https://studentsuccessjournal.org/
Vol **17** (1) 2026 https://doi.org/10.63608/ssj.3877

Perception in the Loop: Understanding AI Chatbot Efficiency Through the Lens of Role, Support, and Technology Use in Higher Education

Xiao Li
Department of Management, College of Business and Technology, University of Nebraska at Kearney, Kearney, NE, USA
Jae Man Park
Department of Global Health Management & Policy, School of Public Health, San Diego State University, San Diego, CA, USA
Jordan P Mitchell
Department of Healthcare Administration, College of Business, University of Houston Clear Lake, Houston, TX, USA

Abstract

The adoption of artificial intelligence (AI) chatbots in higher education promises improved student support and administrative efficiency. Our objective is to offer insights to institutions in effectively adopting AI chatbots, tailored to the needs of both students and faculty. Using secondary survey data from United States higher education, we conducted a moderated mediation analysis to examine the mediation effect of perceived resources/support on the relationship between user role and perceived efficiency of AI chatbots, moderated by technological tool usage. The results revealed that perceived resources/support availability plays a mediating role in shaping how both students and faculty perceive the efficiency of AI chatbots, with students reporting greater efficiency when resources and support are more readily available. This mediation effect becomes marginally stronger as the usage of technological tools increases. While both student and faculty groups demonstrate openness to using AI chatbots, their perceptions of benefits and challenges towards AI chatbots differ significantly.

Keywords: Artificial intelligence (AI); AI chatbots; role differences; perceived efficiency; perceived availability of resources/support; frequency of technological tool usage.

Introduction

Artificial intelligence (AI) has become a transformative force in multiple aspects of daily life and professional fields (Chen et al., 2020; Kumar et al., 2023; Sedkaoui & Benaichouba, 2024), and its influence continues to grow rapidly. With the emergence of sophisticated AI models like OpenAI's ChatGPT, the adoption and integration of AI tools have become an inevitable trend (Haleem et al., 2022; Haque & Li, 2025). According to recent data, the number of AI tool users worldwide is projected to increase from about 116 million in 2020 to over 729 million by 2030 (Statista, 2024), demonstrating its expanding reach and adoption across various sectors. Higher education is one such field that is increasingly investigating AI technology as it offers innovative solutions for augmenting both teaching and learning experiences (Kim, 2024; Kizilcec, 2024; Tuomi, 2024). Among these AI innovations, large language model (LLM)-based AI chatbots, computer programs designed to simulate

Except where otherwise noted, content in this journal is licensed under a Creative Commons Attribution 4.0 International Licence. As an open access journal, articles are free to use with proper attribution. ISSN: 2205-0795

© The Author/s 2026

human-like conversations (Gupta et al., 2020), stand out as particularly useful tools due to their versatility. They can perform a wide array of tasks, including coding, grammar checking, report writing, and content generation (Gill et al., 2024; Okonkwo & Ade-Ibijola, 2021; Yang & Evans, 2019). Popular LLM-based AI chatbots like ChatGPT, Gemini, GitHub Copilot, and Perplexity have garnered attention for their potential to streamline educational processes and improve learning outcomes.

Scholars have highlighted that LLM-based AI chatbots are poised to revolutionize the education system due to their powerful capabilities (Adıgüzel et al., 2023; Labadze et al., 2023), such as providing immediate responses to questions and offering detailed explanations. Unlike earlier waves of technological innovation such as Massive Open Online Courses (MOOCs), which primarily delivered static content at scale (Jones, 2024), LLM-driven chatbots introduce real-time, adaptive, and conversational interaction (Bekkar & Chtouki, 2024; Panagiotidis, 2024). This shift enables personalized guidance, instant feedback, and dynamic problem solving, offering a fundamentally different pedagogical capability than previous technologies. Existing studies highlight these advantages, but most rely on short-term user perceptions or small-sample contexts (Debets et al., 2025; McGrath et al., 2025), limiting the generalizability of findings.

LLM-based AI chatbots enable users to learn in a responsive, interactive, and confidential manner, enhancing the overall educational experience (Chen et al., 2023). For students, AI chatbots serve as virtual teaching assistants, providing support with homework, study assistance, personalized learning experiences, and access to additional resources (Essel et al., 2022; Labadze et al., 2023; Taneja et al., 2024). For educators, LLM-based AI chatbots can enhance pedagogical methods by streamlining administrative tasks, offering tailored feedback, and supplementing instructional content (Jeon, 2024; Labadze et al., 2023; Mageira et al., 2022). Despite the potential benefits and growing adoption of LLM-based AI chatbots in higher education, little is known about whether students and faculty perceive these tools equally or differently, and what underlying factors shape these perceptions. Additionally, there is limited research on the factors that influence perceptions of LLM-based AI chatbot efficiency, such as the availability of resources, institutional support, and the level of technological engagement.

While LLM-based AI chatbots provide promising benefits, emerging studies also identify several ethical and practical concerns, such as inaccurate or hallucinated outputs, embedded bias, and unequal access to AI tools due to subscription costs or digital literacy (Ahmed, 2024; Karimov et al., 2024; Labadze et al., 2023; Williams, 2024). Academic integrity is another central challenge as students may rely on AI-generated content in ways that undermine learning and violate assessment policies (Cotton et al., 2024; Gruenhagen et al., 2024; Yigci et al., 2025). These issues can impact users' trust, confidence, and willingness to use LLM-based AI chatbots in learning processes. As a result, understanding how different groups, such as students and faculty, perceive the efficiency of these tools becomes increasingly important, given that their experiences with both the benefits and challenges may vary substantially.

This study aims to investigate how willingness to use LLM-based AI chatbots and the challenges faced when using them differ by role (student or faculty) and to identify the mechanisms that influence perceptions of LLM-based AI chatbot efficiency. Using 2023 secondary survey data from United States (U.S.) universities, a moderated mediation model was employed to analyze these relationships. Although AI technologies are increasingly used across a wide range of student services, including counselling, academic advising, and administrative support, the present study focuses specifically on pedagogical support. In this study, "student support services" refers to learning-related assistance, such as help with understanding course concepts, completing academic tasks, or navigating study-related questions. This pedagogical orientation aligns with the nature of the survey items and with existing scholarship on LLM-based AI tools used to support learning and teaching. Our findings reveal that the perceived availability of resources and support for using LLM-based AI chatbots mediates the relationship between the respondent's role and perceived LLM-based AI chatbot efficiency. Additionally, the frequency of using technological tools for educational or administrative tasks marginally moderates this mediation effect, suggesting that higher levels of technological engagement strengthen the impact of perceived resources and support on perceived efficiency. By addressing the nuanced factors affecting LLM-based AI chatbot adoption in higher education, this study provides actionable insights for institutions to optimize chatbot implementation.

Conceptual Framework

The conceptual framework for this study is grounded in the technology acceptance model (TAM) and social cognitive theory (SCT). Collectively, these provide a robust foundation for examining the factors that influence perceptions of LLM-based AI chatbots' efficiency in higher education. By integrating both theories, the framework accounts for individual roles (student vs.

faculty), perceived availability of resources/support, and frequency of technological tool usage, offering a broad view of the mechanisms shaping user attitudes toward AI technologies.

Role Differences and Perceived Efficiency of AI Chatbots

TAM posits that perceived usefulness, defined as the extent to which a technology is considered beneficial in achieving desired outcomes, is a key determinant of technology adoption (Davis & Granić, 2024). Empirical studies have consistently shown that the perceived usefulness of AI technologies positively influences individuals' willingness to adopt and integrate these tools into their daily activities (Chan & Hu, 2023; Ma & Lei, 2024; Wang et al., 2021; Wu et al., 2024). When applied to the context of LLM-based AI chatbots in higher education, this model suggests that users will be more likely to view AI chatbots as efficient tools if they perceive they are useful.

Building on this theory, we propose that faculty members are more likely than students to perceive AI chatbots as efficient. Faculty may perceive LLM-based AI chatbots as more efficient partly because of the nature of their workload, which involves substantial instructional, administrative, and research-related tasks that require managing information-intensive exchanges (Blankstein, 2022; Nakano et al., 2021). Although several studies note that academic staff often report limited AI skills or literacy (Mah & Groß, 2024; Titko et al., 2023), the high volume of routine communication and content generation tasks may create strong incentives for them to adopt tools that can streamline their work (Alieto et al., 2024; Bong & Chen, 2024; Ng et al., 2023). This aligns with research showing that faculty regularly interact with digital platforms to support teaching and course management, which can increase their awareness of how LLM-based AI chatbots may improve efficiency (Martin et al., 2019). In contrast, students may have fewer task-related pressures that emphasize efficiency and may also hold more concerns about academic integrity or misuse (Stöhr et al., 2024), leading to a lower perceived efficiency of LLM-based AI chatbots.

Thus, we present the following hypothesis:

***H1*:** Faculty members will report higher perceived efficiency of LLM-based AI chatbots, compared to students.

Perceived Availability of Resources/Support as a Mediator

SCT suggests people's attitudes and behaviors are shaped by a dynamic interaction between personal and environmental factors (Bandura, 2001). In the context of this study, the availability of resources and support, such as training workshops, technical assistance, and access to digital tools, significantly influences how individuals perceive and utilize emerging technologies (Al Darayseh, 2023; Han & Geng, 2023). Compared to students, faculty members often have greater access to these resources due to their established roles, professional networks, and involvement in technology adoption initiatives (Alieto et al., 2024). This greater availability of support may enhance their confidence and competency in using AI chatbots (Wang & Chu, 2023), thereby increasing their perception of these tools as efficient in streamlining academic tasks. Conversely, students may have limited access to resources and may not receive the same level of support as faculty, especially since some LLM-based AI chatbots services require a non-negligible usage fee (Gromova et al., 2023; Pham et al., 2024). This discrepancy in perceived resource and support availability may result in a less favorable perception of AI chatbot tools. Thus, we argue that the perceived availability of resources/support can mediate the relationship between an individual's role at the university and their perceived efficiency of LLM-based AI chatbots. This relationship is articulated in the second hypothesis:

***H2*:** The relationship between role (student vs. faculty) and perceived LLM-based AI chatbot efficiency will be mediated by perceived availability of resources and support, with faculty perceiving higher availability and thus reporting higher efficiency.

Frequency of Technological Tool Usage as a Moderator

The effectiveness of resources and support in shaping perceptions of LLM-based AI chatbot efficiency is likely to vary depending on an individual's frequency of engagement with technological tools. Based on the TAM, individuals who frequently use technology tend to have higher expectations and standards for technological performance (Larsen & Wetherbe, 1999). However, research also suggests that even when individuals have a high frequency of using existing IT systems, this may not directly influence their perceptions of the usefulness and ease of use of newly introduced technologies (Park & Park, 2020). This discrepancy suggests that familiarity with existing technologies does not necessarily translate into positive

acceptance of new ones, highlighting the need to examine how the frequency of technology usage affects the relationship between university role differences and the perceived efficiency of LLM-based AI chatbots.

For faculty members and students alike, frequent usage of technological tools, such as digital learning platforms, content management systems, and educational software, can enhance their ability to recognize the potential value and efficiency of LLM-based AI chatbots in academic settings. Those who use technological tools more regularly may be more adept at integrating new technologies into their workflows and more likely to perceive the benefits of resources and support aimed at facilitating LLM-based AI chatbot adoption. Conversely, those who engage less frequently with such tools may struggle to fully utilize the resources available, reducing the impact of support on their perceptions of chatbot efficiency.

Therefore, we hypothesize the following:

***H3*:** The mediation effect of perceived resources/support availability on the relationship between role (faculty vs. student) and perceived chatbot efficiency will be moderated by frequency of technological tool usage.

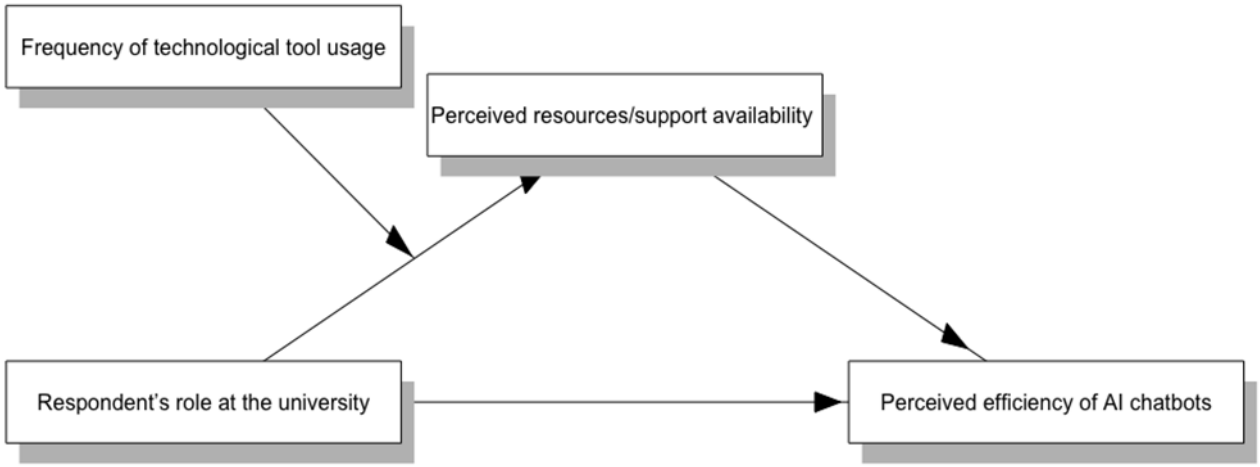
Interaction of Role and Technological Engagement on the Relationship

The conceptual framework further suggests that the indirect effect of role on perceived efficiency of LLM-based AI chatbots, through perceived availability of resources/support, is contingent on the frequency of technological tool usage. This model posits that the degree to which perceived availability of resources and support mediate the relationship between university role and perceived efficiency of LLM-based AI chatbots will depend on how frequently individuals engage with technological tools.

***H4*:** The mediation effect of perceived availability of resources/support on the relationship between role (faculty vs. student) and perceived efficiency of LLM-based AI chatbots will be moderated by frequency of technological tool usage, such that the indirect effect will be stronger for individuals with higher frequency of technological tool usage (see the whole model in Figure 1).

Figure 1

Moderated Mediation Model



Methods

Data Sources and Sample Size

This study utilizes de-identified secondary survey data from a 2023 Kaggle dataset (Romero, 2023), accessed under the Massachusetts Institute of Technology (MIT) license with permission from the dataset owner. The initial dataset includes

responses from students, faculty, and staff; however, this study focuses exclusively on students and faculty, resulting in a final sample size of 147 respondents (105 students and 42 faculty). No missing data were identified in the dataset. Institutional review board approval was waived due to the use of secondary, publicly available data.

Measures

Dependent Variable

The dependent variable in this study is the perceived efficiency of LLM-based AI chatbots. It was measured on a five-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree) in response to the statement "AI chatbots can improve the efficiency of student support services." The survey did not provide a formal definition of "student support services." However, the phrasing of the related items in the questionnaire indicates that participants interpreted this term in a pedagogical sense. The challenges listed in the survey, such as effectiveness, academic integrity, context dependence, and role definition, are instructional in nature and relate to learning processes rather than administrative tasks. Based on this structure, "student support services" in this study refers to learning-related assistance, including help with understanding course content or completing academic work.

Independent Variables

The primary independent variable in this study is the respondent's role at the university, categorized as either student or faculty. Two additional independent variables were analyzed using chi-square tests to explore their association with this primary independent variable: (1) willingness to use LLM-based AI chatbots, measured using a binary response to the question "Are you willing to use AI chatbots?" and (2) challenges when using AI chatbots, measured by the question "What challenges have you faced when using LLM-based AI chatbots for student support services?" Respondents could select multiple challenges from the following options: academic integrity, context dependence, effectiveness, role definition, user experience, and privacy.

Mediator

The mediator in this study is the perceived availability of institutional resources and support for LLM-based AI chatbot utilization. It was measured using a five-point Likert scale response to the question "How would you rate the availability of resources and support (e.g., training materials, tutorials, help desks) for using AI chatbots at your institution?" Response options ranged from Very Poor to Excellent.

Moderator

The moderator in this study is the frequency of technological tool usage. It was measured on a five-point Likert scale (1 = Rarely, 5 = Multiple times a day) in response to the question "How often do you use technological tools, including AI chatbots, for educational or administrative tasks at your institution?"

Covariates

The covariates in this study include age, gender, education level, and perceived ease of use of AI chatbots. Age was categorized into five groups: <20, 20–30, 31–40, 41–50, and >50. Gender was classified as male, female, or prefer not to say. Education level was categorized as undergraduate, postgraduate, or doctoral. Perceived ease of use was measured using two statements: "Interacting with AI chatbots for student support is easy" and "Little effort is needed to learn how to use AI chatbots for student support." Respondents rated each statement using a five-point Likert scale, with options ranging from Strongly Disagree to Strongly Agree. These two items demonstrated excellent internal consistency, with a Cronbach's alpha coefficient of 0.91, indicating a high level of reliability among the measures (Taber, 2018).

Statistical Analyses

Descriptive statistics, including mean values, standard deviations, and percentages, were calculated to provide a comprehensive overview of each variable in the study. For categorical variables such as age, gender, and education level, frequencies and percentages were reported to illustrate the distribution of respondents across different categories. Additionally, intercorrelation analyses were performed to systematically explore the relationships among key variables, providing a deeper understanding of their associations. This study used the Spearman Correlation Matrix to assess correlations between continuous variables, the Kruskal-Wallis Test to examine correlations between categorical and continuous variables, Cramér's V to evaluate correlations between categorical variables, and point-biserial correlation to test the correlation between binary categorical and continuous variables.

Chi-square tests were utilized to assess the association between the respondent's role at the university (student or faculty) and two variables: willingness to use LLM-based AI chatbots and perceived challenges when using AI chatbots. These analyses allowed us to determine whether significant differences exist between students and faculty in their willingness to adopt LLM-based AI chatbots and the challenges they face.

To further investigate the complex relationships among variables, a moderated mediation analysis was conducted using Hayes' PROCESS macro (Model 7) with 5,000 bootstrap samples estimation. This model enabled us to examine how the perceived availability of resources and support (mediator) influences the relationship between role at the university (independent variable) and perceived chatbot efficiency (dependent variable), and how this mediation effect is moderated by the frequency of technological tool usage (moderator). The results of this model are expected to provide deeper insights into the mechanisms that shape user perceptions of LLM-based AI chatbots and their potential adoption in higher education.

All analyses were performed using SPSS (IBM, version 29, Armonk, NY) and R Programming software (R Foundation, Boston, MA, USA, Version 4.3.2) with the vcd packages. A significance level of 0.05 was used for all statistical tests, except for the moderation effects, where a significance level of 0.1 was considered.

Results

Descriptive Statistics

Table 1 summarizes the characteristics of the study sample ($N = 147$). Over three quarters of the respondents strongly agreed that LLM-based AI chatbots could enhance the efficiency of student support services, indicating a generally positive attitude toward LLM-based AI chatbot usage among the participants. Table 1 also displays the intercorrelations among the five key variables. "Perceived efficiency of LLM-based AI chatbots" shows a moderate positive correlation with "Perceived resources/support availability" ($r = .42$), suggesting that respondents who perceive greater efficiency are likely to view resources and support more favorably. Similarly, "Perceived efficiency of LLM-based AI chatbots" is moderately positively correlated with "Perceived ease of use of LLM-based AI chatbots" ($r = .32$), indicating that as perceived ease of use increases, so does the perception of efficiency.

Table 1

Descriptive Statistics (N=147)

Research Variables	Mean (*Standard Deviation*) *Sample Size (N)* Percent (%)	Research Variables							
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Control Variables									
(1) Age	• <20: 5/3% • 20–30: 83/57% • 31–40: 41/28% • 41–50: 15/10% • >50: 3/20%	1							
(2) Gender	• Male: 106/72% • Female: 33/23% • Prefer not to say: 8/5%	0.136	1						
(3) Education	• Undergraduate: 31/21% • Doctoral: 30/21% • Postgraduate: 86/59%	0.615	0.072	1					
(4) Perceived ease of use of AI chatbots	3.643 ± 0.573	0.008	0.208	0.152	1				
Predictor Variables									
(5) Respondent's role at the university (student)	105/71%	0.562	0.119	0.572	-0.184	1			
Mediator									
(6) Perceived resources/support availability	3.952 ± 0.734	0.013	0.122	0.006	0.200	0.144	1		
Moderators									
(7) Frequency of technological tool usage	2.442 ± 0.966	0.012	0.445	0.008	0.065	-0.118	0.194	1	
Outcome Variables									
(8) Perceived efficiency of AI chatbots	4.728 ± 0.531	0.001	0.111	0.051	0.324	-0.159	0.419	0.235	1

Chi-Square Test of Independence Results

Table 2 displays the chi-square test results. The chi-square test results for willingness to use LLM-based AI chatbots based on the respondent's role at the university show a Pearson chi-square value of 2.940 ($\chi^2 = 2.940$, $p = .086$), indicating no strong evidence of a difference in willingness to use AI chatbots between students and faculty. In addition, the continuity correction value is 1.654 ($p = .198$), and the likelihood ratio chi-square is 2.622 ($p = .105$), further supporting the lack of a significant association between the two groups.

The chi-square test results for the perceived challenges when using LLM-based AI chatbots based on the respondent's role at the university reveal significant associations for academic integrity ($\chi^2 = 17.78$, $p < .000$), context dependence ($\chi^2 = 5.041$, $p < .05$), and role definition ($\chi^2 = 5.562$, $p < .05$), suggesting that students and faculty perceive these challenges differently. Privacy concerns show a marginally significant association ($\chi^2 = 3.738$, $p = .053$), while there is no significant association for effectiveness ($\chi^2 = 083$, $p = .774$) and user experience ($\chi^2 = 1.363$, $p = .243$).

Table 2

Chi-Square Test Results

Variable		Pearson Chi-Square	Continuity Correction	Likelihood Ratio
Respondent's role * Willingness to use AI chatbots		2.940 (0.086)	1.654 (0.198)	2.622 (0.105)
Respondent's role * Perceived challenges when using AI chatbots	Academic Integrity	**17.871***** **(0.000)**	**19.863***** **(0.000)**	**18.200***** **(0.000)**
	Context Dependence	**5.041*** **(0.025)**	**5.927*** **(0.015)**	**6.258*** **(0.012)**
	Role Definition	**5.562*** **(0.018)**	**6.747**** **(0.009)**	**8.219**** **(0.004)**
	Effectiveness	0.083 (0.774)	0.262 (0.609)	0.257 (0.612)
	User Experience	1.363 (0.243)	1.868 (0.172)	1.822 (0.177)
	Privacy	3.738 (0.053)	**4.678*** **(0.031)**	**4.399*** **(0.036)**

*$p < .05$; **$p < .01$; ***$p < .001$

Moderated Mediation Analysis Results

A moderated mediation analysis was conducted using Hayes's PROCESS macro (Model 7) to explore the conditional indirect effects of respondent's role on perceived chatbot efficiency through perceived availability of resources and support, moderated by the frequency of technological tool usage. The results (as shown in Table 3) indicate that perceived availability of resources and support significantly mediate the relationship between respondent's role and perceived AI chatbot efficiency (β = .259, *SE* = .055, bootSE = .060, $p < .001$). This suggests that faculty members, compared to students, tend to perceive AI chatbots as more efficient when they also perceive higher availability of resources and support.

The moderation effect of frequency of technological tool usage on the relationship between the respondent's role and perceived availability of resources and support is marginally significant (interaction β = .257, *SE* = .145, bootSE = .151, $p = .078$). This suggests that the effect of role on perceived resources and support varies depending on the level of technological engagement. Figure 2 shows the perceived availability of resources/support increases disproportionately for faculty as the frequency of technological tool usage rises, while for students, the increase is less pronounced.

Further, the conditional indirect effect of role on perceived LLM-based AI chatbots' efficiency through perceived resources and support is significant at moderate (β = .140, *SE* = .058, bootSE = .058, $p < .05$) and high (β = .204, *SE* = .074, bootSE = .074, $p < .01$) levels of technological tool usage, but not at low levels (β = .075, *SE* = .069, bootSE = .069, $p = .165$). This

indicates that the mediating effect of perceived resources and support on the relationship between role and perceived chatbot efficiency is stronger at higher levels of technological tool usage.

The direct effect of role on perceived LLM-based AI chatbots' efficiency is not significant (β = -.139, *SE* = .109, bootSE = 0.101, *p* = .203), indicating that respondent role does not directly influence perceived chatbot efficiency. The index of moderated mediation is not significant (index = 0.067, bootSE = 0.043), suggesting that the overall moderation effect of technological tool usage on the indirect relationship between role and perceived LLM-based AI chatbots' efficiency is not statistically significant. This means that, although some differences were observed in the conditional indirect effects at varying levels of technological tool usage, these differences were not large enough to establish a significant overall moderated mediation effect.

The overall model explains 28.2 percent of the variance in perceived LLM-based AI chatbots' efficiency (R^2 = .282, p < .001) This suggests the importance of perceived resources and support and technological engagement in shaping perceptions of AI chatbots' efficiency.

Table 3

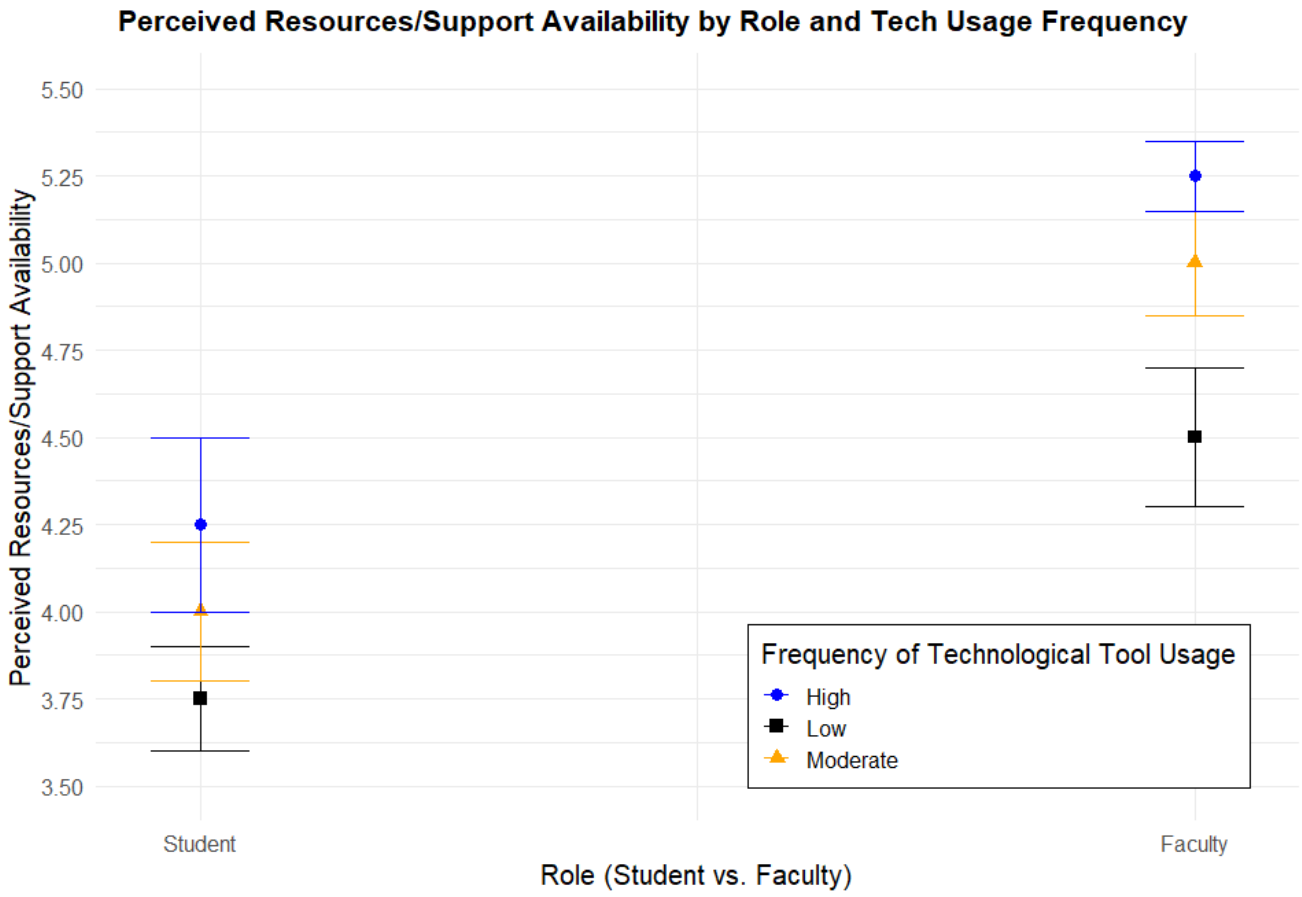
Moderate Mediation Model Analysis Results

	Mediation	**Mediated Moderation**
Research Variables	**Perceived resources/support availability β (BootSE)**	**Perceived efficiency of AI chatbots β (BootSE)**
Control Variables		
Age	-.201 (.133)	-.133 (.083)
Gender	-.094 (.095)	-.003 (.057)
Education level	.012 (.118)	.092 (.093)
Perceived ease of use of AI chatbots	**.271*** **(.135)**	**.199*** **(.093)**
Predictor Variables		
Respondent's role at the university (student vs. faculty)	**-.090*** **(.084)**	-.139 (.101)
Mediator		
Perceived resources/support availability		**.259***** **(.055)**
Moderator		
Frequency of technological tool usage	.027 (.071)	
Interaction Effect		
Respondent's role at the university * Frequency of technological tool usage	**.257†** **(.145)**	
Model Effect		
Direct effect		-.139 (.109)
Conditional Effects of the Focal Predictor at Values of Frequency of Technological Tool Usage		
Low level of frequency of technological tool usage	.290 (.208)	
Moderate level of frequency of technological tool usage	**.539*** **(.158)**	
High level of frequency of technological tool usage	**.787***** **(.213)**	
Conditional Indirect Effects of Respondent's Role at the University on Perceived Efficiency of AI Chatbots		
Low level of frequency of technological tool usage		.075 (.069)
Moderate level of frequency of technological tool usage		**.140***** **(.058)**
High level of frequency of technological tool usage		**.204**** **(.074)**

†$p < 0.1$; *$p < .05$; **$p < .01$; ***$p < .001$
*Moderator value in conditional tables are the mean and +/- *SD* from the mean.

Figure 2

The Moderating Role of Frequency of Technological Tool Usage in the Relationship between Respondent's Role at the University (Student vs. Faculty) and Perceived Resources/Support Availability



Discussion

Our findings reveal a key mechanism by which university roles influence perceptions of LLM-based AI chatbots' efficiency, mediated by the perceived availability of resources and support. This mediation effect is further moderated by the frequency of technological tool usage. Specifically, we found that faculty members, who typically have greater access to institutional resources (Alieto et al., 2024; Bong & Chen, 2024; Jokhan et al., 2022; Murdan & Halkhoree, 2024; Ng et al., 2023), were more likely to view LLM-based AI chatbots as efficient tools. Moreover, this relationship is amplified as technological tool engagement increases, suggesting that higher levels of interaction with technology enhance the perceived availability and utility of resources.

First, as we hypothesized, faculty reported higher perceived efficiency of LLM-based AI chatbots than students, although this direct effect was not statistically significant. These findings align with emerging studies showing mixed attitudes among educators toward AI tools, where some faculty appreciate the potential efficiency gains, while others express uncertainty about accuracy, ethical implications, or the impact on teaching roles (Richardson et al., 2024; Sajja et al., 2025). One possible explanation is that concerns documented in the literature, such as workload pressures and uncertainty about AI accuracy, may temper faculty willingness toward its use (Blankstein, 2022; Nakano et al., 2021). These mixed patterns suggest that faculty attitudes toward LLM-based AI chatbots may be more complex than simply being more positive and may depend heavily on contextual factors such as workload expectations, institutional support, and disciplinary norms. Studies show that faculty

adoption of AI tools is strongly influenced by contextual supports such as structured training, clear usage guidelines, workload considerations, and institutional expectations (Mah & Groß, 2024; Richardson et al., 2024; Sutedjo et al., 2025).

From a practical perspective, our findings indicate that institutions should adopt targeted, evidence-based strategies to support faculty engagement with LLM-based AI tools. Studies show that structured, hands-on AI training programs substantially improve faculty confidence and readiness to use AI in teaching (Mah & Groß, 2024). For instance, the *AI Academy* introduced by Chen et al. (2025) provided hands-on exploration, peer learning, and pedagogical reflection, and participating instructors demonstrated clear gains in AI literacy. Adapting similar workshop-based models can help faculty develop confidence and informed practices for using LLM-based AI chatbots. In addition, developing clear-cut institutional policies, such as sample syllabus statements and academic integrity guidance, can help reduce uncertainty and ethical concerns surrounding AI use, thereby potentially increasing perceived efficiency among faculty (An et al., 2025).

Second, our findings indicate that the availability of resources and support serves as a positive mediator in the relationship between university role and perceived efficiency of LLM-based AI chatbots. This suggests that differences between students and faculty are shaped not only by personal attitudes or skills but also by the institutional environment in which these tools are used. This finding aligns with research showing that access to training, guidance, and technical assistance is a key factor shaping users' confidence and willingness to adopt AI tools (Al Darayseh, 2023; Chiu et al., 2023; Han & Geng, 2023). However, our results extend these studies by demonstrating that resource availability is the mechanism through which role differences translate into perceived efficiency, rather than simply a background factor. Echoing SCT, greater access to resources and support is likely to foster more positive attitudes toward AI chatbot efficiency (Chang et al., 2023; Ofosu-Ampong et al., 2023). For example, Chiu et al. (2023) have found that the support from teachers moderates the effects of student expertise on need satisfaction and intrinsic motivation to learn with AI technologies.

From a practical perspective, our findings indicate that strengthening institutional support structures may be more effective than focusing solely on individual-level interventions. Institutions aiming to enhance the adoption of AI technologies must prioritize the provision of adequate resources, such as training, technical assistance, and digital infrastructure (Saaida, 2023; Williamson, 2018), to positively influence user perceptions of LLM-based AI chatbots. Specifically, institutions may consider establishing centralized AI support hubs or teaching innovation centers (An et al., 2025; Arya et al., 2025) to provide on-demand guidance and consistent access to resources, thereby improving perceptions of AI tool efficiency and usability.

Third, the moderating role of technological tool usage is weaker than expected, with only marginal significance in the interaction term and a non-significant overall moderated mediation index. This differs from studies suggesting that frequent technology users typically report stronger technology acceptance (Mah & Groß, 2024), according to the TAM. Nevertheless, the direction of the results indicates a meaningful tendency: individuals who frequently use technological tools are more likely to perceive higher availability of resources and support. This relationship is particularly pronounced among faculty, for whom perceived resource availability increases substantially with more frequent technological tool usage. In contrast, the increase is less marked among students, suggesting that while both groups benefit from greater technological engagement, faculty members have a more positive perception about resources and support availability. This emerging pattern suggests that while general digital engagement may not automatically translate into robust AI readiness, it may still shape how different groups recognize and interpret institutional support.

From a practical perspective, our findings suggest that institutions should not assume that frequent technology users, especially students, require less guidance when adopting AI tools. Instead, targeted, AI-specific exposure is needed to transform general digital familiarity into tangible AI competence. Evidence-based strategies include providing low-stakes opportunities for students to interact with LLM-based AI chatbots within course activities (Wang et al., 2023), providing incentives that promote sustained technological engagement (Subhash & Cudney, 2018), and integrating AI chatbot-supported tasks into routine academic workflows to build confidence and fluency (Chen et al., 2025; Wang & Xue, 2024). In addition, faculty, who already perceive higher resource availability and engage more frequently with technology, can be utilized as a key resource for supporting students.

Contributions

One of this study's key contributions is the identification of a moderated mediation mechanism that identified that students and faculty differ in their perceptions of LLM-based AI chatbot efficiency. Rather than role differences directly driving

perceptions, our findings suggest that perceived availability of resources and support is the central pathway through which role shapes efficiency perceptions, and this pathway is modestly conditioned by technological engagement. This contributes to the growing literature by highlighting that contextual and environmental factors, not role alone, are the primary drivers of positive AI perceptions in higher education.

A second contribution lies in demonstrating that technological engagement, although statistically weak, shows a meaningful tendency to amplify perceived institutional support, especially among faculty. This finding advances our understanding of AI readiness by distinguishing between general digital familiarity and AI-specific competence, supporting recent studies showing that everyday technology use does not automatically translate into confidence with emerging AI tools.

Finally, this study contributes practical guidance by identifying concrete, evidence-based strategies institutions can adopt to strengthen AI readiness across user groups. Targeted AI-specific exposure, such as low-stakes chatbot activities, routine LLM-supported coursework, and structured training programs like the *AI Academy* (Chen et al., 2025), can build competence. In addition, clear AI policies, accessible training materials, and timely technical assistance help users make better use of available resources.

Study Limitation

While this study adds to the growing body of literature on AI in education, several limitations should be addressed in future research. First, the cross-sectional design limits our ability to infer causality between variables, suggesting the need for longitudinal studies to examine changes over time. Second, because this study uses secondary survey data, we were unable to control the survey design, sampling approach, or the exact wording of the measures. For instance, the survey did not explicitly define "student support services," which may have led participants to interpret this pedagogical construct differently. Similarly, in this study, the term "AI chatbot" is used to denote LLM-based conversational tools. Although the survey did not include a formal definition, the item was developed in the context of modern LLM-driven chatbots, making this the most reasonable interpretation. However, because no explicit definition was provided to participants, some variation in how they understood the term remains possible. Additionally, the dataset does not include institutional characteristics or contextual information that could influence perceptions of AI chatbots. These limitations should be considered when interpreting the findings. Third, several statistical findings in this study were marginal or non-significant and should be interpreted with caution. For example, some chi-square tests and interaction terms showed only borderline significance, and the index of moderated mediation was not significant. These patterns may reflect limited statistical power due to the relatively small sample size ($N = 147$). As a result, the strength and stability of some effects may be constrained, and future research with larger and more diverse samples is needed to verify these relationships. Fourth, the use of self-reported data may introduce response bias, which could be mitigated in future studies by incorporating objective measures, such as actual chatbot usage data. Additionally, while this study focused on specific variables such as perceived efficiency and resources/support availability, future research should consider other contextual factors like institutional policies or technological infrastructure to provide a more comprehensive understanding.

Conclusion

This study examined the differing perceptions of LLM-based AI chatbots between students and faculty in a higher education setting. It focused on how perceived availability of resources and support mediates the relationship between role and perceived LLM-based AI chatbot efficiency, with moderation by the frequency of technological tool usage. The findings suggest that faculty tend to perceive greater resources and support availability for LLM-based AI chatbot usage than students, and this perception is more pronounced as the frequency of technological tool usage increases. These insights highlight the importance of aligning LLM-based AI chatbot implementation strategies with the specific needs and expectations of different user groups. Future research should explore additional factors and diverse contexts to further understand the complexities of LLM-based AI adoption in educational settings.

Funding

This research did not receive any funding.

Conflict of Interest Statement

The authors have no conflicts of interest to disclose.

References

Adıgüzel, T., Kaya, M. H., & Cansu, F. K. (2023). Revolutionizing education with AI: Exploring the transformative potential of ChatGPT. *Contemporary Educational Technology*, *15*(3), Article ep429. https://doi.org/10.30935/cedtech/13152

Ahmed, F. (2024). The digital divide and AI in education: Addressing equity and accessibility. *AI EDIFY Journal*, *1*(2), 12–23. https://researchcorridor.org/index.php/aiej/article/view/259

Al Darayseh, A. (2023). Acceptance of artificial intelligence in teaching science: Science teachers' perspective. *Computers and Education: Artificial Intelligence*, *4*, Article 100132. https://doi.org/10.1016/j.caeai.2023.100132

Alieto, E., Abequibel-Encarnacion, B., Estigoy, E., Balasa, K., Eijansantos, A., & Torres-Toukoumidis, A. (2024). Teaching inside a digital classroom: A quantitative analysis of attitude, technological competence and access among teachers across subject disciplines. *Heliyon*, *10*(2), Article e24282. https://doi.org/10.1016/j.heliyon.2024.e24282

An, Y., Yu, J. H., & James, S. (2025). Investigating the higher education institutions' guidelines and policies regarding the use of generative AI in teaching, learning, research, and administration. *International Journal of Educational Technology in Higher Education*, *22*, Article 10. https://doi.org/10.1186/s41239-025-00507-3

Arya, V., Saraf, A., Chichkanov, N., Papa, A., & Romano, M. (2025). AI-enhanced competency transfer hubs: A conceptual framework for university-industry engagement and knowledge sharing. *The Journal of Technology Transfer*, 1–31. https://doi.org/10.1007/s10961-025-10233-7

Bandura, A. (2001). Social cognitive theory: An agentic perspective. *Annual Review of Psychology*, *52*(1), 1–26. https://doi.org/10.1146/annurev.psych.52.1.1

Bekkar, H.-A., & Chtouki, Y. (2024). Chatbots in education: A systematic literature review. In *2024 10th International Conference on Smart Computing and Communication (ICSCC), Bali, Indonesia* (pp. 637–644). IEEE. https://doi.org/10.1109/ICSCC62041.2024.10690334

Blankstein, M. (2022). Understanding faculty workload. In *Ithaka S+ R US Faculty Survey 2021* (pp. 7–12). Ithaka S+R. www.jstor.org/stable/resrep49458.5

Bong, W. K., & Chen, W. (2024). Increasing faculty's competence in digital accessibility for inclusive education: A systematic literature review. *International Journal of Inclusive Education*, *28*(2), 197–213. https://doi.org/10.1080/13603116.2021.1937344

Chan, C. K. Y., & Hu, W. (2023). Students' voices on generative AI: Perceptions, benefits, and challenges in higher education. *International Journal of Educational Technology in Higher Education*, *20*(1), Article 43. https://doi.org/10.1186/s41239-023-00411-8

Chang, D. H., Lin, M. P.-C., Hajian, S., & Wang, Q. Q. (2023). Educational design principles of using AI chatbot that supports self-regulated learning in education: Goal setting, feedback, and personalization. *Sustainability*, *15*(17), Article 12921. https://doi.org/10.3390/su151712921

Chen, L., Chen, P., & Lin, Z. (2020). Artificial intelligence in education: A review. *IEEE Access*, *8*, 75264–75278. https://doi.org/10.1109/ACCESS.2020.2988510

Chen, S., Tang, X., Cheng, A., Chawla, N., Ambrose, G. A., & Metoyer, R. (2025). *AI Academy: Building generative AI literacy in higher ed instructors*. arXiv. https://doi.org/10.48550/arXiv.2509.11999

Chen, Y., Jensen, S., Albert, L. J., Gupta, S., & Lee, T. (2023). Artificial intelligence (AI) student assistants in the classroom: Designing chatbots to support student success. *Information Systems Frontiers*, *25*(1), 161–182. https://doi.org/10.1007/s10796-022-10291-4

Chiu, T. K., Moorhouse, B. L., Chai, C. S., & Ismailov, M. (2023). Teacher support and student motivation to learn with Artificial Intelligence (AI) based chatbot. *Interactive Learning Environments*. Advance online publication. https://doi.org/10.1080/10494820.2023.2172044

Cotton, D. R., Cotton, P. A., & Shipway, J. R. (2024). Chatting and cheating: Ensuring academic integrity in the era of ChatGPT. *Innovations in education and teaching international*, *61*(2), 228–239. https://doi.org/10.1080/14703297.2023.2190148

Davis, F. D., & Granić, A. (2024). Introduction: "Once upon a TAM". In F. D. Davis & A. Granić (Eds.), *The Technology Acceptance Model* (pp. 1–18). https://doi.org/10.1007/978-3-030-45274-2_1

Debets, T., Banihashem, S. K., Joosten-Ten Brinke, D., Vos, T. E., de Buy Wenniger, G. M., & Camp, G. (2025). Chatbots in education: A systematic review of objectives, underlying technology and theory, evaluation criteria, and impacts. *Computers & Education*, *234*, Article 105323. https://doi.org/10.1007/s10734-024-01288-w

Essel, H. B., Vlachopoulos, D., Tachie-Menson, A., Johnson, E. E., & Baah, P. K. (2022). The impact of a virtual teaching assistant (chatbot) on students' learning in Ghanaian higher education. *International Journal of Educational Technology in Higher Education*, *19*, Article 57. https://doi.org/10.1186/s41239-022-00362-6

Gill, S. S., Xu, M., Patros, P., Wu, H., Kaur, R., Kaur, K., Fuller, S., Singh, M., Arora, P., Parlikad, A. K., Stankovski, V., Abraham, A., Ghosh, S. K., Lutfiyya, H., Kanhere, S. S., Bahsoon, R., Rana, O., Dustdar, S., Sakellariou, R., …

Buyya, R. (2024). Transformative effects of ChatGPT on modern education: Emerging Era of AI Chatbots. *Internet of Things and Cyber-Physical Systems*, *4*, 19–23. https://doi.org/10.1016/j.iotcps.2023.06.002

Gromova, E. A., Ferreira, D. B., & Begishev, I. R. (2023). ChatGPT and other intelligent chatbots: Legal, ethical and dispute resolution concerns. *Revista Brasileira de Alternative Dispute Resolution-Brazilian Journal of Alternative Dispute Resolution-RBADR*, *5*(10), 153–175. https://doi.org/10.52028/rbadr.v5i10.ART07.RU

Gruenhagen, J. H., Sinclair, P. M., Carroll, J.-A., Baker, P. R., Wilson, A., & Demant, D. (2024). The rapid rise of generative AI and its implications for academic integrity: Students' perceptions and use of chatbots for assistance with assessments. *Computers and Education: Artificial Intelligence*, *7*, Article 100273. https://doi.org/10.1016/j.caeai.2024.100273

Gupta, A., Hathwar, D., & Vijayakumar, A. (2020). Introduction to AI chatbots. *International Journal of Engineering Research and Technology*, *9*(7), 255–258. https://www.ijert.org/introduction-to-ai-chatbots

Haleem, A., Javaid, M., & Singh, R. P. (2022). An era of ChatGPT as a significant futuristic support tool: A study on features, abilities, and challenges. *BenchCouncil transactions on benchmarks, standards and evaluations*, *2*(4), Article 100089. https://doi.org/10.1016/j.tbench.2023.100089

Han, J., & Geng, X. (2023). University students' approaches to online learning technologies: The roles of perceived support, affect/emotion and self-efficacy in technology-enhanced learning. *Computers & Education*, *194*, Article 104695. https://doi.org/10.1016/j.compedu.2022.104695

Haque, M. A., & Li, S. (2025). Exploring ChatGPT and its impact on society. *AI and Ethics*, *5*, 791–803. https://doi.org/10.1007/s43681-024-00435-4

Jeon, J. (2024). Exploring AI chatbot affordances in the EFL classroom: Young learners' experiences and perspectives. *Computer Assisted Language Learning*, *37*(1-2), 1-26. https://doi.org/10.1080/09588221.2021.2021241

Jokhan, A., Chand, A. A., Singh, V., & Mamun, K. A. (2022). Increased digital resource consumption in higher educational institutions and the artificial intelligence role in informing decisions related to student performance. *Sustainability*, *14*(4), Article 2377. https://doi.org/10.3390/su14042377

Jones, M. S. (2024). Review of "Failure to disrupt: Why technology alone can't transform education" by J. Reich. *Education Review*, *31*. https://doi.org/10.14507/er.v31.3821

Karimov, A., Saarela, M., & Kärkkäinen, T. (2024). AI-powered education equality: Evidence from five countries. In C. Bonk & G. Marks (Eds.), *Proceedings of E-Learn: World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education* (pp. 500–505). Association for the Advancement of Computing in Education (AACE). https://www.learntechlib.org/primary/p/225038/

Kim, J. (2024). Leading teachers' perspective on teacher-AI collaboration in education. *Education and Information Technologies*, *29*(7), 8693–8724. https://doi.org/10.1007/s10639-023-12109-5

Kizilcec, R. F. (2024). To advance AI use in education, focus on understanding educators. *International Journal of Artificial Intelligence in Education*, *34*(1), 12–19. https://doi.org/10.1007/s40593-023-00351-4

Kumar, D., Haque, A., Mishra, K., Islam, F., Mishra, B. K., & Ahmad, S. (2023). Exploring the transformative role of artificial intelligence and metaverse in education: A comprehensive review. *Metaverse Basic and Applied Research*, *2*, Article 55. https://doi.org/10.56294/mr202355

Labadze, L., Grigolia, M., & Machaidze, L. (2023). Role of AI chatbots in education: Systematic literature review. *International Journal of Educational Technology in Higher Education*, *20*, Article 56. https://doi.org/10.1186/s41239-023-00426-1

Larsen, T. J., & Wetherbe, J. C. (1999). An exploratory field study of differences in information technology use between more-and less-innovative middle managers. *Information & Management*, *36*(2), 93–108. https://doi.org/10.1016/S0378-7206(99)00006-3

Ma, S., & Lei, L. (2024). The factors influencing teacher education students' willingness to adopt artificial intelligence technology for information-based teaching. *Asia Pacific Journal of Education*, *44*(1), 94–111. https://doi.org/10.1080/02188791.2024.2305155

Mageira, K., Pittou, D., Papasalouros, A., Kotis, K., Zangogianni, P., & Daradoumis, A. (2022). Educational AI chatbots for content and language integrated learning. *Applied Sciences*, *12*(7), Article 3239. https://doi.org/10.3390/app12073239

Mah, D.-K., & Groß, N. (2024). Artificial intelligence in higher education: Exploring faculty use, self-efficacy, distinct profiles, and professional development needs. *International Journal of Educational Technology in Higher Education*, *21*(1), Article 58. https://doi.org/10.1186/s41239-024-00490-1

Martin, F., Budhrani, K., & Wang, C. (2019). Examining faculty perception of their readiness to teach online. *Online Learning*, *23*(3), 97-119. https://doi.org/10.24059/olj.v23i3.1555

McGrath, C., Farazouli, A., & Cerratto-Pargman, T. (2025). Generative AI chatbots in higher education: A review of an emerging research area. *Higher Education*, *89*(6), 1533–1549. https://doi.org/10.1007/s10734-024-01288-w

Murdan, A. P., & Halkhoree, R. (2024). Integration of artificial intelligence for educational excellence and innovation in higher education institutions. In *2024 1st International Conference on Smart Energy Systems and Artificial Intelligence (SESAI)* (pp. 1–6). IEEE.

Nakano, S., Beaupré-Lavallée, A., & Bégin-Caouette, O. (2021). Accountability measures in higher education and academic workload: A ten-year comparison. *Brock Education Journal*, *30*(2), 116–136. https://doi.org/10.26522/BROCKED.V30I2.872

Ng, D. T. K., Leung, J. K. L., Su, J., Ng, R. C. W., & Chu, S. K. W. (2023). Teachers' AI digital competencies and twenty-first century skills in the post-pandemic world. *Educational Technology Research and Development*, *71*(1), 137–161. https://doi.org/10.1007/s11423-023-10203-6

Ofosu-Ampong, K., Acheampong, B., Kevor, M.-O, & Amankwah-Sarfo, F. (2023). Acceptance of artificial intelligence (ChatGPT) in education: Trust, innovativeness and psychological need of students. *Information and Knowledge Management*, *13*(4), 37–47. https://doi.org/10.7176/IKM/13-4-03

Okonkwo, C. W., & Ade-Ibijola, A. (2021). Chatbots applications in education: A systematic review. *Computers and Education: Artificial Intelligence*, *2*, Article 100033. https://doi.org/10.1016/j.caeai.2021.100033

Panagiotidis, P. (2024). LLM-based chatbots in language learning. *European Journal of Education*, *7*(1), 102–123. https://revistia.com/ejed/article/view/3011

Park, E. S., & Park, M. S. (2020). Factors of the technology acceptance model for construction IT. *Applied Sciences*, *10*(22), Article 8299. https://doi.org/10.3390/app10228299

Pham, D., Sheffey, J., Pham, C. M., & Houmansadr, A. (2024). *ProxyGPT: Enabling anonymous queries in AI chatbots with (Un) trustworthy browser proxies.* arXiv. https://doi.org/10.48550/arXiv.2407.08792

Richardson, E., Gordon, J., Conklin, S., Barreto, D., & Ginnetti, R. (2024). Artificial intelligence in higher education: Faculty perceptions of integration and other considerations. *UNC System Learning and Technology Journal*, *2*(1). https://journals.charlotte.edu/ltj

Romero, S. (2023). *AI chatbots perceptions students/staff/faculty* [Data set]. Kaggle. Romero, S. (2023). *AI chatbots perceptions students/staff/faculty* [Data set]. Kaggle. Dataset no longer publicly available.

Saaida, M. B. (2023). AI-driven transformations in higher education: Opportunities and challenges. *International Journal of Educational Research and Studies*, *5*(1), 29–36. https://www.multiinnovationjournal.com/assets/archives/2023/vol5issue1/5008-1684139103285.pdf

Sajja, R., Sermet, Y., Cwiertny, D., & Demir, I. (2025). Integrating AI and learning analytics for data-driven pedagogical decisions and personalized interventions in education. *Technology, Knowledge and Learning*. Advance online publication. https://doi.org/10.1007/s10758-025-09897-9

Sedkaoui, S., & Benaichouba, R. (2024). Generative AI as a transformative force for innovation: a review of opportunities, applications and challenges. *European Journal of Innovation Management*. Advance online publication. https://doi.org/10.1108/EJIM-02-2024-0129

Statista. (2024). *Number of artificial intelligence (AI) tool users globally from 2020 to 2030*. Retrieved October 9, 2024, from https://www.statista.com/forecasts/1449844/ai-tool-users-worldwide

Stöhr, C., Ou, A. W., & Malmström, H. (2024). Perceptions and usage of AI chatbots among students in higher education across genders, academic levels and fields of study. *Computers and Education: Artificial Intelligence*, *7*, Article 100259. https://doi.org/10.1016/j.caeai.2024.100259

Subhash, S., & Cudney, E. A. (2018). Gamified learning in higher education: A systematic review of the literature. *Computers in Human Behavior*, *87*, 192–206. https://doi.org/10.1016/j.chb.2018.05.028

Sutedjo, A., Liu, S. P., & Chowdhury, M. (2025). Generative AI in higher education: A cross-institutional study on faculty preparation and resources. *Studies in Technology Enhanced Learning*, *4*(1). https://doi.org/10.21428/8c225f6e.955a547e

Taber, K. S. (2018). The use of Cronbach's alpha when developing and reporting research instruments in science education. *Research in Science Education*, *48*, 1273–1296. https://doi.org/10.1007/s11165-016-9602-2

Taneja, K., Maiti, P., Kakar, S., Guruprasad, P., Rao, S., & Goel, A. K. (2024). Jill Watson: A virtual teaching assistant powered by ChatGPT. In A. M. Olney, I. A. Chounta, Z. Liu, O. C. Santos, & I. I. Bittencourt (Eds.), *Lecture notes in computer science: Vol. 14829. International Conference on Artificial Intelligence in Education. AIED 2024* (pp. 324–337). Springer, Cham. https://doi.org/10.1007/978-3-031-64302-6_23

Titko, J., Steinbergs, K., Achieng, M., & Uzule, K. (2023). Artificial intelligence for education and research: Pilot study on perception of academic staff. *Virtual Economics*, *6*(3), 7–19. https://doi.org/10.34021/ve.2023.06.03(1)

Tuomi, I. (2024). Beyond mastery: Toward a broader understanding of AI in education. *International Journal of Artificial Intelligence in Education*, *34*(1), 20–30. https://doi.org/10.1007/s40593-023-00343-4

Wang, T., Lund, B. D., Marengo, A., Pagano, A., Mannuru, N. R., Teel, Z. A., & Pange, J.. (2023). Exploring the potential impact of artificial intelligence (AI) on international students in higher education: Generative AI, chatbots, analytics, and international student success. *Applied Sciences*, *13*(11), Article 6716. https://doi.org/10.3390/app13116716

Wang, Y., Liu, C., & Tu, Y.-F. (2021). Factors affecting the adoption of AI-based applications in higher education. *Educational Technology & Society*, *24*(3), 116–129. https://www.j-ets.net/collection/published-issues/24_3

Wang, Y., & Xue, L. (2024). Using AI-driven chatbots to foster Chinese EFL students' academic engagement: An intervention study. *Computers in Human Behavior*, *159*, Article 108353. https://doi.org/10.1016/j.chb.2024.108353

Wang, Z., & Chu, Z. (2023). Examination of higher education teachers' self-perception of digital competence, self-efficacy, and facilitating conditions: An empirical study in the context of China. *Sustainability*, *15*(14), Article 10945. https://doi.org/10.3390/su151410945

Williams, R. T. (2024). The ethical implications of using generative chatbots in higher education. *Frontiers in Education*, *8*, Article 1331607. https://doi.org/10.3389/feduc.2023.1331607

Williamson, B. (2018). The hidden architecture of higher education: Building a big data infrastructure for the 'smarter university'. *International Journal of Educational Technology in Higher Education*, *15*, 1-26. https://doi.org/10.1186/s41239-018-0094-1

Wu, H., Wang, Y., & Wang, Y. (2024). "To use or not to use?" a mixed-methods study on the determinants of efl college learners' behavioral intention to use ai in the distributed learning context. *International Review of Research in Open and Distributed Learning*, *25*(3), 158-178. https://doi.org/10.19173/irrodl.v25i3.7708

Yang, S., & Evans, C. (2019). Opportunities and challenges in using AI chatbots in higher education. Proceedings of the 2019 3rd International Conference on Education and E-Learning. https://doi.org/10.1145/3371647.3371659

Yigci, D., Eryilmaz, M., Yetisen, A. K., Tasoglu, S., & Ozcan, A. (2025). Large language model-based chatbots in higher education. *Advanced Intelligent Systems*, *7*(3), 2400429. https://doi.org/10.1002/aisy.202400429

Please cite this article as:
Li, X., Park, J. M., & Mitchell, J. P. (2026). Perception in the loop: Understanding AI chatbot efficiency through the lens of role, support, and technology use in higher education. *Student Success, 17*(1), 32-48. https://doi.org/10.63608/ssj.3877

This article has been accepted for publication in *Student Success.* Please see the Editorial Policies under the 'About' section of the Journal website for further information.

Student Success: ***A journal exploring the experiences of students in tertiary education.***

Except where otherwise noted, content in this journal is licensed under a Creative Commons Attribution 4.0 International Licence. As an open access journal, articles are free to use with proper attribution. ISSN: 2205-0795