Research on the Use Preference of AI Education Support System

Weicheng Fan[1,*], Jiayu Zhang[2], Muhan Mao[1]
[1]*Zhejiang Guangsha Vocational and Technical University of Construction, Jinhua, Zhejiang, China*
[2]*Zhejiang Huize Engineering Design Co., LTD, Hangzhou, Zhejiang, China*
**Corresponding Author*

Abstract: This study investigates the key factors influencing students 'adoption of AI-assisted education systems in vocational undergraduate institutions, utilizing preference theory through semi-structured interviews and fuzzy set qualitative comparative analysis. The findings reveal that student preferences are shaped by multiple dimensions including answer quality, response efficiency, psychological safety, communication attitudes, social anxiety, and creativity. Results demonstrate that response efficiency serves as a prerequisite for students' preference for AI teaching assistants, while psychological safety and individual traits (e.g., social anxiety and creativity) mediate these pathways. The study aims to provide theoretical foundations and practical insights for optimizing AI teaching assistant functionalities and advancing human-machine collaborative education models.

Keywords: Preference-Based Usage; Vocational Bachelor's Degree; AI Teaching Assistant; AI Educational Support System

1. Introduction

In the age of artificial intelligence, advancing the widespread adoption of AI-powered educational support systems holds profound significance for addressing students 'growing demands for personalized and self-directed learning [1]"New Generation Artificial Intelligence Development Plan" explicitly advocates for intelligent education development, emphasizing the deployment of AI-assisted systems like smart teaching assistants to drive structural transformations in future education through AI as the core driving force. Meanwhile, "Education Informatization 2.0 Action Plan" further stresses the need to break through and promote key technologies such as intelligent teaching assistants and AI learning companions. The concentrated rollout of these policies marks an unprecedented level of attention and emphasis on the strategic importance of AI educational support systems in the education sector.

In this context, AI-assisted education systems have transitioned from theoretical exploration to widespread educational implementation. Currently, numerous educational institutions have pioneered the adoption of various AI systems, with their core application value primarily manifested in two aspects: First, effectively reducing repetitive tasks such as answering questions and grading assignments for human teachers, thereby alleviating their teaching pressure; Second, providing students with real-time, precise learning feedback and path guidance. This deep integration not only aligns with the global trend of educational digital transformation but also offers critical technical support and practical pathways for building student-centered, data-driven personalized learning environments [2,3].

2. Relevant Connotation

2.1 Definition of AI Education Assistance System

The AI Education Assistant System (hereafter referred to as AI Tutor) plays multiple roles in education. Its core functions include answering student questions, teaching foundational theories, serving as academic advisors, and providing tailored learning materials [4]. Unlike traditional education models with delayed feedback, AI Tutors leverage real-time interaction to promptly address student needs, effectively meeting diverse demands in self-directed learning environments. From the teacher's perspective, this technology reduces repetitive teaching tasks, allowing educators to focus on developing students' metacognitive abilities and higher-order thinking skills. Meanwhile, advancements in large language models like DeepSeeker have enhanced the system's ability to automatically retrieve online resources, enabling it to generate

more high-quality answers for open-ended course-related questions. Research data shows that compared to human teachers, AI Tutors excel in stimulating learning initiative, improving efficiency, and optimizing outcomes [5,6]. Additionally, driven by considerations such as cost control, teacher workload reduction, and service upgrades, schools and online learning platforms are actively promoting deep integration of AI Tutors. This trend indicates that AI Tutors are accelerating their integration into modern educational systems.

2.2 Theory of Preference

Preferences typically refer to individuals 'selective tendencies and personal preferences toward products, services, or information in specific contexts. These preferences are often shaped by multiple interacting factors. According to preference theory, when faced with multiple options, people leverage accumulated experience and knowledge to gather relevant information, evaluate each choice, form preferences, and ultimately make decisions. This theory has been extensively validated in user behavior research, enabling in-depth exploration of users' preferences between AI-assisted teaching assistants and human teachers across different scenarios [7].

2.3 Current Problems of AI Teaching Assistants

The current application of AI teaching assistants in educational scenarios has revealed inherent limitations. On one hand, they demonstrate significant shortcomings in emotional interaction, lacking the empathy of human teachers to accurately identify and respond to students' emotional fluctuations and personalized learning needs. On the other hand, their knowledge base remains constrained by preset databases, often failing to generate effective solutions when addressing complex or innovative questions beyond the course syllabus. Given these functional and emotional deficiencies, AI teaching assistants are unlikely to fully replace human teachers in the foreseeable future.

In this context, developing a new educational model centered on human-machine collaboration has emerged as a pivotal trend in future education [8,9]. This approach prioritizes student-centered learning, with student satisfaction serving as the core evaluation metric. By integrating the strengths of human educators and AI technologies, it aims to elevate educational service quality. To achieve this, conducting in-depth research on students' perceptions of human teachers and AI teaching assistants, their effectiveness evaluations, and specific usage preferences becomes the essential prerequisite and scientific foundation for optimizing resource allocation and designing efficient collaborative mechanisms.

3. Background and Significance of the Study

Given the current imbalance in faculty-to-student ratios and tight academic schedules at Zhejiang Guangsha Vocational and Technical University of Construction, studying students 'preferences for AI teaching assistants holds multiple strategic values. From the developers' perspective, this research helps optimize AI assistant functionalities and user interfaces, enhancing product appeal and accelerating their adoption in education. For vocational undergraduate institutions, it enables rational allocation of AI and human teaching resources while maintaining educational quality and reducing operational costs. For educators, it helps teachers identify their strengths, focus on professional development, and reinforce their unique value. For students, it allows them to select suitable assistant types based on personal needs, thereby stimulating learning interest and improving academic efficiency.

4. Factors Affecting the Use Preference of AI Teaching Assistants

4.1 Research Basis

Developed by Chaoxing Group, Chaoxing AI Assistant is an online platform providing students, teachers, and institutions with services including learning resource recommendations, homework grading, personalized learning plans, online Q&A, and effectiveness evaluation. Currently widely used in higher education courses, it has become the most frequently utilized teaching aid tool among all faculty and students at Zhejiang Guangsha Vocational and Technical University of Construction, thus possessing solid research foundations and academic significance. This study employs preference theory and semi-structured interview methods to systematically analyze the functional advantages of Chaoxing AI Assistant, while exploring key factors influencing student preferences. Additionally, the research utilizes

fuzzy set qualitative comparative analysis to comprehensively interpret the multi-factor causal relationships and their mechanisms that drive higher usage preferences for the AI assistant.

4.2 Factors Influencing the Use Preference of AI Teaching Assistants

This study employed semi-structured interviews to investigate factors influencing students' selection of AI teaching assistants versus human instructors. To minimize potential biases, participants were guided through standardized interview protocols (Table 1). All respondents were assured of strict confidentiality to ensure anonymous participation, thereby safeguarding the authenticity of their responses.

Table 1. Semi-Structured Interview Outline

order number	Clustering	Specific interview questions
1	Tools Function cognition	Have you ever used Chaoxing AI assistant on Xuetong? What are some of the features?
2	Experience the app	How do you feel about using the Super Star AI assistant?
3	Contextual choices Motivation analysis	In what situations would you prefer to use an AI assistant and why? In what situations would you prefer to ask a teacher for help and why?
4	contrast difference Choose to influence	What is the difference between Superstar AI Assistant and course teachers? What circumstances affect your choice tendency?
5	personal factors impact analysis	What factors influence your preference for using Chaoxing AI Assistant? What's the reason?
6	Collection of optimization suggestions	What aspects of SuperStar AI Assistant do you think need further optimization and improvement?

4.2.1. Collecting data and analysis

This study adopted a stepwise expansion approach to increase the qualitative sample size until theoretical saturation was achieved. After completing interviews with 25 participants and finding no new information, it was determined that theoretical saturation had been reached. Consequently, the study established a sample size of 25 semi-structured interview data for its qualitative research component, which is comparable to the sample sizes used in mixed-method studies dominated by quantitative approaches in recent years [10]. During implementation, the study utilized Wenjuanxing AI interview technology, with AI-powered assistants conducting interviews with university students. Each session averaged approximately 30 minutes, achieving a 100% response rate from all participants.

This study employed coding techniques within the grounded theory framework to systematically organize and analyze data. The 25 interviewees were sequentially numbered from A1 to A25. The coding process followed a three-stage progressive model. First, the open coding phase focused on extracting core concepts from raw data through meticulous analysis of interview transcripts, systematically categorizing key statements and semantic fragments. Initial analysis yielded 50 free nodes, which were systematically consolidated into 24 primary-level concept codes. Next, the associated coding phase integrated these primary codes through horizontal comparisons and vertical aggregation, forming 9 first-order thematic codes. Finally, the selective coding phase examined internal connections between these themes by constructing conceptual network diagrams to reveal hierarchical structures and logical relationships. This culminated in 7 second-order thematic codes, establishing a comprehensive theoretical framework.

The analysis results are presented in Table 2. The key factors influencing students 'preference tendencies primarily involve behavioral differences between AI tutors and human teachers in communication and response, specifically manifested in answer quality, communication skills, attitude towards interaction, response timeliness, and psychological safety. Additionally, students' individual social anxiety and innovative differences also affect their selection preferences. Beyond previously discussed dimensions such as answer quality, communication skills, and response timeliness, communication methods and psychological safety perception significantly influence students' preference formation. Most students perceive AI tutors as more patient, positive, and emotionally stable. When interacting with AI tutors, they tend to feel more relaxed and can naturally express genuine thoughts, thereby gaining higher psychological safety experiences. This further demonstrates the

unique value of AI tutors in teaching, serving as an effective supplement and update to traditional cognitive frameworks.

5. Impact Pathways of Students' Preferences for AI Teaching Assistants

Both AI tutors and human teachers possess distinct strengths and limitations. When students face the choice between AI tutors and human teachers, they conduct comprehensive evaluations across multiple dimensions. During this process, various equivalent combination paths (i.e., different combinations of influencing factors) may emerge, which could lead students to prefer AI tutors. To address this, the study on configuration paths of student preferences for AI tutors will employ fuzzy set qualitative comparative analysis. Through this method, we will explore the combination structures of multiple influencing factors summarized in Table 2, clearly distinguish core conditions from peripheral conditions, and ultimately identify multiple effective pathways that make students more inclined to use AI tutors.

Table 2. Semi-Structured Interview Outline

Secondary theme	First-order topic	Interview content
Answer quality heterogenicity	Relevance	The AI assistant provides detailed explanations tailored to my questions and clarifies issues clearly. However, their responses sometimes feel like reading from a script, making them hard to follow. (A05)
	Is it accurate	The teacher's answer is more accurate and authoritative, while the AI assistant's answer is mixed with online content and sometimes uncertain. (A13)
	Is it comprehensive?	AI teaching assistants can provide divergent interpretations on some issues, provide diversified cases, and give more examples when giving multiple examples. Teachers' examples are limited.(A01)
ablility to communicate heterogenicity	Whether there is a barrier	The teacher's lectures are easier to understand and the conversation flows smoothly. Sometimes the AI assistant can't understand my questions and will give irrelevant answers. (A21)
Communication attitude heterogenicity	Be patient and careful	Teachers sometimes end the question and answer session in a hurry because they are busy. But the AI assistant is always there and very patient. (A24)
Response efficiency	Whether to answer promptly	The AI assistant responds almost instantly, whereas questions to the teacher require waiting and the response time is uncertain. (A03)
Psychological security heterogenicity	Whether the expression is natural	You can speak freely when communicating with the AI assistant, and it feels natural. It's a bit stressful to communicate with the teacher, and it takes a long time to prepare when expressing problems. (A17)
social anxiety	Feeling anxious in communication	I am afraid of social interaction, and it is not difficult to chat with AI, but it is difficult to organize my language when chatting with teachers. (A09)
innovativeness	Like to try new technology	AI assistant is the big trend of AI, now everyone is using AI, I like to try these new technologies. (A10)

5.1 Questionnaire Design

The items used in the measurement were drawn from existing literature [11-13]. All questionnaire items were scored using a 5-point Likert scale, with responses ranging from 1 (strongly disagree) to 5 (strongly agree). Prior to the formal survey, a pilot study with a small sample size (n=30) was conducted to preliminarily assess the questionnaire's reliability and validity, which met the expected standards. The final version of the questionnaire was then distributed to a broader population.

5.2 Data Collection and Validity Test

This study focused on students at Zhejiang Guangsha Vocational and Technical University of Construction in Jinhua City, Zhejiang Province. Questionnaires were distributed through the Wenjuanxing online platform (URL: https://www.wjx.cn). Participants evaluated both AI teaching assistants and human teachers based on their experiences using these tools, assessing service characteristics, trust orientation, and willingness to use them. To ensure data quality, the questionnaire included two attention-check questions, with only valid samples passing all screening questions deemed qualified. A total of 380 questionnaires were distributed, with 351 valid responses collected (92.37% validity rate). Among valid samples, 168 respondents (47.86%) were male and 183 (52.14%) female. By academic year distribution: 66 first-year college students (18.80%), 54 second-year college students (15.38%), 72 first-year undergraduates (20.51%), 42 second-year undergraduates

(11.97%), 56 third-year undergraduates (15.95%), and 61 fourth-year undergraduates (17.38%). The sample coverage across academic stages was relatively even, indicating good representativeness and rationality of the study's sampling. SPSS software was used to conduct KMO and Bartlett's test of sphericity. Results showed a KMO value of 0.928, Cronbach's Alpha reliability coefficient of 0.949, and a significance level of 0.000, indicating good item reliability and correlations between factors (Table 3). Among them, the cumulative variance contribution value was 68.139%, indicating that the questionnaire results had a good explanatory ability.

Table 3. KMO and Bartlett Test

Kaiser-Meyer-Olkin test for sampling appropriateness		.928
Bartlett's sphericity test	Approximate Chi-Square	10124.653
	free degree	1431
	conspicuousness	.000

6. Qualitative Comparison Analysis of Fuzzy Sets

6.1 Variable Calibration and Necessity Analysis

Table 4. Analysis of Results for Necessity

	Consistency level (>0.9)	Coverage (>0.6)
Quality of answers	0.762464	0.591886
~Answer Quality	0.331513	0.560626
ablility to communicate	0.760376	0.592530
~ ablility to communicate	0.333602	0.559496
Communication attitude	0.751701	0.593422
~Communication Attitude	0.342276	0.558545
Timeliness of responses	0.976032	0.776583
~Answer time	0.227291	0.494011
Psychological security	0.821473	0.894010
~Psychological security	0.499476	0.855761
social anxiety	0.741527	0.574129
~ social anxiety	0.352450	0.599453
innovativeness	0.731514	0.571709
~ innovativeness	0.362464	0.604105

Note: ~ indicates that the variable does not exist

Based on theoretical frameworks and practical research, three key anchor points are established: complete subordination threshold, crossover point, and complete non-subordination threshold. This study employs numerical data obtained from a 5-point Likert scale, referencing existing research methodologies to define the highest score "5" as complete subordination (subordination degree of 1), the middle score "3" as the crossover point (subordination degree of 0.5), and the lowest score "1" as complete non-subordination (subordination degree of 0) [14]. The study conducts necessity tests for each dependent variable. If a prerequisite condition shows a consistency level above 0.9 and coverage rate exceeding 0.6, it is considered a necessary condition for the outcome. Using fsQCA4.1 software for necessity testing (Table 4), the results indicate that response timeliness serves as a necessary condition for students' preference toward choosing AI teaching assistants.

6.2 Findings

Following the necessity analysis, the study conducted a sufficiency analysis to identify whether configurations of multiple causative conditions could sufficiently lead to the outcome. Using calibrated set membership scores, this research applied a truth table algorithm for sufficiency analysis to identify condition combinations that could fully drive high willingness to use, ultimately forming five groups. The sufficiency condition analysis using QCA4.1 software yielded solutions indicating greater willingness to use AI teaching assistants (Table 5). The final results showed solution consistency at 0.936132 (with solutions above 0.8 considered valid) and solution coverage at 0.832483, demonstrating the representativeness of the findings.

Table 5. Results of Fuzzy Set Qualitative Comparative Analysis

Prerequisites	A solution that is more willing to use AI teaching assistants				
	1	2	3	4	5
Quality of answers	●		●		●
ablility to communicate			⊗	⊗	
Communication attitude		●		●	●
Response efficiency	·	·	·	·	·
Psychological security	·	●	·	·	·
social anxiety			·	●	●
innovativeness	●	●			

consistency	0.968268	0.969078	0.958058	0.943038	0.969309
Original coverage	0.724398	0.715141	0.433166	0.423366	0.513626
Only coverage	0.035773	0.030264	0.011457	0.007924	0.026252
Consistency of solutions	0.936132				
Coverage of the solution	0.832483				

Note: ● exists as a core condition, while ⊗ is absent; · exists as an auxiliary condition, while ⊗ is absent.

6.2.1 Combination 1: answer quality + response efficiency + psychological security + innovation

The research findings indicate that answer quality and innovation are the core criteria for students' preference in AI tutors, while response efficiency and psychological security serve as supplementary factors. Therefore, when students receive high-quality answers, efficient responses, and psychological security, they are more likely to use AI tutors-even when these tutors demonstrate weaker communication skills and attitudes compared to human teachers-especially when the tutors exhibit strong innovative capabilities.

6.2.2 Combination 2: communication attitude + response efficiency + psychological security + innovation

The study reveals that communication attitude, psychological security, and innovation are the core factors influencing students 'preference for AI tutors, while response efficiency serves as a secondary consideration. Students with strong communication attitudes, efficient responses, and psychological security are more likely to use AI tutors, regardless of the tutors' answer quality or communication skills.

6.2.3 Combination 3: answer quality + communication skills + response efficiency + psychological security + social anxiety

Research findings indicate that answer quality serves as the core criterion for students' preference in using AI teaching assistants, while response efficiency, psychological safety, and social anxiety act as supporting factors. This demonstrates that even when AI assistants lack communication skills comparable to human teachers, students experiencing social anxiety still prefer using them due to their superior answer quality, efficient responses, and reassuring psychological comfort.

6.2.4 Combination 4: ~ communication ability + communication attitude + response efficiency + psychological security + social anxiety

Research findings indicate that communication attitude and social anxiety constitute the core factors influencing students' preference for AI teaching assistants, while response efficiency and psychological safety serve as supporting conditions. This demonstrates that when students possess strong communication attitudes, efficient responses, and a sense of psychological security, they are more likely to utilize AI teaching assistants-even if their AI counterparts demonstrate inferior communication skills and answer quality compared to human instructors.

6.2.5 Combination 5: answer quality + communication attitude + response efficiency + psychological security + social anxiety

The research findings indicate that answer quality, communication attitude, and social anxiety form the core factors influencing students' preference for AI tutors, while response efficiency and psychological security serve as supplementary conditions. This demonstrates that when AI tutors exhibit high-quality answers, positive service attitudes, efficient responses, and strong psychological security, even students with limited communication skills and high social anxiety still show significantly stronger willingness to use them.

Among the five combinations mentioned, while response efficiency serves as a supplementary condition, it consistently demonstrates necessity. Rapid response is an inherent advantage of AI teaching assistants over human counterparts. When AI teaching assistants excel in answer quality and communication attitude, their high response efficiency further enhances students 'willingness to use them. The findings of this study also support existing research conclusions: artificial intelligence need not sacrifice response speed for anthropomorphic design; maintaining its inherent efficient response characteristics better contributes to improving users' actual usage inclination [15].

7. Conclusion

This study systematically identifies key factors and their multifaceted pathways influencing students 'preferences for AI teaching assistants. The findings reveal that AI assistants demonstrate significant advantages in response

efficiency and psychological safety, while factors like answer quality and communication attitudes are shaped by individual traits. However, the study's single-institution sample limits generalizability. Future research should expand sampling scope and implement longitudinal tracking to enhance conclusions 'universality and dynamism. Additionally, AI assistants' limitations in emotional interaction and complex problem-solving require improvements through technological iteration and instructional design. Future investigations should further explore AI-teacher role boundaries, collaborative mechanisms, and long-term educational impacts to promote deeper integration and high-quality development of intelligent education systems.

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