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Investigating Factors Influencing Teachers' Intention to Teach Artificial Intelligence in Schools

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A B S T R A C T

The present study aimed to investigate the factors influencing teachers' intention to teach artificial intelligence (AI) in schools. This study is applied research in terms of its objective. Given that this study utilizes both library research methods and field methods such as questionnaires, it can be stated that the present study is a descriptive-survey research of the correlational type based on its nature and method. The statistical population of this research comprises all public school teachers in Tehran. Considering the unlimited number of these individuals, 384 teachers were selected as the sample using Cochran's formula. The sampling method in this study is cluster sampling. For gathering information related to the literature review and research background, library methods were used. To collect data to confirm or refute the research hypotheses, field methods were employed. In this study, the validity of the questionnaire was examined through face validity, content validity, convergent validity, shared reliability, and Cronbach's alpha coefficient, all of which were confirmed. The data analysis in this research was conducted at both descriptive and inferential levels. The examination and testing of the research hypotheses were carried out using structural equation modeling and SmartPLS software. The results indicated that AI anxiety, perceived usefulness, student readiness, and attitude are factors influencing teachers' behavioral intention to teach AI. The findings showed that all these factors could impact the formation of teaching intention among teachers. Overcoming the challenges can be achieved through specialized training, technical assistance, encouragement and support for teachers, and creating a safe environment for experimentation and learning from mistakes. These efforts can help teachers gain the confidence and skills necessary to teach technology to their students.

Keywords: *Artificial Intelligence, Technology, Technology Education, Usefulness*

1. Introduction

Emotions may vary among individuals concerning optimism and discomfort or anxiety about using new technology (Dai et al., 2020). Anxiety related to artificial intelligence (AI), also known as "technophobia" (Katsarou, 2021), results from the inaccuracy in deploying and upgrading technology, confusion in outcomes, and panic due to the unknown nature of technological development (Tomašev et al., 2020). Li and Huang (2020) classified the factors influencing AI anxiety into learning anxiety,

behavioral bias anxiety, privacy violation anxiety, artificial vigilance anxiety, transparency anxiety, ethical violation anxiety, job replacement anxiety, and existential risk anxiety (Li & Huang, 2020). From the perspective of Katsarou' (2021) self-efficacy theory, the presence or absence of technophobia or AI anxiety is a strong predictor of competence, digital literacy, and thus, positive or negative behavioral intention (Katsarou, 2021).

Perceived usefulness by Sugandini et al. (2018) is defined as the level of belief that an individual has that using technology enhances their performance and frees them from effort (Sugandini et al., 2018). The idea of perceived usefulness and perceived ease of use was popularized by Davis (1989), who explained perceived usefulness as "the degree to which a person believes that using a particular system would enhance their job performance," while perceived ease of use refers to "the degree to which a person believes that using a particular system would be free of effort." (Davis, 1989). Sugandini et al. (2018) and Davis (1989) established a direct relationship between these two terms. However, this study focuses on perceived usefulness and its correlation with behavioral intention (Davis, 1989; Sugandini et al., 2018). Perceived usefulness is generally important in predicting behavioral intention and thus the outcome of AI use (Darmansyah et al., 2021).

The potential of AI to address issues related to sustainable development goals, such as human rights, gender, and inequality, was predicted to influence students' acceptance and readiness to learn AI (Tomašev et al., 2020). Student readiness involves various soft skills that ensure adequate mental preparedness for optimal learning. Student readiness is also considered self-efficacy or self-concept and their belief in an event based on past experiences (Dai et al., 2020). A broader view defines readiness and its relationship with optimism towards adopting new technology or strategy. This definition describes readiness as "an optimistic view that an individual can control and use technology flexibly" (Chai et al., 2020). Chai et al. (2021) showed that students' perception of AI learning for social benefits is an important predictor of their readiness to learn AI, suggesting that curriculum providers offer insights into the application of AI for solving real-world problems as a method for students. This research indicates that readiness for AI is not immediately apparent to students, but using AI for social benefits increases students' confidence in their ability and readiness to use AI (Chai et al., 2021).

The Technology Acceptance Model developed by Fred Davis (1989) is one of the most cited theories explaining how individuals' attitudes, which can be positive or negative, determine their behavioral intention (Dai et al., 2020). The Technology Acceptance Model is a branch of technology that stems from the Theory of Reasoned Action (Pan et al., 2019). In Wu et al. (2011), technology acceptance is described as an individual's behavior towards a specific action determined by behavioral intention, which determines the individual's behavior. This relationship explains the symbiosis between attitudes and behavioral intention (Wu et al., 2011). Therefore, numerous studies have shown the significant determining role of attitude in behavioral intention (Pan et al., 2019). Pan et al. (2019) studied physicians' intention to adopt smart healthcare services from a technology transfer perspective and found a significant relationship between attitude and physicians' behavioral intentions (Pan et al., 2019). Similarly, Wu et al. (2011) established a strong link between variables such as attitude, subjective norm, and behavioral control in the behavioral intention to use mobile healthcare services (Pan et al., 2019).

Recognizing the lack of AI knowledge among teachers as a barrier to AI implementation, studies have been initiated to examine teachers' readiness to teach AI through professional development programs (Lee & Perret, 2022) and the design of shared learning resources globally. Given that professional development for teachers in this area is essential, examining teachers' intention and readiness to teach AI in classrooms is crucial, as teachers' acceptance and willingness can indicate their interest in technology education and impact their teaching practices (Nikolopoulou et al., 2021). Accepting course content in the classroom would be impossible without the teacher's presence (Lin & Brummelen, 2021). Therefore, examining teachers' perceptions of their intention and readiness to teach AI helps understand factors supporting the successful implementation of AI in schools. Unfortunately, there is a lack of extensive research in this area, highlighting a gap in information resources. Consequently, this study aims to identify and investigate the factors influencing teachers' intention to teach AI in schools.

2. Methods and Materials

2.1. Study Design

Research methods in behavioral sciences are usually divided based on two criteria: purpose and nature. To explain the research method, the type of research must first be identified. Generally, research methods in behavioral sciences can be divided based on the research objective and

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data collection method. Research based on objective is divided into fundamental and applied research. Fundamental research aims to discover the nature of objects, phenomena, and relationships between variables, principles, laws, and the construction or testing of theories, contributing to the advancement of scientific knowledge. The primary objective of this research is to explain relationships between phenomena, test theories, and add to existing knowledge in a specific field. Conversely, applied research uses the results of fundamental research to improve and perfect behaviors, methods, tools, devices, structures, and patterns used in human societies. The objective of applied research is to develop practical knowledge in a specific field. Here, the level of discourse is abstract and general but within a specific context. Research is also categorized based on data collection methods. Based on the provided descriptions, it can be said that the present study is applied research in terms of its objective. This type of research aims to improve behaviors, methods, tools, devices, structures, and patterns used in human societies. This research uses fundamental research results and aims to develop practical knowledge in a specific field. Moreover, given that this study uses library research methods and field methods such as questionnaires, it can be stated that the present study is a descriptive-survey research of the correlational type based on its nature and method.

2.2. Participants

The statistical population of this research comprises all public school teachers in Tehran. Given the unlimited number of these individuals, 384 teachers were selected as the sample using Cochran's formula. The sampling method in this study is cluster sampling.

2.3. Data Collection

In this study, library methods were used for gathering information related to the literature review and research background, while field methods were employed to collect information to confirm or refute the research hypotheses.

Library Studies: Any researcher, before starting their research, and when interested in a particular topic, must visit the library. By studying books, articles, and other research in the field of interest, they can refine and articulate their research topic. For the literature review and background, libraries and internet resources were utilized.

Field Studies: In this method, primary data collection tools include questionnaires or structured interviews. In this study, experts' and committee members' opinions were used to identify relevant factors, and a preliminary questionnaire was prepared using a Likert scale.

For data collection, a standardized questionnaire by Iannoual et al. (2022) was used. The questionnaire design was based on the Likert scale, which is a common measurement scale. The questionnaire consists of two main parts:

General Information: This section includes demographic information about the respondents.

Specific Information: This section includes specialized questions designed to be as understandable and straightforward as possible. A five-point Likert scale was used, ranging from Very Low (1) to Very High (5).

2.4. Validity and Reliability of the Questionnaire

The questionnaire's validity was examined through face validity, content validity, and convergent validity. The designed questionnaire was reviewed by ten experts in the field of information technology, who provided feedback on each question. Minor revisions were made, and the revised questionnaire was used. Content validity was assessed using CVR and CVI coefficients. The CVI form showed that all questions were suitable regarding simplicity, clarity, and relevance, with coefficients above 0.79 for each question. Additionally, since the CVR for all questions was above 0.62, no questions needed to be removed. Construct validity was confirmed using confirmatory factor analysis, with all items having factor loadings above 0.4. Convergent validity was examined using the average variance extracted (AVE), with all variables having AVE values above 0.5, indicating satisfactory convergent validity.

The questionnaire's reliability was assessed using Cronbach's alpha and composite reliability coefficients. All constructs had coefficients above 0.7, indicating good reliability.

2.5. Data Analysis

Data analysis was conducted at both descriptive and inferential levels. Descriptive statistics and SPSS software were used to examine respondents' demographic characteristics and response distribution. Normality of data was tested using the Kolmogorov-Smirnov test, and questionnaire reliability was assessed with Cronbach's alpha. Hypotheses were tested using structural equation modeling and SmartPLS software.

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3. Findings and Results

Initially, the demographic characteristics of the respondents were examined. According to the results, 73% of the respondents were female and 27% were male. Additionally, 56% of respondents were under 30 years old, 24% were between 31 and 40 years old, and 20% were over 41 years old. In terms of education, 23% held a bachelor's degree, 52% held a master's degree, and 25% had a doctoral degree. Following this, descriptive statistics of the variables were examined. According to the results in Table 1, all variables had a mean above 3.

Table 1

Descriptive Statistics of Variables

Variable	Mean	Standard Deviation	Skewness	Kurtosis
Teachers' Behavioral Intention	3.407	0.676	-0.064	-0.304
AI Anxiety	3.825	0.436	-0.385	1.194
Perceived Usefulness	3.825	0.486	-0.539	1.019
Student Readiness	3.511	0.352	0.180	-0.328
Attitude	3.547	0.328	0.212	0.474

Figure 1

Path Coefficients of Research Relationships

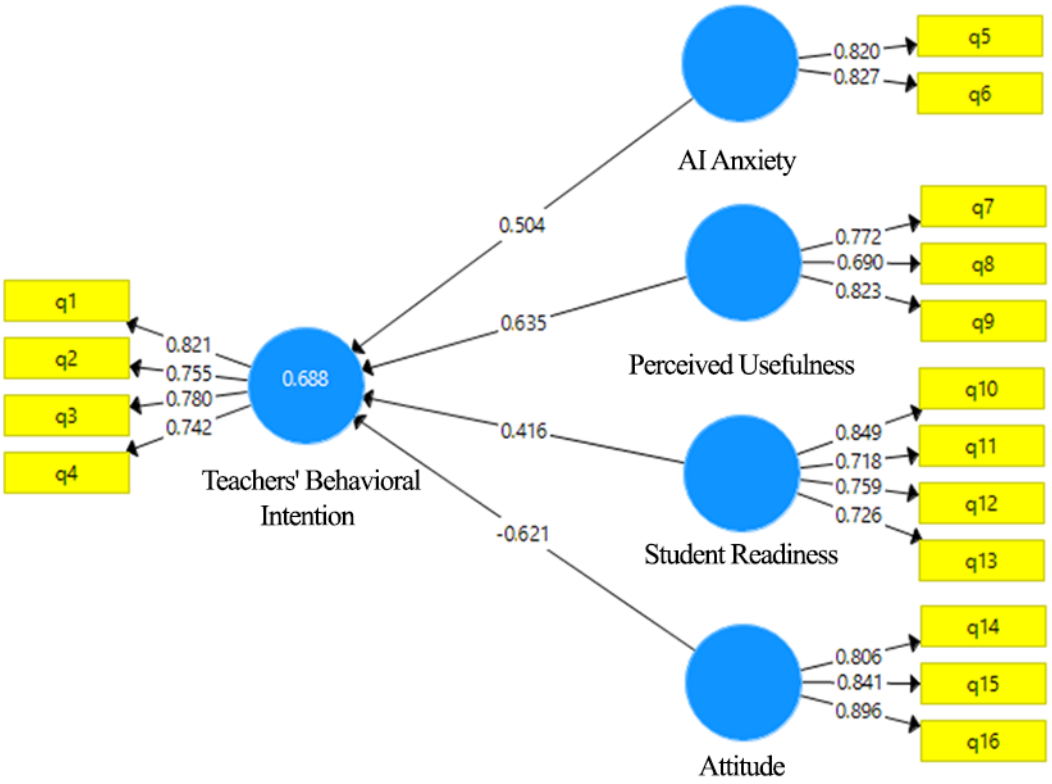

Figure 2

Bootstrapping Results (Significance) of Research Relationships

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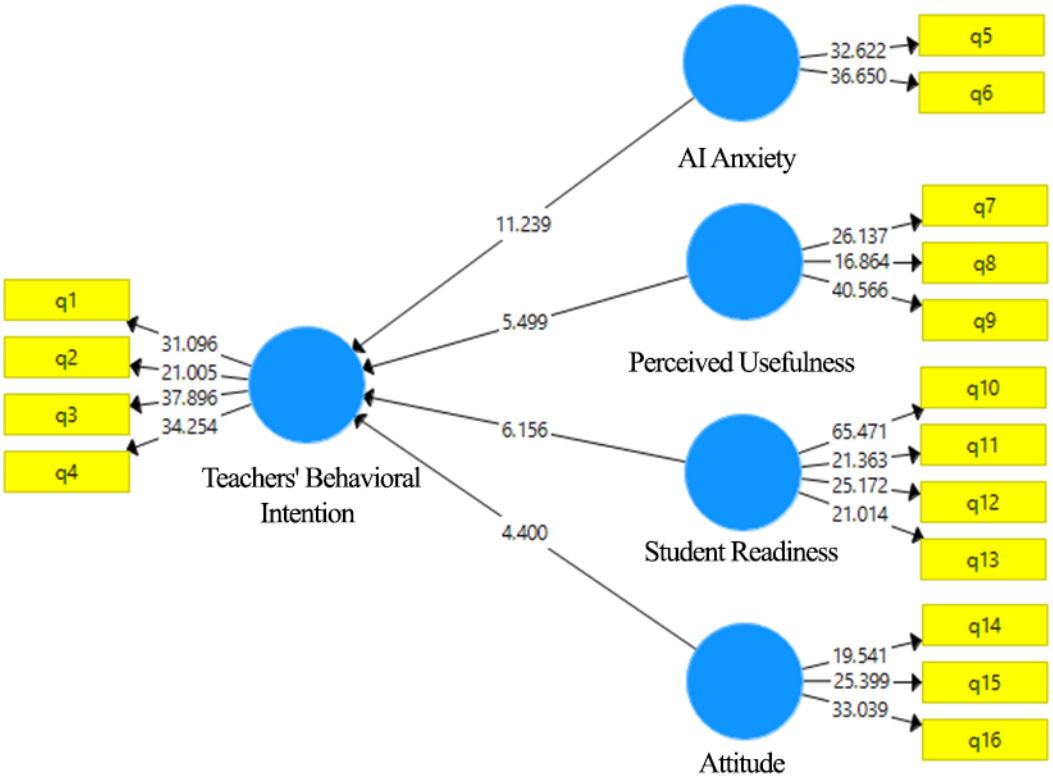

The structural model examines the relationships between latent exogenous (independent) and endogenous (dependent) variables. The structural model only investigates the latent variables and their interrelationships. The numbers on the paths indicate the path coefficients and factor loadings. To test the significance of the path coefficients using the bootstrapping method, t-statistic values were calculated. If the t-statistic values are greater than 2.58, the path coefficient is significant at the 0.05 level.

The R^2 coefficient for endogenous (dependent) latent variables indicates the impact of an independent variable on a dependent variable, with values of 0.19, 0.33, and 0.67 considered weak, moderate, and strong respectively. The R^2 value for the model construct was calculated to be 0.688.

This criterion shows the model's predictive power for dependent variables. Q^2 values of 0.02, 0.15, and 0.35 indicate weak, moderate, and strong predictive power respectively. A positive Q^2 is desirable. The Q^2 values for the research variables were 0.298, 0.254, 0.269, 0.257, and 0.267, indicating positive and desirable predictive power. Thus, it can be concluded that the model has satisfactory predictive power for the variables.

Structural equation modeling (PLS) experts consider a GOF index below 0.10 as small, between 0.10 and 0.25 as medium, and above 0.36 as large. The GOF index for the sample model was 0.622, indicating a large fit. Based on these findings, it can be concluded that the tested model fits well with the sample. Additionally, since all factor loadings for the model's observed variables were above 0.4 and significant above 2.58, the construct demonstrates desirable validity. The hypothesis testing results are presented in Table 2.

Table 2

Hypothesis Testing Results

Path	Path Coefficient	Significance	Result
AI Anxiety - Teachers' Behavioral Intention	0.504	11.239	Hypothesis Supported

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Perceived Usefulness - Teachers' Behavioral Intention	0.635	5.499	Hypothesis Supported
Student Readiness - Teachers' Behavioral Intention	0.416	6.156	Hypothesis Supported
Attitude - Teachers' Behavioral Intention	-0.621	4.400	Hypothesis Supported

Given that the path coefficients for all hypotheses are above 0.4 and the significance is greater than 1.96, all research hypotheses are supported.

4. Discussion and Conclusion

As observed, this study examined the factors influencing teachers' intention to teach artificial intelligence (AI) in schools. AI anxiety, perceived usefulness, student readiness, and attitude were identified as factors affecting teachers' behavioral intention to teach AI. The results showed that all these factors could impact teachers' teaching intentions. It can be said that this anxiety stems from the concern that teachers might make mistakes when using technology in the classroom, leading to a reluctance to teach these topics. Additionally, low confidence in using technology can cause teachers to avoid teaching these skills to their students. Technology is rapidly developing and changing. If teachers feel they cannot keep up with these changes, they might refrain from teaching them. Some teachers may worry about being judged by students, colleagues, and parents if they appear ineffective in using technology. Changing teaching methods towards technology can be challenging for some teachers, and this fear of change can be a barrier to teaching technology.

Furthermore, the perceived usefulness of technology in education can be a strong motivator for teachers to invest in teaching technology to their students. Technology can enhance the quality of education, making learning experiences more engaging and effective for students through digital tools such as educational software, online learning platforms, and interactive tools. By teaching technology, teachers help students develop skills like problem-solving, critical thinking, innovation, and digital literacy, which are crucial in today's knowledge-based economy. Technology can make educational resources more accessible to students, including digital books, educational videos, and other online resources, improving education for diverse students in various environments. Tools like virtual collaboration spaces, online study groups, and social networks can enhance interaction between students and teachers, promoting teamwork. Technology can improve the student assessment process by providing tools that help teachers track student progress more accurately and give valuable feedback. However, it should be noted that the high perceived usefulness will only motivate teachers if they are familiar with technology and feel capable of using it to enhance education. If teachers lack confidence or sufficient training in this area, they might refrain from using technology in their teaching. Therefore, providing necessary training and support to improve teachers' technological skills is essential to help them leverage all the benefits of technology in education.

Student readiness for learning technology can be a strong motivator for teachers to invest in teaching technology to their students. This readiness indicates that students are interested in learning technology and using it, which can have several impacts. Students interested in technology might request their teachers to use technological tools in their classes, encouraging teachers to invest in teaching technology. If students have a positive experience using technology in education, it can show teachers that technology use can be effective, motivating them to invest more in this area. Teachers strive to meet their students' needs and interests. If students are interested in technology, teachers may invest in teaching technology to address these needs. Considering the importance of technology in the job market, teachers may feel the need to prepare students to work in a world where technology plays a significant role, ensuring their future success. Ultimately, student readiness for learning technology can represent an opportunity for teachers to invest in teaching technology and equip students with essential 21st-century skills.

Some teachers may fear changing their traditional teaching methods and worry that technology might challenge their accustomed teaching practices. Some teachers may view technology as a threat to their jobs, especially if they believe technology could replace teachers. Some teachers may see technology as a luxury item not essential for education, particularly if they work in resource-limited educational environments. Overcoming these challenges can be achieved through specialized training, technical assistance, encouragement and support for teachers, and creating a safe environment for experimentation and learning from mistakes. These efforts can help teachers gain the confidence and skills necessary to teach technology to their students.

Authors' Contributions

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All authors have contributed significantly to the research process and the development of the manuscript.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

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Declaration of Interest

The authors report no conflict of interest.

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Ethical Considerations

In this research, ethical standards including obtaining informed consent, ensuring privacy and confidentiality were observed.

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