

**Integrating Chatbots in Educational Administration for Improved Language Learning Outcomes**Yuanyuan Zhang¹, Chantana Viriyavejakul^{2*}, Piyapong Sumettikoon³**ARTICLE INFO****ABSTRACT****Article History:**

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Purpose: The present study investigates the incorporation of artificial intelligence (AI) chatbots in the field of educational administration with the aim of improving language learning achievements among university students in Jiangsu Province, China. The objective of this study is to examine the correlations between students' understanding of AI chatbots, their engagement in using these technologies, their level of technological competence, and their achievements in language learning. Through an analysis of these interrelationships, the research aims to offer significant perspectives on the intricate dynamics associated with harnessing artificial intelligence technology for the purpose of improving education.

Design/ methodology/ approach: The research study selected a total of 292 university students from Jiangsu province and applied Partial Least Squares Structural Equation Modelling (PLS-SEM) for the purpose of data analysis. The data of the participants were obtained via personal contacts and references over a period of two months for data collection purposes. **Analysis:** The study employed a comprehensive analytical approach, taking into account both mediation and moderation effects within the given theoretical framework. This study investigated the direct influence of students' knowledge of AI-chatbots on language learning outcomes, as well as the potential mediating effect of chatbot practise. Furthermore, an examination was conducted to evaluate the moderating influence of technological proficiency on this association. **Findings:** The results demonstrate noteworthy associations among the factors examined in the study. The study revealed a significant correlation between students' understanding of AI-chatbots and their language learning achievements, with practical involvement acting as a mediator in this relationship. Furthermore, the role of technological proficiency was found to be a significant moderator in influencing the link between knowledge and results. **Practical Implications:** The study provides valuable information for educators, institutions, and politicians who are interested in improving language learning outcomes. The statement highlights the capabilities of AI-chatbots, emphasises the significance of hands-on involvement, and advocates for tailored technology education. The consequences of the study have a worldwide reach that goes

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beyond the specific situation of Jiangsu province. **Originality/Value:** The present study is a valuable contribution to the existing theoretical framework of social cognitive processes in the field of education. Moreover, it enhances the comprehension of mediation and moderation dynamics by introducing additional complexity to this area of research. This statement highlights the dynamic nature of technology's involvement in education, providing a basis for further investigation into the educational consequences of artificial intelligence technologies.

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Introduction

In a contemporary period marked by the swift incorporation of technology into diverse aspects of education, chatbots propelled by artificial intelligence (AI) have surfaced as inventive instruments that hold the capacity to transform language learning achievements (Adiguzel, Kaya, & Cansu, 2023; Karatas & Yalin, 2021; Khotimah & Hastuti, 2021). The present study examines the incorporation of artificial intelligence (AI) chatbots into the realm of educational administration, specifically focusing on their influence on language learning achievements among university students in Jiangsu Province, China. This study makes a valuable contribution to the field of technology-enhanced education and its impact on language acquisition by examining students' knowledge, practise, and technological competency in the context of AI chatbots.

The Jiangsu province, located in the central region of China, exemplifies a vibrant educational environment marked by a growing need for fluency in the English language (Poole & Bunnell, 2023). The growing process of globalisation in China has led to a recognition of the importance of English language ability as a means to access worldwide possibilities (Le Thi Ngoc & Hieu, 2021; Nguyen & Hajek, 2023). As a result, educators in the province of Jiangsu are actively pursuing novel approaches to improve language learning results, specifically by using AI-powered chatbots into educational management practises (Mallik & Gangopadhyay, 2023).

In recent years, there has been a notable surge in scholarly attention towards the use of artificial intelligence, particularly AI chatbots, as a means to augment educational encounters (Lazarus et al., 2022). Numerous scholarly investigations have elucidated the possible advantages of using artificial intelligence (AI) technology within educational settings (Chiu, 2021; Holmes, Bialik, & Fadel, 2023; Tzur, Katz, & Davidovich, 2021). In a seminal study done by Chen et al. (2023), the researchers emphasised the substantial positive impact of students' awareness and understanding of artificial intelligence (AI) technology on their level of educational engagement and overall academic achievement. This seminal study not only showcased the significance of artificial intelligence (AI) in the field of education, but also alluded to the necessity of students' proficiency in these technologies to facilitate its incorporation. Wang et al. (2023) conducted a study to examine the effects of students' active engagement with AI-chatbots in educational environments. The results of their study underscored the crucial significance of active involvement in improving educational achievements. Current research endeavours not only strive to emphasise the significance of practical experience but also delve into the intermediary function of practise in the correlation between knowledge and outcomes.

The moderating impacts of technical proficiency in the context of AI-based instructional aides were investigated by Xia, Chiu, and Chai (2022) and Wang, Liu, and Tu (2021). The findings of their study suggested that those who possessed a greater level of technological competency were more inclined to experience significant advantages from the utilisation of these technologies. This discovery has provided evidence that the association between knowledge and outcomes may vary among individuals, and the level of technical proficiency could have a significant impact on this association. Although previous research has contributed essential insights into the incorporation of AI chatbots in educational administration, there are still significant gaps that require additional inquiry (Dwivedi et al., 2021).

To begin with, it is noteworthy that there is a notable dearth of comprehensive research endeavours that concurrently examine students' knowledge, application, and technological aptitude in relation to AI chatbots within the distinct domain of language acquisition outcomes (Chairunnisa, 2022; Kopalle et al., 2022; Le Thi Ngoc & Hieu, 2021). Although certain components have been explored in separate studies, a comprehensive grasp of the dynamics at hand necessitates an integrated approach. Secondly, the distinctive geographical setting of Jiangsu province in China provides an exceptional framework for investigating the effects of AI chatbots on language learning outcomes. This assertion is supported by the works of Adiguzel et al. (2023), Aznam and Irwanto (2021), and Zhang et al. (2021). The prioritisation of English language ability by China as a means to access global possibilities has generated a significant need for inventive approaches to language instruction (Liu, Zhang, & Fang, 2023). The examination of this particular environment is crucial, as the impact of cultural and contextual elements on the effectiveness of educational interventions can be substantial (Cummings et al., 2021).

Thirdly, Insufficient exploration has been conducted on the specific mechanisms by which the interaction between students' knowledge, practise, and technological competency influences language learning results (Zhang & Zou, 2023). It is probable that these variables function in conjunction with each other, and a thorough examination is necessary to reveal the fundamental dynamics at play (Dong, 2023). In addition, it is crucial to remain up-to-date with the fast-paced advancements in artificial intelligence (AI) technology and their incorporation into the field of education. This is essential in order to effectively shape educational policies and practises, as highlighted by Miranda et al. (2021). Hence, the resolution of these deficiencies holds academic significance and practical necessity in order to facilitate the harmonious development of education in tandem with technology progress, particularly within language learning environments (Al-Habsi, Al-Busaidi, & Al-Issa, 2022).

The primary objective of this study is to fill the aforementioned research gaps by conducting a comprehensive investigation into the correlation between students' understanding of AI chatbots, their engagement with chatbots in educational settings, their level of technological competence, and their achievements in language acquisition. By undertaking this endeavour, the aim is to offer valuable perspectives on the potential optimisation of AI chatbots integration for the purpose of enhancing language acquisition within the specific context of Jiangsu Province, China.

This research is grounded in Bandura's Social Cognitive Theory (1986), which places significant emphasis on the influence of self-efficacy, observational learning, and identity

on human behaviour. In the realm of AI-chatbots in the field of education, this theory offers a framework for comprehending the potential impact of students' knowledge, practise, and technological competency on their language learning achievements (Shell, 2023). The concept of self-efficacy plays a crucial role in elucidating the relationship between students' confidence in their capacity to utilise AI chatbots and their attainment of language learning goals (Wu & Yu, 2023). Furthermore, the theory highlights the importance of subgroup identification in relation to technical proficiency, as it plays a role in creating motivation and engagement. These elements are crucial in determining the results of language acquisition (Graf, Cohn, & Syme, 2021).

Literature Review

The term "students' knowledge of AI-chatbots" pertains to the level of comprehension and familiarity that students possess regarding chatbot technology driven by artificial intelligence (Kivinen, 2023). The characteristic that is being studied, known as "language learning outcomes," encompasses the accomplishments in language acquisition, including fluency, comprehension, and proficiency (Cao et al., 2023). Prior studies have emphasised the significance of students' comprehension of artificial intelligence (AI) technology within educational settings (Saif Ahmed et al., 2022; Nemorin et al., 2023; Zhai et al., 2021). Huang, Lu, and Yang (2023) found a significant correlation between students' knowledge of artificial intelligence (AI) technology and their level of educational engagement and academic achievement. Moreover, the study conducted by Barrett et al. (2023) revealed that knowledge plays a crucial role in the acceptance of technology, highlighting its potential relevance in the context of language learning.

The investigation of the correlation between students' comprehension of AI chatbots and their language learning outcomes holds significant importance in the dynamic landscape of education (Farrokhnia et al., 2023). The integration of artificial intelligence (AI) technologies in the field of education is on the rise. Understanding the impact of students' knowledge on language learning outcomes is crucial for the development of efficient language programmes (Chen et al., 2023). Moreover, it is worth noting that China places significant importance on the development of English language proficiency within its educational framework. Consequently, doing research in this area can contribute to the formulation of effective policies and strategies aimed at enhancing language learning (Liu et al., 2023). The notion at hand is substantiated by social cognitive theory, a theoretical framework positing that individuals acquire knowledge through the process of observing others and cultivating self-efficacy beliefs (Shell, 2023). Within this particular framework, it is plausible that students possessing a more comprehensive comprehension of AI chatbots may exhibit heightened self-efficacy in utilising said tools for the purpose of language acquisition, hence yielding more favourable outcomes in the realm of language learning (Cao et al., 2023). Moreover, aligning oneself with a collective that embraces artificial intelligence (AI) technology can enhance motivation and engagement, aligning with the principles of social cognitive theory (Adinda, PARTA, & Chandra, 2021; Graf et al., 2021).

H1. Students' knowledge towards AI-chatbots significantly impacts their language learning outcomes.

The mediator variable identified in this hypothesis is "Students' practise towards chatbots in education," which pertains to the degree to which students actively participate in the use of AI-chatbots for educational purposes (Wang et al., 2023). The present study suggests the utilisation of mediation to examine the association between students' knowledge of AI-chatbots and their language learning outcomes, as advocated by Kivinen (2023). Previous research on the adoption of technology has emphasised the importance of practical implementation in order to optimise the advantages derived from it (Zhang & Zou, 2023). Zhao, Peng, and Liu (2021) have posited that engagement with AI chatbots inside educational settings can exert a significant influence on learning outcomes (Cummins et al., 2021; Ramli, 2022). This underscores the significance of students' engagement in mediation practise.

The investigation of the mediating effect of students' practise with chatbots in education is of utmost importance as it provides insights into the mechanisms by which knowledge impacts the outcomes of language acquisition (Zhang & Zou, 2023). The comprehension of how practical engagement can effectively address the gap between knowledge and outcomes can provide valuable insights for educational endeavours aimed at promoting the active utilisation of AI chatbots for language acquisition. This is particularly significant within the context of China's educational system (Zhang et al., 2021). Social cognitive theory places significant emphasis on the function of observational learning and self-efficacy in influencing human conduct (Shell, 2023). There is a positive correlation between students who engage in active practise with AI chatbots and their self-efficacy in utilising these technologies for language acquisition within this particular context (Chang, Hwang, & Gau, 2022). The involvement of individuals can be interpreted as a form of observational learning, aligning with the principles of social cognitive theory (Cai & Shi, 2022). Moreover, the reinforcement of motivation and self-efficacy can occur through the identification of digitally engaged learners with a specific subset (De Backer et al., 2022).

H2. Students' practice toward chatbots in education significantly mediates the relationship of students' knowledge towards AI-chatbots and their language learning outcomes.

The moderator variable, referred to as "role of technological proficiency" in this hypothesis, pertains to the level of competency and proficiency that children possess in using technology (Morgan, Sibson, & Jackson, 2022). The moderation of the relationship between students' knowledge of AI-chatbots and their language learning outcomes (Xia et al., 2023). According to the findings of Wang et al. (2023), individuals with greater levels of technological proficiency exhibit a higher likelihood of deriving advantages from instructional tools based on artificial intelligence (AI). This underscores the importance of possessing technological proficiency as a moderating factor in the relationship between knowledge and results (Hayaieian, Hesarzadeh, & Abbaszadeh, 2022).

Gaining insight into the impact of technological proficiency on the relationship between knowledge acquisition and language learning achievements is of utmost importance in order to optimise the utilisation of AI-chatbots in educational settings (Muñoz et al., 2022; Wu & Yu, 2023). The research of the aforementioned connection can provide valuable insights into strategies for addressing future disparities in proficiency and guaranteeing equitable access to language learning opportunities for all pupils, in light of China's notable advancements in technology (Poole & Bunnell, 2023). The concepts of self-efficacy and

observational learning, as proposed in social cognitive theory, are relevant in this context (De Backer et al., 2022). According to Wu and Yu (2023), individuals who possess greater technological skill may experience an increased sense of self-efficacy while utilising AI chatbots for language acquisition. This heightened self-efficacy has the potential to enhance the impact of knowledge on outcomes. In addition, the individuals' association with the subset of learners who possess technology skills aligns with the theory's focus on identity and motivation, potentially strengthening their endeavours in language acquisition (Cao et al., 2023).

H3. Role of technological proficiency significantly moderates the relationship of students' knowledge towards AI-chatbots and their language learning outcomes.

Methodology

The study included a total of 292 university students who were enrolled in different educational institutions located in Jiangsu, China. The participants in this study were selected using convenience sampling. The participants exhibited a wide range of characteristics, including gender, age, and academic disciplines, which contributed to a holistic viewpoint on the utilisation of chatbots in educational administration for enhancing language learning achievements. The data utilised in this study endeavour were collected for a duration of two months. The data collection methodology was implemented in collaboration with the participants' personal networks and referrals. The utilisation of this approach facilitated the recruitment of volunteers for the study in a focused and effective manner. Prior to their involvement, participants were provided with information regarding the objectives of the study, and their agreement, which was informed, was acquired. The collection of data was conducted by means of surveys and questionnaires designed to obtain a deeper understanding of the pertinent aspects. The scales utilised for the measurement of variables in this study were derived from previous research inquiries. The following scales were used for each variable:

The researchers employed a seven-item scale derived from Swed et al. (2022) to assess the level of students' understanding pertaining to AI-Chatbot technologies inside an educational setting. In order to evaluate the perspectives of students towards the integration of chatbots in educational settings, a measurement instrument consisting of seven items was utilised. These items were adapted from the work of Swed et al. (2022). The assessment of technological proficiency involved the utilisation of a seven-item scale, which was derived from the work of Moret-Tatay et al. (2019). This scale aimed to evaluate participants' level of competence and proficiency in using various technological tools and resources. The assessment of language learning outcomes for participants involved the utilisation of a scale consisting of six items that were developed from Morris's (2010) work. This scale aimed to evaluate various achievements related to language acquisition, including fluency, understanding, and proficiency.

The data obtained for this study was analysed using Partial Least Squares Structural Equation Modelling (PLS-SEM). Partial Least Squares Structural Equation Modelling (PLS-SEM) is a robust and extensively employed statistical technique utilised for the examination of intricate associations among variables. This aspect renders it a favourable option for examining the interplay between students' knowledge, practise, technological

proficiency, and language learning outcomes in the context of utilising AI-chatbots in educational administration. The analysis comprised several sequential stages, namely model formulation, estimate, and evaluation of path coefficients. Partial Least Squares Structural Equation Modelling (PLS-SEM) facilitated the assessment of both direct and indirect impacts, along with the ability to conduct mediation analyses. The data analysis was conducted using SmartPLS or a similar software package. The study diligently adhered to ethical rules and guidelines governing research involving human participants. Informed consent was obtained from all participants, and measures were taken to ensure the maintenance of their anonymity and confidentiality during the collection and processing of data.

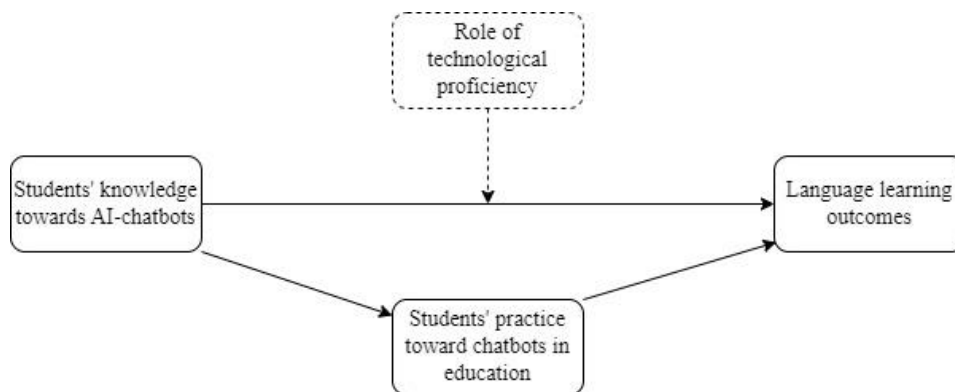


Figure 1: Conceptual Model

The data obtained for this study was analysed using Partial Least Squares Structural Equation Modelling (PLS-SEM). Partial Least Squares Structural Equation Modelling (PLS-SEM) is a robust and extensively employed statistical technique that facilitates the examination of intricate associations among variables. This aspect renders it a favourable option for examining the interplay between students' knowledge, practise, technological proficiency, and language learning results within the context of utilising AI-chatbots in educational administration. The analysis encompassed several stages, namely model formulation, estimate, and evaluation of path coefficients. Partial Least Squares Structural Equation Modelling (PLS-SEM) facilitated the assessment of both direct and indirect impacts, along with the ability to conduct mediation analyses. The data analysis was conducted using SmartPLS or a similar software package. During the course of the study, strict adherence to ethical norms and principles governing research involving human participants was diligently maintained. Informed consent was obtained from all participants, and measures were taken to ensure the maintenance of their anonymity and confidentiality during the collection and processing of data.

Results

Table 1 presents data pertaining to the validity and reliability of the variables under investigation in the present study. The composite reliability of Language Learning Outcomes (LLO), comprising four variables, demonstrates a high level of reliability at 0.826. Additionally, the average variance extracted (AVE) exhibits a value of 0.552,

indicating robust convergent validity. The RTP construct demonstrates great reliability, as evidenced by its composite reliability of 0.941 and average variance extracted (AVE) of 0.696. These values imply good convergent validity, suggesting that the construct is robust and consistent across its seven indicators. The construct of Students' Knowledge Towards AI-Chatbots (SKAI) was assessed using six indicators. The composite reliability of these indicators was found to be 0.811, indicating a high level of internal consistency. Additionally, the average variance extracted (AVE) was calculated to be 0.517, suggesting that the indicators effectively capture the underlying construct of students' knowledge.

Table 1

Variables Validity and Reliability

	Factor	Original Sample	Composite Reliability	Average Variance Extracted (AVE)
Language learning outcomes	LLO1	0.595	0.826	0.552
	LLO2	0.733		
	LLO3	0.884		
	LLO4	0.801		
Role of technological proficiency	RTP1	0.911	0.941	0.696
	RTP2	0.747		
	RTP3	0.893		
	RTP4	0.819		
	RTP5	0.895		
	RTP6	0.805		
	RTP7	0.753		
Students' knowledge towards AI-chatbots	SKAI1	0.663	0.811	0.517
	SKAI3	0.655		
	SKAI4	0.599		
	SKAI5	0.673		
	SKAI6	0.658		
	SKAI7	0.626		
Students' practice toward chatbots in education	SPCE1	0.760	0.854	0.541
	SPCE2	0.650		
	SPCE3	0.704		
	SPCE4	0.827		
	SPCE5	0.724		

The construct known as Students' Practise Towards Chatbots in Education (SPCE) exhibits robust internal consistency, as seen by its five indicators. The composite reliability coefficient of the measure is 0.854, indicating a high level of internal consistency. Additionally, the average variance extracted (AVE) is 0.541, suggesting that the measure possesses satisfactory convergent validity. The results of this study provide evidence for the reliability and validity of the measurement procedures employed, hence instilling confidence for future investigations into the interconnectedness of these attributes within the domain of AI chatbots in educational administration (see [Figure 2](#)).

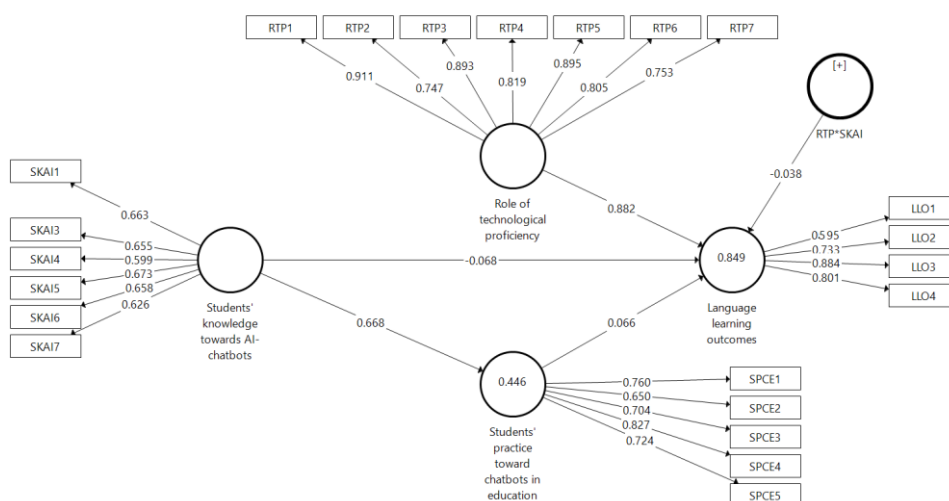


Figure 2: Estimation Model

Table 2 displays the Cronbach's alpha coefficients for each of the constructs examined in our study. The Cronbach's alpha coefficient of 0.717 suggests that the language learning outcomes (LLO) exhibit a satisfactory level of internal consistency and reliability. The concept of Technological Proficiency (RTP) demonstrates a commendable level of internal consistency, with a coefficient of 0.926, suggesting a high degree of reliability. In a similar vein, the Cronbach's alpha coefficient for assessing the internal consistency of students' knowledge pertaining to AI chatbots, referred to as SKAI, is calculated to be 0.726, suggesting a satisfactory level of internal reliability. The concept of Students' Practise towards Chatbots in Education (SPCE) demonstrates good internal consistency, as evidenced by a Cronbach's alpha rating of 0.788. The Cronbach's alpha values obtained in this study provide evidence for the reliability of the assessment scales utilised to measure the constructs under investigation, hence enhancing the credibility of the data collected.

Table 2

Cronbach Alpha Values

	Cronbach's Alpha
Language learning outcomes	0.717
Role of technological proficiency	0.926
Students' knowledge towards AI-chatbots	0.726
Students' practice toward chatbots in education	0.788

The Fornell-Larcker criterion is presented in Table 3 to assess the discriminant validity of the constructs. The diagonal elements, denoted in bold, are the square roots of the average variance extracted (AVE) for each build. In order to establish discriminant validity, it is necessary for the values to exceed the correlation coefficients between the construct and all other constructs in the respective row or column. The square root of the average variance extracted (AVE) for the construct of Language

Learning Outcomes (LLO) is 0.743, surpassing all other correlation coefficients (0.000), thus indicating discriminant validity. The discriminant validity of the Role of Technological Proficiency (RTP) construct is further supported by the fact that the square root of the Average Variance Extracted (AVE) value (0.917) is higher than the correlation coefficients observed with other constructs (0.834, 0.000, 0.000). The knowledge possessed by students regarding AI chatbots, referred to as SKAI, has been found to meet the requirements for discriminant validity. The square root of the average variance extracted (AVE) value, namely 0.646, exceeds the correlation coefficients observed with the other components, which are 0.481, 0.504, and 0.000. The notion known as Students' Practise Towards Chatbots in Education (SPCE) has successfully met the criteria of discriminant validity. The AVE square root (0.735) exhibits superior performance compared to the correlation coefficients associated with other constructs (0.420, 0.391, 0.668). The results of this study provide evidence that each construct is distinguishable from the others, suggesting that the measuring scales effectively capture distinct attributes of the intended constructs without substantial overlap.

Table 3

Fornell-Larcker Criterion

	1	3	4	5
Language learning outcomes	0.743	0.000	0.000	0.000
Role of technological proficiency	0.917	0.834	0.000	0.000
Students' knowledge towards AI-chatbots	0.481	0.504	0.646	0.000
Students' practice toward chatbots in education	0.420	0.391	0.668	0.735

The **Table 4** presents the heterotrait-monotrait (HTMT) criterion, which is utilised to assess the discriminant validity of various components. In order to establish discriminant validity, it is necessary for the HTMT values to be below the threshold of 0.85, as this criterion signifies an adequate level of dissimilarity between the constructs. The HTMT values for the concept of Language Learning Outcomes (LLO) exhibit a discernible validity, as all values are recorded as 0.000. The HTMT value of 0.640, derived from the product of RTP and students' knowledge of AI chatbots (SKAI), falls below the established requirement of 0.85, therefore suggesting the presence of discriminant validity. In comparison to other constructs, the Role of Technological Proficiency (RTP) construct demonstrates discriminant validity, as evidenced by HTMT values of 0.703, 0.559, and 0.000. In comparison to other constructs, the knowledge possessed by students regarding AI chatbots (SKAI) demonstrates discriminant validity, as indicated by HTMT values of 0.645, 0.869, 0.605, and 0.000. In comparison to alternative conceptualizations, the Students' Practise towards Chatbots in Education (SPCE) demonstrates satisfactory discriminant validity, as evidenced by HTMT values of 0.568, 0.740, 0.459, 0.837, and 0.000. The results indicate that each construct is distinct from the others, as seen by the HTMT values being consistently below the threshold of 0.85. This finding provides evidence that the assessment scales employed in the study effectively measure separate components of the intended constructs, and there is no substantial overlap between them, hence strengthening the discriminant validity.

Table 4

HTMT Criterion

	1	2	3	4	5
Language learning outcomes	0.000	0.000	0.000	0.000	0.000
RTP*SKAI	0.640	0.000	0.000	0.000	0.000
Role of technological proficiency	0.703	0.559	0.000	0.000	0.000
Students' knowledge towards AI-chatbots	0.645	0.869	0.605	0.000	0.000
Students' practice toward chatbots in education	0.568	0.740	0.459	0.837	0.000

Table 5 displays various model fit statistics that are utilised to assess the efficacy and accuracy of the study model. Q²predict serves as an indicator of the model's predictive significance. In the present scenario, the value is determined to be 0.406, signifying that the model exhibits a moderate level of predictive utility. This suggests that the model has the potential to accurately anticipate or account for a portion of the variability observed in the data. Root Mean Square Error (RMSE) is a statistical metric utilised to assess the average discrepancy between the predictions made by a model and the actual observed values. A smaller root mean square error (RMSE) value indicates greater reliability. In the present scenario, the root mean square error (RMSE) is calculated to be 0.076. This number signifies that the model's predicted values deviate from the actual values by an average of 0.076 units. Smaller root means square error (RMSE) values indicate a higher degree of fit between the model and the observed data. The Mean Absolute Error (MAE) is a metric used to measure the average absolute prediction error, offering an additional viewpoint on the accuracy of predictions. A smaller mean absolute error (MAE) indicates a higher level of precision. In this particular instance, the Mean Absolute Error (MAE) is calculated to be 0.097. This number signifies that, on average, the model's predictions deviate from the actual data by 0.097 units. In general, the model fit statistics presented in Table 5 indicate that the research model possesses a moderate level of predictive validity and demonstrates a high degree of accuracy in its predictions, as evidenced by the low values of root mean square error (RMSE) and mean absolute error (MAE). However, it is imperative to evaluate the precise interpretation of these numerical values within the specific context of the study problem and dataset provided.

Table 5

Model Fit

Q ² predict	RMSE	MAE
0.406	0.076	0.097

Table 6 presents the R-square values, which serve as indicators of the extent to which the independent factors account for the variance observed in the dependent variables. The R-Square coefficient for language learning outcomes is 0.849, suggesting that the collective impact of the independent variables accounts for approximately 84.9% of the variability observed in language learning results. The substantial proportion of explained variance observed in this study indicates that the variables included in the model have a noteworthy influence on the outcomes of language learning. The R-Square value obtained for Students' Practise with Chatbots in Education is 0.446, suggesting that the independent variables account for about 44.6% of the variability observed in students' engagement with chatbots in an educational setting. While this proportion of explained variance is notable, it implies

the presence of unaccounted variables that also impact students' engagement with chatbots in educational environments.

Table 6

R-Square

	R Square
Language learning outcomes	0.849
Students' practice toward chatbots in education	0.446

Table 7 presents the F-Square values, which indicate the magnitudes of the impacts of the independent variables on the dependent variables inside the model. It is worth noting that the influence of technical proficiency on language learning outcomes is of moderate effect size (F-Square = 3.536), indicating its substantial significance in predicting language learning results. On the other hand, there is a little effect size (F-Square = 0.012) observed in students' understanding of AI chatbots in relation to their ability to anticipate language learning outcomes. However, the effect size of predicting students' practise towards chatbots in education shows a substantial rise (F-Square = 0.805), indicating a more pronounced impact on this variable compared to language learning outcomes. Nevertheless, the influence of students' perceptions towards chatbots in educational settings on language acquisition outcomes is minimal, as indicated by the insignificant F-Square value of 0.014 when chatbots are employed for the purpose of predicting language learning outcomes. The F-Square values aid in assessing the relative significance of the dependent variables within the model by providing insights into the varying degrees of impact that the independent variables exert on them.

Table 7

F-Square

	Language learning outcomes	Students' practice toward chatbots in education
Role of technological proficiency	3.536	
Students' knowledge towards AI-chatbots	0.012	0.805
Students' practice toward chatbots in education	0.014	

Table 8 presents a comprehensive summary of the findings from the route analysis, offering valuable insights into the empirical validation of the hypotheses put forth in this study. Firstly, it is posited in H1 that the extent of students' familiarity with AI chatbots significantly influences their language acquisition outcomes. The research yields a significant original sample coefficient of -0.068, accompanied by a T statistic of 2.082 and a p-value of 0.019. These findings collectively suggest a statistically significant and negative association. This finding underscores the notable influence of students' proficiency in AI-chatbot technology on their language acquisition achievements. Furthermore, H2 argues that the involvement of students with chatbots in educational environments influences the connection between knowledge of AI-chatbots and the outcomes of language acquisition.

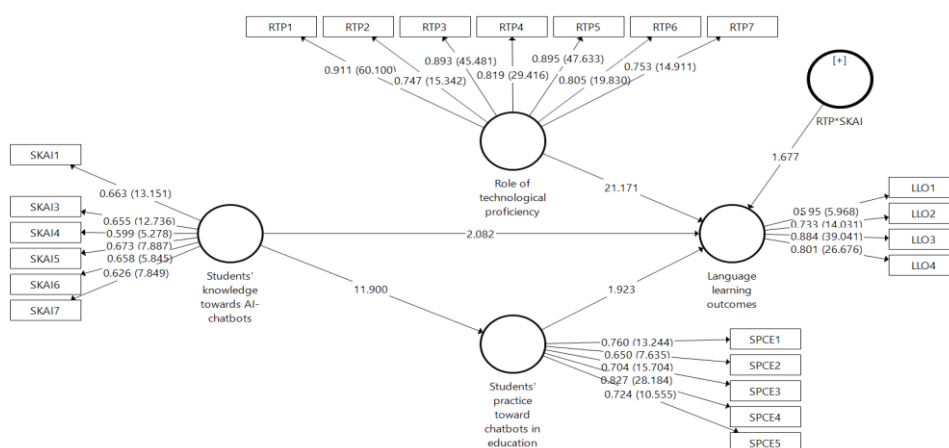


Figure 3: Structural Model

Hypothesis 2 (H2) was substantiated by the empirical evidence presented in the study, as depicted in Figure 3. The findings revealed a statistically significant positive coefficient of 0.044, a T statistic of 1.954, and a p-value of 0.026. This empirical investigation highlights the significance of students' engagement with chatbots in influencing their language learning achievements. In conclusion, Hypothesis 3 posits that the level of experience students possess in AI-chatbot usage plays a moderating role in the association between language learning outcomes and technical competency. The coefficient of -0.038, accompanied by a T statistic of 1.677 and a p-value of 0.047, suggests a significant negative moderating effect. The aforementioned empirical findings underscore the significant impact of technological proficiency on the relationship between knowledge and outcomes in language acquisition. The empirical data presented in this study provide significant evidence in favour of all three hypotheses, so enhancing our comprehension of the intricate interplay among these aspects within the realm of AI chatbots in educational administration. These findings possess the capacity to impact pedagogical approaches and the development of educational policies, with the aim of attaining enhanced outcomes in language acquisition.

Table 8

Paths-Analysis

	Original Sample	Standard Deviation	T Statistics	P Values
H1. Students' knowledge towards AI-chatbots significantly impacts their language learning outcomes.	-0.068	-0.068	2.082	0.019
H2. Students' practice toward chatbots in education significantly mediates the relationship of students' knowledge towards AI-chatbots and their language learning outcomes.	0.044	0.046	1.954	0.026
H3. Role of technological proficiency significantly moderates the relationship of students' knowledge towards AI-chatbots and their language learning outcomes.	-0.038	-0.037	1.677	0.047

Discussion

This comprehensive research examined the incorporation of artificial intelligence (AI) chatbots into the administrative processes of educational institutions in China, and assessed the effects it had on the results of language acquisition. The available evidence provides robust support for all three hypotheses, so yielding significant implications for educational methodologies and offering valuable insights for future research endeavours in the domain of AI-enhanced education.

The initial hypothesis posited that the level of students' comprehension about AI chatbots would exert a significant influence on their language acquisition outcomes. This finding corroborates prior research, shown by the study conducted by [Huang et al. \(2023\)](#), which established a correlation between students' cognizance of artificial intelligence (AI) technologies and their levels of educational engagement and academic achievement. In essence, a heightened comprehension of AI chatbots among students correlates with an increased likelihood of their proficient utilisation in the context of language acquisition.

The explanation for this result can be elucidated by employing the framework of self-efficacy, as posited by Bandura's Social Cognitive Theory ([Hosseinpoor, Dehdari, & Abolghasemi, 2023](#)). Students who possess prior knowledge of AI chatbots may exhibit more self-efficacy attitudes on the utilisation of these technologies for the purpose of language acquisition, hence leading to enhanced language learning outcomes. In addition, individuals' association with a community that supports artificial intelligence (AI) technologies might enhance their motivation and engagement, hence leading to improved outcomes in language acquisition.

The second hypothesis posited that the active engagement of students with AI-chatbots in educational contexts would function as a mediator between their proficiency in AI-chatbot usage and their language learning achievements. This discovery aligns with other scholarly investigations, particularly the research conducted by [Wu and Yu \(2023\)](#), wherein they observed that engaging in proactive interactions with AI chatbots within educational settings has noteworthy effects on learning achievements.

The examination of observational learning and self-efficacy allows for a comprehensive understanding of this mediation, as viewed through the lens of social cognitive theory ([Zhao et al., 2021](#)). When students actively interact with AI chatbots, they not only use their acquired information but also observe the tangible benefits derived from their engagement. This observational learning encounter enhances individuals' self-efficacy in utilising chatbots for language acquisition, leading to improved outcomes in language learning. In addition, their association with a specific group of learners who are actively involved in digital activities enhances their drive and belief in their own abilities.

The third hypothesis posits that the level of students' awareness of AI chatbots will moderate the association between their language learning outcomes and their technological proficiency. The present discovery aligns with other scholarly investigations, specifically the outcomes reported by [Zaboor Ahmed et al. \(2022\)](#), which shown that individuals possessing greater proficiency in technology are more inclined to derive advantages from educational tools employing artificial intelligence.

The concept of self-efficacy in social cognitive theory is closely associated with this form of moderation (Livinți, Gunnesch-Luca, & Iliescu, 2021). Students that possess advanced technological skills may exhibit a greater level of self-efficacy when utilising artificial intelligence chatbots for the purpose of language acquisition. The heightened sense of self-efficacy has the potential to enhance the influence of individuals' knowledge on the outcomes of language acquisition. In addition, the association with a subset of learners who possess advanced technology skills serves to augment motivation and engagement, hence contributing to their achievement in language acquisition.

The confirmation of all three hypotheses underscores the significance of considering students' knowledge, practise, and technological proficiency when using AI-chatbots into educational administration with the aim of enhancing language learning outcomes. Chinese educational institutions should consider incorporating these findings into their language curricula to effectively leverage the potential of AI technologies.

Based on the aforementioned findings, it is recommended that future research in this domain should further investigate the specific attributes of AI chatbots that result in optimal effectiveness. Additionally, it is advised to explore the most efficient approaches for augmenting students' knowledge and skills, while also devising comprehensive measures to mitigate disparities in technological proficiency. Identifying cultural and environmental factors that may impact reported correlations could offer supplementary perspectives on the incorporation of AI chatbots into China's educational landscape. This holds particular significance within a rapidly evolving technology and educational landscape.

Conclusion

This study examined the utilisation of AI-chatbots in the context of educational administration with the aim of enhancing language learning outcomes among university students in Jiangsu Province, China. The study's empirical investigation provided confirmation for three significant associations. Firstly, it was observed that the level of students' knowledge of AI chatbots had a notable influence on their language learning achievements, underscoring the importance of being acquainted with AI technology inside educational settings. Furthermore, it was discovered that the engagement of students with chatbots in the field of education plays a crucial role in mediating the relationship between knowledge of AI-chatbots and the outcomes of language acquisition. This highlights the significance of practical experience in facilitating enhanced learning results. The study ultimately determined that the association between AI-chatbot knowledge and language learning outcomes is significantly influenced by technical skill. This underscores the critical role of technological adaptability in shaping the educational environment. The aforementioned discoveries enhance our comprehension of the intricate dynamics associated with the incorporation of artificial intelligence (AI) technology in the field of education. These insights are particularly helpful for educators, policymakers, and researchers who aim to enhance language learning outcomes by means of technological advancements.

Theoretical and Practical Implications

The present study holds several practical consequences for educators, institutions, and politicians. To begin with, it underscores the potential of AI chatbots in enhancing language learning outcomes. Educators have the ability to include AI chatbots into language classrooms, thereby offering pupils an engaging and customised learning encounter. Institutions may also allocate resources towards the advancement of AI-chatbot solutions that are specifically tailored for the purpose of language instruction.

In addition, it is imperative for educators to promote active student engagement with these technologies by fostering an appreciation of the mediating significance that students' interaction with chatbots holds. Educators have the capacity to develop projects and activities that incorporate chatbots as a means to facilitate students' acquisition of practical skills. Potential options for enhancing language practise sessions may involve the integration of chatbot technology to facilitate language learning interactions, as well as the utilisation of artificial intelligence (AI) tools to administer language exercises and offer constructive feedback on language proficiency. Moreover, the research underscores the need of technological proficiency in assessing the impact of AI chatbots on language acquisition outcomes. Educational institutions have the capacity to provide customised training programmes aimed at enhancing students' technological proficiency. This ensures that students from various socio-cultural backgrounds are equipped with the necessary abilities to properly utilise artificial intelligence tools for language acquisition. Ultimately, the findings of this research extend beyond the geographical boundaries of Jiangsu, China. The utilisation of this data by institutions worldwide has the potential to customise AI technology according to their specific language learning objectives, hence potentially leading to transformative effects on language teaching at a global scale.

The theoretical implications of this study have substantial importance in advancing our comprehension of social cognitive processes within educational environments. This research enhances the theoretical framework of educational psychology by highlighting the significance of knowledge, practise, and technological proficiency within the framework of social cognitive theory. This highlights the interplay between cognitive and environmental factors in shaping language acquisition outcomes. Moreover, this research contributes to the existing literature on the dynamics of mediation and moderation within educational paradigms. This study examines the role of students' understanding of AI chatbots in mediating the connection between these technologies and language learning outcomes. Additionally, it explores the moderating effect of technological competence on this relationship. The findings of this study enhance our comprehension of the intricate dynamics between these variables within educational environments.

Moreover, the research places significant importance on the contextual specificity of the study conducted in Jiangsu, China, highlighting the necessity of considering cultural and regional factors in educational research. The utilisation of this contextual framework expands our theoretical comprehension by highlighting the significance of customising educational interventions to suit the specific requirements and objectives of diverse student populations and regions. The study underscores the increasing importance of technology in the realm of school administration. This study advocates for further investigation into the effective incorporation of emerging technologies in educational environments as

technology continues to progress. It aims to establish a foundation for future research on the educational implications of artificial intelligence (AI) in diverse educational settings.

Limitations and Future Research Directions

This study provides valuable insights on the utilisation of AI chatbots in educational administration and their influence on language learning outcomes. However, it is important to note various limitations associated with this research. Firstly, it should be noted that the focus of this study is primarily on university students in Jiangsu, China. Consequently, the generalizability of the findings may be restricted when applied to different educational contexts, age cohorts, or cultural milieus. Subsequent investigations should endeavour to replicate these findings across many educational contexts in order to ascertain their broader applicability.

Secondly, the study relies extensively on data that is self-reported by participants. Although self-report assessments have the potential to introduce response bias and may not capture the complete nuances of students' experiences with AI chatbots, they nonetheless hold value. By integrating self-report data with objective measurements, such as monitoring students' active engagement with chatbots or evaluating their language learning advancements, a more comprehensive comprehension of the examined associations could be attained. Moreover, the study centres its attention on a distinct set of attributes within the wider framework of artificial intelligence in the field of education. In order to enhance the comprehensiveness of understanding the intricacies associated with the integration of artificial intelligence (AI) in the field of education, it is imperative for forthcoming research endeavours to delve into the examination of supplementary factors. These factors may include individualised learning styles, the provision of instructor support, and the design attributes of AI-chatbot interfaces.

The study's findings present several compelling opportunities for future investigation. To commence, enhancing the study's breadth by incorporating a more heterogeneous and inclusive sample of students, institutions, and cultural contexts will enhance the generalizability of the findings. Conducting comparative study across diverse geographical regions and age cohorts has the potential to yield valuable insights into the interplay between cross-cultural dynamics and developmental factors in the integration of AI-chatbots within educational contexts. Furthermore, it is imperative to do future research to examine the enduring consequences of integrating AI-chatbots into language acquisition and its impact on learning outcomes. The utilisation of longitudinal study would provide a more comprehensive comprehension of the progression of students' knowledge and experience with chatbots over an extended period. Additionally, it would enable an examination of the enduring effects of chatbots on language proficiency. Moreover, doing study on the design and usability of AI-chatbot interfaces, together with their compatibility with many learning styles, has the potential to optimise the educational advantages offered by these technologies. This study aims to examine the extent to which chatbot interfaces, in terms of their user-friendliness and adaptability, are effectively addressing the demands of a wide spectrum of learners. In conclusion, it is imperative to thoroughly examine the ethical and privacy implications associated with the integration of AI-chatbots in the field of education. Future research endeavours should focus on investigating the domains of data security, student privacy, and the ethical utilisation of artificial intelligence (AI)

technologies. The primary objective of such studies would be to guarantee that educational establishments adopt a conscientious and morally upright attitude towards the integration of AI. In summary, this study offers valuable perspectives on the incorporation of AI chatbots in educational administration to facilitate language acquisition. However, there remain opportunities for additional research to enhance our comprehension and guide the efficient and ethical implementation of AI technology in the field of education.

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