The Application Effect of Human-Computer Interaction Learning Software in Assisting Middle School English Listening and Speaking Teaching

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Abstract
The development of electronic teaching tools in the information age has brought about a profound change in the field of education. Especially in middle school English teaching, traditional teaching methods are facing new challenges and opportunities. In recent years, human-computer interaction learning software has gradually become an effective auxiliary teaching tool, which can significantly improve students' English listening and oral speaking abilities through diversified learning resources and personalized learning paths. This study quantitatively analyzed the English listening and oral speaking abilities by purposive sampling, investigated students' learning interests, confidence, and classroom participation of middle school students before and after using the software. The results showed that using human-computer interaction learning software can significantly improve students' listening abilities, oral speaking abilities and learning interests. Regression analysis further indicated that the improvement of oral speaking and listening abilities, as well as the increase in learning interest, had a significant positive impact on students' final grades. This study provided theoretical basis and practical guidance for educators in applying human-computer interaction learning software to analyze students' learning situation, evaluate the effectiveness of the software in middle school English teaching.
Keywords: English as Foreign Language (EFL), Human-Computer Interaction Learning Software, Middle School English, Listening Ability, Oral Speaking Ability, Learning Interest

Introduction
With the rapid development of information technology, the application of electronic teaching tools in the field of education is becoming increasingly popular, especially in middle school English teaching, where traditional teaching methods are facing unprecedented challenges and opportunities (Xiao et al.,2024). Under the trend of globalization, English has become an important tool for international communication, and the cultivation of its listening and speaking abilities has become one of the important goals of middle school English teaching (Dong et al., 2024). However, the traditional classroom teaching method has certain

limitations in meeting students' personalized learning needs and stimulating learning interest (Khan et al.,2024). Therefore, exploring new teaching methods to enhance students' English listening and speaking abilities has become an important issue in the field of education. In recent years, human-computer interaction learning software has gradually become an effective auxiliary teaching tool, which integrates diverse learning resources and provides personalized learning paths, creates a more interactive and efficient learning environment for students(Martín-Sómer et al.,2023).Although existing research has preliminarily demonstrated the potential of human-computer interaction software in enhancing student learning outcomes, there is still a lack of in-depth empirical studies on its specific application in middle school English listening and speaking instruction. In particular, the mechanisms by which such software specifically influences students' English listening and speaking abilities, learning interest, self-confidence, and classroom satisfaction remain unclear. These research gaps provide an important entry point for this study.

This study aimed to explore the application effect of human-computer interaction learning software in middle school English listening and speaking teaching, especially its practical role in improving students' English listening and speaking abilities. Through quantitative research methods, a survey and analysis were conducted on the English listening and speaking abilities, learning interests, self-confidence, and classroom satisfaction of ninth grade students in a Chinese middle school before and after using human-computer interaction learning software (Zhao et al.,2024). The data collection was conducted in the form of a questionnaire survey, and statistical methods such as regression analysis were used to evaluate the effectiveness of human-computer interaction learning software. At the same time, combined with the literature review section, a systematic review of the current research status of English listening and speaking teaching in middle schools was conducted to better understand the role and potential of software in teaching.

Literature Review
Overview of Middle School English Listening and Speaking Teaching
In recent years, middle school English listening and speaking teaching, as an important component of English education, has received widespread attention. In middle school English listening and speaking teaching methods, innovation in teaching modes and strategies has become an important means to improve students' listening and speaking abilities. The middle school English listening and speaking classroom teaching method driven by effective output can stimulate students' real learning interest and practical participation ability (Zhou, 2022). The deep integration of information technology and middle school English listening and speaking teaching method has improved students' listening and speaking abilities through the penetrating classroom teaching of "listening and speaking" (An, 2020). In addition, the application of non-testing evaluation system in middle school speaking English teaching can comprehensively assess students' learning process and effectively improve their speaking ability (Luo, 2017). Based on the output-oriented approach (POA) combined with middle school oral speaking English teaching, the three dimensions of driving, facilitating, and evaluating can effectively improve the oral speaking production ability of middle school students (Wang et al., 2020).

Cultivating students' core English literacy has become a key point of middle school English teaching reform (curriculum standard). In middle school oral speaking English classes,

curriculum design and evaluation methods guided by core competencies can actively enhance students' comprehensive language abilities (Huang et al., 2016). Reforming the oral speaking teaching mode can also cultivate students' core English literacy, while personalized teaching methods can extent improve the drawbacks of traditional oral speaking teaching up to a point (Hao, 2020).

Students' personal characteristics and classroom interactions have a significant impact on the development of their English listening and speaking abilities, while actors such as students' gender, language beliefs, and teachers' cognitive characteristics significantly affect their learning readiness and classroom performance (Hao, 2016). Although there were gender differences in certain aspects, factors such as gender, classroom structure cognition, achievement goals, and perceived instrumentality have significant impacts on academic achievement in English courses (Rostami et al., 2011).

With the development of digital teaching method, the application of multimodal teaching in middle school English listening and speaking teaching method has gradually attracted attention. The language expression and identity recognition of middle school students in digital stories within a multimodal framework, demonstrate the potential of multimodal resources in enhancing students' expressive abilities (Kim et al., 2021). Digital teaching methods have improved students' listening and speaking abilities in early language learning and have a significant impact on their long-term language development abilities (Jaekel et al., 2022). Task based language teaching optimizes listening and speaking teaching by increasing students' learning motivation, enhancing their learning interest and comprehension ability (Jin, 2024).

The teaching methods of teachers have a direct impact on students' listening and speaking abilities. Traditional teaching methods have constrained the development of students' listening and speaking abilities, teachers train and innovate teaching strategies to improve this situation (Nu ñ ez Rios et al., 2023). Cognitive and metacognitive learning methods have a greater impact on students' academic achievement in middle school, teachers were particularly important in choosing teaching methods (Hu et al., 2024). In summary, research shows that through innovative English listening and speaking teaching methods, cultivation of core competencies, application of multimodal teaching, and optimization of teacher strategies, students' listening and speaking abilities can be effectively improved.

A Review of English Software Teaching Literature
In recent years, with the rapid development of technology, a large number of English teaching tools based on computers and artificial intelligence have emerged the field of English language education. These tools enhance the learning experience of language learners in various ways and improve learning outcomes.

The Application of Multimodality and Multimedia in Language Learning
The rise of multimodal language learning tools provides learners with multiple sensory inputs, promoting the comprehensive development of language skills. The perceived ease of use and perceived usefulness in technology acceptance models have a significant impact on learners' sustained engagement (Huang et al., 2024). Multimedia annotation has a significant effect on vocabulary acquisition for beginners, especially in recognition tests (Mahdi et al., 2024).

Multimedia technology has played an important role in middle school English teaching. Multimedia technology not only expands students' thinking and imagination space, but also stimulates their learning enthusiasm, which makes English learning easier and more enjoyable. (Song Jindan, 2012; Feng Xiaoyan, 2021).

Artificial Intelligence and Computer Aided Language Learning
With the rapid development of artificial intelligence (AI) technology, intelligent computer-assisted language learning (ICALL) has gradually become an important component of second language education. The effectiveness of AI in English language learning is significant, especially in terms of sample size and learning stage regulation, shows a larger effect (Xu&Wang, 2024), furthermore, AI technology has considerable potential in promoting language learning processes (Wang et al., 2024). The use of AI for automated assessment can promote students' language learning autonomy in real-life description tasks, the immediate feedback function in it can significantly improve students' description quality (Zhao et al., 2024). The cross-cultural, humorous, and empathetic dimensions of AI dialogue systems can effectively enhance learners' engagement and learning motivation (Zhai et al., 2024). In the ICALL environment, there is an interaction between academic emotion regulation, mindfulness, learning motivation, and autonomy, especially academic emotion regulation and mindfulness, which have a positive impact on learning motivation and autonomy for learners (Namaziandost&Rezai, 2024).

The integration of human-computer interaction and online learning mode
The emergence of chatbots has significantly reduced the reading anxiety of the experimental group students. Chatbots have potential advantages in technology, teaching, language, and emotional support, despite some challenges and limitations (Zheng, 2024). The advancement of speech recognition technology has provided new possibilities for English language learning methods. A speech recognition algorithm based on interactive artificial intelligence system has successfully constructed an English video teaching system with strong recognition ability and interactivity. This system improves students' learning experience and meets their personalized learning needs through speech feature extraction and speech signal preprocessing techniques (Fu et al., 2025). In modern e-learning systems, the integration of social media and entertainment elements has become a key point in enhancing learner engagement and learning outcomes. By incorporating gamification elements into the learning system, utilizing deep learning algorithms to analyze students' learning habits and progress, the system can provide personalized learning paths and recommended content for each student, significantly enhance their learning interest and motivation (Chen, 2024). The submission and feedback of homework on the Internet not only improves students' learning efficiency, but also provides teachers with effective teaching evaluation tools (Chen Feifei et al., 2024). In the comparison of the effectiveness between online learning and traditional learning modes, the online learning group performed better in listening abilities than the traditional learning group, especially showing advantages in flexibility and resource utilization (Khan&Khan, 2024). Educational software has a positive impact on students' recognition, psychomotor, and emotional domains (Hamedani et al., 2013). The richness of online teaching tools and resources greatly improve the efficiency of classroom teaching methods, along with it provide strong support for students' post class learning consolidation (Deng Lingyi&Huang Baoer, 2022). Content and Language Integrated Learning (CLIL) can enhance students' learning motivation and positive emotion in the short term, but its effectiveness is limited in

the long run, especially when initial vocabulary knowledges are considered, the advantages of CLIL will no longer significant (Mettewie et al., 2024). Educators need to pay more attention to students' background knowledges and learning stages when designing CLIL courses.

In summary, modern English language learning software has shown significant effects in promoting learner engagement, vocabulary acquisition, emotional regulation, and learning motivation. With the continuous advancement of technology, especially the application of AI and multimodal tools, language learning tools will continue developing, providing learners with more personalized and interactive learning experiences. Speech recognition technology and AI driven dialogue systems particularly demonstrate strong potential, while the combination of social media and entertainment elements provide new directions for the development of e-learning. Future research should further explore the application effects of these tools in different learning backgrounds and learner groups to optimize their teaching value.

Methodology
Research Design
This study focused on ninth grade middle school students, aimed to explore the impact of human-computer interaction learning software on their English listening and oral speaking abilities. Through experimental design, the listening and speaking abilities of students were tested before and after using the software (Hamedani et al., 2013). The software features used included listening and oral speaking training, in-depth strengthening of test points, simulation of human-computer dialogue exams, breakthrough in error analysis, and intelligent learning situation analysis, which aimed to systematically improve students' English listening and oral speaking abilities. After the end of the semester, a questionnaire was distributed through Wenjuanxing software to investigate students' English listening and speaking learning situation before and after using human-computer interaction learning software, including their English listening and speaking abilities, learning interests, confidence, and classroom participation before and after the software (Zhao et al., 2024). After quantifying and non-quantifying, the students' learning situation (Xu et al., 2024), STATA was used for data analysis. Based on the analysis results (Huang et al., 2024), the improvement of students' listening and oral speaking abilities by human-computer interaction learning software was explored.

Table 1
Research process of human-computer interaction learning software learning situation

Research Process		
Process	Software	Contents
Step 1	Human-Computer Interaction Learning	Collect initial and final test scores
Step 2	Wenjuanxing	Investigate students' learning situation before and after using Human-Computer Interaction Learning software
Step 3	STATA	Regression analysis of students' learning situation and test scores

Teaching Design

The research subjects were ninth grade students who enrolled in a certain middle school in China in 2019. Students had two oral speaking classes per week for a total of 16 weeks, totaling approximately 32 classes. The arrangement of oral speaking courses aimed to strengthen students' English-speaking ability through systematic teaching and repeated practice (Khan et al.,2024).

Classroom teaching was based on comprehensive practice questions for senior high school entrance examination speaking English in future, using on-site scoring method. Teachers can see the score of each question in real time and provide targeted guidance based on students' performance. Teachers can also play the audio of a student's incomplete question separately, analyze their pronunciation errors and missing information with the students, help them improve their oral speaking expression. In addition, oral speaking homework was assigned once a week, students practiced at home through their phones or computers on the Human-Computer Interaction Learning software. During the winter vacation, they practice a set of questions daily. In the classroom, teacher led the teaching method, while human-computer interaction learning software served as an auxiliary learning tool for students after class, consolidated the content learned in the classroom.

Overview of Human-Computer Interaction Learning Software
The human-computer interaction learning software used in this study integrates multiple functional modules, aimed to comprehensively enhance students' English listening and oral speaking abilities through systematic learning paths and personalized learning experiences. The following were the main functions of the software and its application in teaching.

Listening and Speaking Special Training
The listening and oral speaking training modules were the core functions of this software. These modules simulated real English listening and oral speaking scenarios, providing diverse practice materials such as daily conversations, news reports, academic speeches, etc., covered various difficulty levels from basic to advanced. Students can gradually improve their fluency and accuracy in listening comprehension and oral speaking expression through repeated practice. In addition, the modules were equipped with an instant feedback system, which allowed students to receive detailed feedback on pronunciation, intonation, and language fluency immediately after completing exercises, and enabled targeted improvements.

Deep reinforcement of examination points
The deep reinforcement function of exam points was specifically designed for the core exam points of the English listening and oral speaking section of the middle school entrance examination. This module selected the most representative training questions through in-depth analysis of exam question types and test points over the years. Students can strengthen their grasp of key knowledge points by repeatedly practicing these high-frequency exam questions. At the same time, the software would dynamically adjust the difficulty of exercises based on students' learning progress and performance, ensured that students gradually strengthen their listening and oral speaking abilities in the process of constantly challenging themselves, made sufficient preparations for the middle school entrance examination.

Simulation of Human Computer Dialogue Exam

The human-machine dialogue exam simulation module aimed to help students familiarize themselves with the real scenarios of English listening and oral speaking exams in advance. This module simulated a human-computer dialogue examination environment, allowed students to practice oral speaking expression independently without teacher supervision. The simulated exam covered various types of questions in the senior high school entrance examination oral speaking test, such as text reading, situational dialogues, text retelling and answering questions, prepared for ninth grade students. After completing the mock exam, the software would automatically generate score and detail evaluation reports to help students understand their weaknesses, make targeted improvements. This simulation training not only helped improve students' exam taking ability, but also effectively alleviated exam anxiety and enhanced students' confidence.

Breakthrough in Error Analysis
The breakthrough module for error analysis automatically collected and analyzed students' mistakes in practice and simulated exams, generated personalized error books. For each incorrect question, the software would provide detailed analysis, included the reason for the error, correct answer, and explanations of relevant knowledge points. Students can review their mistakes repeatedly through this module, effectively avoided similar errors from happening again. This feature not only helped students consolidating weak links, but also promoting the deep internalization of knowledge and improving learning outcomes.

Intelligent learning situation analysis
The intelligent learning situation analysis module generated detailed learning situation reports by comprehensively analyzing students' daily practice data, simulated exam scores, and learning behaviors. The report included students' learning progress, knowledge mastery, improvement trajectory of listening and oral speaking abilities, as well as the main problems that exist. Teachers can use this data to understand students' learning status and develop more targeted teaching plans; And students can clarify their learning goals, adjust their learning strategies by reviewing their own study reports. The application of this module improved the accuracy and personalization of teaching, which helped to achieve personalized teaching.

By combining the above functional modules, the software not only provided students with a comprehensive listening and oral speaking training program, but also provided teachers with scientific teaching support tools, significantly improved teaching effectiveness and learning efficiency. This teaching method based on human-computer interaction fully embodied the enormous potential of modern educational technology in cultivating English listening and oral speaking abilities.

Population & Samping
This study used purposive sampling method (Kamangu et al., 2024), with students from a ninth-grade class taught by the researcher as the sample, to ensure the actual correlation of the sample and the validity of the data. Among 507 ninth grade students in a certain middle school, this study selected a class taught by the researcher, with a total of 38 students. The reason for choosing this class was mainly based on the balance between students' English proficiency and academic performance, in order to ensure the representativeness and universality of the research results. Before the start of the study, all participating students

underwent a basic test of their English listening and speaking abilities to determine their starting level and provide a reliable benchmark for subsequent analysis. Through this sample selection method, the study aimed to reduce potential biases caused by significant individual differences, thereby enhancing the reliability, validity, and interpretability of the research results (Shi Hui et al., 2022).

The school where the researcher worked is located in a typical city along the eastern coast of China, with abundant educational resources and high-quality English teaching. Ninth grade is the last year of middle school in China, usually around the age of 15. It is an important stage for preparing the high school entrance examination and transitioning from middle school to high school. Building a solid foundation in this stage is crucial for subsequent high school studies. At this stage, students face significant academic pressure, especially in improving their English listening and oral speaking abilities, and have a clear requirement for learning. Therefore, selecting ninth grade students as research samples can not only reflect the effectiveness of human-computer interaction learning software in actual teaching, but also providing empirical support for further optimizing teaching methods.

Despite using purposive sampling methods, there were still some potential bias issues. In order to reduce the impact of these biases on the research results, certain measures were taken in this study. During the data analysis process, other variables that may affected students' English listening and oral speaking abilities, such as grade level and study times, which were controlled for. By controlling these variables, it was possible to evaluate the actual impact of human-computer interaction learning software on students' English listening and speaking abilities more accurately, thereby reducing biases caused by individual differences. All students underwent a basic test of their English listening and oral speaking abilities before the start of the study, to ensure consistency of the sample at the starting level. This measure helped to reduce bias caused by differences in initial capabilities, ensure a more fair evaluation of software usage effectiveness in subsequent analysis. Although the sample for this study was from a class, the class's test scores were relatively great in terms of English proficiency and academic performance in school, indicated that students' learning situation was representative in human-computer interaction learning of English listening and oral speaking. In addition, in terms of English teaching, many English teachers from the school represented the region to present open classes, shared and report on courses, participated in the most cutting-edge English teaching interactions in the region, which indicated that the school's English teaching level has a certain typicality in the region. Therefore, the research results can be extended to a wider range of ninth grade students to a certain extent.

Instrument
In addition to the human-computer interaction learning software used in teaching, the research tool also used Wenjuanxing software as the questionnaire survey software and STATA as the data analysis software. In the research design, human-computer interaction software collected students' test scores. The first data collection was to collect baseline tests conducted by students before the experiment begin to determine their initial ability level; The second data collection was conducted after the experiment to test the effectiveness. At the end of the semester, Wenjuanxing software was used to distribute survey questionnaires to investigate students' English listening and oral speaking learning before and after using human-computer interaction learning software (Huang et al., 2024). After quantifying and

non-quantifying the learning situation, STATA was used for data regression analysis (Zhao et al., 2024). By comparing the results of two tests and quantitatively analyzing dimensions such as English listening and oral speaking ability, learning interest, frequency of use, and confidence, this study aimed to explore the effectiveness of human-computer interaction learning software in improving students' listening and oral speaking abilities (Namaziandost et al., 2024). This comparative analysis can effectively reveal the educational value and potential impact of software, providing data support for educational practice.

Data Collection
Data collection was conducted through two methods: human-computer interaction software system and questionnaire survey.
Firstly, students' initial and final grades were automatically recorded and collected through human-computer interaction software during the teaching and testing phase, teachers can observe and export them in real-time through the intelligent learning analysis module.

Table 2
Method for collecting students' test scores

Variable	Definition
Final	Students' final exam scores & initial exam results：The human-machine dialogue simulation exam adopted artificial intelligence technology to automatically score, covered both listening and oral speaking parts, with a total score of 30 points. The scoring criteria included accuracy, fluency, completeness, rhythm, and language organization ability, with different weights assigned to each dimension based on the type of question. The system compared the candidate's voice input with the standard answer through speech recognition and natural language processing technology, comprehensively calculated the score of each question, and then summarizes it as the total score by weight.
Begin	

Secondly, after the end of the semester, the researchers conducted a detailed survey on the learning situation of 38 students in the class through the Wenjuanxing software. The questionnaire design included both quantitative and non-quantitative parts.

Table 3
Quantitative for students' learning situation

Variable	Definition
Usage frequency	The frequency of using this human-computer interaction learning software
Self-confidence	The degree of improvement in self-confidence felt through English listening and speaking exercises
Speech, intonation, and speed	The level of assistance in understanding English pronunciation, intonation, and pace using this software
Keep up	Is it easier for students to understand and keep up with English listening and speaking exercises in class after using this software
Coral	The degree of improvement in oral speaking proficiency after using the software

Clistening	The degree of improvement in listening ability after using the software
Cinterest	After using the software, the degree of improvement in learning interest

The quantitative part of the problem adopts a four-point scoring system (Anjaria, 2022), with 0 points indicating complete lack of understanding, 1 point indicating partial understanding, 2 points indicating partial understanding, and 3 points indicating complete understanding (Shrestha, 2024).

Table 4
Level-Scoring Table for Student Situation

LEVEL / Weight / Research Title	4	2	1	0
Usage frequency	Fully understand	Most understand	Partial understand	Completely do not understand
Self-confidence	Fully understand	Most understand	Partial understand	Completely do not understand
Speech, intonation, and speed	Fully understand	Most understand	Partial understand	Completely do not understand
Keep up	Fully understand	Most understand	Partial understand	Completely do not understand
Coral	Fully understand	Most understand	Partial understand	Completely do not understand
Clistening	Fully understand	Most understand	Partial understand	Completely do not understand
Cinterest	Fully understand	Most understand	Partial understand	Completely do not understand

The non-quantitative part adopted a multiple-choice format, aimed to understand students' learning preferences, software usage frequency, and subjective feelings, in order to comprehensively analyze the application effect of the software and students' learning experience. Students evaluated themselves based on their personal learning situation according to this standard and fill out a survey questionnaire.

Table 5
Non-quantizing for Student Situation

Variable	Definition
Practice methods	Ways to practice English listening and oral speaking abilities: classroom listening exercises, listening to English audio or watching English videos, participating in English corners or clubs, following texts
Usage time	Time period for using software: during class, when doing homework after class, after class time, weekends or holidays
Purpose	The main purpose of using the software was to improve listening, speaking, review classroom content, and prepare for exams

Changes	The biggest changes in using software: improved listening skills, improved speaking skills, increased confidence, and increased interest in learning
Difficulty	Difficulties encountered in using software: operational issues, content difficulty, time management, network problems
Other Recommendations	Other suggestions for improving English listening and speaking abilities: increase interactive exercises, provide more grammar and vocabulary support, improve the timeliness of feedback, and provide personalized learning paths

Finally, the researchers scored the quantitative part according to a four-point scoring system, and organized and archived the initial and final grades, as well as the quantitative scoring results of the questionnaire, by student name, and analyzed them using STATA software. This dual data collection method ensured the comprehensiveness and depth of the research results, providing reliable empirical evidence for exploring the educational effects of human-computer interaction learning software.

Table 6
STATA regression variable design

Variable	Definition	Collecting software	Analysis software
Final	Students' final exam scores & initial exam results： The human-machine dialogue simulation exam adopted artificial intelligence technology to automatically score, covered both listening and oral speaking parts, with a total score of 30 points. The scoring criteria included accuracy, fluency, completeness, rhythm, and language organization ability, with different weights assigned to each dimension based on the type of question. The system compared the candidate's voice input with the standard answer through speech recognition and natural language processing technology, comprehensively calculated the score of each question, and then summarizes it as the total score by weight.	Human-Computer Interaction Learning Software	STATA
Begin			
Usage frequency	The frequency of using this human-computer interaction learning software		
Self-confidence	The degree of improvement in self-confidence felt through English listening and speaking exercises		
Speech, intonation, and speed	The level of assistance in understanding English pronunciation, intonation, and pace using this software	Wenjuanxing	
Keep up	Is it easier for students to understand and keep up with English listening and speaking exercises in class after using this software		

Coral	The degree of improvement in oral speaking proficiency after using the software
Clistening	The degree of improvement in listening ability after using the software
Cinterest	After using the software, the degree of improvement in learning interest

Findings and Discussion
Results
Reliability Analysis
To verify the reliability of the answers to quantitative research questions in the questionnaire survey of this study, Cronbach's alpha coefficient was used to test the reliability of the questionnaire. In the reliability analysis of quantitative issues related to students' semester situation, which included English listening and oral speaking ability, learning interest, self-confidence, and classroom satisfaction, a total of 38 questionnaires were distributed and 38 were collected, involving 9 items of quantitative questions. Through calculation, there were 38 valid samples and 0 invalid samples. The Cronbach's alpha coefficient was 0.7499, which was greater than 0.7, indicating that the measurement tool for students' semester situation has high internal consistency and can stably reflect students' performance or attitude in human-computer interaction learning software.

Table 7
Reliability analysis of student learning situation scale

Test scale	= mean (standardized items)
Reversed items:	Final Begin
Number of items in the scale:	9
Scale reliability coefficient:	0.7499

Descriptive Statistics
This study conducted descriptive statistical analysis on 38 students' English listening and oral speaking abilities, learning interests, frequency of use, self-confidence, and other aspects after using human-computer interaction learning software. Table 1 presents the statistical results of the number of observations (Obs), mean (Mean), standard deviation (Std. dev.), minimum value (Min), and maximum value (Max) for each variable.

Table 8
Descriptive Statistics

Variable	Obs	Mean	Std.	dev.	Min	Max
Final	38	25.93	3.932	14.80	30	
Clistening	38	0.921	1.549	-2	3	
Coral	38	0.763	1.364	-2	3	
Cinterest	38	0.553	0.828	-1	2	
usagefrequ~y	38	2.842	0.855	1	4	
selfconfid~e	38	3.316	0.620	2	4	
speechinto~d	38	3.526	0.557	2	4	
keepup	38	3.447	0.602	2	4	

Begin	38	24.15	5.116	12	29.90

Descriptive statistical results show that after using human-computer interaction learning software, students' oral speaking ability (mean=0.763, standard deviation=1.364) and listening ability (mean=0.921, standard deviation=1.549) had improved to varying degrees, and their learning interest (mean=0.553, standard deviation=0.828) had also improved. However, there were significant differences in these improvements among individuals. In addition, students generally maintain a high frequency of software use (mean=2.842, standard deviation=0.855), and show significant improvements in self-confidence (mean=3.316, standard deviation=0.620) and classroom participation (mean=3.526, standard deviation=0.557). Overall, students reported a good learning experience, indicated that the software had a certain positive effect on improving middle school English listening and speaking abilities.

Correlation Analysis

The correlation test results indicated that there was a strong positive correlation (r=0.784) between the improvement of students' oral speaking ability and listening ability after using human-computer interaction learning software. There was also a moderate positive correlation (r=0.645 and 0.646, respectively) between the improvement of learning interest and listening and speaking ability. In addition, there was a high correlation between self-confidence and classroom participation (r=0.758), approaching the critical value of multicollinearity (r>0.8). Overall, there were no significant multicollinearity issues in the data, indicating that these variables can be stably used to explain changes in students' abilities and psychological states in subsequent analysis.

Table 9
Correlation Analysis

(obs=38)

Final	Cliste~g	Coral	Cinter~t	usagef~y	selfco~e	speech~d	keepup	Begin
Final	1							
Clistening	0.0984	1						
Coral	0.159	0.784	1					
Cinterest	0.0875	0.646	0.645	1				
usagefrequ~y	-0.0301	0.113	0.199	0.203	1			
selfconfid~e	-0.0312	0.111	-0.0370	0.0720	0.607	1		
speechinto~d	-0.0781	-0.0445	-0.152	0.114	0.577	0.758	1	
keepup	0.0177	0.300	0.166	0.196	0.561	0.771	0.569	1
Begin	0.723	-0.486	-0.430	-0.406	-0.0347	0.00790	0.0935	-0.0852	1

Data Analysis
Regression Analysis
The regression results show that there was a significant positive correlation between the degree of improvement in listening ability (Climbing) and the final grade (Final) at the 10% level, with a regression coefficient (Coefficient) of 0.6219776. This indicated that after controlling for the influence of other variables, the improvement of listening ability had a significant positive impact on final grades. Specifically, the coefficient 0.6219776 means that every time a student's listening ability improved by one unit, their final grade increases by an average of approximately 0.622 points.

There was a positive correlation between the degree of improvement in oral speaking ability (Coral) and the final grade (Final) at a significance level of 5%, with a regression coefficient of 0.7975204. This indicated that, controlling for the influence of other variables, the improvement of oral speaking proficiency has a significant positive impact on final grades. Specifically, the coefficient of 0.7975204 means that every time a student's oral speaking ability improves by one unit, their final grade increases by an average of about 0.798 points.

In addition, there was a significant positive correlation between the level of interest in learning (Cinterest) and final grades (Final) at the 5% level, with a regression coefficient (Coefficient) of 0.9925088. This indicated that, controlling for other variables, the improvement of learning interest had a significant positive impact on final grades. Specifically, the coefficient 0.9925088 means that every time a student's interest in learning increases by one unit, their final grade increases by an average of approximately 0.993 points. This result indicated that the improvement of learning interest had a very significant promoting effect on students' academic performance, and this effect was highly significant statistically. It can be inferred that stimulating and enhancing students' interest in learning may be an important strategy for improving their academic performance. Teachers should attach importance to stimulating students' interest in learning in teaching, thereby effectively improving teaching effectiveness and students' academic performance.

Table 10
Regression Analysis

Source	SS	df	MS	Number of obs	=	38
Model	497.4	8	62.17	Prob>F	=	0.000
Residual	74.63	29	2.574	R-squared	=	0.870
Total	572.0	37	15.46	Root MSE	=	1.604

Final	Coefficient	Std.err.	t	P>|t|	95% conf.	interval
Clistening	0.622	0.322	1.930	0.0640	-0.0374	1.281
Coral	0.798	0.365	2.180	0.0370	0.0507	1.544
Cinterest	0.993	0.467	2.130	0.0420	0.0379	1.947
usagefrequency	-0.391	0.445	-0.880	0.387	-1.301	0.519

selfconfidence	0.721	0.877	0.820	0.417	-1.072	2.514
speechintonationandspeed	-1.392	0.816	-1.710	0.0990	-3.061	0.277
keepup	0.133	0.743	0.180	0.859	-1.387	1.653
Begin	0.816	0.0600	13.61	0	0.694	0.939
cons	7.653	2.386	3.210	0.00300	2.773	12.53

Non-quantitative Results

According to non-quantitative survey results, female students accounted for 69.81% and male students accounted for 30.19% of the surveyed users. Before using human-computer interaction learning software, users mainly practiced English listening and speaking through classroom listening exercises (35.25%) and reading texts (33.81%). The time users spent using the software was mainly concentrated in their spare time (41.51%) and weekends or holidays (22.64%). The main usage purposes of users included improving English listening skills (41.51%) and preparing for exams (33.96%). In terms of technical support, 47.17% of users rarely encounter problems, while 26.42% of users had never encountered problems. After using the software, 56.60% of users reported a significant improvement in their listening ability. The biggest obstacle during use was time management, accounted for 46.15%. Users suggest prioritizing the improvement of the software's oral speaking training (37.74%) and listening training (35.85%) functions, which believed that adding interactive exercises (29.17%) and providing more grammar and vocabulary support (27.78%) would help improve learning outcomes.

Discussion

According to regression analysis, the improvement of listening ability has a significant positive impact on students' final grades, which confirmed the research results of predecessors (Khan et al.,2024). To further improve students' listening skills, teachers should increase the listening practice time in the classroom, enhance the frequency and intensity of listening training, cover diverse listening materials such as news broadcasts, academic lectures, daily conversations, etc., and ensure that students are exposed to different types of listening materials. Teachers use the listening and speaking training module of human-computer interaction learning software to assign corresponding listening tasks after class, and regularly check students' completion and learning progress to ensure that students continue to participate and benefit from the training of this module. According to the progress of students, gradually increase the difficulty and complexity of listening materials to help students better cope with different types and difficulties of listening questions in actual exams (Khan et al.,2024).

Regression analysis shows that the improvement of oral speaking proficiency has a significant positive impact on final grades, which confirmed the research results of predecessors (Dong et al.,2024). Teachers should create more opportunities for oral speaking interaction in the classroom, organize group discussions, role-playing, and scenario simulations, encourage students to actively participate, and improve their fluency and confidence in oral speaking expression. At the same time, utilizing the human-machine dialogue exam simulation function helps students familiarize themselves with the exam process and enhance their test taking ability. It was recommended to arrange students using this function for simulated exercises in their homework after class regularly. Teachers can provide feedback based on the results of simulated exams and provide individual guidance for

students' weak areas. Through the breakthrough module of error analysis, teachers can provide detailed correction and guidance for students' pronunciation and expression errors, help them improve their oral speaking abilities in details.

Although regression analysis shows that the improvement of listening and oral speaking abilities had a significant positive impact on students' final grades, there was a certain gap in the effectiveness of improving listening and oral speaking abilities. Specifically, every time a student's listening ability improved by one unit, their final grade increased by an average of about 0.622 points; Whenever a student's oral speaking ability improves by one unit, their final grade increases by an average of about 0.798 points, indicated that the impact of improving speaking ability on final grade was greater than that of improving listening ability. According to theory, improving oral speaking proficiency not only involves language input (such as listening comprehension), but also requires precision and fluency in language output, which requires students to achieve a high level of pronunciation, grammar structure, and vocabulary application. Therefore, the improvement of oral speaking proficiency often reflects students' comprehensive mastery of language, which may have a broader and deeper impact on academic performance (Demir, 2017; Côté & Gaffney, 2021). In practice, oral speaking practice was usually accompanied by an increase in students' confidence and classroom participation. This two-way interaction not only enhances students' oral speaking ability, but also promotes their performance in other academic fields (Dirjal et al., 2021; Grieve et al., 2021). In contrast, listening ability mainly focuses on language input and comprehension, however, it has little relatively limited impact on final grades, more reflects in a single dimension of language comprehension (Alzheimer, 2021).

It is worth mentioning that, in addition to the direct improvement of oral speaking and listening abilities, there was a significant positive correlation between the enhancement of learning interest and students' academic performance. This was consistent with previous research findings, indicated that human-computer interaction learning software can stimulate and maintain students' interest in learning, play a key role in their academic performance (Chen,2024). When students were interested in learning content, they not only show stronger cognitive engagement, but also demonstrated greater patience and persistence when facing challenges (Dewaele&Alfawzan, 2018). Learning interest had been proven to effectively enhance students' classroom participation and initiative in extracurricular learning. For example, through gamification teaching methods, students' interest in learning was significantly enhanced, which in turn promotes their academic performance (Jaramillo Mediavilla et al., 2024). In addition, while enjoying the learning process, students were often more willing to overcome difficulties in their studies, thus forming a positive learning cycle, which further promotes their academic progress (Li, Jiang, & Dewaele, 2018). This combination of theory and practice indicated that learning interest was not only a driving force for academic success, but also a key point in inspiring students to continue learning and making progress. Therefore, teachers can increase the fun and practicality of the course and stimulate students' interest in learning by introducing multimedia teaching, interactive classroom activities, and practical cases related to students' lives. By utilizing the intelligent learning analysis function of the software, personalized learning plans are developed based on each student's learning situation and interests, which encourage students to delve deeper into their areas of interest, enhance their learning motivation. By setting interesting extracurricular tasks such as watching English videos and participating in English corner

activities, students are encouraged to independently choose and complete learning content what they are interested in, cultivating their ability and interest in self-directed learning.

According to non-quantitative results, the main obstacle students encounter while using software was time management issues, and it is recommended to add oral speaking and listening training functions. Teachers can teach students time management skills in the classroom, such as developing study plans, allocating study time reasonably, etc., so as to help students use their spare time more effectively for software exercises. According to student feedback, software developers should prioritize improving oral speaking and listening training functions, increase interactivity, provide more grammar and vocabulary support to enhance students' overall learning experience. Teachers should regularly track students' usage, understand their learning experience and suggestions through questionnaires or face-to-face interviews, adjust teaching strategies and software usage in a timely manner, to ensure maximum teaching effectiveness (Xiao et al.,2024).

The regression analysis results of this study showed that human-computer interaction learning software had significant improvement effect on students' English listening abilities, oral speaking abilities and learning interest. This finding is consistent with previous research results (Xu & Wang, 2024), which pointed out that the application of artificial intelligence technology in language learning can significantly improve listening and oral speaking abilities. This study further validated the viewpoint, demonstrated that human-computer interaction learning software, which worked as an advanced technological tool, can effectively enhance students' language abilities. In addition, this study found that the improvement of oral speaking proficiency had a greater impact on final grades than listening ability, which is consistent with the findings of (Demir et al.,2017), indicated that the enhancement of oral speaking practice not only increases students' confidence, but also had a more positive impact on overall academic performance. However, this study also challenged some existing research perspectives, such as (Côté & Gaffney's, 2021) emphasis on the fundamental role of listening ability in language learning. However, although the importance of listening ability cannot be ignored, there were relatively minor impact on final grades, which suggests that in specific learning environments, the improvement of oral speaking proficiency may be more directly reflected in academic performance, and further research is needed to explore the reasons for this difference.

Conclusion

This study explored the application effect of human-computer interaction learning software in middle school English listening and oral speaking teaching. Through empirical analysis, it is found that the software significantly improves students' listening and oral speaking abilities, and had a positive impact on enhancing learning interest. The regression analysis results indicated that the improvement of listening ability, speaking ability, and learning interest all had a significant positive impact on students' final grades, especially the promotion effect of learning interest on academic performance was particularly evident. Based on these findings, it is recommended to widely use human-computer interaction learning software in middle school English teaching, combined with personalized teaching strategies, so as to further enhance students' English listening abilities, oral speaking abilities and overall academic performance.

Although this study revealed the positive effects of human-computer interaction learning software in improving middle school students' English listening and speaking abilities, there are still some limitations. Firstly, the sample size of this study was limited to one class from a certain high school, which may limit the generalizability of the research results. Therefore, future research should expand the sample size to cover students from different regions and educational backgrounds, in order to improve the representativeness of the results. Secondly, this study mainly relied on quantitative data analysis, which did not had delved into the subjective experiences and emotional changes of students during the use of software. Future research can further explore students' perceptions of using human-computer interaction learning software and its long-term impact on learning motivation through qualitative research methods. Finally, with the continuous development of educational technology, the functionality and interactivity of learning software will continue to improve. In the future, researchers should focus on the application of new technologies such as artificial intelligence and virtual reality in language learning, in order to explore more innovative and effective teaching tools and further enhance the effectiveness of middle school English listening and oral speaking teaching.

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