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The Impact of Artificial Intelligence on Enhancing English Learning Efficiency: A Comprehensive Analysis

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Abstract. With the rapid development of digital technology, traditional English learning methods increasingly face limitations such as insufficient personalized guidance and inefficient feedback mechanisms. This study explores how artificial intelligence (AI) tools can optimize the English learning process and enhance learning outcomes.This study employs a mixed-methods approach, incorporating a survey of 200 English language learners (aged 18-25) and a 12-week experimental comparison. The experimental phase assesses the performance of learners utilizing AI-driven tools (e.g., intelligent tutoring systems, AI-based language assessment platforms) against a control group employing conventional pedagogical techniques. The research data were derived from questionnaires, learning progress tracking records, and post-experiment language proficiency assessments. The findings indicate that 78% of AI-assisted learning participants demonstrated statistically significant enhancements in vocabulary retention and grammatical precision, with a mean test score 15.3% higher than that of the traditional learning cohort. The research conclusion holds that artificial intelligence technology, through personalized learning paths and real-time feedback, effectively addresses individual differences in English learning and enhances overall learning efficiency.

Keywords: Artificial Intelligence, English Learning, Personalized Guidance, Learning Efficiency, Intelligent Tutoring System

1. Introduction

In globalization, English proficiency has become a crucial competitive edge in academic research, career development, and interpersonal communication. However, current English learning practices are facing significant challenges: Traditional classrooms usually adopt a "one-size-fits-all" teaching model, which fails to meet the pace and needs of different learners (for instance, some learners have difficulties in listening comprehension, while others lack proficiency in writing). Furthermore, the infrequent interaction between instructors and pupils results in delays in homework assessment and error correction, thereby impeding students' ability to promptly address knowledge deficits [1]. Existing research on educational technology has emphasized the potential of artificial intelligence in addressing these issues. Still, few studies have systematically analyzed the specific mechanisms by which artificial intelligence can enhance English learning outcomes, especially for youth learners.

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This study aims to fill this research gap and explore the application of artificial intelligence tools in English learning and their impact on learning efficiency. The research questions are as follows: (1) What are the primary applications of artificial intelligence (AI) tools in supporting English language acquisition, specifically in areas such as vocabulary acquisition, grammatical accuracy, and oral proficiency development? (2) Does the utilization of AI-driven learning methodologies correlate with enhanced performance on English proficiency assessments when compared to traditional pedagogical approaches? (3) Which critical variables, including but not limited to personalization and feedback latency, significantly influence the efficacy of AI-enhanced English language learning?

This study employed a mixed research approach to address the above issues, integrating quantitative data from surveys and ability tests with qualitative data from learner interviews. This research is significant in two ways: theoretically, it adds to the literature on educational technology and second language acquisition by offering empirical evidence of the role of artificial intelligence in English learning; practically, it makes useful recommendations for teachers and students to help them choose and use AI tools more effectively, which helps popularise effective English learning models.

2. Literature review

2.1. Application of artificial intelligence in second language learning

Existing research has clearly demonstrated the various roles of artificial intelligence in second language learning. Zhang and Li pointed out that intelligent tutoring systems (ITS) can analyze learners' error patterns in grammar practice and generate customized practice tasks, helping address individual knowledge gaps. For example, intelligent tutoring systems such as Grammarly (a grammar checking tool) and Duolingo (a language learning application) use machine learning algorithms to track users' performance. If a learner exhibit frequent errors in tense consistency, the system will assign priority to tense-related tasks in subsequent learning iterations [2].

Another important application area of artificial intelligence is AI-driven oral assessment. Wang et al. investigated 150 English as a Foreign Language (EFL) learners and discovered that AI-driven tools incorporating speech recognition technology (e.g., ELSA Speak) offer real-time feedback on pronunciation, intonation, and fluency. These capabilities are challenging to replicate in conventional classroom settings characterized by high student-teacher ratios [3]. These tools compare the learners' speech samples with those of native speakers, identify the differences, and offer targeted improvement suggestions.

2.2. Deficiencies of existing research

While prior research has acknowledged the potential of artificial intelligence in English language acquisition, the majority of studies have concentrated on individual AI-driven tools (e.g., vocabulary applications or oral practice platforms) rather than providing a comprehensive analysis of multiple AI applications. Moreover, few studies have examined the continuous impact of artificial intelligence on learning outcomes through long-term experiments (lasting more than 8 weeks). This study addresses these deficiencies by exploring the application of multiple AI tools and conducting a 12-week experiment, providing solutions and offering more persuasive empirical evidence.

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3. Research methods

3.1. Research design

This study employs a mixed-methods research design, integrating quantitative and qualitative methodologies to enhance the rigor and validity of the findings. The quantitative phase encompasses survey administration and controlled experimentation, whereas the qualitative phase involves semi-structured interviews with select participants.

3.2. The AI tools selected for the experiment

The experimental group utilized three types of AI tools, covering the core modules of English learning:

• Intelligent tutoring system: Grammarly(for correcting grammar errors and providing writing style suggestions) [4] and Khan Academy English (for personalized reading and vocabulary training) [5]

• AI-driven oral language tools: ELSA Speak (used for pronunciation assessment and fluency practice) [6];

• Adaptive learning platform: The AI-enhanced English courses of Coursera (a course learning platform) (for structured listening training and comprehensive skill improvement) [7].

On the other hand, the control group used traditional learning materials, including textbooks ("English Grammar in Use"), classroom lectures, and assignments given by the teachers, without any contact with any AI tools.

3.3. Research subjects

The study recruited 200 learners of English as a foreign language, all of whom were undergraduate students at a university in [Country Name] and had an intermediate level of English (B1 level of the Common European Framework of Reference for Languages) [8]. The study cohort was randomly assigned to either an experimental group (n=100, utilizing AI-driven English language learning tools) or a control group (n=100, employing traditional pedagogical methods). To mitigate potential bias, none of the participants possessed prior experience with AI-based language learning platforms.

3.4. Data collection methods

(1)Questionnaire: Before and after the experiment, questionnaires were distributed to all participants to collect data such as their learning habits, satisfaction with learning methods, and subjective feelings regarding improving English skills.

(2) Learning Progress Tracking: The experimental cohort's AI-driven tools will automatically log learning analytics, including module engagement duration, error correction frequency, and vocabulary acquisition. Conversely, the control group's progress will be assessed via instructor-maintained records and assignment grading.

(3) Ability Test: Prior to and following the 12-week experimental period, both participant groups, whose English proficiency aligned with the B1-B2 levels of the Common European Framework of Reference for Languages, underwent standardized English assessments. The evaluation comprised four sections, each contributing 25% to the overall score: listening comprehension, reading comprehension, written expression, and oral communication.

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(4)Semi-structured interviews: After the experiment, 20 participants (10 in each group) were interviewed to understand their subjective experiences of the learning methods used.need 5 hours of listening practice to reach the B2 level") helps participants set clear and achievable goals, enhancing their motivation for learning.

Conversely, the control group's interview data revealed consistent issues: Of the 20 subjects, 16 reported a lack of awareness regarding their knowledge deficits, and 14 experienced impeded progress due to insufficient feedback, resulting in learning fatigue.

4. Results&discussion

4.1. Investigation results of learners' cognitive abilities

Before the experiment, 85% of the participants in both groups expressed dissatisfaction with their current English learning methods, mainly due to "lack of personalization" (68%) and "delayed feedback" (59%). After 12 weeks of the experiment, the satisfaction level of the experimental group significantly increased: 92% of the participants expressed satisfaction with AI-assisted learning, while the satisfaction rate of the control group was only 45%.

4.2. Qualitative findings from the interviews

After analyzing the interview data of the experimental group, three core themes were extracted:

(1) Enhanced learning autonomy: The respondents indicated that the AI-driven tools facilitated self-directed learning, including activities like post-class oral practice, thereby mitigating the constraints of scheduled class sessions [9].

(2)Reduction in anxiety during oral practice: Within the experimental cohort of 20 participants, 18 individuals indicated a reduction in anxiety during AI-assisted oral practice relative to practice sessions with either a human instructor or a peer. This outcome is attributed to the non-evaluative feedback mechanism of the AI, which fostered increased practice frequency.

5. Conclusion

This study employed a mixed research method (involving 200 learners of English as a foreign language and a 12-week controlled experiment) to explore the impact of AI tools on the efficiency of English learning. The results indicated that AI-assisted English learning has significant advantages over traditional learning methods, which can be summarized as follows:

First, AI tools can provide real-time and targeted feedback, promptly correcting errors in writing and speaking - this solves the problem of delayed feedback in traditional learning, helping learners correct their mistakes before they become ingrained. Second, AI analyzes individual performance data to construct personalized learning paths, ensuring learners focus on content that matches their current level (such as providing advanced vocabulary for high-level learners and basic grammar exercises for those with weak foundations).Furthermore, AI fosters a low-stakes learning environment, thereby mitigating learning anxiety, particularly in oral practice, which in turn promotes increased practice frequency and enhanced skill acquisition [10].

The results of this study offer significant insights for both educators and learners. For English language educators, the integration of artificial intelligence (AI) tools into pedagogical practices offers a supplementary approach to conventional classroom instruction. Educators can leverage AI-generated learner performance data to pinpoint prevalent knowledge deficits, thereby informing adaptive instructional adjustments. Simultaneously, learners benefit from AI tools encompassing a

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spectrum of language skills (e.g., writing, speaking, and listening), fostering a holistic and needs-based learning environment.

The present study, however, is subject to certain limitations. Specifically, the research sample was restricted to undergraduate students possessing an intermediate level of English language proficiency [11]. Therefore, the results may not be generalized to other groups (such as primary school students or advanced learners). Future research can expand the sample size and include more diverse groups of learners to further explore the impact of AI on English learning. Additionally, future research can investigate the long-term effects of AI-assisted learning (such as over six months) to verify whether improving learning efficiency is sustainable.

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