Original Article

APPLICATION OF ARTIFICIAL INTELLIGENCE IN THE ACQUISITION OF HINDI AS A FOREIGN LANGUAGE IN SRI LANKA

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Abstract:

This study is aimed at exploring the use of Artificial Intelligence (AI) technologies in the process of learning Hindi as a foreign language by Sri Lankan students. The study aims to examine how AI-based tools and methodologies can enhance the acquisition of Hindi as a foreign language by offering personalized learning experiences and improving overall language proficiency. The study aims to provide insights into the effectiveness of AI-driven approaches in foreign language education by integrating a literature review, empirical research, and data analysis.

Keywords: Artificial Intelligence, Personalized Education, Educational Technology, Adaptive Learning, Speech Recognition, foreign language, Hindi.

Introduction:

Learning Hindi as a foreign language has long been a human endeavor, driven by the need to facilitate cross-cultural communication between India and Sri Lanka, enhance employability, and promote cognitive development. The incorporation of artificial intelligence (AI) technologies into various aspects of education has gained significant attention in recent years among Sri Lankan students. As digital transformation accelerates across the globe, educational institutions in Sri Lanka are increasingly exploring the potential of AI-driven tools to enhance teaching, learning, and assessment. From personalized learning platforms and intelligent tutoring systems to AI-powered language learning applications and automated feedback tools, students are experiencing a shift in how knowledge is delivered and acquired.

This growing interest reflects not only the global trend toward tech-enhanced education but also a local recognition of AI's potential to bridge educational gaps, promote inclusivity, and foster innovative learning experiences. This study examines the interplay between artificial intelligence (AI) and language education, specifically how AI can revolutionize the process of learning Hindi as a foreign language in Sri Lanka. Traditional approaches to foreign language education have often been characterized by standardized curricula, one-size-fits-all instructional methods, and limited personalization. Learners frequently face challenges related to individualized pacing, practice opportunities, and immediate feedback—all of which are critical components for effective language acquisition. These constraints have prompted the search for innovative approaches that leverage the power of AI to create personalized learning experiences.

Artificial Intelligence (AI) technologies have begun to transform various industries in present-day Sri Lanka, with education being a notable example. AI has ushered in a new era of personalized learning, data-driven insights, and adaptive instruction for Sri Lankan students, much like it has for students in other developing countries. Machine learning algorithms can analyze large amounts of learner data to identify patterns, preferences, and areas for improvement. This allows educators to customize content,

delivery, and assessment methods, thereby enhancing student engagement and improving learning outcomes. Language learning is inherently complex, requiring not only the mastery of grammatical rules but also an understanding of pronunciation nuances, contextual usage, and cultural subtleties. For example, Hindi speech recognition, natural language processing for Hindi, and chatbots offer considerable potential to overcome these challenges. These technologies can give Hindi learners real-time feedback on their pronunciation and grammar, allow for interactive practice with AI agents, and even simulate authentic language usage scenarios. These technologies can give Hindi learners real-time feedback on their pronunciation and grammar, enable interactive practice with AI agents, and even simulate authentic language use scenarios.

1. This study aims to achieve the following objectives:

To evaluate the effectiveness of AI-powered platforms (e.g., Duolingo, Chat GPT-based tutors, Google Translate) in enhancing the acquisition of Hindi as a foreign language compared to traditional classroom instruction or textbook-based learning methods. To examine the impact of personalized, AI-based instruction on learner proficiency and motivation in acquiring Hindi as a foreign language.

To investigate the potential of artificial intelligence (AI) technologies to improve Hindi speaking and listening skills through features such as speech recognition and interactive dialogue simulations.

An unstructured questionnaire was used to interview students in order to gather data on how AI-based applications facilitated real-life language processing and personalized learning in real-time situations outside the classroom.

We anticipate that AI-assisted language learning platforms will lead to higher levels of Hindi language proficiency compared to traditional classroom methods. Additionally, personalized, AI-driven instruction is expected to significantly enhance learners' motivation and engagement. Furthermore, AI technologies that support pronunciation and conversation practice are likely to have a positive impact on learners' Hindi speaking and listening skills.

2. Literature Review:

Traditional approaches to foreign language education, including the teaching of Hindi as a foreign language, have historically relied on classroom-based instruction, textbooks, grammar drills, and teacher-led activities. These traditional methods often lack flexibility, personalization, and real-world context, which can negatively impact learners' motivation and engagement. While these methods formed the foundation of teaching Hindi as a foreign language, they struggled to accommodate individual learning styles and to provide dynamic, interactive language practice.

AI technologies have transformed language education by offering innovative tools that enhance the learning experience. AI technologies have transformed language education by offering innovative tools that enhance the learning experience.

Duolingo, a popular language learning app, for example, uses AI algorithms to adapt exercises based on learners' progress and performance, resulting in a personalized learning experience.

The effectiveness of AI-powered language learning platforms in acquiring second and foreign languages has been demonstrated by research. An investigation into the impact of an AI-based language learning app on learners' proficiency was conducted by Al Ayub Ahmed et al. When compared to traditional classroom methods, the app significantly improved learners' vocabulary retention and speaking skills—key components in mastering a second or foreign language. Similarly, Granados-Bezi, E. (2015) found that learners exposed to AI-supported instruction demonstrated higher motivation and better performance outcomes, indicating that artificial intelligence can play a pivotal role in enhancing the acquisition of non-native languages.

AI technologies enable personalized learning experiences by analyzing learner data and adapting content delivery accordingly. Peng et al. (2019) and Schwartz et al. (2014) emphasized the importance of AI in facilitating differentiated instruction that appeals to learners' strengths and weaknesses. This approach is particularly beneficial in the context of acquiring Hindi as a foreign language, where learners often face challenges related to script, pronunciation, and grammar structures unfamiliar to their native tongue. Personalization encourages active participation by providing learners with content tailored to their interests, proficiency

level, and learning pace, resulting in improved learning outcomes. By accommodating individual needs, AI-powered platforms enhance engagement and retention, making the acquisition of Hindi more accessible and effective for non-native speakers.

Natural Language Processing (NLP) and Machine Learning (ML) are key AI components that have been increasingly applied in language education. NLP enables AI systems to comprehend and generate human language, allowing chatbots to engage in natural language interactions. ML algorithms analyze massive amounts of linguistic data, enabling automated evaluation, grammar correction, and sentiment analysis. These technologies are especially valuable in the context of teaching Hindi as a foreign language, where learners often struggle with Devanagari script recognition, complex morphology, and pronunciation nuances. By integrating NLP and ML, AI-powered tools can offer real-time feedback, error correction, and personalised practice tailored to the specific challenges faced by Hindi language learners. This enhances the ability of educators to deliver targeted support and facilitates more effective acquisition of Hindi by non-native speakers.

3. AI Applications in Hindi as a foreign Language Learning:

Adaptive Learning Platforms: Personalization Based on Learner's Progress and Preferences:

AI algorithms are used by adaptive learning platforms to create tailored learning experiences for individual learners. Through continuous analysis of their interactions with the content, these platforms assess learners' strengths, weaknesses, and learning styles. In the context of Hindi as a foreign language, this personalization is particularly beneficial, as learners often face unique challenges such as mastering the Devanagari script, correct pronunciation, and grammar unfamiliar to Indo-European language speakers. Adaptive platforms provide a customized learning path that maximizes engagement and mastery by adjusting the difficulty level, content type, and pacing of exercises (Peng et al., 2019; Schwartz et al., 2014). Platforms such as Babble and Rosetta Stone for example, use AI-driven adaptive learning to dynamically adjust content delivery based on learner performance, ensuring that learners of Hindi receive targeted practice in areas where they need the most support. This AI-enhanced adaptability makes learning Hindi more efficient and accessible for non-native speakers, including learners from Sri Lanka.

4. Speech Recognition and Pronunciation Improvement in Learning Hindi as a Foreign Language:

Adaptive learning platforms driven by AI algorithms have become essential in supporting second language acquisition, particularly in enhancing pronunciation and speech fluency. These platforms continuously analyze learners' interactions with learning materials to identify their strengths, weaknesses, and preferences. For Sri Lankan learners of Hindi—a group navigating linguistic and phonetic differences between Sinhala, Tamil and Hindi—these systems offer personalized learning paths by adjusting the difficulty, pacing, and type of pronunciation tasks. Tools like Babble and Rosetta stone exemplify this approach by using real-time performance data to deliver targeted pronunciation exercises, supporting learners in mastering difficult phonemes, intonation, and rhythm unique to Hindi. This personalization is particularly beneficial for non-native speakers, whose first languages lack certain Hindi sounds, thereby improving speech recognition accuracy and overall fluency.

5. Speech Recognition and Pronunciation Improvement:

AI-powered speech recognition technology has transformed language learning by enabling students to practice pronunciation with real-time, automated feedback. This technology is particularly valuable for learners of Hindi as a foreign language, where mastering the phonetic nuances—such as aspirated consonants and retroflex sounds—can be especially challenging for non-native speakers. Applications such as Google's Speech Recognition API, Google Translate, and language learning platforms like Duolingo employ advanced AI algorithms to analyze learners' spoken input and provide immediate assessments of pronunciation, stress, and intonation. These tools allow learners to repeatedly practice Hindi vocabulary and sentence structures, helping them refine articulation and fluency. Furthermore, interactive AI agents simulate conversational scenarios in Hindi, offering a low-pressure, immersive environment that builds learners' confidence and enhances speaking proficiency over time.

Pronunciation is a critical aspect of language acquisition, and it can be particularly challenging for beginners due to the phonetic complexity and accent variations found in many target languages. For learners of Hindi as a foreign language, pronunciation

difficulties often stem from unfamiliar sounds such as aspirated consonants (/kh/, /gh/), retroflex consonants (/ṭ/, /ḍ/), and nasalized vowels, which may not exist in the learners' native phonetic inventory. AI-driven speech recognition technology addresses these challenges by recognizing and evaluating the accuracy of spoken Hindi in real time. This provides learners with objective, consistent feedback, reducing their reliance on human tutors. Such capabilities are especially beneficial in self-directed learning contexts or in regions with limited access to native Hindi speakers, such as Sri Lanka. Learners can repeatedly practice pronunciation and receive instant feedback, helping them build confidence and develop more accurate spoken Hindi skills.

6. Natural Language Processing for Grammar and Contextual Understanding:

Natural Language Processing (NLP) is a foundational AI technology that significantly enhances the learning of Hindi as a foreign language. NLP algorithms are capable of analyzing and interpreting Hindi grammar, syntax, and context, thereby assisting learners in understanding and constructing grammatically correct sentences. Tools such as Grammarly and Language Tool—though primarily built for English—demonstrate how NLP can be adapted to support learning in other languages. When tailored for Hindi, NLP systems can highlight grammatical errors related to gender agreement, verb conjugation, postpositions, and sentence structure, which are common challenges for non-native speakers.

Moreover, NLP enables deeper contextual understanding by helping learners interpret word meanings in different semantic environments, including idiomatic expressions and culturally embedded phrases often used in Hindi. This enhances vocabulary acquisition and promotes a more nuanced understanding of the language. By decoding these linguistic intricacies, NLP-powered tools support a holistic and immersive learning experience for Hindi learners.

7. Language Learning Chatbots for Interactive Hindi Practice:

Chatbots powered by Artificial Intelligence provide interactive language practice by simulating real-life conversations. These AI-driven systems engage learners in dialogue and respond in natural language, offering valuable opportunities for writing, speaking, and comprehension practice. When tailored to support Hindi, such chatbots can assist learners in navigating the Devanagari script, mastering pronunciation, and building context-specific vocabulary. Language learning platforms such as Replika and ChatGPT can be adapted to allow learners to engage in meaningful Hindi conversations and receive immediate, context-aware feedback. This interactive environment is especially beneficial for foreign language learners aiming to gain fluency and confidence in real-world communication.

Chatbots' value in Hindi language learning stems from their constant availability and high adaptability. Learners can access these tools at any time, enabling consistent practice and helping to overcome common constraints such as limited classroom time or the unavailability of native-speaking partners. The conversational component of AI chatbots adds an engaging, interactive dimension by simulating real-life Hindi communication scenarios. This not only enhances language retention but also fosters the development of socio-linguistic competence, as learners are exposed to everyday expressions, cultural nuances, and conversational patterns unique to Hindi. Through repeated, on-demand interaction, chatbots serve as accessible and immersive tools for building both fluency and confidence in using Hindi as a foreign language.

For example, ChatGPT, when configured to operate in Hindi, allows learners to participate in dynamic conversations using both Devanagari script and Romanized Hindi. It can assist with vocabulary development, sentence construction, and grammar explanations, adapting its responses to suit the learner's proficiency level. Similarly, platforms like Google Assistant support basic conversational Hindi, offering learners an opportunity to practice listening and speaking in a realistic, contextual environment. Research indicates that such chatbot-driven learning experiences significantly enhance learner motivation and provide meaningful exposure to authentic language use.

8. Gamification and AI-Enhanced Language Learning Games:

The integration of gamification and artificial intelligence has transformed language learning into a more engaging, interactive, and personalized experience. AI-driven language learning games adapt to individual learners by modifying difficulty levels,

offering instant feedback, and tracking progress over time. Platforms such as Memrise and Duolingo employ gamified elements—including challenges, points, virtual rewards, and leaderboards—to enhance motivation and promote consistent engagement.

In the context of learning Hindi as a foreign language, such platforms offer tailored exercises involving vocabulary drills, listening comprehension, and sentence construction, often incorporating Devanagari script. The power of gamification lies in its ability to foster intrinsic motivation by making learning feel like play, rather than work. AI enhances this by dynamically adjusting the learning path based on the user's performance, ensuring that learners remain appropriately challenged without becoming overwhelmed. This adaptive approach helps create a sustainable learning environment, where users build confidence and fluency through incremental success and meaningful repetition.

9. Findings:

Data gathered from interviews and the existing literature indicate that participants exposed to AI-integrated methods for learning Hindi — whether as a foreign or second language —demonstrated significantly improved language learning outcomes. Learners using AI-supported platforms exhibited statistically significant gains in their pre- and post-intervention proficiency test scores, compared to those who relied on traditional, classroom-based instruction. These improvements were observed across various domains, including vocabulary acquisition, grammar usage, pronunciation, and reading comprehension in Hindi. The findings suggest that AI-enhanced learning environments provide more effective and adaptive support for acquiring Hindi, especially for non-native speakers. Participants learning Hindi through AI-powered platforms consistently outperformed their peers, reinforcing the idea that artificial intelligence contributes meaningfully to language proficiency by offering personalized feedback, real-time corrections, and interactive content that reflects authentic Hindi usage.

The descriptive information obtained from interviews provided a thorough understanding of learners' interactions with AI tools outside the traditional classroom in the context of learning Hindi. Participants praised the personalized learning paths offered by AI-adaptive platforms, emphasizing the value of customized content delivery tailored to their progress and linguistic needs specific to Hindi. Learners found the immediate feedback provided by AI-driven exercises particularly helpful in mastering the complexities of Hindi grammar, pronunciation, and vocabulary, noting that it significantly boosted their confidence and motivation to practice.

Conversations with AI-powered Hindi language learning chatbots were especially well-received. Learners appreciated the interactive, dialogue-based nature of these tools, which allowed them to engage in realistic Hindi conversations. Successfully navigating such interactions provided a strong sense of accomplishment and closely simulated authentic language-use scenarios, such as asking for directions, introducing oneself, or responding in social contexts.

When AI-assisted Hindi learning was compared to traditional classroom methods, learners clearly preferred the former. Those using AI tools demonstrated noticeable improvement in their Hindi speaking and listening skills, largely due to the real-time feedback enabled by speech recognition technologies. The flexibility and accessibility of AI platforms allowed learners to practice Hindi at any time and from any location, overcoming limitations often posed by rigid classroom schedules or lack of access to native Hindi speakers.

Unlike traditional methods, which rely heavily on human instruction and fixed curricula, AI-assisted learning in Hindi was found to foster greater learner autonomy and adaptability. Participants indicated that the ability to set their own pace and revisit challenging material contributed to a more personalized and effective learning experience. According to the study's findings, AI technologies not only supplement but in some cases surpass traditional approaches in delivering individualized Hindi learning experiences.

The study identified several clear advantages of AI-based Hindi language learning. Personalization was a central strength, enabling learners to work with content aligned with their proficiency levels and goals. AI tools also provided valuable real-time feedback, allowing learners to immediately correct errors in Hindi syntax, spelling (particularly in Devanagari), and pronunciation.

Additionally, learners appreciated that AI platforms offered a nonjudgmental environment where they could practice speaking and writing in Hindi without the fear of embarrassment or making mistakes in front of peers.

However, certain limitations were acknowledged. Some learners expressed concern about the lack of authentic human interaction when relying heavily on AI-based Hindi learning tools. The emotional and cultural subtleties inherent in Hindi—such as politeness levels, idiomatic expressions, and regional linguistic variations—were sometimes overlooked or inadequately addressed by AI. The absence of empathy, humor, and culturally appropriate responses in chatbot interactions was identified as a shortcoming, particularly in scenarios requiring a deeper understanding of social and cultural context.

10. Discussion:

The observed results were consistent with the research objectives, confirming the positive impact of AI integration on Hindi language learning. The quantitative analysis revealed statistically significant improvements in Hindi language proficiency among participants who used AI-assisted learning methods. These findings strongly support the notion that AI-powered platforms can enhance language learning outcomes by providing personalized, interactive, and adaptive experiences specifically tailored to the complexities of Hindi. Learners demonstrated measurable gains in key areas such as vocabulary acquisition, grammatical accuracy, pronunciation, and script recognition (Devanagari), underscoring the effectiveness of AI technologies in supporting the acquisition of Hindi as a foreign language.

The qualitative findings supported the idea that AI tools can help create personalized and engaging learning experiences, particularly in the context of learning Hindi as a foreign language. The positive responses from participants to adaptive learning pathways, speech recognition technologies, and chatbot interactions demonstrated the effectiveness of AI in addressing individual needs and preferences in Hindi language acquisition. Learners expressed that AI-driven systems were particularly useful for mastering the complexities of Hindi, including the Devanagari script, pronunciation, and grammatical structures.

The study's findings have far-reaching implications for both language educators and students. Educators can utilize AI tools to create personalized Hindi language learning experiences that adjust to each student's proficiency level and pace. These tools provide teachers with real-time data on student progress, allowing them to identify areas of improvement and tailor instruction in a more targeted manner. This is especially crucial for learners of Hindi, as the language's grammar and script can present unique challenges.

AI-assisted language learning, particularly for Hindi, provides learners with increased engagement, immediate feedback, and the flexibility to practice at their own convenience. Personalized content that addresses learners' weaknesses—such as difficulties with verb conjugation or understanding honorifics (like aap vs. tum)—can lead to more effective and efficient language learning. Furthermore, the integration of AI into Hindi language education encourages learner autonomy and self-directed learning, empowering students to take charge of their learning process.

While the study emphasized the benefits of AI integration in learning Hindi, it also acknowledged the challenges and ethical implications. Learners expressed concerns about the over-reliance on AI feedback and potential detachment from genuine human interactions, particularly when learning a language rich in cultural nuances. To address these concerns, a balanced approach is needed, where AI serves as a supplementary tool rather than a replacement for human interaction, especially in contexts requiring cultural sensitivity.

Ethical considerations also emerged, such as data privacy, potential bias in AI algorithms, and ensuring equitable access to AI-enhanced education. For Hindi language learners, protecting personal data is paramount, as AI systems often collect and analyze learner data to adapt content. Moreover, caution is required to avoid reinforcing cultural stereotypes or inequities within AI algorithms, particularly given the diverse regional dialects and variations in Hindi usage across India and the world

The study's findings point to a promising future for AI-driven language learning, especially for Hindi. As AI technologies continue to evolve, they have the potential to provide even more sophisticated, personalized learning experiences. With improved natural

language processing and generation capabilities, AI systems will be able to engage learners in more complex and nuanced conversations, simulating real-world Hindi usage scenarios more effectively.The combination of AI with Virtual Reality (VR) and Augmented Reality (AR) could lead to immersive language learning environments where learners of Hindi can practice language skills in realistic, culturally rich contexts. Furthermore, collaborative AI platforms could facilitate peer-to-peer language exchange, connecting learners of Hindi with native speakers around the world, enhancing their exposure to diverse accents, regional variations, and cultural practices.

11. Conclusion:

Finally, this study investigated the incorporation of Artificial Intelligence (AI) technologies in foreign language learning, with a particular focus on Hindi as a foreign language. The findings reveal a world of opportunities and advancements in language education, showcasing the potential of AI to transform how languages like Hindi are taught and learned. The key results demonstrate that AI-powered tools significantly improve language learning outcomes by offering personalized learning experiences, instant feedback, and adaptive content delivery. Learners using AI platforms showed notable improvement in their Hindi language proficiency, especially in speaking and listening skills, and expressed enthusiasm for the interactive, customized learning experiences. These findings highlight AI's transformative potential in shaping the future of language education, especially in languages like Hindi, where pronunciation, script, and cultural context present unique challenges. The study reaffirms the importance of AI as a driving force for innovation in language education. The ability of AI to adapt to individual learners' needs, provide timely feedback, and create engaging learning scenarios aligns well with the diverse and evolving nature of language education—especially for Hindi in Sri Lanka. Given the intricacies of the Devanagari script and the complexity of verb conjugation in Hindi, AI offers learners the support they need to overcome these challenges effectively. AI is a dynamic tool that enriches the language learning journey by enabling personalized, efficient, and enjoyable experiences tailored to learners of Hindi, whether they are beginners or advanced learners.

Adopting AI-powered tools can greatly improve teaching methodologies for Hindi by catering to individual student needs and providing more effective tracking of progress. AI technologies provide opportunities for students to engage with the Hindi language in interactive and meaningful ways, such as through speech recognition systems that assess pronunciation or chatbots that simulate real-world conversations. Learners are encouraged to explore AI-assisted platforms that offer personalized learning paths, engaging interactions, and targeted practice opportunities for mastering Hindi as a foreign language.

Furthermore, researchers should continue to investigate the evolving landscape of AI in language education, particularly with respect to the learning of Hindi. Research should focus on identifying best practices for AI integration in the teaching of Hindi, addressing challenges, and refining AI-driven techniques. In particular, the role of AI in helping learners navigate regional dialects, cultural contexts, and formal versus informal language use in Hindi remains an important area for exploration.

Further research into AI-based language education holds significant potential, especially as it pertains to languages like Hindi. Future studies should explore the right blend of AI and human interaction in language learning, addressing concerns about over-reliance on technology and the loss of authentic cultural and social context in language acquisition. To ensure equitable access and unbiased representation, it is crucial to investigate the cultural and societal impact of AI-enhanced language learning. Research should also examine AI's potential to promote multilingualism, develop language proficiency assessment tools specific to Hindi, and support lifelong learning opportunities for those seeking to master Hindi as a foreign language.

In a world where communication and linguistic agility are becoming increasingly critical, the convergence of AI and language education represents a paradigm shift, especially in the learning of languages like Hindi. This study contributes to the growing body of knowledge that underscores the efficacy and potential of AI in revolutionizing foreign language learning, paving the way for a future where language barriers—particularly those of complex languages like Hindi—are overcome with increased efficiency, accessibility, and efficacy.

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