluation of perceived usefulness for teacher educators and their estimation of its usefulness for PSTs. The second was comparing ease of use for both groups. Finally, the researchers compared attitudes towards use to concerns about AI. The paired sample t-test conducted for comparing participants' perceived usefulness of Generative AI tools and their PSTs' perceived usefulness of Generative AI tools revealed a significant difference $t(54)=3.59$, $p<.001<.05$, 95% CI [.11, .39]. The effect size, as measured by Cohen's d, was $d=0.48$, indicating a moderate effect.

The paired sample t-test conducted to compare participants' perceived ease of use of Generative AI tools and their PSTs' perceived ease of use of Generative AI tools revealed a non-significant difference $t(53)=-.087$, p=ns, 95% CI [-.22, .20].

The paired sample t-test conducted for comparing participants' attitudes toward using Generative AI tools and their concerns about it revealed a significant difference $t(53)=4.049$, $p<.001<.05$, 95% CI [.44, 1.31]. The effect size, as measured by Cohen's d, was $d=.55$, indicating a moderate effect.

Discussion

The emergence of GenAI and its burgeoning applications in different educational settings indicate a pressing need for research studies to address GenAI's acceptance in education, its educational affordances, and educators' attitudes toward GenAI. The present study was conducted to explore teacher educators' acceptance of GenAI and their perceptions of using GenAI for instructor use and with their PSTs.

This study's results indicated that ease of use was rated very high for emerging technology and thus is not likely to be a limiting factor for the teacher educators' intention of using GenAI. Teacher educators likely found GenAI easy to use because hardware and bandwidth infrastructure are already available. Additionally, the interface using text or speech without the boundaries of a specific programming language makes the technology immediately and robustly accessible. This result is consistent with the findings of previous studies (Darayseh, 2023; Yang & Appleget, 2024) that AI-powered chatbots are perceived to be easy to use.

The easy access to AI-powered chatbots removes the barriers of technology requirements from its users, teacher educators, and PSTs alike. Unlike other technologies (e.g., LMS or XR) for which teacher educators may need training before using (Scherer et al., 2019; Yuen et al., 2008), GenAI requires little prerequisite knowledge. According to Mishra and colleagues (2023), GenAI technologies possess two unique features: generative and social. The social feature, in particular, facilitates easy collaboration, making it simpler for users to interact and work with the technologies.

The results of the survey also suggested a significant positive relationship between the attitude towards GenAI and the frequency of GenAI usage, indicating the more positive attitude of the teacher educators towards these AI-powered tools, the more they will use them. This positive correlation means that fostering teacher educators' positive attitudes towards AI-powered tools may increase GenAI use. Ivanov et al.'s (2024) study explored effective factors in employing GenAI and found similar results in higher education instructors. Their findings underscored the significant role of positive attitudes and perceived ease of use in lecturers' confidence in efficiently using GenAI tools in higher education settings. As teacher educators become more receptive to GenAI technologies, they will likely integrate these tools more frequently into their teaching practices, enhancing their PSTs' learning experience and potentially improving educational outcomes.

Moreover, teacher educators' positive attitudes and enhanced experiences can drive transformative changes in teacher education by developing innovative teaching methods, personalized learning experiences, and more inclusive curricula, as suggested by Bozkurt and colleagues (2024). It can also equip PSTs with essential skills to leverage AI in their future classrooms, advancing technological integration in education. Embracing AI tools of the teacher educators and PSTs can ultimately lead to a more dynamic, responsive, and effective educational environment.

The present study explored concerns about GenAI in teacher education. The results showed that concerns about using GenAI were moderately negatively correlated with attitudes. This correlation may be underestimated because of attenuation (Trafimow, 2016), but it may also indicate that some of the respondents can be both concerned and consider GenAI positively. Ivanov et al. (2024) indicated that lecturers were not highly concerned about the issues

involved in using GenAI, such as bias and data security, in educational settings. Similarly, in this study, teacher educators' positive attitudes toward using GenAI outweighed their concerns and hesitations about adopting these tools in their teaching practice.

Conclusion and Implications

The emergence of GenAI in education underscores the need for research on its acceptance, educational benefits, and educators' attitudes. This study explored teacher educators' acceptance of GenAI and their perceptions of its use for themselves and their PSTs. Results showed that ease of use was highly rated, suggesting that the technology's accessibility, supported by existing infrastructure and user-friendly interfaces, encourages adoption. The study also found a significant positive relationship between positive attitudes towards GenAI and its usage frequency, indicating that fostering positive attitudes is related to GenAI use. Previous research supports these findings, highlighting that ease of use and positive attitudes boost confidence and integration of AI tools in teacher education. Positive attitudes towards GenAI may drive innovative teaching methods, personalized learning, and inclusive curricula, ultimately enhancing PSTs' skills in leveraging AI. Despite moderate concerns about GenAI, such as bias, data security, and privacy, positive attitudes outweighed hesitations, aligning with findings from previous studies. This suggests that while concerns exist, they do not significantly hinder the adoption of GenAI in teacher education.

The present study has some limitations. The small sample size of 55 teacher educators from the U.S. higher education institutions may limit the generalizability of the results. The ever-changing nature of GenAI and its evolving educational applications can be considered as other factors which impact the attitudes of teacher educators toward this technology. Future studies could collect data in different time points to gain more insights on teacher educators' attitudes toward nuances of GenAI tools in learning environments. With the increasing prevalence of GenAI, there is a need to investigate additional factors, such as academic achievement and critical thinking, that can enhance its adoption by teacher educators.

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