OmniaScience

Journal of Technology and Science Education

JOTSE, 2025 – 15(3): 662-678 – Online ISSN: 2013-6374 – Print ISSN: 2014-5349

https://doi.org/10.3926/jotse.3652

THE IMPACT OF PRESSURE FROM BEING REPLACED BY ARTIFICIAL INTELLIGENCE ON THE CAREER ACTIVITIES OF PRE-SERVICE TEACHERS

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Received June 2025

Accepted November 2025

Abstract

The rapid advancement of artificial intelligence (AI) has raised concerns about job displacement, particularly among pre-service teachers. This study examines the perceived pressure of AI replacement, self-awareness in relation to AI, educational policies and training, and career activities among pre-service educators. A survey of 680 pre-service teachers from three Vietnamese universities was conducted, with data analyzed using SPSS and AMOS. Results indicate that self-awareness and educational policies significantly influence perceived replacement pressure, which in turn impacts career activities. Additionally, gender and academic year contribute to variations in perceived pressure, with female and fourth-year students experiencing higher levels. These findings highlight the need for AI literacy integration in teacher training programs to mitigate anxiety and enhance AI preparedness. The study contributes to the discourse on AI in education by identifying key factors affecting pre-service teachers' adaptation and proposing solutions for effective AI integration in teacher training.

Keywords **–** AI literacy, AI interaction education, Artificial intelligence, Pre-service teachers, Career activities.

To cite this article:

Duc, N.M., Trang, V.T., Tuoi, T.T., Hanh, P.T.H., & Tuan, N.M. (2025). The impact of pressure from being replaced by artificial intelligence on the career activities of pre-service teachers. *Journal of Technology and Science Education,* 15(3), 662-678. https://doi.org/10.3926/jotse.3652

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1. Introduction

In the context of strategic development competition among countries today, international relations are undergoing significant changes, the global economy is weakening, and the 4.0 industrial revolution is profoundly affecting all nations and aspects of life and society. The process of globalization is slowing down and experiencing considerable adjustments (Verde, 2017). Emerging issues have become increasingly complex and difficult to resolve, highlighting the need for skills to tackle new challenges and a deep

understanding of how to address the nature of solving complex problems has evolved over the past few decades thanks to advances in computer science, artificial intelligence (AI), and cognitive psychology (Berg, Raj & Seamans, 2023; Joksimovic, Ifenthaler, Marrone, De-Laat & Siemens, 2023). The term "AI" can be understood as "AI is a technical system that uses data and processes it to make decisions. AI can enhance human autonomy" (Chatila & Havens, 2019; McCarthy, 2007; OECD, 2019).

Given its superior development capabilities, AI is increasingly being applied in various fields (DeBello, 2024; Jeong, Mallard, Coombe & Ward, 2023; Cuddy, 2021; Choi, Hickman, Monahan & Schwarcz, 2023). With its learning and adaptation skills to user needs, coupled with a massive database system, AI can perform many of a teacher's tasks with superior speed and efficiency (Autor, 2024; Tambuskar, 2022; Rangavittal, 2024; Sultan, 2023). AI also has a distinct advantage in continuously interacting with learners and adjusting data to suit their needs, making the learning process more personalized and creating a positive learning experience (Rahman & Watanobe, 2023; Rasul, Nair, Kalendra, Robin, de-Oliveira-Santini, Ladeira et al., 2023; Ruwe & Mayweg-Paus, 2023; Zhu, Sun, Luo, Li & Wang, 2023).

With the emergence and continuous development of AI, many predictions suggest that AI will replace many jobs and allow computers to dominate the world (Kankanhalli, 2020). Interaction with AI also leads to increased trust in it, resulting in the tendency to view AI as a benchmark for evaluation and comparison, leading to fear of being replaced among humans (Granulo, Fuchs & Puntoni, 2019). Whether AI development will replace the jobs of pre-service teachers is becoming a concern. Numerous studies have directly explored the concern of AI potentially replacing teachers (Douali, Selmaoui & Bouab, 2022; Fitria, 2023; Selwyn, 2019). These studies imply that AI development is replacing teachers' jobs, an objective factor impacting the pressure of replacement felt by pre-service teachers. However, teachers and pre-service teachers need to be clearly aware of the irreplaceable role of humans in education – the ability to create emotional connections, creativity, and the ability to assess personalized learning needs, which machines can hardly fully meet. These studies have not clarified the pressure of being replaced by AI on pre-service teachers. Addressing this research gap, the present study aims to investigate the degree of pressure experienced by pre-service teachers concerning the perceived threat of being replaced by AI. It also clarifies the superior development of AI and its multifaceted, multi-dimensional impacts on education in general and the career activities and career preparation process of students in particular based (Crawford, Cowling & Allen, 2023; Day, 2023; De-Castro, 2023; Farrokhnia, Banihashem, Noroozi & Wals, 2024; Lee, 2023; Rudolph, Tan & Tan, 2023; Su & Yang, 2023). This research seeks to address three main questions:

1. How do factors influence pre-service teachers' pressure of being replaced by AI?
2. How do factors influence pre-service teachers' career activities?
3. What solutions can help pre-service teachers overcome the pressure of being replaced by AI?

By answering these questions, the study aims to provide a foundation for future research, offer insights for teacher training institutions to refine output standards and training programs, and guide policymakers in developing policies to minimize professional pressures on pre-service teachers in the future.

2. Literature Review

2.1. Replacement Pressure

In the realm of contemporary education, the incorporation of AI into the professional practices of educators is steadily emerging as an essential trend. This requires that pre-service teachers cultivate skills and thoroughly prepare for their professional journeys. For effective collaboration with AI, students must possess digital skills and technological knowledge, as well as critical thinking and creativity in applying technology (Trust, Whalen & Mouza, 2023). It is essential for students to improve their awareness, skills, vision, and ethics regarding the use of AI in education, in order to better prepare themselves for the integration of AI into educational activities (Wang, Yu & Huang, 2022). This approach not only boosts

the confidence of pre-service teachers in utilizing AI for instruction but also prepares them for a job market where AI's integration is inevitable.

Within the realm of artificial intelligence, the "Level of Replacement Pressure" denotes the psychological stress index (spanning from low to high) encountered by pre-service teachers when they sense that their prospective career roles could be supplanted by AI (Cohen & Williamson, 1988). Yikealo, Yemane and Karvinen (2018) defines a stressor as any factor that obstructs or diminishes a person's capacity to adjust, or that provokes a response in their body or mind. Causes may arise from a variety of factors, including environmental, psychological, biological, and social influences. These can have either negative or positive effects, depending on the individual, the duration and intensity of stress, personal characteristics, cognitive evaluations of stress, and the availability of social support. Our evaluation indicates that the concern regarding "pressure of being replaced by AI" constitutes a form of psychological stress shaped by two primary influences: subjective and objective factors.

2.2. Career Activities

For pre-service teachers, "career activities" refer to their primary tasks and engagements while studying at universities or colleges. Some career activities of pedagogical students include: studying in class, participating in internships, participating in extracurricular activities, participating in seminars, training, scientific research, tutoring, etc. The main goal of these activities is to improve knowledge and professional skills in pedagogy, besides developing teachers' professional qualities and practicing practical skills in teaching, and further learning about the educational environment and the reality of teachers' work. In the context of modern education, the integration of AI has become an inevitable trend, significantly influencing the career activities and career development of pre-service teachers. To cooperate and work effectively with AI, students need to be equipped with digital skills and technological knowledge, as well as critical thinking and creativity in using technology (Trust et al., 2023). Students also need to enhance their awareness, skills, vision, and ethics in using AI in education, to increase their readiness to integrate AI into educational activities (Wang et al., 2022). This not only helps pre-service teachers feel more confident when using AI in teaching but also prepares them for a labor market where the presence of AI is inevitable.

Beyond technical preparation, career activities also emphasize the need for innovative teaching approaches that integrate AI tools into practice (Bekdemir, 2024). In modern education, AI helps pre-service instructors access advanced teaching tools, improving their abilities and confidence. AI also helps optimize the process of student assessment, predict learning outcomes, and support personalized teaching. All of these factors contribute to creating a solid foundation for the future careers of pre-service teachers, while preparing them to face both the challenges and opportunities of the future.

2.3. Self-Awareness Compared to AI

According to Lazarus, pressure only occurs when an individual perceives that an event could harm them. Some studies suggest that AI mimicking human interactions can make people feel excluded or push them to interact more effectively in cognitive tasks. They argue that this is why AI stimulates people to compare their performance and abilities, with AI gradually becoming a standard in comparison processes. Such perceptual comparisons can lead to consequences, particularly affecting the fear of being replaced and job performance (Granulo et al., 2019; Nam, 2019).

The findings indicate that pre-service teachers primarily feel the pressure of being replaced by AI when comparing their own abilities to those of AI (Hur, 2025). This means the pre-service teachers recognizes AI's superior development and fears they might be replaced in the future. Consequently, self-awareness compared to AI emerges as a key factor contributing to the pressure of being replaced. In this study, "self-awareness compared to AI" is understood as the reflection of an individual's thoughts, emotions, and attitudes when comparing themselves to AI.

2.4. Education and Training Policies

In practice, how AI will be applied in teaching, the teacher's role, the necessary skills for teachers to apply AI in teaching, and the organization of training courses on AI knowledge are tasks for policymakers. Generally, the influence of AI on education is partly determined by education and training policies. Previous studies indicate that policies encouraging AI applications in teaching not only provide positive support but can also have negative consequences for teachers, implying changes in teaching methods or imposing pressure to acquire technological skills, which can lead to physical, social, and psychological issues (Banerjee & Banerjee, 2023; Fernández-Batanero, Román-Graván, Reyes-Rebollo & Montenegro-Rueda, 2021; Konecki, Baksa & Konecki, 2024).

A report on "The Impact of Educational Technology on Teachers' Stress and Anxiety" found that most technostress (stress related to technology implementation) in teachers stems from a lack of training on educational technology and fear of new developments, with 50% attributed to a lack of training and education on technology. The study concluded that "the key to mitigating and solving this issue lies in technology skills training" (Fernández-Batanero et al., 2021). Many studies agree that technological pressure on teachers largely comes from a lack of educational policies and training related to technology training for teachers (Hassan, Yaakob, Mat-Halif, Abdul-Aziz, Abdul-Majid & Sumardi, 2019; Jena, 2015; Revilla-Muñoz, Alpiste-Penalba, Fernández-Sánchez & Santos, 2016). Based on these studies, our research team concludes that education and training policies are an objective factor leading to the pressure of being replaced among pre-service teachers. In this context, "Educational policies and training" encompass the objectives and directions established in education and training that are associated with the integration of AI.

2.5. The Development of AI Replacing Teacher Jobs

"AI replacing teaching" refers to the development of AI algorithms that enable automation, enhance processing capabilities, and perform various roles and tasks traditionally carried out by teachers. In the context of this research, the emergence and continuous development of AI are evaluated as events that could cause the pressure of being replaced. The question of AI development has become a contentious issue, especially in recent years, with many pessimistic forecasts in the media suggesting AI will replace numerous jobs and allow computers to dominate the world (Kankanhalli, 2020). As AI continues to evolve and perform effectively across various fields, engagement with AI cultivates trust, resulting in a propensity to regard AI as a standard for assessment and comparison, hence exacerbating the anxiety of potential obsolescence due to AI (Granulo et al., 2019). Research has investigating AI's capacity to replace teaching positions (Douali et al., 2022; Fitria, 2023; Selwyn, 2019). The research indicate that most survey participants voiced apprehensions regarding the future implementation of AI in education, especially in early childhood settings. These findings suggest that the emergence of AI as a substitute for teaching positions is a notable external factor exacerbating the anxiety of pre-service teachers regarding job displacement.

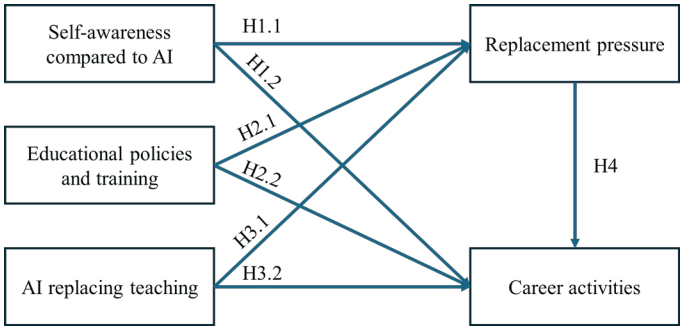

Figure 1. Proposed research model

Although AI-replacement pressure have been documented, empirical evidence on their effects on pre-service teachers' professional development remains limited. This gap is more pronounced where AI-related educational policies and training are implemented unevenly across institutions. To help address

this gap, the study proposes a research model to explore the factors influencing pre-service teachers' anxiety about job displacement due to AI. As illustrated in Figure 1. this research model serves as the basis for the hypotheses developed and tested in this study.

Hypotheses on factors affecting the pressure of being replaced by AI among pre-service teachers

- *H1.1: Self-awareness compared to AI positively affects replacement pressure;*
- *H2.1: Educational policies and training positively affect replacement pressure; and*
- *H3.1: AI replacing teaching positively affects replacement pressure.*

Hypothesis on the impact of AI replacement pressure on career activities in education

- *H4: Replacement pressure positively affects the career activities.*

Hypotheses on factors altering pre-service teachers' career activities under AI replacement pressure

- *H1.2: Self-awareness compared to AI positively affects the career activities.*
- *H2.2: Educational policies and training positively affect the career activities; and*
- *H3.2: AI replacing teaching positively affects the career activities.*

3. Method

3.1. Participants

Category	Subcategory	Frequency	Percentage
University	Hanoi National University of Education	371	54.6%
	Vietnam National University, Hanoi	159	23.4%
	Hanoi Pedagogical University 2	150	22.1%
Gender	Female	429	63.1%
	Male	251	36.9%
Year of Study	First Year	183	26.9%
	Second Year	173	25.4%
	Third Year	196	28.8%
	Fourth Year	128	18.8%
Living Area	Rural	218	32.1%
	Urban	377	55.4%
	Mountainous	85	12.5%
Major	Natural Sciences	281	41.3%
	Social Sciences	363	53.4%
	Others	36	12.5%
Academic Performance	Poor	15	2.2%
	Average	87	12.8%
	Fair	249	36.6%
	Good	216	31.8%
	Excellent	113	16.6%

Table 1. Demographic statistics of the survey sample

Following the guidelines of Hair, Anderson, Tatham and Black (1998), the minimum sample size for this study was determined to be five times the total number of observed variables. With 27 survey items (m = 27), this criterion translates to a required sample size of at least 135 respondents (n = 5*m), a standard widely accepted for factor analysis research (Knapp & Comrey, 1973). In this study, the research team determined a sample size of 680. significantly exceeding the minimum requirement. These 680 pre-service teachers, aged 18 to 22, include first-year to fourth-year pre-service teachers from three universities in Vietnam (Hanoi National University of Education, Hanoi Pedagogical University 2, and Vietnam National University, Hanoi). The characteristics of the survey sample are described in Table 1.

3.2. Instruments

The study employed a structured questionnaire to collect data on the key constructs in the proposed research model, including level of replacement pressure, self-awareness compared to AI, educational policies and training, AI replacing teaching, and career activities. Measurement items were adapted from previous studies to ensure contextual relevance. Additionally, newly proposed items developed by the research team were reassessed for reliability and clarity. The factors and statements are presented in Table 2.

Variable Name	Code	Statement	Reference
Replacement pressure	LRP1	You feel worried and confused when you have to use AI and apply it in your studies and research.	Cohen & Williamson (1988)
	LRP2	You feel anxious and stressed every time the media reports on the increasing development of AI technology.	
	LRP3	You lack confidence in your ability to solve difficult problems encountered when using AI.	
	LRP4	Future job opportunities are not unfolding as you hoped, and you feel fearful that AI may perform your future job better.	
	LRP5	You cannot cope with the difficult problems you encounter when using AI.	
	LRP6	You cannot control your stress/frustration while your career opportunities are gradually disappearing due to being replaced by AI.	
Self-awareness compared to AI	SAC1	I think that I cannot adapt and cope with the pressure of being replaced by AI.	Proposed by authors
	SAC2	I cannot develop AI skills.	
	SAC3	I do not have the necessary skills and knowledge to meet the requirements of teaching in the age of AI.	
	SAC4	I cannot control my emotions when faced with the pressure of being replaced by AI.	
	SAC5	I cannot do my job well without the help of AI.	
Educational policies and training	EPT1	The teacher training program is not providing knowledge about technology and AI to students.	Proposed by authors
	EPT2	There are no supplementary and developmental training courses on technology (AI), or students are not supported in developing skills to use technology and AI in teaching.	
	EPT3	The school's facilities are inadequate to support the use of technology (AI), or there are few opportunities to practice using technology (AI) in teaching and learning.	
	EPT4	The school does not encourage and support students to create projects or research that apply AI.	
	EPT5	The school is not integrating technology (AI) into the training program.	
AI replacing teaching	RT1	AI can replace teachers in creating and delivering teaching materials (lesson plans).	Proposed by authors
	RT2	AI can assist teachers in personalized teaching and provide academic counseling to individual students.	
	RT3	AI can develop curricula and participate in school management activities.	
	RT4	AI can replace teachers in managing learning data and analyzing students' learning data.	
	RT5	AI can grade assignments, conduct tests, evaluate, and manage students.	

Variable Name	Code	Statement	Reference
Career activities	CA1	I have clear plans and goals in my studies and work (e.g., learning English, computer science, technology, etc.).	Lazarus & Folkman (1984)
	CA2	I try to do something to relieve negative emotions caused by the pressures of technology or feeling left behind by technology.	
	CA3	I share and confide in those around me about my concerns that AI could replace my teaching job.	
	CA4	I accept that AI is developing rapidly and that my profession might be replaced.	
	CA5	I try to look at the positive aspects that AI can bring to help me and apply them in my studies or work.	
	CA6	I take time to reflect on myself and reassure myself about my future.	

Table 2. Factors and statements used in the research model

3.2.1. Measuring the Pressure of Being Replaced in the Education Profession

The Perceived Stress Scale (PSS) (Cohen & Williamson, 1988) was used to assess replacement pressure, measuring individuals' perceptions of unpredictability, uncontrollability, and overload in their lives. This validated tool, grounded in Lazarus and Folkman's stress framework (1984), is widely applied in stress assessment. To align with the study's AI-replacement context, core scale items were retained while refining phrasing. Four overlapping items were removed to reduce participant fatigue. The revised six-item scale was reviewed by experts and demonstrated high reliability (Cronbach's Alpha = 0.906), exceeding the 0.6 threshold (Hair, Black, Babin & Anderson, 2009).

3.2.2. Measuring the Career Activities of Pre-Service Teachers

This study assessed career activities using Lazarus and Folkman coping strategies framework, which defines two stress-coping approaches:

- Problem-focused coping: Concentrating on changing the stressful situation; and
- Emotion-focused coping: Concentrating on managing one's emotional response to the situation.

Based on this model, a six-item questionnaire was developed to capture pre-service teachers' professional learning activities, reflecting their coping mechanisms regarding AI replacement pressure. The scale demonstrated strong reliability (Cronbach's Alpha = 0.888), exceeding the 0.7 standard (Hair et al., 2009).

3.2.3. Measuring Factors Influencing the Pressure of Being Replaced in the Education Profession by AI

This study evaluates factors influencing replacement pressure based on prior research and theoretical frameworks on stress and AI. These factors are categorized into three groups:

- Self-awareness compared to AI: Includes 5 items measuring individuals' perceptions when comparing themselves to AI ($\alpha = 0.902$), the highest reliability score (> 0.9);
- Educational policies and training: Includes 5 items assessing education and training policies related to AI ($\alpha = 0.819$), confirming reliability; and
- AI replacing teaching: Includes 5 items examining AI's advancement and its potential to assume teaching roles ($\alpha = 0.869$), demonstrating strong reliability.

3.3. Data Analysis

Data analysis was performed with SPSS and AMOS software. The approach commenced with data cleansing to eliminate incomplete responses, so confirming the reliability of the dataset. Cronbach's Alpha, KMO, and EFA were employed to evaluate scale reliability and validity, ascertain correlations, and

refine variables. CFA was then performed to validate the measurement model, with fit indices such as CFI and RMSEA meeting acceptable thresholds. Finally, SEM was employed to test the hypotheses and examine the impact of AI replacement pressure on the career activities of pre-service teachers. The results confirmed the proposed model's validity and provided insights into the research questions.

4. Results

To address the research questions, this section presents the evaluation of the measuring model, the assessment of direct effects, and the analysis of group disparities regarding the perceived threat of AI replacement, yielding substantial insights into the interrelations among the components.

4.1. Test of the Measurement Model

To ensure the validity and reliability of the proposed research model, the measurement model was evaluated through Confirmatory Factor Analysis (CFA). This process assesses the relationships between observed variables and their corresponding latent constructs, verifying the structural integrity of the scales. According to Table 5, the factor analysis method requires the KMO index to be greater than 0.5 (Garson, 2003) and the Bartlett's test to have a significance level (sig) < 0.05, proving the data is suitable for factor analysis and the variables are correlated. The KMO value is 0.884 > 0.5, indicating the data is suitable for factor analysis. The Bartlett's test result is 5801.362 with a significance level of Sig. = 0.000 < 0.05, rejecting the hypothesis that the observed variables are uncorrelated in the population. Thus, the hypothesis of a uniform correlation matrix is rejected, meaning the variables are correlated and suitable for factor analysis.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.884
Bartlett's Test of Sphericity	Approx. Chi-Square	5801.362
	Df	105
	Sig.	0.000

Table 5. KMO and Bartlett's test table

Table 6 shows that the observed variables are grouped into five factors, with all factor loadings exceeding 0.3, indicating no weak variables. Observing the CFA model with scales represented by observed variables (from E1 to E29) and latent variables (SAC, EPT, RT, CA, and LRP), these latent variables represent different aspects being measured, such as replacement pressure, education and training policies, career activities of pre-service teachers.

The factor loadings for all observed variables range from 0.60 to 0.88, indicating. moderate to strong correlations with their corresponding latent constructs (Figure 2). This reinforces the validity of the CFA model, assuming each observed variable represents a specific latent variable. For instance, the CA variable group represents career activities of pre-service teachers with 6 items, with factor loadings ranging from 0.60 to 0.84, indicating strong connections and each variable representing the career activities of pre-service teachers when faced with replacement pressure.

The relationships between latent variables (two-way arrows between latent variables) range from 0.47 to 0.80. indicating medium to high correlations between the different concepts represented by these latent variables. This might reflect some interaction between the variable groups "Career activities", "Self-awareness compared to AI", "Educational policies and training", "Level of replacement pressure", and "AI replacing teaching".

Regarding the statistical accuracy of the model (Table 7), the Chi-square value is 1270.329 with 287 degrees of freedom (df), leading to a Chi-square/df ratio of 4.426. This value indicates a fairly good model fit. Other model fit indices such as GFI, TLI, CFI, and RMSEA are .886, .910. .927, and .071. respectively. These indices are relatively high (GFI, TLI, CFI > 0.9 is good) and RMSEA is low (< .08 is good), all indicating a good fit of the CFA model with the data.

	Component				
	SAC	**LRP**	**RT**	**EPT**	**CA**
SAC5	0.816				
SAC2	0.787				
SAC4	0.778				
SAC1	0.765				
SAC3	0.692				
LRP5		0.874			
LRP6		0.831			
LRP3		0.808			
LRP1		0.593			
LRP4		0.541			
LRP2		0.506			
RT1			0.857		
RT5			0.784		
RT2			0.717		
RT4			0.682		
RT3			0.638		
EPT4				0.764	
EPT3				0.741	
EPT5				0.722	
EPT2				0.681	
EPT1				0.578	
CA2					0.812
CA3					0.773
CA1					0.748
CA5					0.493
CA6					0.441
CA4					0.403

Table 6. Factor loading table with rotated matrix table

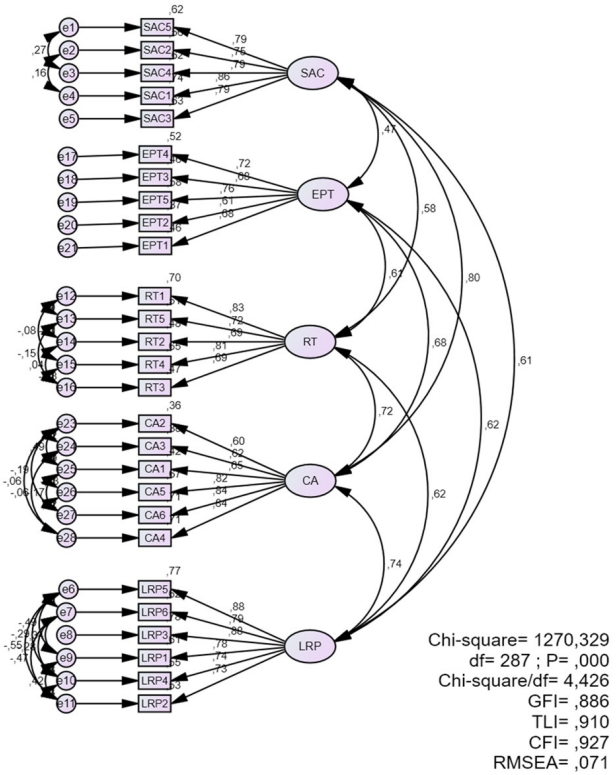

Figure 2. Confirmatory factor analysis model

Model	CMIN/DF	GFI	CFI	RMSEA
Default model	4.426	0.886	0.927	0.071
Condition	≤ 5	≥ 0.8	≥ 0.9	≤ 0.08
Evaluation	Acceptable	Acceptable	Good	Acceptable

Table 7. Results of the CFA

4.2. Assessment of the Measurement Model

To evaluate the relationships among the variables in the research model, Structural Equation Modeling (SEM) was employed. The results of the SEM analysis, summarized in Table 8, provide strong evidence for the hypothesized direct effects between the key constructs. A visual representation of the SEM results is provided in Figure 3, illustrating the direct effects among the variables. The model shows a complex structure involving many observed variables (e indicators) and latent variables (oval shapes). The latent variables include SAC, EPT, RT, LRP, and CA, corresponding to the groups of observed variables. The relationships between latent variables are depicted through path coefficients (numbers on the arrows).

Five factors are retained in the model, and the hypotheses remain as initially proposed. To explore the interactions among variable groups, such as factors influencing the pressure of being replaced for pre-service teachers or factors impacting their career activities, the impact values of the factors are presented in Table 8. Using a 95% confidence standard, all variables have Sig. equal to 0.000. making these relationships significant. Thus, 3 variables affect LRP, including SAC, EPT, and RT; 4 variables affect CA, including LRP, SAC, EPT, and RT. Specifically, the Estimate column shows positive results, meaning these impacts are in the same direction. Among the 7 proposed hypotheses, none are rejected, and all are accepted.

The R-square value of the impact of independent variables on the dependent variable: The R-square value for LRP is 0.542, indicating that independent variables account for 54.2% of the variation in the pressure levels of pre-service teachers. Similarly, the R-square for career activities of pre-service teachers is 0.807, indicating that independent variables account for 80.7% of the variation in career activities of pre-service teachers when facing replacement pressure. Overall, these findings provide empirical support for the hypothesized relationships, offering valuable insights into the direct effects of perceived replacement pressure on pre-service teachers and its influence on their professional activities.

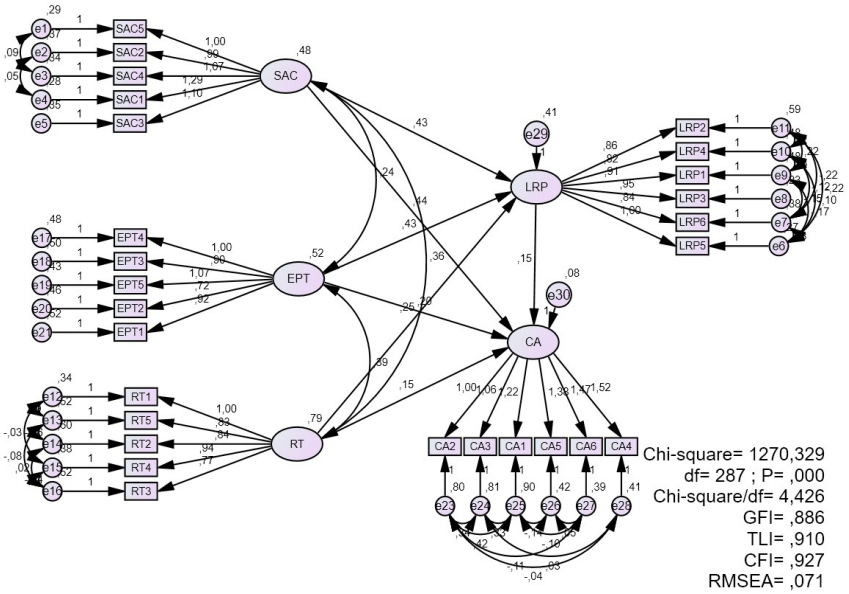

Figure 3. Structural equation modeling

Hypotheses	Path	Estimate	S.E.	C.R.	Ranking	P	R2	Result
H1.1	SAC → LRP	0.317	0.058	7.451	2	0.00	54,2%	Supported
H2.1	EPT → LRP	0.333	0.062	7.057	1	0.00		Supported
H3.1	RT → LRP	0.230	0.052	4.677	3	0.00		Supported
H1.2	SAC → CA	0.456	0.045	9.796	1	0.00	80.7%	Supported
H2.2	EPT → CA	0.216	0.037	5.345	2	0.00		Supported
H3.2	RT → CA	0.198	0.030	4.881	4	0.00		Supported
H4	LRP → CA	0.207	0.029	4.946	3	0.00		Supported

Table 8. Hypothesis testing results

4.3. Test of Differences between Groups on the Pressure of Being Replaced by AI

To examine whether significant differences exist in replacement pressure across various demographic groups, a test of group differences was conducted. The analysis compares factors such as gender, year of study, living area, and major to identify variations in students' perceptions of AI-induced replacement pressure. The results of these comparisons are summarized in Table 9.

Category	Subcategory	N	Mean	P	Ranking	Result
University	Hanoi National University of Education	371	3.48	0.00	2	Difference
	Vietnam National University, Hanoi	159	3.61		1	
	Hanoi Pedagogical University 2	150	2.98		3	
Major	Natural Sciences	281	3.35	0.28	3	No Difference
	Social Sciences	363	3.43		2	
	Others	36	3.56		1	
Gender	Female	429	3.38	0.49	2	No Difference
	Male	251	3.43		1	
Academic Performance	Poor	15	3.26	0.63	5	No Difference
	Average	87	3.36		3	
	Fair	249	3.39		2	
	Good	216	3.47		1	
	Excellent	113	3.35		4	
Year of Study	First Year	183	3.55	0.00	1	Difference
	Second Year	173	3.12		3	
	Third Year	196	3.47		2	
	Fourth Year	128	3.47		2	
Living Area	Rural	218	3.32	0.26	3	No Difference
	Urban	377	3.44		2	
	Mountainous	85	3.45		1	

Table 9. Test of differences between groups on the pressure of being replaced by AI

As shown in Table 9, pre-service teachers from the Vietnam National University experience the highest pressure (3.61) compared to those from Hanoi Pedagogical University 2 (2.98), which reports the lowest pressure, while Hanoi National University of Education has an average pressure level of 3.48. These differences are likely due to varying educational policies and the geographical location of the institutions, with centrally located and technologically advanced schools exposing students more to AI-related concerns. In terms of academic years, first-year pre-service teachers feel the most pressure (3.55) due to uncertainties and unclear career paths, while second-year pre-service teachers experience the least (3.12) as they gain clearer career directions and practical experience. Interestingly, there are no significant differences in AI replacement pressure among pre-service teachers of different fields of study, genders, academic performance, or living areas. A Sig. value of 0.49 shows that pressure levels are similar across

genders, contradicting previous studies that suggest females often experience higher stress levels than males. Similarly, no differences were found among pre-service teachers with varying academic performances or from different living areas, with Sig. values of 0.638 and 0.265, respectively, indicating that pre-service teachers feel the same pressure regarding AI replacement, regardless of these factors. These findings suggest that while factors like school type and academic year significantly impact pre-service teachers' perceptions of AI-related pressures, other demographics do not significantly alter these perceptions, underscoring the complexity of anxiety about AI in educational settings.

5. Discussion

The integration of AI in education presents both opportunities and challenges, significantly shaping pre-service teachers' professional development and career paths. While AI enhances learning personalization, educational management, and teaching methodologies, it also raises concerns about job displacement, risks, and unforeseen challenges, particularly in the education sector.

5.1. Discussing the Pressure of Being Replaced by AI

Findings indicate that pre-service teachers in Vietnam, particularly at Hanoi National University of Education, Hanoi Pedagogical University 2, and Vietnam National University, Hanoi, experience AI-related job replacement anxiety. Key contributing factors include self-perceived competency (Estimate = 0,317), educational policies (Estimate = 0,333), and AI's rapid advancements (Estimate = 0,230). The findings indicate that there is a significant relationship between educational and training policies and the anxiety surrounding potential job displacement due to AI. This suggests that one of the factors contributing to this anxiety is the lack of adequate training in educational technologies and the concern about the necessity to keep up with continuous advancements in AI. The findings align with previous studies carried out by Fernández-Batanero et al. (2021), Jena (2015), Revilla-Muñoz et al. (2016), and Hassan et al. (2019), which collectively highlight that technological pressures often arise from educational and training policies. Fernández-Batanero et al. (2021) noted that a lack of training and education in technology accounts for 50% of the pressures. The findings highlight that educational and training policies serve as a vital external factor that greatly impacts the pressure associated with potential AI replacement. To reduce this anxiety, institutions should publish clear, consistent guidelines for AI use in learning, teaching, and practicum. They should also offer short, task-focused training (e.g., lesson planning, feedback, AI-supported assessment) to build confidence and professional agency.

Moreover, the study indicates that "the swift progression of AI" is significantly correlated with "the anxiety of being replaced by AI." This result is consistent with the findings of the studies carried out by Granulo et al. (2019), Douali et al. (2022), Zhai, Chu, Chai, Jong, Istenic, Spector et al. (2021), and Alam (2021). The report also highlights the fact that different universities have varying degrees of pressure on their students. Pre-service teachers at the Vietnam National University indicated the highest levels of pressure, whereas those at Hanoi Pedagogical University 2 reported the lowest levels, with pre-service teachers from Hanoi National University of Education positioned in between. The observed differences can be linked to the diverse training programs and the varying levels of technology integration in the educational practices at each institution.

The study also identified variations in pressure levels among different academic years. This outcome is consistent with the conclusions drawn by Bayram and Bilget (2008) noted differences in stress levels across various pre-service teachers groups. However, the study found no significant differences by gender, academic performance, or geographic region, suggesting that perceptions of the risk of being replaced by AI are universal among teacher education students.

5.2. Discussing the Career Activities of Pre-Service Teachers

Findings indicate that self-awareness compared to AI, educational policies, AI replacing teaching jobs, and replacement pressure positively influence pre-service teachers' career activities. Among these, self-awareness compared to AI has the most significant impact (Estimate = 0,456), because higher AI-related self-awareness

leads pre-service teachers to view AI as a tool to be directed rather than a threat. Teacher education should cultivate this self-awareness through brief, practice-based tasks that compare human-AI performance and justify task delegation and oversight. Embedding these activities in methods courses and practicum helps sustain teacher agency and convert anxiety into adaptive professional engagement.

Additionally, replacement pressure ranks third in influence (Estimate = 0,207), suggesting that higher perceived AI-related stress drives increased participation in career activities as a coping mechanism. This outcome is notably at odds with the conclusions of Frydenberg (2009), which indicated that elevated stress levels impair individuals' ability to deal well (Nguyen & Nguyen, 2020). The findings reveal that while pre-service teachers encounter pressure, they have not reached a state of "burnout," which enables them to adjust their self-perceptions and advocate for changes in educational policies and training to develop adaptive strategies and innovations suitable for the digital era.

The research findings validate the hypothesis on the pressures and factors influencing the risk of AI replacement, as well as the differences among various participant groups. This study provides substantial insights into the effects of AI on pre-service educators, including professional, psychological, and future career orientation dimensions. The results offer a multifaceted view, emphasizing the problems and potential that AI introduces to education. The findings highlight the urgent need for innovation in teacher education programs, preparing pre-service teachers with the essential knowledge and skills to effectively address and leverage AI breakthroughs in the future.

The results indicate a clear necessity for a comprehensive educational framework aimed at preparing pre-service teachers with vital professional knowledge, abilities, life competencies, and technical expertise. This method would prepare pre-service teachers to become future educators skilled in adaptation and innovation in the digital age.

6. Conclusions

This study's outcomes offer insights into the replacement pressure faced by pre-service teachers. The research indicates that this pressure is not only present but is also acutely experienced within the realm of contemporary education, where AI is progressively utilized in instruction and educational administration. The data indicates that pre-service instructors are experiencing considerable challenges due to the advancement of AI. Factors include self-awareness in relation to AI, educational regulations and training, and the potential for AI to supplant teaching significantly influence the replacement pressure experienced by pre-service teachers. This is evidently demonstrated by the elevated average scores of criteria associated with the anxiety of being supplanted by AI. Self-awareness, in contrast to AI, is a significant component that induces tremendous worry and uneasiness. Pre-service teachers exhibit a deficiency in confidence about their capacity to address complex challenges utilizing AI and harbor concerns that AI may execute their roles more proficiently in the future. This underscores that the swift advancement of AI presents both benefits and significant obstacles for pre-service educators.

Furthermore, the study indicates that existing educational policies and training inadequately assist pre-service teachers in acquiring skills and knowledge regarding AI. A significant number of pre-service teachers contend that teacher training programs inadequately address technology and AI, that facilities do not fulfill educational requirements, and that there is an absence of additional training courses on AI. These issues have led to heightened replacement pressure and anxiety among pre-service teachers. The advancement of AI in education alters the conventional function of educators. Numerous jobs, including the development of instructional materials, assessment of assignments, and administration of educational data, have been augmented or supplanted by AI. This exacerbates sentiments of fear and concern among pre-service teachers, as they believe that future employment prospects may be supplanted by AI.

The study indicates that to address these pressures and anxieties, there is a need for more appropriate educational policies and training programs that emphasize the enhancement of pre-service teachers' skills and knowledge related to AI. Simultaneously, it is imperative to establish a conducive learning and practice

environment that fosters pre-service teachers' confidence in utilizing AI for teaching and educational administration. These techniques not only alleviate anxiety but also enhance the preparedness of pre-service teachers for a job market increasingly shaped by the advancement of AI.

7. Limitations

This study has several limitations that should be acknowledged. First, the data were collected primarily through students' self-reports, which may be influenced by individual perceptual bias. Second, the cross-sectional design does not allow for a persuasive determination of causal relationships; therefore, longitudinal studies are needed to verify the proposed associations. Third, the survey sample was limited to three teacher education institutions in northern Vietnam, which may not represent the entire teacher education system or broader international contexts. Consequently, the generalization of the findings to other settings should be made with caution.

Declaration of Conflicting Interests

The authors declare that they have no competing interests or conflicts of interest in relation to this study.

Funding

This research received no specific grant from any funding agency, commercial entity, or not-for-profit organization.

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Journal of Technology and Science Education, 2025 (www.jotse.org)