Investigating AI's Automated Feedback in English Language Learning

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Article Info	Abstract

This literature review examines the role of artificial intelligence (AI) in enhancing feedback mechanisms within English language learning, emphasizing the integration of AI technologies such as Natural Language Processing (NLP), Machine Learning (ML), and speech recognition to provide real-time, personalized feedback. The purpose of this review is to synthesize existing research findings on the effectiveness of AI-driven feedback in improving language skills such as grammar, vocabulary, and pronunciation, while also assessing learner engagement and retention rates. A thorough methodology involving a selection of recent peer-reviewed articles, academic databases, and a mixed-methods approach for data synthesis and analysis was employed to ensure comprehensive coverage of the topic. The review highlights that AI feedback often surpasses traditional methods in terms of speed, availability, and personalization. However, it also identifies significant challenges, including issues with accuracy, dependency on extensive datasets, and institutional resistance, which could hinder the broader adoption of AI in educational settings. Also, the paper discusses potential technological improvements, the need for integrative feedback approaches combining human and AI elements, and highlights gaps in current research that offer directions for future inquiry. This comprehensive analysis aims to provide educators, technologists, and policymakers with insights into leveraging AI to foster more effective and engaging language learning experiences.

INTRODUCTION

Feedback plays a crucial role in English language learning, as evidenced by studies emphasizing its significance in various aspects of the learning process. Self-assessment has been identified as a valuable tool that not only motivates students to engage with their English learning but also fosters critical thinking and autonomy in their language acquisition (Jamrus & Razali, 2019). Additionally, teachers' formative assessment feedback has been shown to enhance students' English learning outcomes, highlighting the impact of constructive feedback on educational achievements (Shah, 2022). Moreover, incorporating written corrective feedback has been found to improve learners'

metalinguistic awareness and interaction with teachers and peers, underscoring the importance of feedback mechanisms in language development (Hanan et al., 2022).

Artificial intelligence (AI) has significantly impacted modern educational technologies, transforming the learning landscape. The integration of AI in education involves enhancing cognitive levels, fostering innovative abilities, optimizing resource utilization, and advancing educational practices (Jingshan, 2023). AI technologies such as machine learning (ML) and natural language processing (NLP) are employed to personalize learning experiences, automate administrative tasks, provide tailored feedback, and pinpoint areas needing reinforcement in class (Hinojo-Lucena et al., 2019; Pokrivcakova, 2019). AI-powered learning applications have played a crucial role in reshaping traditional teaching methods, offering adaptive learning experiences customized to individual student needs (Chang et al., 2022). The influence of AI in language learning is evident through automated speech evaluation systems that assist in improving learners' speaking skills (Zou et al., 2023). Furthermore, AI's capacity to understand human speech and implement innovative teaching models like the flipped classroom approach underscores its potential to revolutionize language learning and teaching practices (Moulieswaran & Kumar, 2023). The significant impact of AI on teaching and learning in higher education is underscored by its ability to enable communication with computers through thought, with broader implications for reshaping the higher education landscape (Popenici & Kerr, 2017).

The purpose of the article is to systematically gather, analyze, and synthesize existing research on the application and impacts of AI in providing automated feedback to English language learners. This review aims to compile significant studies, evaluate the effectiveness of AI tools, identify prevailing trends, and discuss both the benefits and challenges associated with AI-driven feedback. It also seeks to pinpoint gaps in the current research landscape, suggest future directions for both technological enhancements and pedagogical integrations, and explore the implications for educational policymakers and practitioners. By doing so, the review will provide a comprehensive understanding of how AI technologies are transforming language learning feedback mechanisms and outline the potential advancements that could further benefit learners and educators.

METHOD

The methodology for the literature review on "Investigating AI's Automated Feedback in English Language Learning" includes selecting sources based on criteria such as a date range within the last 10 years, types of publications including journal articles, and keywords like "artificial intelligence," "automated feedback," "English language learning," and related terms. Key databases such as Google Scholar, ERIC, IEEE Xplore, and JSTOR are used alongside general search engines to ensure comprehensive coverage. The approach to data synthesis and analysis integrates both qualitative and quantitative methods; qualitative analysis involves thematic analysis and narrative synthesis to interpret text-based data, while quantitative analysis looks at statistical measures to evaluate the outcomes and effectiveness of AI tools. This mixed-methods approach allows for a thorough examination of both numerical data and contextual insights, providing a well-rounded view of how AI influences English language learning feedback mechanisms.

RESULTS AND DISCUSSIONS
AI Technologies Relevant to Language Learning

AI technologies have revolutionized the field of language learning, offering innovative solutions that enhance both the efficiency and effectiveness of teaching and acquisition processes. From NLP and ML algorithms to speech recognition and interactive AI tutors, these technologies are pivotal in shaping personalized learning experiences and improving linguistic competencies on a global scale.

Natural language processing (NLP) is a multidisciplinary field that integrates AI,

computational linguistics, and machine learning to analyze and understand human language. NLP involves the development of algorithms that can extract meaning from unstructured text data, enabling the identification of key elements in spoken or written communication (Sadiku et al., 2018). This technology has diverse applications across various domains, including healthcare, where NLP is utilized to extract relevant information from clinical notes and improve patient care (Hsu et al., 2024; Suh et al., 2022). Moreover, NLP plays a crucial role in discourse analysis, sentiment analysis, machine translation, and information verification, showcasing its versatility and impact in different fields (Clarke et al., 2020; Elshazly et al., 2021; Hirschberg & Manning, 2015). By integrating NLP into qualitative research methodologies, efficiency, sample sizes, and validation processes can be enhanced, highlighting the potential of NLP to revolutionize research practices (Abram et al., 2020). NLP continues to advance, offering innovative solutions that streamline processes, extract insights from vast amounts of textual data, and enhance decision-making across industries.

Machine learning (ML) models have been widely applied in various educational settings, demonstrating their versatility and impact on teaching and learning practices. Research has shown the effectiveness of ML-based student modeling methodologies in intelligent tutoring systems, enabling the development of models to explain, predict, and describe system and human behaviors (Yang et al., 2021). Moreover, the use of ML in teaching and learning English as a foreign or second language has yielded promising results, suggesting a positive future for ML in language education (AlHarbi, 2022). Additionally, ML prediction models have been utilized to improve video-based learning experiences, with studies focusing on evaluating different ML frameworks to predict students' engagement and performance (Rahman et al., 2023). Furthermore, the integration of ML algorithms in human activity recognition for military restricted areas has shown the potential of ML in identifying and categorizing activities using innovative methods (Patil et al., 2022) The

incorporation of ML techniques such as decision trees and logistic regression in predicting students' performance and developing evaluation models for English teaching quality underscores the significant role of ML in shaping educational outcomes and enhancing teaching practices (Krishna, 2021; Qi et al., 2022).

Speech recognition technologies, also known as automatic speech recognition (ASR), convert spoken language into text or commands, enabling intelligent speech interaction between humans and machines (Jiao et al., 2021; Zhang & Liu, 2018). In the context of language education, speech recognition plays a crucial role in evaluating spoken English proficiency and pronunciation accuracy (Geng, 2021; Mu et al., 2020). The application of speech recognition technology in educational systems, such as spoken English teaching systems, has shown promise in enhancing learning experiences and improving student engagement (Blunt & Haskins, 2021; Jiao et al., 2021). Moreover, the integration of speech recognition in multimodal systems for educational interactions and edutainment-based applications underscores its importance in facilitating smooth user-system interactions and supporting educational learning processes (Jeon & Kim, 2022). Advancements in speech recognition technology, including the utilization of deep learning models and transfer learning algorithms, have significantly improved recognition accuracy and expanded the potential applications of speech recognition in diverse fields, ranging from music education platforms to mental health consultation services (Fu, 2020; Shen, 2021).

Effectiveness of AI-Driven Feedback

The effectiveness of AI-driven feedback in language learning is a critical area of investigation, given its potential to revolutionize educational methodologies and outcomes.

1. Studies Focusing on Grammar and Vocabulary Improvement through AI Feedback

Zou et al. (2023) delved into how artificial intelligence speech evaluation programs can

significantly enhance the speaking abilities of English as a Foreign Language (EFL) learners by providing automatic feedback. Their research underscores the positive impact of AI-driven feedback in fostering language improvement. In a similar vein, Hwang et al. (2023) focused on the application of AI feedback through Smart Roam-Lingo, aiming to help students refine their writing by enhancing cohesion and consistency. This study highlights the transformative role of personalized AI feedback in language learning. Meanwhile, Zhang (2022) introduced a deep learning model for grammar error correction, demonstrating how AI can greatly improve grammar accuracy and error detection in English language learning.

Tong et al. (2021) explored the broader implications of AI feedback, particularly its impact on employee performance. Their research sheds light on the dual effects of how AI feedback is implemented and communicated, offering insights into the complex dynamics of using AI in educational feedback mechanisms. Lastly, Afri & Putra (2021) investigated a targeted approach to vocabulary enhancement using derivational morphemes, showcasing how AI feedback mechanisms can effectively support and augment English vocabulary learning. Collectively, these studies illustrate the diverse and powerful ways in which AI is reshaping language education, making it more effective and personalized.

2. Research on Pronunciation Correction using AI Tools

The effectiveness of utilizing AI technology to correct English pronunciation errors has been demonstrated in various studies. Shufang (2021) designed an automatic English pronunciation error correction system based on radio magnetic pronunciation recording devices, showcasing the successful integration of AI technology for this purpose. Similarly, (Neri et al., 2008) explored the effectiveness of computer-based speech corrective feedback for improving segmental quality in L2 Dutch pronunciation, emphasizing the role of ASR-based feedback in enhancing pronunciation accuracy. Seferoğlu (2005) investigated the integration of accent reduction software in advanced English language

classes to improve students' pronunciation at segmental and suprasegmental levels, highlighting the positive impact of technology on pronunciation skills. Furthermore, Humardhiana (2022) studied the use of AI-powered apps to enhance novice newsreaders' English pronunciation, underscoring the efficacy of AI technology in improving pronunciation skills. Additionally, Kholis (2021)evaluated the Elsa Speak app, which utilizes automatic speech recognition (ASR) technology to enhance English pronunciation skills, demonstrating its effectiveness in improving students' pronunciation abilities.

3. Analysis Of Learner Engagement And Retention Rates With AI-Assisted Platforms

To analyze learner engagement and retention rates with AI-assisted platforms, several relevant references can provide valuable insights. Wang et al. (2022) explores how learner engagement impacts non-formal online learning outcomes through value co-creation, emphasizing the significant role of engagement in enhancing learning outcomes and platform value. Narang et al. (2022) delves into the impact of content sharing strategies on engagement in online learning platforms, highlighting the importance of identifying strategies to enhance learner engagement. Zou et al. (2023) discusses the development of AI speech evaluation programs for EFL learners, showcasing how AI technology can enhance speaking skills. S. Fu et al. (2020) investigates the affordances of AI-enabled automatic scoring applications on learners' continuous learning intention, enriching knowledge on the antecedents of emotional and cognitive engagement in AI-enabled online learning environments.

Comparison between Traditional Human Feedback and AI-Driven Feedback

1. Speed and Availability

When comparing traditional human feedback with AI-driven feedback in the context EFL learning, several factors come into play. Traditional human feedback is known for its personalized touch and ability to provide nuanced guidance tailored to individual needs

(Hammond et al., 2018). Human instructors can offer detailed explanations, encouragement, and emotional support, which are crucial in language learning (Konyrova, 2024). However, the availability of human instructors is limited, and providing timely feedback to each student can be challenging (Hammond et al., 2018).

On the other hand, AI-driven feedback in EFL learning, as noted by (Golub et al., 2024), has demonstrated the potential to expedite the learning process and reduce performance evaluation anxiety, with AI systems providing immediate and precise feedback that enables continuous practice and improvement for students. Additionally, AI tools such as automated writing evaluation systems and intelligent tutoring systems can provide personalized feedback at scale, addressing the issue of availability (Yesilyurt, 2023).

Speed is a significant advantage of AI-driven feedback systems. AI can analyze large amounts of data quickly and provide instant feedback to learners (Luo et al., 2021). This rapid feedback loop can enhance the efficiency of learning and help students make real-time adjustments to their language skills (Luo et al., 2020). Furthermore, AI systems can automate arduous tasks, freeing up time for instructors to focus on higher-order teaching activities (Wishup, 2023).

2. Precision And Personalization

In the realm of EFL learning, the comparison between traditional human feedback and AI-driven feedback concerning precision and personalization reveals distinct advantages and considerations. El Ebyary & Windeatt (2010) emphasize that while traditional human feedback is cherished for its personalized approach, offering tailored guidance and emotional support vital for language learners, and providing nuanced explanations that foster a deeper understanding of language nuances, the limited availability of human instructors can impede the timely delivery of feedback to each student.

On the other hand, Kim et al. (2022) highlight that AI-driven feedback in EFL learning is characterized by its precision and scalability, with AI systems providing immediate and accurate feedback that enables continuous language practice and skill enhancement. Additionally, they note that automated writing evaluation systems and intelligent tutoring systems offer personalized feedback at scale, effectively addressing the challenge of limited availability inherent in traditional settings. AI technologies have the potential to transform language instruction by offering efficient feedback, support, and guidance to students, ultimately leading to a more effective learning experience (Wale & Kassahun, 2024).

Precision is a notable strength of AI-driven feedback systems. AI can swiftly analyze vast amounts of data and provide instant feedback to learners, aiding in the refinement of language skills (GOLUB et al., 2024). Additionally, AI tools can automate tasks, freeing up instructors' time to focus on higher-order teaching activities. The integration of AI in language teaching can enhance real-time language practice through dynamic interactions with AI-powered chatbots, boosting proficiency and confidence (Amin, 2023).

3. Learner Preference And Satisfaction

Distinguishing between traditional human feedback and AI-driven feedback in English as a Foreign Language (EFL) learning reveals varying preferences and satisfaction levels among learners. Albelihi (2022) emphasizes the role of corrective feedback in allowing teachers and learners to evaluate their performance and contemplate their progress. Learners' feedback preferences, such as comprehensive and indirect feedback focusing on grammatical, mechanical, and lexical errors, are aligned with their teachers' practices. Conversely, Zou et al. (2023) suggests that AI speech evaluation programs can provide more intuitive feedback, including scores and colors, along with corresponding practice suggestions to effectively enhance EFL learners' speaking skills.

Furthermore, learner motivation significantly influences feedback experiences and preferences in EFL contexts. Gan (2020) underscores the importance of attitudes towards English learning and intended learning effort as crucial motivational variables that forecast how

EFL students perceive and respond to feedback. This highlights that learners' intrinsic motivation and engagement levels play a substantial role in determining their satisfaction with feedback mechanisms.

Challenges and Limitations of AI in Providing Feedback

1. Accuracy Issues

AI has been increasingly integrated into EFL education to provide feedback and support to learners. However, several challenges and limitations exist in ensuring the accuracy and effectiveness of AI feedback in EFL contexts. One significant challenge highlighted by Abalkheel (2021) is the technical and organizational hurdles faced in integrating AI into remote EFL teaching. These challenges include the lack of support for technology adoption, complex implementation processes, and the need for continuous feedback mechanisms. Additionally, ethical considerations such as data privacy and confidentiality must be regularly updated to ensure the responsible use of AI in educational settings. Y. Zhang (2024) discusses the emergence of AI-powered writing assistants and automated writing evaluation systems in EFL education. These tools aim to enhance students' writing skills by providing feedback and suggestions based on AI algorithms. However, the effectiveness and reliability of these systems in accurately assessing and improving writing skills remain a concern. Alsahli & Meccawy (2022) emphasize the lack of empirical evidence on the challenges faced by EFL students and teachers in providing and receiving online corrective feedback. This gap in understanding the difficulties encountered during online writing lessons underscores the need for further research to address the limitations of AI feedback in EFL writing instruction. Moreover, Jiang (2022) points out the complexity of analyzing multi-modal signals, including text, audio, facial expressions, and body language, to enhance the effectiveness of AI in EFL teaching and learning. Integrating these diverse signals poses challenges in accurately interpreting and providing feedback tailored to individual learners' needs.

2. Dependence on large datasets and potential biases in AI algorithms

The integration of Artificial Intelligence (AI) in English as a Foreign Language (EFL) education raises concerns about the reliance on large datasets and potential biases in AI algorithms. Ski et al. (2020) emphasize that high-quality large-scale datasets are crucial for accurate predictive models in AI, as datasets of inferior quality can introduce biases, leading to decreased predictive accuracy. Timmons et al. (2023) highlight that biased AI decision-making processes can have negative impacts on specific groups, affecting outcomes and perpetuating biased decisions. Dennehy et al. (2023) caution against using biased or inaccurate data to train AI algorithms, as this can heighten the risk of inequalities and injustices. Additionally, Shrestha et al. (2019) point out that the lack of interpretability in AI-based decision-making algorithms poses challenges in identifying embedded biases, thereby hindering trust in AI-generated outcomes.

3. Resistance From Educational Institutions And Teachers

Resistance from educational institutions and teachers towards implementing new practices, such as peer assessment (PA) in EFL classes, can be influenced by various factors. Meletiadou & Tsagari (2022) highlight the importance of considering EFL teachers' perceptions when planning the integration of PA to enhance student motivation and academic performance. Additionally, Gan et al. (2019) point out that certain assessment practices, like interactive-informative assessment and student self-assessment, may not align with school qualifications assessments, leading to potential resistance from EFL teachers. Moreover, Wijaya (2022) emphasizes the need for EFL teachers to integrate their personal beliefs with institutional beliefs to promote better educational outcomes, indicating a potential clash of ideologies that could contribute to resistance. Understanding the challenges faced by EFL teachers, as discussed by Alsahli & Meccawy (2022), in providing and

receiving online corrective feedback further sheds light on the complexities that may deter teachers from embracing new feedback methods.

Recommendation

1. Potential Technological Advancements to Improve AI Feedback Systems

To enhance AI feedback systems in EFL education, several potential technological advancements can be considered. AI speech evaluation programs can offer intuitive feedback such as scores and colors, along with practice suggestions to aid EFL learners in improving their speaking skills efficiently (Zou et al., 2023). Additionally, leveraging AI-powered digital writing assistants can provide EFL writers with rewrite options to enhance their writing by suggesting appropriate synonyms, correcting errors, and helping adopt a preferred writing tone (Zhao, 2023). Furthermore, AI algorithms can predict new words based on students' original and previous writing, offering feedback suggestions for their next writing, thus supporting personalization and contextualization in authentic contexts (Hwang et al., 2023). Moreover, incorporating multimodal feedback, such as screencast video feedback, can be beneficial in EFL writing contexts, providing a diverse range of feedback options to cater to different learning styles and preferences (Pachuashvili, 2021). By integrating these advancements, EFL educators can create more personalized, effective, and engaging feedback systems that cater to the diverse needs of EFL learners, ultimately enhancing their language learning experiences.

2. Integrative Approaches Combining Human and AI Feedback for Optimal Results

Integrative approaches that combine human and AI feedback can lead to optimal results in EFL learning contexts. By incorporating AI-powered digital writing assistants that offer features like automatic writing evaluation, adaptive feedback, and detailed textual suggestions, learners can receive personalized guidance to enhance their writing skills (Nazari et al., 2021; Zou et al., 2023)

Additionally, integrating AI algorithms with learning analytics can improve student engagement and performance by enabling them to provide more elaborate and constructive feedback to peers, ultimately enhancing the learning experience and outcomes (Darvishi et al., 2022; Ouyang et al., 2023). Moreover, the combination of human feedback, such as teacher corrective feedback, with AI feedback mechanisms can effectively reduce errors and improve writing performance among EFL learners (Budianto et al., 2020; Khah & Farahian, 2016). These integrative approaches not only cater to individual learning needs but also promote a collaborative learning environment where students can benefit from both human expertise and AI capabilities to optimize their language learning experiences.

3. Future Research Needs And Gaps Identified In The Literature

Future research in the field EFL feedback systems could benefit from addressing several identified gaps in the literature. Studies such as those by Zou et al. (2023) and Y. H. Wang & Young (2015) suggest a need to explore learners' preferences for explicit versus implicit feedback in speaking and pronunciation improvement. Additionally, research like that of Yu & Lee (2015) and Zulaiha et al. (2020) highlights the importance of investigating student perspectives on feedback practices, particularly in higher education contexts, to better understand their preferences and responses. Furthermore, the work of Cabot (2022) emphasizes the significance of considering context-dependent factors and personal beliefs in feedback practices, indicating a need for research that delves into these aspects to enhance feedback effectiveness. Moreover, the study by Albelihi (2022) underscores the necessity of examining both EFL teachers' and learners' beliefs and preferences regarding written corrective feedback to bridge existing gaps in understanding feedback dynamics. By addressing these research needs, future studies can contribute to the development of more tailored and effective feedback systems in EFL education.

CONCLUSION

In conclusion, the integration of AI in language learning feedback systems presents a transformative potential for educational environments, enhancing both the delivery and quality of learning experiences. This literature review has systematically explored the critical role of AI technologies, such as Natural Language Processing (NLP), Machine Learning (ML) models, and speech recognition, in providing timely, precise, and personalized feedback, thereby significantly advancing learner outcomes in grammar, vocabulary, and pronunciation. The writer's findings confirm that AI-driven feedback can surpass traditional methods in terms of speed and availability, yet challenges such as algorithmic bias, data dependency, and resistance from educational stakeholders remain pertinent issues. The future of educational feedback lies in the further refinement of AI technologies and the innovative integration of human insights with machine efficiency. Continued research is crucial to address the identified gaps and to foster an educational landscape that leverages AI to its fullest potential, ultimately enhancing both learner engagement and educational efficacy.

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