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Exploring AI-based adaptive learning systems for teaching English:

A comparative study. A case of M1 students at

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DEDICATION

To my cherished parents—your unwavering love and sacrifices are the foundation of all I pursue.

To my dear sister and brother—thank you for your constant support and belief in me.

And to the little light of our lives, my sweet niece—may your innocence and laughter always remind us of what truly matters.

With all my love and deepest gratitude.

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Abstract

This dissertation investigates the role of AI-based adaptive learning systems in enhancing English language learning at the university level. Adaptive learning technologies personalize instruction by responding to individual learner profiles, including strengths, weaknesses, learning pace, and engagement patterns. The study explores both the benefits and challenges of implementing such systems using a mixed-methods approach. A total of 30 Master 1 university students in English studies participated in the research. A structured questionnaire was administered to gather insights into user experiences, levels of satisfaction, perceived improvements in learning outcomes, and the practicality of using AI tools in academic English learning. The questionnaire addressed areas such as learning preferences, the quality of perceived feedback, motivation, and improvements in vocabulary and grammar. Findings suggest that AI-based systems positively influence learner engagement, vocabulary retention, grammatical accuracy, and oral fluency. Participants reported greater autonomy, more targeted feedback, and enhanced motivation. However, challenges such as limited digital infrastructure, lack of training, and unequal access to technology were also identified. These findings offer practical implications for educators, curriculum designers, and policymakers aiming to integrate intelligent technologies into English language education in higher education settings.

Keywords: AI, adaptive learning systems, English language learning, personalized instruction, educational technology, learner perceptions

List of Abbreviations

AI – Artificial Intelligence

ELT – English Language Teaching

ICT – Information and Communication Technology

LMS – Learning Management System

NLP – Natural Language Processing

PBL – Project-Based Learning

EFL – English as a Foreign Language

ESL – English as a Second Language

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GENERAL INTRODUCTION

General Introduction

Background Information

Artificial Intelligence (AI) is a technology that allows machines to perform tasks that typically require human intelligence, such as learning, problem-solving, and decision-making. AI uses concepts from fields like mathematics, computer science, and neuroscience to create systems that can “think” and improve over time. A key part of AI is machine learning, where systems learn from experience and adjust based on what they’ve learned. AI can also help machines understand the world around them, such as through speech recognition or image analysis, similar to how voice assistants like Siri or Alexa understand spoken commands.

In English language learning, AI-based adaptive learning systems are changing the way students learn. These systems personalize lessons by adjusting the content and pace based on each student's abilities and progress. For example, if a student is struggling with vocabulary, the system can provide extra practice in that area, while skipping over content the student already knows. This helps students learn more efficiently and stay engaged, as they are always working at a level that is just right for them. AI can also offer real-time feedback, helping students correct mistakes and improve their skills more quickly.

AI-based systems in English language learning are not meant to replace teachers but to support them. They provide teachers with useful insights about each student’s progress and challenges, allowing teachers to offer more focused and personalized support. By using AI, language learning can become more flexible and accessible, helping students improve their English skills in a way that fits their individual needs.

Problem Statement

Traditional methods of teaching English often use a one-size-fits-all approach, where all students receive the same lessons, exercises, and feedback. However, students do not all learn in the same way or at the same pace. Some may struggle with grammar, while others find it difficult to improve their speaking or listening skills. This lack of personalization can lead to disengagement, slow progress, and frustration among learners.

Despite the proven potential of AI-based adaptive learning systems, there is still limited understanding of their effectiveness in real-world educational settings, especially in English language learning. Many educators are also uncertain about how best to integrate such systems into their curriculum. As a result, there's a gap in research exploring the actual impact of these technologies on learners' progress, motivation, and confidence.

Hypothesis

It is hypothesized that **AI-based adaptive learning systems significantly enhance English language acquisition** by providing personalized content, real-time feedback, and targeted practice. This improvement is expected to be more effective than traditional, uniform instructional approaches, particularly in diverse learning environments.

Objectives of the Study

- To explore how AI-based adaptive learning systems function in the context of English language learning.
- To assess the impact of these systems on learners' performance, engagement, and motivation.
- To compare learner experiences and outcomes between traditional methods and AI-supported instruction.

- To identify key challenges and limitations in the implementation of AI adaptive tools.
- To provide recommendations for educators and institutions on effective integration of AI in language learning environments.

Significance of the Study

This study is significant as it explores the transformative role of AI-based adaptive learning systems in enhancing English-language education through personalized, data-driven instruction. Unlike traditional e-learning models that deliver uniform content to all learners, adaptive learning systems use artificial intelligence to analyze individual learner behavior, proficiency, and progress in real time, adjusting the instructional path accordingly. This level of personalization is particularly critical in language learning, where students often differ widely in their vocabulary range, grammar comprehension, and communication skills. By focusing on how adaptive systems can respond to these differences, the study aims to address current limitations in standardized instruction and contribute to more engaging, responsive, and effective learning experiences.

Furthermore, the research has practical value for educators and instructional designers by offering insights into how adaptive technologies can support differentiated teaching and learner autonomy. It also holds broader implications for educational equity, providing scalable and accessible solutions for diverse and underserved learners. In doing so, this study contributes to the growing body of literature on AI in education, aligns with global trends in Education 4.0 and 5.0, and informs future policy and practice in the integration of intelligent technologies in English-language learning environments.

Organization of the dissertation

My dissertation is divided into two main parts: one theoretical and the other practical. It begins with a general Introduction, in which I present the research background,

define the problem, outline the main objectives and research questions, and explain the significance of the study. The first part, which is theoretical in nature, explores the concept of AI-based adaptive learning systems, with a focus on their application in English language learning. It includes a review of the relevant literature on adaptive learning technologies, artificial intelligence in education, and the pedagogical theories that support personalized and data-driven instruction.

This part also introduces the comparative aspect of the study by examining different adaptive learning models and platforms used in various English-language learning contexts. The second chapter of the dissertation is practical and contains the Results and Discussion. It presents the findings of my comparative study based on data collected through questionnaires and/or interviews with teachers and learners who have used different AI-based adaptive learning systems.

The analysis aims to assess the effectiveness, user perceptions, and implementation challenges of these technologies in real educational settings. Finally, the dissertation concludes with a General Conclusion that summarizes the main findings, discusses the limitations of the study, offers pedagogical implications, and proposes directions for future research in the field of AI-enhanced English language education.

Chapter one

Theoretical Background

Chapter one:

Artificial Intelligence in Education

Definition and Scope of Artificial Intelligence

Artificial Intelligence (AI) is a specialized domain within computer science that aims to develop systems capable of performing tasks that traditionally require human intelligence. These tasks include understanding natural language, recognizing patterns, solving problems, making decisions, learning from experience, and adapting to new situations (Russell & Norvig, 2016). Unlike conventional software that follows fixed, rule-based instructions, AI systems are designed to exhibit a degree of autonomy and adaptability, enabling them to respond intelligently to complex and dynamic environments.

The foundation of AI lies in the integration of multiple disciplines such as computer science, which provides the algorithmic structures and computational models; mathematics, particularly statistics and probability, which support data-driven learning; and cognitive psychology, which offers insights into how humans perceive, think, and learn. These interdisciplinary contributions help AI developers simulate aspects of human cognition, such as memory, reasoning, and decision-making, in artificial systems.

Over the decades, the scope of AI has significantly expanded to encompass several interrelated subfields. Machine learning (ML), a major branch of AI, involves creating algorithms that allow computers to learn from data and improve their performance over time without direct human intervention. Deep learning, a subset of ML, uses artificial neural networks modeled after the human brain to analyze complex data sets such as images, audio, and text. Natural language processing (NLP) focuses on enabling machines to understand, interpret, and generate human language, facilitating applications like chatbots, voice assistants, and automated translation services. Computer vision empowers machines to interpret visual information, such as

recognizing faces or detecting objects in images. Robotics integrates AI into physical systems, allowing robots to perform actions autonomously in real-world environments.

The evolution of AI has transformed it from a theoretical concept to a practical and impactful tool embedded in daily life. AI is now found in smartphone assistants like Siri and Google Assistant, recommendation systems used by platforms such as Netflix and Amazon, fraud detection algorithms in banking, and autonomous systems in transportation. In each of these applications, AI's ability to process large volumes of data, learn from user behavior, and make real-time decisions is crucial. AI's current development is also tightly linked with technological trends such as big data and cloud computing, which provide the infrastructure and resources necessary to train and deploy intelligent systems at scale. Furthermore, AI is a cornerstone of the broader digital transformation seen in modern economies and is driving innovation across sectors including healthcare, finance, manufacturing, agriculture, and education.

Despite its rapid growth, AI still faces philosophical, ethical, and practical challenges, including ensuring fairness, avoiding bias, protecting privacy, and maintaining transparency. These concerns underscore the need for responsible AI development guided by both technical and ethical standards. AI is a powerful, evolving field that merges computational logic with human-inspired intelligence. Its broad scope encompasses not only the development of intelligent systems but also their application in solving real-world problems, making it one of the most influential and transformative technologies of the 21st century (Russell & Norvig, 2016).

Machine Learning: The Core of Modern AI

Machine learning (ML) is one of the most essential components of artificial intelligence, enabling systems to learn from data and improve their performance over time without being explicitly programmed for every task. In contrast to traditional programming, where a system

follows fixed instructions, machine learning allows systems to detect patterns, draw inferences, and make decisions based on historical and real-time data. This adaptability makes ML particularly valuable in settings that require constant updates and feedback, such as education.

At the core of ML is the concept of experience-driven improvement. As the system is exposed to more data—such as student responses, performance metrics, or interaction patterns—it "learns" from this input and adjusts its actions accordingly. For instance, in an AI-powered English language-learning platform, the machine-learning model may track how often a learner makes certain grammar mistakes and gradually adapt by offering more targeted exercises and explanations to address those errors. This continuous feedback loop enables a personalized learning experience that evolves with the student's progress.

There are three major types of machine learning that contribute to the development of intelligent systems in education: supervised learning, unsupervised learning, and reinforcement learning. Supervised learning involves training a model on labeled data, where the correct outputs are known in advance. For example, a dataset might include correct and incorrect uses of English grammar, allowing the model to learn how to distinguish and correct similar mistakes. Unsupervised learning, on the other hand, works with unlabeled data; and is used to identify hidden patterns or groupings, such as clustering students, based on learning styles or proficiency levels. Reinforcement learning is a more interactive approach where the system learns through trial and error, receiving feedback in the form of rewards or penalties based on its performance—similar to how a student learns from success and mistakes.

These ML approaches work together to create more intelligent and responsive educational tools. Over time, the systems become increasingly effective at predicting learner needs, recommending appropriate resources, and guiding users toward mastery of specific skills. For example, a reinforcement-learning model could learn which types of practice activities lead to better retention of vocabulary and prioritize those in future sessions with the learner.

In educational contexts, machine learning also supports predictive analytics, where systems anticipate which learners are at risk of falling behind and prompt timely interventions. Additionally, it enables real-time feedback, allowing students to receive instant corrections and explanations, which enhance learning efficiency and motivation. This data-driven personalization represents a significant advancement over static, one-size-fits-all learning systems.

Machine learning forms the backbone of modern AI, making it possible for educational technologies to become adaptive, intelligent, and responsive to individual learners. Its role in processing data, detecting patterns, and providing feedback is transforming how students engage with content, making learning more effective and learner-centered (Luckin, 2016).

Applications of AI in Education

Artificial Intelligence (AI) is significantly transforming the educational landscape by introducing tools and systems that improve both teaching efficiency and learning outcomes. One of the major contributions of AI is the automation of administrative tasks, such as grading quizzes, managing attendance, or scheduling assignments. This allows teachers to devote more time to direct student interaction and instructional planning, rather than routine paperwork.

Another important application is the analysis of student performance data. AI systems are capable of collecting and interpreting vast amounts of information about students' learning behaviors, such as response time, accuracy in answers, and engagement with content. Through this analysis, teachers receive real-time feedback about which students are struggling, excelling, or disengaged. This information helps educators intervene earlier with specific strategies or resources, rather than waiting until exam results reveal the problem.

Most notably, AI enables the creation of personalized learning paths. Traditional education often follows a fixed curriculum that may not suit all students equally. AI, on the other hand, can adapt the learning content and pace based on each learner's needs, preferences, and progress. For

example, if a student frequently struggles with reading comprehension, the AI system can assign simplified texts, visual aids, or interactive activities aimed at improving that specific skill. This kind of adaptive learning improves learner engagement, builds confidence, and increases the chances of academic success.

In addition to these functions, AI supports a wide range of intelligent educational technologies, including Intelligent Tutoring Systems (ITS), learning analytics dashboards, and automated assessment platforms. Intelligent Tutoring Systems simulate one-on-one tutoring by providing hints, explanations, and immediate feedback, much like a human tutor would. These systems adjust the difficulty of tasks in real time, ensuring that learners remain challenged without feeling overwhelmed. Automated assessment tools, such as AI-based essay graders or oral fluency evaluators, provide instant scoring and suggestions, which help students improve continuously and independently.

Moreover, AI plays a role in predictive modeling, which allows schools and teachers to forecast future learning outcomes based on past data. For instance, systems can predict which students are at risk of dropping out or failing a course and alert instructors to take preventative action. These capabilities contribute to a more data-informed educational environment, where decision-making is guided by insights rather than assumptions.

The implementation of AI promotes inclusivity by supporting students with different learning needs, such as those with learning disabilities or language barriers. AI-powered tools like speech recognition, text-to-speech, or real-time translation can make content more accessible and equitable for diverse learners. AI is reshaping education by improving the efficiency of teaching, providing data-driven insights, and enabling personalized learning. Its applications are not just futuristic concepts but are already being used in classrooms around the world to enhance both teaching and learning experiences (Rane, 2023).

AI and the Evolution of Education: Education 4.0 and 5.0

Artificial Intelligence is not only enhancing existing educational practices but is also playing a foundational role in broader educational reforms referred to as Education 4.0 and Education 5.0. Education 4.0 represents a shift toward digital transformation in teaching and learning, characterized by the integration of advanced technologies like AI, cloud computing, and big data into educational environments. This movement emphasizes flexibility, personalized learning, and the development of 21st-century skills.

Education 5.0 takes this transformation a step further by integrating human-centric values such as empathy, collaboration, and sustainability with technological innovation. In this model, AI serves not just as a tool for efficiency, but also as a partner in nurturing holistic development. It enables real-time feedback, learner autonomy, and supports inclusive education by adapting to different learning needs, cultures, and contexts. These frameworks illustrate the growing alignment between AI-driven education and societal goals, reinforcing AI's potential as a transformative force in future learning landscapes (Rane, 2023).

AI in Language Learning: Personalized Instruction and Feedback

In the domain of English language learning, AI systems are making significant contributions by offering personalized support tailored to individual learners' strengths and weaknesses. These systems can analyze patterns in a learner's language use—whether in grammar, vocabulary, pronunciation, or comprehension—and provide customized content to target specific learning gaps (Gligorea et al., 2023). For instance, AI-based language platforms can assess a learner's speech and provide instant feedback on pronunciation accuracy, intonation, and fluency. Similarly, writing tools powered by AI can detect grammatical errors, suggest vocabulary enhancements, and guide learners toward more coherent writing structures. By continuously adapting content and pacing based on a learner's responses, AI enables more

efficient and engaging learning experiences. This kind of personalized instruction not only supports better retention but also boosts learners' confidence by keeping the content within their zone of proximal development (Gligorea et al., 2023).

Challenges and Ethical Considerations in AI Integration

Despite the promising potential of AI in education, there are important challenges and ethical issues that must be addressed. Data privacy is a major concern, as AI systems require access to large amounts of learner data to function effectively. Ensuring the security and responsible use of this data is essential to maintain trust and safeguard learners' rights (Holmes et al., 2019).

Moreover, there are concerns about algorithmic transparency and bias. If AI systems are trained on biased data or lack transparency in their decision-making processes, they may unintentionally reinforce inequalities or provide inaccurate feedback. Another key issue is the evolving role of the teacher. While AI can support and enhance teaching, it should not replace the human connection that educators bring to the classroom. Teachers are crucial in fostering critical thinking, creativity, and emotional intelligence—skills that AI cannot replicate. Therefore, effective AI integration requires a balanced approach that combines technological innovation with pedagogical and ethical awareness (Luckin, 2016).

Personalization through Deep Learning in Adaptive Platforms

Introduction

Deep learning has emerged as a key enabler of personalization in adaptive learning systems. Advanced architectures such as Convolutional Neural Networks (**CNNS**) and Recurrent Neural Networks (**RNNS**) allow educational platforms to analyze learner data in real time, detect patterns in user behavior, and adjust instructional content to fit individual needs. Darwich and Bayoumi (2025) emphasized the significance of deep learning in tailoring content delivery, noting that similar techniques are employed in adaptive language learning to recommend exercises and adjust vocabulary complexity. These adaptive mechanisms not only enhance learner engagement but also improve the efficiency of knowledge retention by ensuring that tasks match the learner's current skill level and learning pace (darwich,M & Bayoumi,M, n.d., #).

Reinforcement learning (RL) offers a strategic framework for delivering adaptive feedback in educational systems. RL models operate through reward-based mechanisms that allow platforms to refine learning pathways based on learners' interactions and performance outcomes. A scoping review conducted in 2025 revealed that RL is highly effective in optimizing decision-making within educational settings by enabling systems to adjust question sequencing, difficulty levels, and scaffolding methods. Furthermore, empirical research has shown that adaptive feedback driven by RL fosters deeper cognitive engagement and significantly improves learner outcomes, particularly in complex skill areas such as language acquisition (science direct, 2025; SAGE Journals, 2025).

The Role of Generative AI in Content Creation and Assessment

Generative artificial intelligence has dramatically changed how content is created and assessed in adaptive learning environments. Tools like ChatGPT can autonomously generate

quizzes, interactive tasks, writing prompts, and tailored feedback based on real-time learner input. Mcnulty (2025) outlined how generative AI empowers educators to design assessments that are dynamically aligned with learner progress and comprehension. This level of adaptability ensures that learners receive challenges appropriate to their evolving skill level. Additionally, Duolingo's integration of generative AI demonstrates the scalability of this approach, having doubled its language offerings by automating content development (The Verge, 2025).

AI-Driven Intelligent Tutoring Systems (ITS) in Language Learning

AI-powered Intelligent Tutoring Systems (ITS) simulate human-like instruction by offering real-time feedback, customized prompts, and adaptive lesson progression. These systems apply natural language processing and machine learning to monitor learner performance and tailor content accordingly. Park University (2025) reported that ITS are capable of adjusting instructional strategies based on individual learner profiles, making them particularly effective for personalized language learning. A recent study further highlighted how ITS in English learning contexts resulted in improved learner engagement and achievement by providing timely corrective feedback and personalized learning trajectories (SAGE Journals, 2025).

Learning Analytics and Predictive Models in Adaptive Platforms

Learning analytics and predictive modeling are essential for enabling proactive instructional strategies within adaptive systems. These AI-powered tools collect and analyze user data—such as time spent on tasks, error patterns, and engagement levels—to predict future performance and adjust instruction accordingly. Digitaldefynd (2025) emphasized the transformative role of learning analytics in customizing educational content, while byteplus (2025) showcased how predictive algorithms can anticipate when learners are likely to struggle and intervene before disengagement occurs. In language learning, this means predicting difficulties with grammar or vocabulary and dynamically adapting instructional material to

address them. These predictive features enhance the responsiveness of adaptive platforms and help maintain learner motivation and progress.

Gamification and Adaptive Learning in Language Education

Gamification strategies, when integrated with AI, can significantly boost motivation and effectiveness in language learning. AI enables adaptive gamified systems to respond to learner performance by adjusting task complexity, reward systems, and feedback mechanisms in real time. EduSynch (2025) noted that combining AI with gamification transforms language education into an engaging, interactive experience. In such systems, learners are rewarded with points or badges based on accuracy and speed, while the AI backend personalizes content delivery to maximize learning outcomes. ResearchGate (2025) also emphasized how AI-enhanced gamification allows platforms to automatically identify learner preferences and adapt instructional content accordingly. This convergence of AI and game-based learning fosters sustained engagement and improved retention in English language learning.

Conclusion

Chapter One provided a comprehensive foundation for understanding how AI-based adaptive learning systems are transforming English language education. Structured into theoretical and applied parts, the chapter began by defining artificial intelligence not as a singular tool but as a broad interdisciplinary field. It explored key subfields such as machine learning, deep learning, natural language processing, and reinforcement learning—each contributing to the development of intelligent systems that can personalize language instruction.

Through models like Intelligent Tutoring Systems (ITS), learning analytics, and predictive modeling, the chapter emphasized how AI enables real-time assessment and tailored feedback based on learner input. These features mark a significant departure from

traditional methods, introducing more learner-centered approaches that respect individual pace, background, and skill level.

The second part of the chapter extended these theoretical insights by integrating findings from applied research and case studies—some even outside of language education. These examples illustrated how adaptive AI systems personalize training, simulate real-world scenarios, and provide feedback loops that can be effectively transferred to language learning contexts. Notable technological trends such as deep learning-based personalization, reinforcement learning for feedback, and gamification were highlighted for their impact on learner motivation, engagement, and achievement.

However, the chapter also acknowledged that such technological integration is not without challenges. Issues of data privacy, the high cost of implementation, educator resistance, and ethical dilemmas regarding the automation of teaching processes must be carefully navigated. The risk of over-reliance on AI and the potential marginalization of human judgment and emotional intelligence are real concerns that require attention.

Importantly, the chapter concluded by emphasizing the enduring role of teachers. While AI can enhance instruction, it cannot replace the nuanced, empathetic, and socially supportive role that human educators provide. A balanced, hybrid model—merging AI-driven adaptability with human guidance—is essential for meaningful, ethical, and effective learning.

This sets the stage for Chapter Two, which will shift focus toward comparing various AI-powered platforms in English language learning. These platforms will be evaluated based on their architecture, instructional effectiveness, and adaptability across different learner demographics and educational environments.

CHAPTER TWO:

AI-Based Adaptive Learning Systems for Teaching English

AI-Based Adaptive Learning Systems for Teaching English

Overview of AI-Based Adaptive Learning Systems

Artificial intelligence (AI) has become a transformative force in education, significantly impacting language learning by offering innovative, adaptive, and personalized learning experiences. The integration of AI technologies like natural language processing (NLP), machine learning (ML), and speech recognition into educational platforms has fundamentally reshaped how languages are taught and acquired. Warschauer emphasizes that AI-based adaptive learning systems enable personalized instruction by continuously analyzing learner behavior, performance, and preferences.

These systems use complex algorithms to assess individual strengths and weaknesses, dynamically adjusting content to meet the specific needs of each learner. For example, adaptive platforms can detect pronunciation errors, vocabulary gaps, or grammar weaknesses in real-time, providing immediate corrective feedback that accelerates language acquisition. Additionally, Warschauer highlights the potential for AI to improve language fluency through interactive conversation simulations and automated speech analysis, which are critical for mastering spoken language skills. (Warschauer, Learning in the digital age: Rethinking education in the 21st century., 2020).

Moreover, these adaptive systems benefit from extensive data analytics, drawing insights from vast amounts of learner interaction data to refine instructional methods and optimize learning pathways. This approach not only enhances personalized learning but also helps identify common challenges faced by language learners, allowing educators to tailor instructional content more effectively. For instance, an AI-driven platform might adjust reading exercises based on a student's comprehension level or modify listening tasks based on pronunciation difficulties, ensuring a more targeted learning experience.

Selwyn further explores the broader implications of AI in education, highlighting the potential for AI to disrupt traditional pedagogical models. He argues that AI technologies can shift education from one-size-fits-all approaches to highly personalized learning experiences, fundamentally altering the teacher-student dynamic. In language learning, this means moving away from standard textbooks and lectures toward interactive, data-driven lessons that adapt in real-time to individual learner needs. Selwyn also emphasizes the ethical considerations surrounding the use of AI in education, including data privacy, algorithmic bias, and the digital divide. He warns that while AI has the potential to democratize access to quality education, it also poses significant challenges if not implemented carefully. For instance, over-reliance on automated systems can reduce critical thinking and human interaction in the learning process, potentially undermining language proficiency over time (Selwyn, 2020).

Furthermore, Selwyn highlights the importance of digital literacy for both educators and students, noting that effective integration of AI requires not just technological infrastructure but also a deep understanding of how to leverage these tools for maximum educational impact. This perspective underscores the need for ongoing professional development for teachers, as well as the incorporation of digital skills into language curricula, to ensure that AI technologies are used effectively and ethically in education.

In addition to the core benefits of personalized feedback and real-time adjustments, AI-based adaptive learning systems also integrate natural language processing (NLP) technologies that help learners engage in meaningful interactions with the language. According to Warschauer, these systems can detect complex language errors such as syntax mistakes, word choice inconsistencies, and tense errors. By identifying these issues in real-time, the systems provide immediate, context-sensitive feedback that not only corrects the learner's mistakes but also offers explanations to

deepen their understanding. For instance, an AI system could not only highlight an incorrect verb form but also provide an example sentence with the correct usage, helping learners internalize the grammar rule. This immediate corrective feedback is crucial for language acquisition, as it reinforces learning and accelerates mastery.

Furthermore, adaptive learning platforms are increasingly utilizing speech recognition technologies to offer pronunciation assessments. Selwyn argues that incorporating AI into language instruction facilitates the creation of "virtual tutors" capable of listening to learners' spoken language and offering feedback on their pronunciation, intonation, and fluency. This feature is especially valuable in English language learning, where pronunciation can significantly affect communication. By continuously adjusting the learning material based on a learner’s progress, AI systems ensure that learners are consistently challenged without being overwhelmed, striking an optimal balance between ease and difficulty. For instance, learners who exhibit strong pronunciation skills might receive advanced speaking tasks involving rapid speech or accents from different English dialects, while beginners could be given slower, clearer prompts to help them build foundational skills.

Selwyn also notes that AI-based systems can adapt the difficulty level of exercises, making them more tailored to individual learners’ capabilities. Unlike traditional methods, where all students in a class might be given the same task regardless of their proficiency level, AI allows learners to work at their own pace. In a typical language classroom, the teacher must adjust the lesson for varying proficiency levels, often resulting in learners not being adequately challenged or engaged. With AI, each learner’s unique progress is tracked, and the system adjusts the complexity of tasks accordingly. A beginner might work on basic vocabulary exercises, while an advanced learner could engage with complex sentence structures or even practice English idioms and colloquial

phrases. This ensures that the learners are always working within their "zone of proximal development," a concept developed by Vygotsky that describes the ideal level of challenge for effective learning (Vygotsky, 1978).

Moreover, AI's ability to aggregate data across large numbers of learners provides valuable insights into learning patterns, which can be used to refine the educational process. Warschauer highlights how AI platforms collect interaction data, which can be analyzed to detect broader trends. For example, if a large group of students consistently struggles with the same grammar rule, this may indicate a gap in the instructional material, prompting instructors to revise their teaching strategies. The feedback loop created by AI systems not only benefits learners but also provides teachers with a powerful tool for enhancing curriculum design and pedagogy. Teachers can leverage these insights to adjust their approach, addressing common challenges faced by students and customizing the lesson plans to meet better the needs of the class. (Warschauer M., 2020).

While the potential of AI in language education is immense, Selwyn cautions that technology alone is not a panacea for the challenges of language learning. He argues that successful integration of AI requires careful consideration of both its benefits and limitations. One of the key challenges is ensuring that AI-based systems are inclusive and accessible to learners from diverse backgrounds. Students from different cultural, linguistic, and socio-economic backgrounds may face unique challenges when using AI tools. For example, students who are not familiar with digital technologies might struggle to navigate effectively AI platforms, reducing the potential benefits of adaptive learning systems. Therefore, Selwyn emphasizes the need for a balanced approach that integrates human instruction with AI-driven personalization. Teachers play an essential role in guiding students through the learning process, providing emotional support, and fostering

a sense of motivation and engagement that purely automated systems cannot replicate (Selwyn. N., 2020)

In this way, while AI has the potential to revolutionize language learning by offering personalized, adaptive, and scalable educational experiences, its success hinges on thoughtful implementation, robust teacher training, and ongoing evaluation of its effectiveness in diverse educational settings.

Foundations of AI-Based Adaptive Learning Systems

The Rise of AI in Education

AI has emerged as a transformative force in education, offering the potential to revolutionize traditional teaching and learning practices. AI technologies enable educational systems to analyze vast amounts of learner data, identify patterns in student behavior, and generate personalized learning pathways. These systems rely on core technologies like machine learning (ML), deep learning, and natural language processing (NLP), which allow them to process complex inputs and adapt to individual learners' needs. For example, deep learning algorithms, which utilize artificial neural networks, are particularly effective at recognizing intricate patterns in large language datasets, supporting personalized instruction by predicting student responses and identifying knowledge gaps. Such algorithms continuously refine their responses over time, learning from user interactions to provide increasingly accurate and contextually appropriate feedback, thereby enhancing the overall learning experience(Russell, 2021).

Cognitive Learning Theories and AI Personalization

The foundations of AI-based adaptive learning systems are deeply rooted in cognitive learning theories, which focus on the internal processes involved in learning, such as memory, perception, and problem-solving. One influential model is Anderson's

ACT-R (Adaptive Control of Thought-Rational) theory, which explains how learners acquire knowledge through a combination of declarative and procedural memory. In this framework, declarative memory involves the storage of factual information, while procedural memory is related to the skills required for task performance. AI systems utilize this cognitive model to personalize learning pathways by dynamically adjusting content based on a learner's cognitive state, ensuring that instruction aligns with their current knowledge level. For instance, AI platforms can track a learner's progress, identify misconceptions, and adapt instructional materials to reinforce understanding, much like a human tutor would This approach is particularly effective in language learning, where repetition and gradual skill development are essential for mastery.

Situative Learning Theories and Contextual Practice

In addition to cognitive theories, many AI-based adaptive learning systems are also influenced by situative learning theories, which emphasize the importance of context and social interaction in the learning process. Situative perspectives argue that learning is inherently tied to the environments in which it occurs, making the context of language use critical in language education. This approach contrasts with purely cognitive models by highlighting the role of social and cultural context in shaping learning outcomes. For example, conversational AI tools can simulate real-world interactions, allowing learners to practice language skills in authentic, meaningful contexts. These systems often integrate multimedia resources, real-time feedback, and interactive exercises to immerse learners in realistic scenarios, promoting deeper understanding and long-term retention of language skills.

Learning Analytics for Personalized Education

Modern AI-based adaptive learning systems also leverage learning analytics to enhance educational outcomes. Learning analytics involve the collection, analysis, and interpretation of educational data to improve teaching strategies and personalize learning experiences. These systems can identify at-risk learners, optimize course content, and provide predictive insights into student performance, making education more responsive and data-driven. For instance, AI-powered platforms can track student engagement, monitor progress, and adjust instructional strategies in real time, significantly improving learning efficiency and effectiveness. This data-driven approach not only helps educators identify areas where students may be struggling but also allows for the continuous refinement of AI algorithms to better support individual learning needs.

Ethical Challenges and Data Privacy Concerns

Despite their potential, AI-based adaptive learning systems also present significant challenges. One major concern is data privacy, as these systems rely on vast amounts of personal information to deliver personalized learning experiences. Protecting this data and ensuring its ethical use is critical, as breaches can undermine student trust and compromise educational outcomes. Additionally, the risk of algorithmic bias poses a serious ethical dilemma. AI systems trained on biased datasets may unintentionally reinforce existing inequalities, leading to unfair educational outcomes for marginalized groups. Addressing these issues requires ongoing algorithm monitoring, transparent data practices, and careful system design to ensure these technologies serve all learners equitably.

The Path Forward

In summary, the foundations of AI-based adaptive learning systems lie in a combination of advanced technologies and well-established educational theories. By integrating cognitive insights, situative learning principles, and sophisticated data analytics, these systems have the potential to transform education, making it more personalized, efficient, and accessible. However, realizing this potential will require careful attention to ethical considerations, data privacy, and the continuous refinement of AI algorithms to ensure fair and effective learning outcomes (Russell, 2021).

Core Features and Components of AI-Based Adaptive Learning Systems

Personalization and Content Adaptation

AI-based adaptive learning systems are designed to provide personalized educational experiences by dynamically adjusting content, feedback, and learning paths based on individual learner profiles. Personalization is a foundational element of these systems, enabling platforms to tailor content based on individual learner data, preferences, and performance. This capability relies on user modeling and advanced algorithms that analyze learner interactions to match content with each student's knowledge state, learning pace, and engagement levels. For instance, adaptive hypermedia systems adjust instructional sequences to present information that aligns with the learner’s current abilities and learning goals, optimizing cognitive load and supporting long-term retention.

Personalization extends beyond just content selection, encompassing the dynamic adjustment of difficulty levels, presentation styles, and instructional formats based on real-time performance data. This approach is crucial for maintaining learner motivation, as it helps students build on their existing knowledge without becoming overwhelmed.

By continuously analyzing learner inputs, adaptive systems can create personalized learning pathways that enhance language acquisition efficiency and promote deeper understanding (Brusilovsky, 2007).

Real-Time Feedback and Predictive Analytics

Real-time feedback is another critical component of adaptive learning systems, providing immediate, data-informed responses to student inputs. This rapid feedback is essential for Correcting errors, reinforcing accurate responses, and guiding learners toward mastery. Predictive analytics further enhance this capability by anticipating potential learning difficulties based on historical performance data. For example, platforms like Duolingo use machine-learning algorithms to identify challenging language elements, offering targeted practice to improve retention and learner confidence.

These systems can predict when a learner is likely to forget a particular word or grammatical rule, prompting timely review sessions to reinforce understanding. This proactive approach not only accelerates learning but also reduces the likelihood of cognitive overload, creating a more engaging and effective educational experience. By integrating real-time feedback and predictive analytics, AI-based systems can offer highly responsive, personalized learning experiences that closely mirror the support provided by human tutors (Baker, 2019).

Intelligent Tutoring Systems (ITS)

Intelligent Tutoring Systems (ITS) represent one of the most advanced forms of adaptive learning technology, designed to replicate the personalized guidance typically provided by human tutors. ITS offer step-by-step support, hints, and explanations as learners work through challenging material, making them particularly effective for language learning, where precise, context-specific feedback is critical for developing

fluency and accuracy. Unlike conventional e-learning platforms, ITS can interpret complex learner inputs, such as spoken language or essay responses, and provide context-aware feedback that addresses both content and linguistic nuances. This capability allows ITS to adapt to each learner's unique strengths and weaknesses, providing highly individualized instruction. For instance, an ITS can assess a learner's pronunciation, grammar, and conversational skills, offering tailored feedback that targets specific areas for improvement, thereby supporting more effective and personalized language acquisition (Anderson, 1955).

The Role of Core Features in Effective Language Learning

In summary, the core features and components of AI-based adaptive learning systems – including personalization, real-time feedback, predictive analytics, and intelligent tutoring – are essential for creating highly individualized educational experiences. These technologies enable platforms to align instructional strategies with each learner's unique needs and abilities, supporting more efficient language acquisition and long-term retention. However, effectively integrating these components requires careful design and continuous optimization to ensure that AI systems provide meaningful, context-aware support that truly enhances the learning process (Brusilovsky, 2007).

Application of AI-Based Adaptive Systems in English Language Teaching

Vocabulary and Grammar Instruction

AI-based adaptive learning systems have significantly enhanced vocabulary and grammar instruction in English language teaching. These systems analyze individual learner profiles to identify knowledge gaps, providing targeted practice that aligns with each student's current proficiency level. For instance, platforms like Lingvist use adaptive algorithms to optimize vocabulary training by presenting words that match a learner's

known vocabulary set while periodically revisiting challenging terms to reinforce retention. This approach is grounded in the principles of spaced repetition, which has been shown to improve significantly long-term memory retention by timing reviews to match the learner's forgetting curve.

Additionally, many adaptive systems integrate contextualized grammar exercises, which adjust to the learner's writing and speaking style, providing real-time corrective feedback. For example, these systems can detect common grammatical errors and offer personalized explanations that guide learners toward correct usage, thereby promoting deeper language proficiency and reducing the likelihood of repeated mistakes. These combinations of targeted vocabulary training and Context-aware grammar feedback helps learners internalize language rules more effectively, supporting both written and spoken communication skills.

Pronunciation and Speech Recognition Tools

AI has also transformed pronunciation training through the integration of advanced speech recognition and analysis technologies. These tools provide instant feedback on pronunciation accuracy, enabling learners to refine their speaking skills with minimal instructor intervention. For instance, platforms like ELSA Speak utilize sophisticated phonetic analysis algorithms to identify subtle pronunciation errors, offering personalized corrective feedback that targets specific sounds or stress patterns that are challenging for non-native speakers. This precision is particularly valuable, as pronunciation errors are often deeply ingrained and difficult to correct without immediate, targeted feedback. Moreover, automated pronunciation tools can significantly boost learner confidence by providing a private, non-judgmental practice environment where students can practice speaking without the fear of making mistakes in front of peers. This approach not only

improves pronunciation but also enhances overall speaking fluency, making learners more confident in real-world communication.

Contextual Learning and Conversational Practice

Contextual learning and conversational practice are critical components of language fluency, and AI-driven adaptive systems excel in these areas. These platforms leverage natural language processing (NLP) to simulate real-life conversations, providing learners with the opportunity to develop practical communication skills in realistic contexts. For example, interactive chatbots and conversational agents can engage learners in scenario-based dialogues, reinforcing vocabulary, grammar, and cultural nuances in context. These systems can dynamically adjust the complexity of conversations based on the learner's proficiency level, ensuring that practice remains appropriately challenging yet achievable (Ellis, 2017).

This adaptive approach not only improves speaking and listening skills but also fosters cultural understanding by exposing learners to context-specific language usage, such as idioms, slang, and regional expressions, which are often overlooked in traditional language instruction. By integrating context-rich practice, AI-based systems can significantly enhance learners' ability to communicate effectively in real-world situations.

The Impact of AI on Language Mastery

In summary, AI-based adaptive learning systems play a transformative role in English language teaching by addressing critical language skills, including vocabulary acquisition, grammar comprehension, pronunciation accuracy, and conversational fluency. These technologies leverage personalized algorithms, real-time feedback, and context-aware instruction to create engaging, effective, and learner-centered educational

experiences. As these systems continue to evolve, they hold the potential to further enhance language-learning outcomes, making English education more accessible and impactful for diverse learner populations (Schmitt N. R., 2020).

Comparative Analysis of Popular AI-Based English Learning Systems

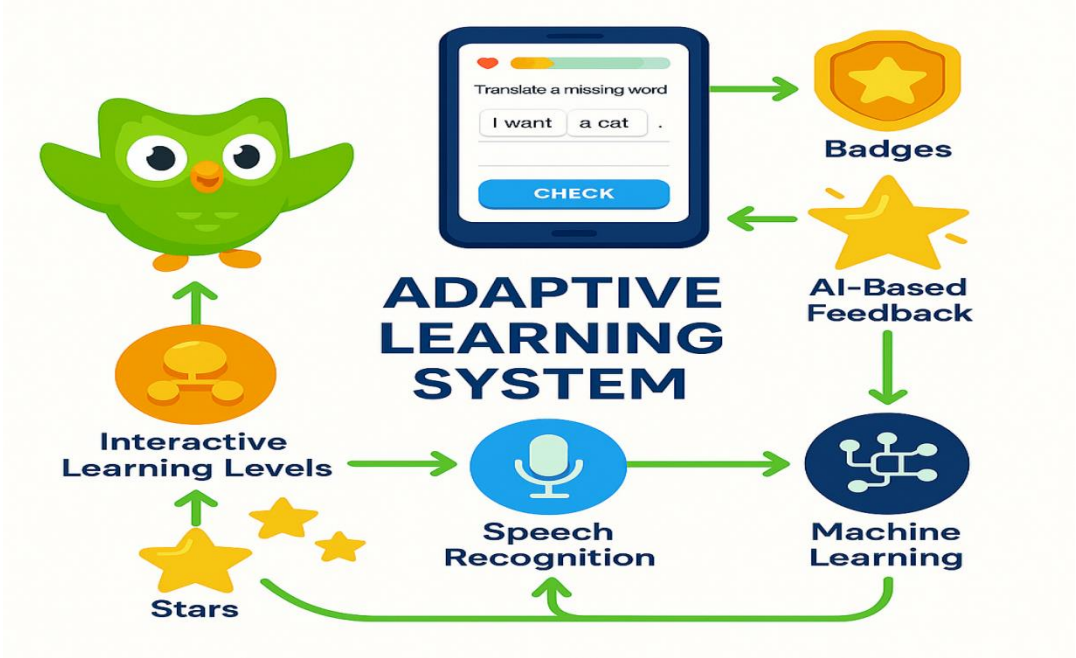
Duolingo: Gamified Adaptive Learning

Duolingo is one of the most popular language learning platforms globally, recognized for its gamified approach that makes language acquisition engaging and accessible. The platform employs sophisticated AI algorithms to personalize lessons based on real-time analysis of user performance. By continuously tracking learner progress, identifying weaknesses, and adjusting content difficulty, Duolingo ensures that learners receive exercises tailored to their evolving needs. Its effective use of spaced repetition helps users consolidate vocabulary by strategically revisiting difficult words at optimal intervals, thereby enhancing long-term retention.

Additionally, Duolingo integrates Speech recognition technology that provides instant feedback on pronunciation, allowing learners to practice speaking in a low-pressure, supportive environment. Despite these strengths, some researchers argue that Duolingo's short, game-like exercises offer limited contextual learning and may fall short in preparing learners for authentic, real-world communication scenarios. Thus, while highly effective for vocabulary and basic language skills, it may need supplementation for comprehensive language mastery.

Duolingo’s Gamified Adaptive Learning Interface

Figure 1



Note: Illustration showing Duolingo’s interface and gamification elements such as badges, progress paths, and user notifications.

ELSA Speak: Precision in Pronunciation Training

ELSA Speak is a specialized AI-driven platform focused on improving pronunciation through advanced speech recognition technology. Unlike generalist language apps, ELSA’s AI algorithms analyze detailed phonetic components such as accent, intonation, and stress patterns to provide highly individualized and precise feedback. This deep analysis is supported by large linguistic datasets that enable the system to detect subtle pronunciation errors often missed by human instructors, offering targeted corrections that improve phonetic accuracy. ELSA is particularly valued by learners aiming to enhance their speaking fluency and confidence, especially for

professional communication and public speaking contexts. However, its narrow focus on pronunciation means it lacks comprehensive training in grammar, vocabulary, and other language domains, which limits its effectiveness for broader language development.

ELSA Speak: Precision in Pronunciation Training

Figure 2

This figure illustrates the ELSA Speak interface, highlighting features such as real-time pronunciation feedback, visual accuracy indicators, and microphone-based user input. The system exemplifies AI-powered precision in speech training for English language learners.

Lingvist: Data-Driven Vocabulary Personalization

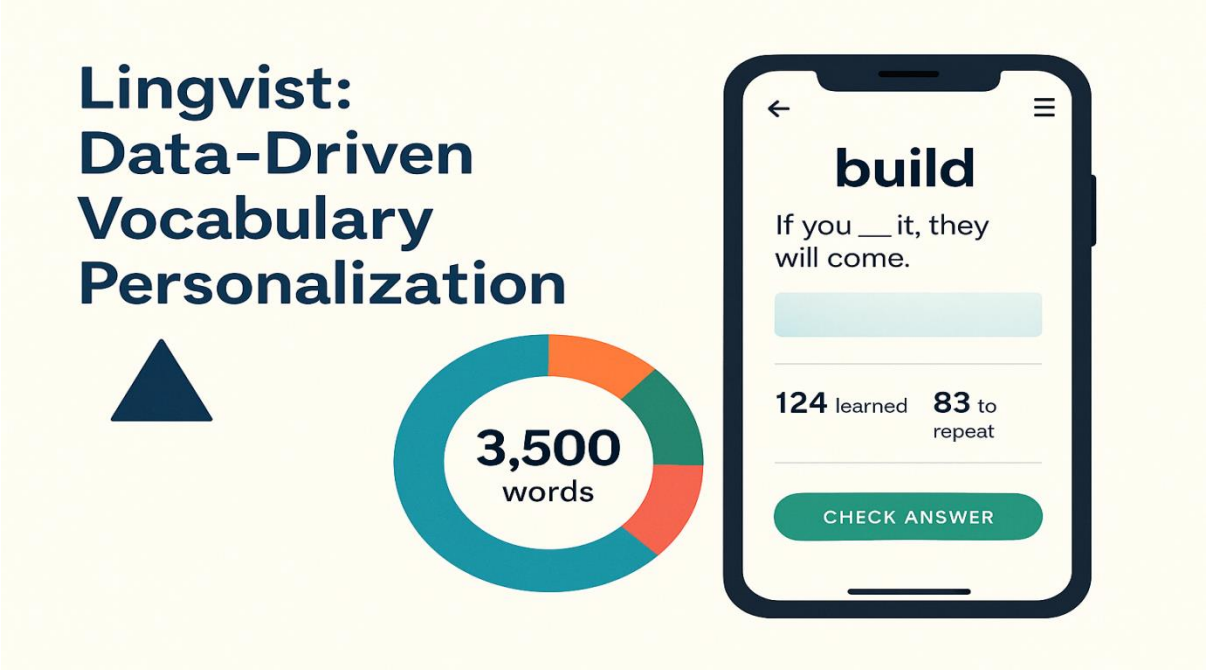
Lingvist applies a data-driven methodology to language learning by utilizing AI and natural language processing (NLP) to tailor vocabulary instruction to individual learners' proficiency levels and goals. The platform analyzes user input dynamically, adjusting exercise difficulty and revisiting problematic vocabulary items based on ongoing performance. This personalized learning loop accelerates progress by

concentrating on the most relevant vocabulary, moving away from rigid, one-size-fits-all Curricula. Furthermore, Lingvist employs statistical retention models that predict when learners are likely to forget specific words, prompting timely review sessions to strengthen long-term memory. Despite these advantages, the platform's reliance on data-driven personalization may limit its ability to offer nuanced, context-rich language experiences, which are crucial for mastering pragmatic and cultural aspects of English. As with many AI-based systems, the balance between algorithmic efficiency and rich, meaningful interaction remains an ongoing challenge.

Lingvist: Data-Driven Vocabulary Personalization

This figure illustrates how Lingvist uses artificial intelligence to personalize vocabulary learning by tracking learned and review words from a 3,500-word dataset.

Figure 3



Challenges and Ethical Considerations

Data Privacy and Security Concerns

The integration of AI-based adaptive learning systems in English language education hinges on the collection and analysis of extensive student data, including sensitive personal information, behavioral patterns, and performance records. While this data is fundamental for enabling personalized learning experiences, it simultaneously raises profound privacy and security concerns. AI systems often process intricate data types such as speech recordings, written assignments, and cognitive response patterns, which, if inadequately protected, could be vulnerable to breaches leading to identity theft, unauthorized surveillance, or misuse.

Consequently, educational institutions must implement rigorous data protection frameworks, encompassing secure storage solutions, strong encryption protocols, and strict access control mechanisms, to shield student information from potential cyber threats. Moreover, transparent data governance policies are essential to regulate data collection, usage, and sharing practices in accordance with global privacy standards like the General Data Protection Regulation (GDPR). These regulations not only safeguard learners' privacy rights but also foster trust in AI-enabled educational tools by emphasizing transparency and accountability in data management.

Algorithmic Bias and Fairness

Algorithmic bias represents a significant ethical challenge in AI-driven education, stemming from the tendency of AI models to mirror and sometimes amplify societal prejudices embedded within their training datasets. Educational AI systems, particularly those employed in language learning, often rely on historical and linguistic data that may inadvertently perpetuate stereotypes or disadvantage certain learner groups. For

example, pronunciation assessment algorithms primarily trained on native Western English accents may misjudge or unfairly penalize non-native speakers with diverse dialects, resulting in biased evaluations and limiting equitable access to learning opportunities. To address these concerns, AI developers and educational technologists must prioritize fairness by diversifying training data to reflect a broad spectrum of linguistic and cultural backgrounds.

Additionally, the implementation of bias detection tools and regular audits of AI performance are crucial for identifying and mitigating discriminatory tendencies within adaptive learning systems. Such proactive measures not only contribute to more just and inclusive educational environments but also enhance the legitimacy and user acceptance of AI technologies in language education. (Floridi, 2020)

Evolving Teacher Roles and Technological Dependence

The increasing adoption of AI in classrooms is transforming the traditional role of educators, raising important questions about the balance between technology and human teaching. While AI excels at automating routine administrative tasks, such as grading and providing instant feedback, it lacks the capacity to replicate the complex, empathetic, and context-sensitive guidance that human teachers provide. An over-reliance on AI tools risks relegating teachers to passive facilitators rather than active designers of meaningful learning experiences, which may diminish their professional Autonomy and constrain pedagogical creativity.

Furthermore, the rapid evolution of AI technologies demands ongoing professional development to equip educators with the skills necessary to integrate these tools effectively into their instructional practices. Teachers must cultivate not only technical proficiency but also a critical understanding of AI's pedagogical implications,

ensuring that technology complements rather than supplants their educational expertise. Ultimately, maintaining a balanced partnership between AI systems and human educators is essential for fostering engaging, personalized, and ethically sound language learning environments.

Future Trends and Innovations in AI-Based English Teaching

Emerging Technologies in AI-Based Language Teaching

Emerging technologies such as virtual reality (VR), augmented reality (AR), and advanced natural language processing (NLP) are radically transforming language education by providing immersive, multisensory learning environments that simulate authentic communicative contexts. VR and AR create dynamic, interactive spaces where learners can engage in realistic scenarios that demand practical use of language, such as ordering food in a foreign restaurant, participating in a business negotiation, or asking for directions in a new city.

These immersive simulations enhance experiential learning by situating language use within culturally rich, contextualized frameworks, which research shows improves retention and reduces anxiety associated with real-world communication. By repeatedly practicing in these risk-free environments, learners develop not only linguistic competence but also pragmatic skills like politeness strategies and cultural norms, critical for effective cross-cultural communication. Parallel to immersive VR and AR, advances in NLP allow AI systems to analyze complex aspects of language, including phonetics, syntax, semantics, and pragmatics.

Modern AI-powered tools incorporate sentiment analysis and prosody recognition to evaluate intonation, stress patterns, and emotional tone, providing learners with highly detailed, real-time corrective feedback that mimics the nuanced

input of human tutors. For instance, these systems can detect subtle pronunciation deviations such as vowel length or consonant aspiration that non-expert listeners might miss, enabling focused remediation on phonological features. Furthermore, coupling speech analytics with machine learning facilitates identification of learner-specific error patterns, allowing systems to tailor exercises that address persistent challenges in pronunciation and fluency. This synergy of immersive environments and linguistic precision tools represents a paradigm shift from passive to active, personalized, and contextually relevant language learning experiences.

Personalized Language Learning Pathways

Personalization is critical for optimizing language acquisition, as learners differ widely in prior knowledge, cognitive styles, motivation, and linguistic goals. AI-based adaptive systems leverage continuous data collection—such as learner responses, interaction speed, and error types—to create individualized learning trajectories that dynamically adjust as proficiency develops. For example, if a learner demonstrates difficulty with irregular past tense verbs or conditional sentences, the system increases targeted practice on these areas, gradually introducing more complex structures as mastery improves. Such data-driven scaffolding supports zone of proximal development, ensuring learners are neither bored by material that is too easy nor frustrated by content that is too difficult. (Brusilovsky, 2007)

Gamification elements embedded within these AI systems—such as points, badges, leaderboards, and progression levels—serve to motivate learners by introducing clear goals and rewarding sustained effort. This motivational scaffolding is grounded in Self-determination theory, which emphasizes autonomy, competence, and relatedness as key drivers of intrinsic motivation. Additionally, multimodal input modes—text,

audio, video, and interactive dialogue—address different learning preferences, helping to encode linguistic information through multiple sensory channels. Research shows that multimodal learning enhances memory retention by engaging dual coding mechanisms and deeper cognitive processing (Paivio, 1991). Emerging emotion recognition technologies further refine personalization by assessing affective states such as frustration or boredom through facial expression or voice tone analysis. This enables systems to modulate exercise difficulty, provide encouragement, or suggest breaks, creating a learner-centered environment that supports emotional as well as cognitive engagement. By promoting learner autonomy and self-regulation through clear progress visualization and adaptive feedback, these AI systems empower students to take ownership of their language development journey.

Future Research Opportunities and Ethical Considerations

Despite significant advances, the long-term impact of AI-driven adaptive language learning remains a critical area for investigation. While immediate gains in vocabulary acquisition or pronunciation accuracy are well documented, longitudinal studies assessing sustained language proficiency and communicative competence are sparse. Future research must examine whether AI personalization translates into durable linguistic skills and real-world language use, particularly in spontaneous conversational contexts. Psychological effects also warrant deeper scrutiny, especially concerns that overreliance on AI feedback may undermine learners' development of metacognitive skills or reduce opportunities for rich human interaction, which remains crucial for sociocultural language learning.

Ethical considerations are paramount given the extensive personal data AI systems collect, ranging from biometric voice features to detailed behavioral metrics.

The risks of data breaches or misuse are significant, necessitating stringent cybersecurity measures including encryption, anonymization, and clear data governance protocols to ensure compliance with regulations such as GDPR. Beyond privacy, algorithmic fairness poses a profound challenge: AI models trained on biased or unrepresentative datasets risk perpetuating systemic inequalities, particularly disadvantaging speakers of non-standard dialects, minority languages, or less widely spoken varieties of English. For example, pronunciation assessment tools calibrated predominantly on Western accents may inaccurately penalize legitimate phonetic variation in learners from diverse backgrounds, leading to unfair evaluations and potential demotivation. Addressing such bias requires diversified, inclusive datasets and ongoing algorithmic audits to detect and correct discriminatory patterns.

A multidisciplinary, collaborative approach involving educators, AI developers, ethicists, and policymakers is essential to balance pedagogical efficacy with ethical responsibility. This collaboration can drive the development of AI systems that respect learner privacy, promote equity, and enhance educational outcomes while safeguarding human values in language learning. Such responsible innovation will be critical to realizing the full potential of AI as a transformative force in English language education.

Personalization and Learner-Centric Approaches

Personalization lies at the heart of AI-based adaptive learning systems, enabling tailored instruction that responds to each learner's unique needs, strengths, and weaknesses. Unlike conventional teaching methods that apply a uniform approach to all students, adaptive systems use real-time data to adjust learning pathways, creating a more engaging and effective educational experience. For example, platforms like Lingvist utilize advanced natural language processing (NLP) and machine learning

algorithms to identify vocabulary gaps, adjust difficulty levels, and provide targeted practice, resulting in more efficient language acquisition (Sundberg, 2022). These systems can analyze learner inputs to identify specific weaknesses, such as difficulty with irregular verbs or complex sentence structures, and automatically adjust the learning content to address these gaps, promoting long-term retention (Dabbagh & Kitsantas, 2020).

Moreover, the personalized nature of these systems supports learner autonomy, allowing students to progress at their own pace and focus on areas where they need the most improvement. This approach aligns closely with Vygotsky's concept of the Zone of Proximal Development (ZPD), which emphasizes the importance of challenging learners just beyond their current abilities to maximize growth (Vygotsky, 1978). By constantly adapting to each learner's progress, AI-based platforms ensure that students remain Motivated and engaged, reducing the risk of cognitive overload or frustration (Warschauer, 2020).

Enhancing Speaking and Pronunciation Skills

AI has also transformed pronunciation training through the integration of sophisticated speech recognition technologies. Platforms like ELSA Speak use deep learning algorithms to analyze phonetic accuracy in real-time, providing precise, individualized feedback that can be difficult for human instructors to match, especially in large, diverse classrooms (Li, 2023). These systems evaluate pronunciation at a granular level, detecting subtle errors in stress, intonation, and phoneme articulation, which are often critical for achieving native-like pronunciation (Hu & Deng, 2019). This capability is particularly valuable for English language learners, as pronunciation is a significant barrier to fluency and effective communication.

Additionally, these systems can adjust feedback based on a learner's progress, gradually increasing the complexity of pronunciation exercises as the learner's skills improve. For instance, a beginner might start with simple, clear phrases, while more advanced learners could practice rapid, idiomatic speech or engage in complex conversational scenarios. This personalized approach not only builds speaking confidence but also helps reduce the anxiety often associated with speaking in a foreign language (Pennington, 2016). The ability to practice in a private, non-judgmental environment further enhances learner motivation and reduces the fear of making mistakes, a critical factor in language acquisition (Derwing & Munro, 2015).

Real-Time Feedback and Error Correction

One of the most powerful features of AI-based adaptive learning systems is their ability to provide real-time, context-aware feedback. These systems leverage NLP to analyze learner inputs and generate immediate, personalized responses, correcting grammar errors, refining word choice, and suggesting alternative phrasings (Warschauer, 2020). This immediate corrective feedback not only reinforces correct language use but also deepens understanding by providing explanations for each correction, helping learners internalize complex linguistic rules (Schmitt, 2020).

For example, an AI system might detect that a learner consistently struggles with the use of past perfect tense and subsequently provide targeted exercises that reinforce this grammar point. This ability to pinpoint and address specific weaknesses sets AI-based systems apart from traditional methods, which often provide generic feedback that may not address individual learning needs effectively (Nation, 2013).

Data-Driven Insights and Continuous Improvement

AI systems also offer powerful data analytics capabilities, providing educators with deep insights into learner progress, common challenges, and overall language proficiency. These systems collect and analyze large volumes of student interaction data, revealing patterns that can inform instructional design and curriculum adjustments (Floridi, 2020). For example, if a significant number of students consistently struggle with particular grammar rules or vocabulary items, this data can guide educators in refining their teaching strategies and materials to better address these gaps (Warschauer, 2020).

Furthermore, AI platforms can identify broader trends in language learning, helping researchers and educators understand the factors that contribute to successful language acquisition. This data-driven approach not only improves individual learning

Experiences but also supports broader educational research, providing valuable insights that can shape future teaching practices and educational policies (Floridi, 2020).

Challenges and Ethical Considerations

Despite their numerous advantages, AI-based adaptive learning systems face significant challenges. Data privacy is a critical concern, as these systems rely on extensive data collection to function effectively. Protecting sensitive student data, including speech patterns, writing samples, and behavioral data, is essential to maintaining trust and compliance with regulations like the GDPR (Solove & Schwartz, 2018). Moreover, the risk of algorithmic bias remains a pressing issue, as AI systems trained on biased data can unintentionally reinforce existing inequalities in educational outcomes (Noble, 2018). Addressing these challenges requires careful design, robust

data security measures, and ongoing ethical oversight to ensure that these systems are fair, transparent, and inclusive.

The Evolving Role of Teachers

The integration of AI in education also has significant implications for the role of teachers. While AI can automate routine tasks like grading and provide personalized feedback, it cannot replace the nuanced, empathetic guidance that human educators provide. Teachers play a critical role in motivating students, fostering critical thinking, and providing emotional support, all of which are essential for successful language learning (Selwyn, 2019). Effective use of AI in education, therefore, requires a balanced approach that combines the efficiency of AI-driven instruction with the human touch of traditional teaching.

Final Thoughts and Future Directions

In conclusion, AI-based adaptive learning systems have the potential to revolutionize English language education by providing personalized, data-driven instruction that addresses the unique needs of each learner. However, their success depends on careful implementation, ongoing teacher training, and rigorous ethical oversight. By addressing these challenges, educators and technologists can harness the full potential of AI to create more effective, equitable, and engaging learning experiences for English language learners world.

Conclusion

The integration of AI-based adaptive learning systems into English language education represents a paradigm shift in how language instruction is conceived and delivered. Unlike traditional pedagogical models that rely heavily on fixed curricula and generalized instruction, AI-powered systems enable a more personalized, learner-centered

approach. These systems can analyze individual learning behaviors, track progress in real time, and dynamically adjust content based on each learner's needs, strengths, and areas for improvement. This shift fosters greater learner autonomy and engagement, addressing one of the long-standing criticisms of conventional language teaching—that it often overlooks individual differences in learning pace, style, and background.

Findings from Chapter Two underscore the transformative potential of AI in enhancing language acquisition. Key features such as real-time assessment, adaptive feedback loops, and content generation tailored to learner profiles contribute to more efficient and effective learning experiences. Platforms examined—ranging from conversational agents like ChatGPT to structured language learning apps such as Duolingo—demonstrated varying degrees of adaptability, with some offering highly interactive, gamified environments that sustain learner motivation, while others focused on accuracy and progress tracking through predictive analytics.

However, alongside these advancements, the chapter also brought to light several pressing challenges that must be addressed to ensure the responsible and equitable implementation of AI in education. These include concerns over data privacy and security, the potential dehumanization of the learning process, and the risk of algorithmic bias reinforcing educational inequalities. Additionally, the chapter highlighted the importance of maintaining a human element within AI-integrated learning environments. Teachers are not rendered obsolete; rather, their role evolves into facilitators who interpret AI-generated insights, provide emotional and contextual support, and ensure that the use of technology aligns with broader pedagogical goals.

Ultimately, while the promise of AI in English language education is significant, its success depends on thoughtful integration—where technological capabilities are

harmonized with ethical considerations, infrastructure readiness, and a commitment to learner well-being. These insights pave the way for deeper investigation in the following chapters, particularly concerning the long-term effectiveness of adaptive learning systems across diverse learner populations and institutional contexts.

Chapter Three

Field Work

Chapter Three

Field Work

Introduction

This chapter outlines the methodological framework and fieldwork procedures conducted to investigate the role and effectiveness of artificial intelligence (AI)-based adaptive learning systems in English language education. It presents a detailed account of how the study was designed and implemented to collect relevant data from a sample of university-level English learners. The research particularly focuses on comparing learners' experiences with three prominent AI-driven language learning platforms: **Duolingo**, **ELSA Speak**, and **Lingvist**. Each of these applications is designed to offer personalized learning pathways based on the learner's progress and performance, which aligns with the study's core interest in adaptive learning.

The chapter begins by describing the **research design**, which is structured as a comparative mixed-methods approach. This design was selected to enable both quantitative measurement and qualitative exploration of the learners' interactions with the platforms. The mixed-methods strategy offers a comprehensive lens through which the advantages, challenges, and learning outcomes associated with each application can be analyzed.

Next, the chapter presents details about the **population and sampling techniques**, explaining how thirty Master One students from Mohamed Khider University of Biskra were selected as participants. This section outlines the demographic and academic profile of the target population and explains the rationale for using a random sampling method to enhance the representativeness of the study.

The **research instrument** is also introduced—a structured online questionnaire created using Google Forms. This tool was chosen for its accessibility and ease of distribution and included both closed-ended and open-ended questions designed to capture learners' perceptions, usage frequency, and feedback on the effectiveness of the AI tools in developing English skills such as vocabulary, pronunciation, and overall language proficiency.

Subsequently, the chapter discusses the **procedures followed during data collection**, including the timeline, participant orientation, and ethical considerations such as informed consent and voluntary participation. The data were collected after the learners engaged with the platforms over a period of time and were asked to respond to the questionnaire based on their usage experience.

In addition, this chapter elaborates on the **data analysis methods** used to interpret the collected responses. Quantitative data were analyzed using descriptive statistics such as frequencies and percentages, while qualitative responses were examined through thematic analysis to extract recurring patterns and meaningful insights.

Finally, the chapter acknowledges the **limitations** encountered during the fieldwork phase. These include sample size constraints, potential biases in self-reported data, limited access to digital tools among some participants, and the short duration of exposure to the platforms.

Altogether, this chapter provides the necessary methodological foundation that validates the research findings. By clearly outlining the steps taken during the empirical phase of the study, it supports the transparency, replicability, and academic rigor of the overall research process.

Population and Sampling

The population targeted in this study consisted of Master One students specializing in English language studies at **Mohamed Kheider University of Biskra**, Algeria. These students represent a relevant population for the investigation, as they are actively engaged in advanced language learning and are familiar with digital tools and platforms that support language acquisition.

A total of **30 participants** were selected to take part in the study. The sampling technique used was **simple random sampling**, allowing for an equal chance for each student from the Master One groups to be included, thereby reducing bias and increasing the generalizability of the findings within the academic context of the university.

Participants were not selected based on prior experience with AI-based tools; instead, they were introduced to three applications—**Duolingo**, **ELSA Speak**, and **Lingvist**—and given time to interact with them before responding to the questionnaire. This approach ensured that all respondents had a basic level of familiarity with the platforms under investigation.

Demographically, participants ranged in age from 21 to 26 years and included both male and female students. Their academic backgrounds in English language studies made them capable of critically evaluating learning applications in terms of language development, usability, and adaptability. The diversity within the group in terms of prior exposure to digital tools and personal learning preferences also contributed to a richer and more nuanced dataset.

Research Instruments

To collect the required data for this research, an **online questionnaire** was developed and administered using **Google Forms**. The questionnaire served as the principal instrument for gathering both **quantitative** and **qualitative** data. This method was chosen for its efficiency in reaching participants, ensuring anonymity, and automatically organizing responses for analysis.

The questionnaire was structured into **three sections**:

- **Section One: Demographic Information**

  This part gathered basic information about the participants, including gender, age, level of study, and prior experience with AI-based applications.

- **Section Two: Application Use and Perception**

  This section focused on the participants' experiences with **Duolingo**, **ELSA Speak**, and **Lingvist**. It included multiple-choice and Likert-scale questions addressing usability, learning improvement, personalization, motivation, and satisfaction.

- **Section Three: Open-Ended Reflections**

  Participants were asked to express their thoughts on the effectiveness of each application, as well as suggestions for improvement. This qualitative input provided rich, descriptive insights into learner preferences and critical evaluation of the platforms.

The structure and content of the questionnaire were validated by two academic supervisors to ensure clarity, relevance, and alignment with the research objectives.

You can find the full questionnaire below:

Appendix A: Master's Student Questionnaire

Title: *Exploring AI-Based Adaptive Learning Systems for Teaching English: A Comparative Study*

Institution: Mohammed Kheider University of Biskra, Faculty of Letters and Languages, Department of English

Purpose: To gather insights on student experiences and perceptions regarding AI-based adaptive learning tools for English language learning.

Target Group: Master 1 Students

Section 1: Demographic Information

Q1. What is your gender?

- Female
- Male
- Prefer not to say

As shown in Table 1, the majority of respondents identified as female.

Table 1

Gender	Frequency
Female	26
Male	2
Prefer not to say	2

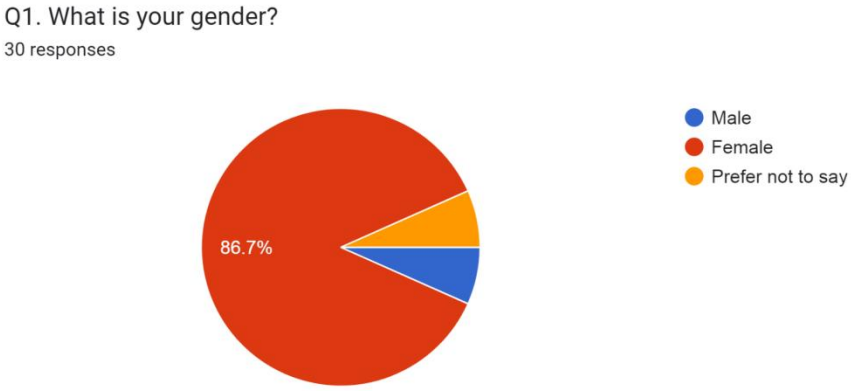


Figure 4

Q2. How many years have you been studying English?

- Less than 1 year
- 1–5 years
- 6–10 years
- More than 10 years

Table 2

Years of study	Frequency
Less than 1 year	1
1-5 years	16
6-10 years	8
More than 10 years	5

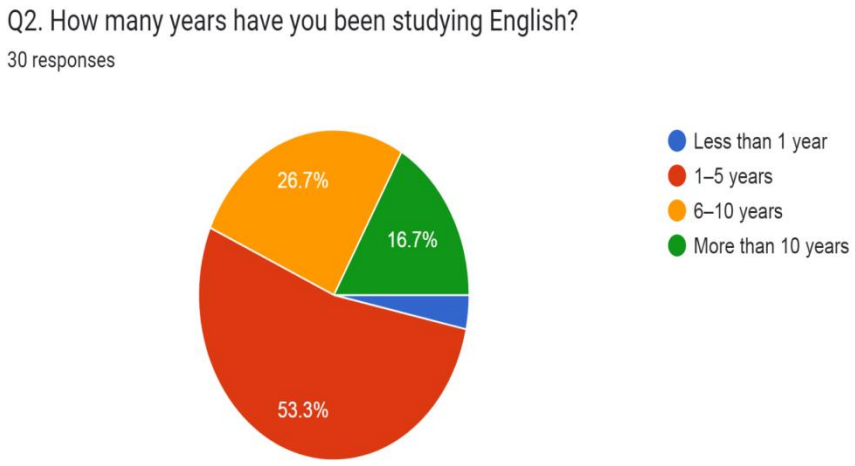


Figure 5

Q3. What is your primary reason for learning English?

- Academic purposes
- Career advancement
- Travel or study abroad
- Other

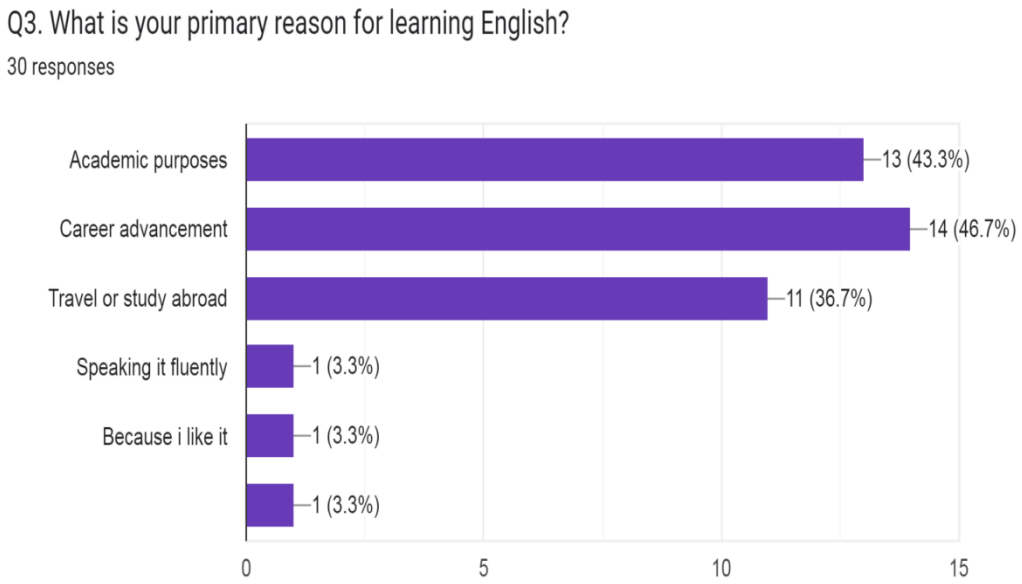


Figure 6

Section 2: Awareness and Usage of AI-Based Adaptive Learning Tools

Q4. Are you familiar with AI-based adaptive learning tools for English learning?

- Yes, I use them regularly
- Yes, but I have not used them personally
- No, I am not familiar with them
- Other,

Table 3

Response	Frequency
Yes i use them regularly	15
Yes,but i have not used them personally	14
No,I am not familiar with them	2
Other	1

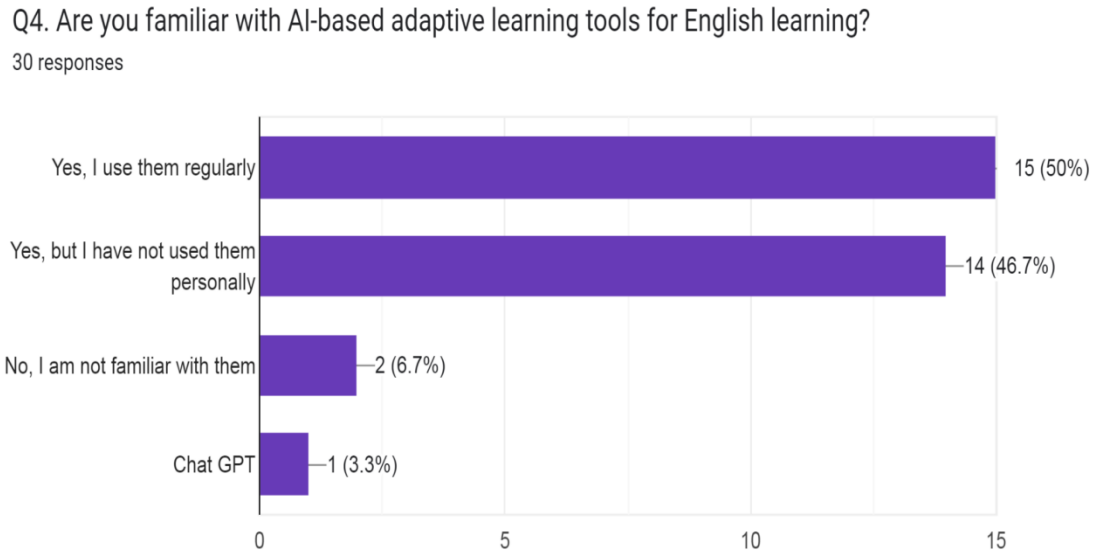


Figure 7

Q5. If yes, which platforms have you used? *(Multiple choices possible)*

- Duolingo
- Grammarly
- LingQ
- ELSA Speak
- Other

Table 4

Platform	**Frequency**
Duolingo	**16**
Grammarly	**5**
LingQ	**0**
ELSA Speak	**2**
Others	**5**

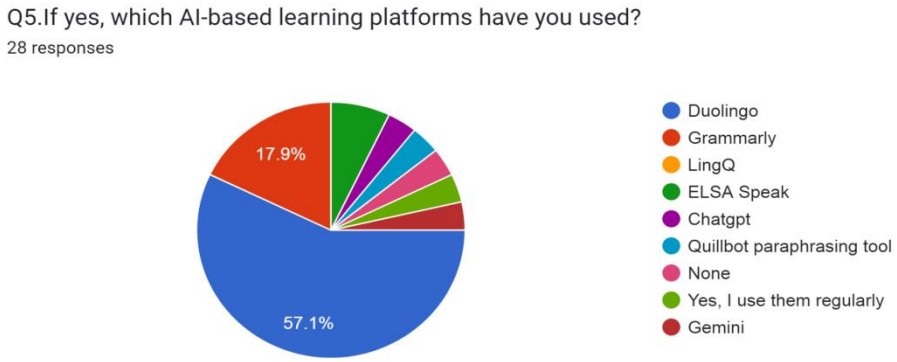


Figure 8

Q6. How often do you use AI-based tools to learn English?

- Daily
- Weekly
- Occasionally
- Never

Table 5

Frequency of use	Number o respondents
Daily	4
Weekly	5
Occasionally	16
Never	4

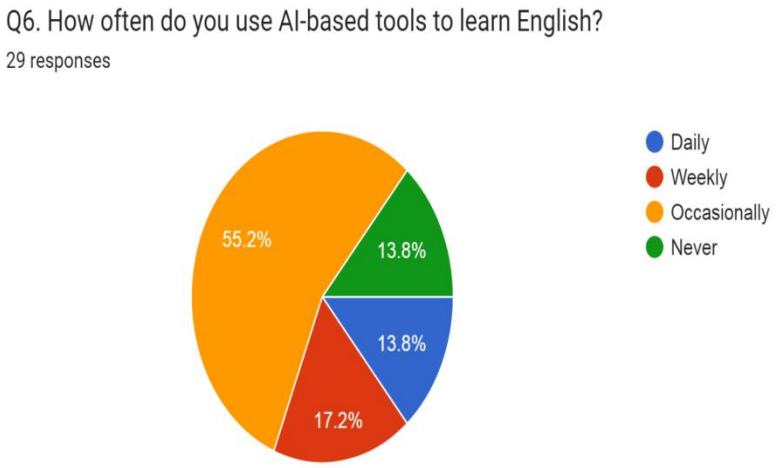


Figure 9

Q7. What is the main purpose of using AI-based tools?

- Practicing vocabulary and grammar
- Improving pronunciation and speaking
- Personalized learning experience
- Preparing for exams (IELTS, TOEFL)
- Other

Table 6

Purpose	**Frequency**
Practicing vocabulary and grammar	16
Improving pronunciation and speaking	10
Personalized learning experience	9
Preparing for exams (IELTS,TOEFL)	2

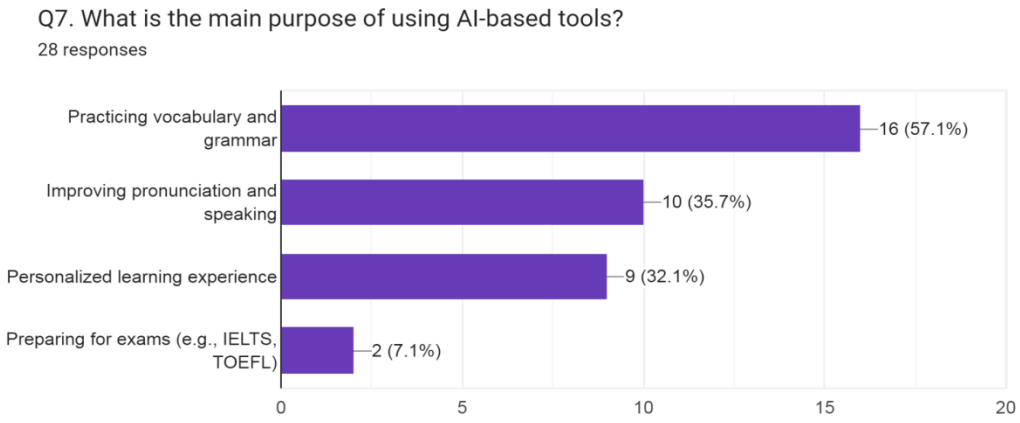


Figure 10

Q8. Do AI-based tools help personalize your learning experience?

- Yes, very effectively
- Yes, but with some limitations
- No, they do not personalize well

Table 7

Response	Frequency
Yes,very effectively	11
Yes,but with some limitations	15
No,they do not personalize well	3

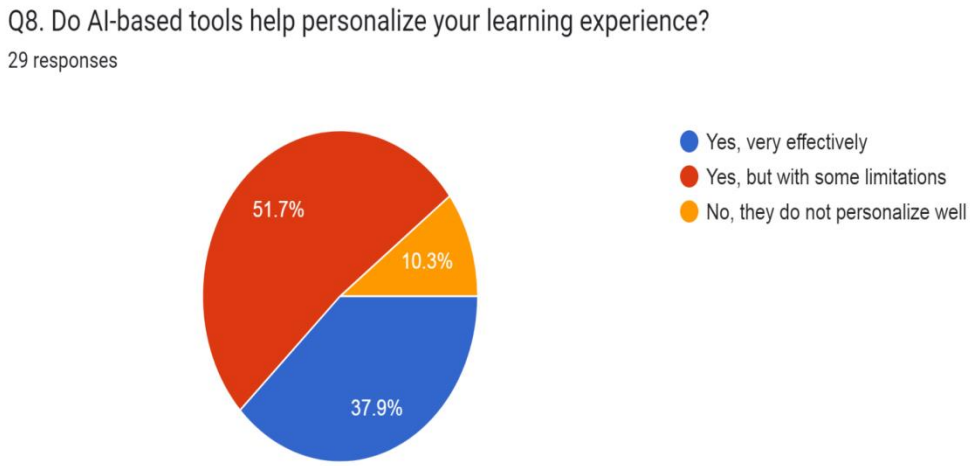


Figure 11

Q9. Have you noticed improvement in your English skills after using AI-based tools?

- Yes, significant improvement
- Some improvement
- No noticeable change

Table 8

Response	**Frequency**
Yes,significant improvement	9
Some improvement	17
No noticeable change	3

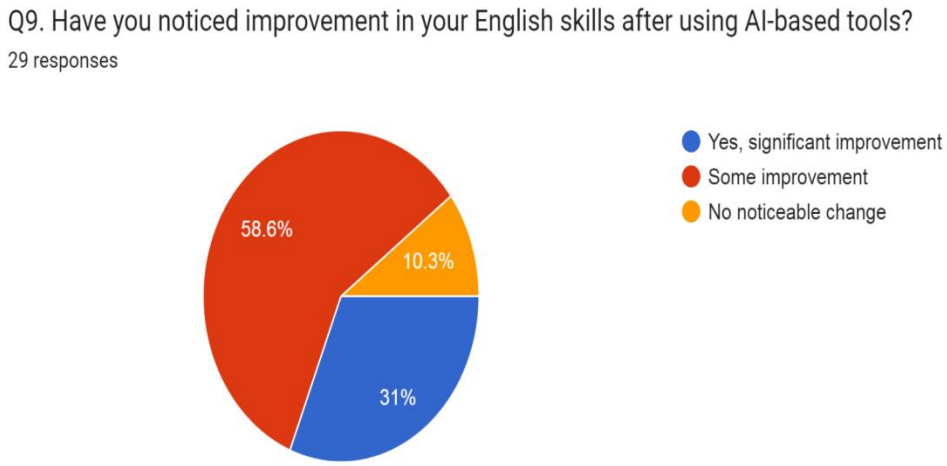


Figure 12

Section 3: Challenges and Limitations

Q10. What challenges have you faced when using AI-based tools for learning English?

- Difficulty understanding how to use the tool
- Lack of personalized content
- Inaccurate or unclear feedback
- Technical problems (e.g., app crashes)
- Feeling unmotivated or disconnected
- Other

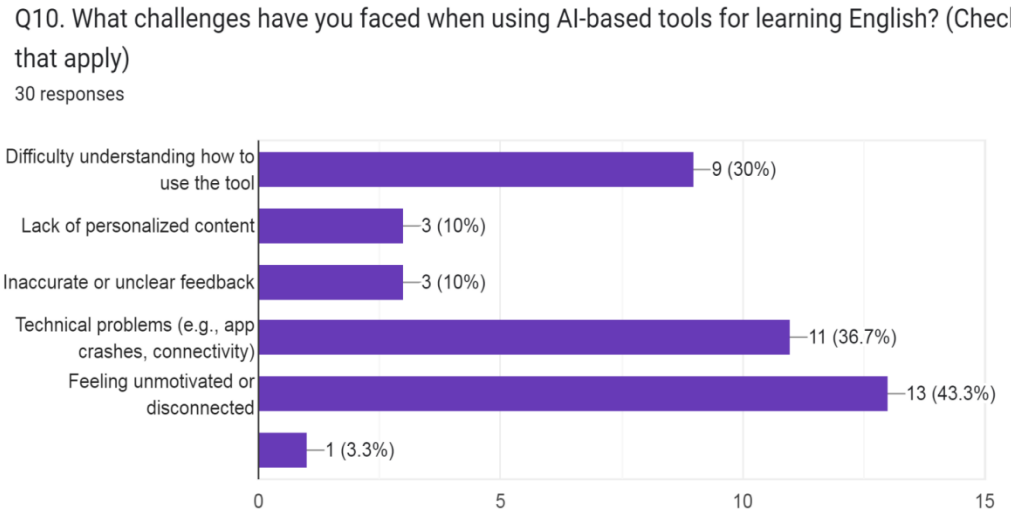


Figure 13

Q11. Do you think AI-based learning can replace traditional classroom learning?

- Yes, completely
- No, but it's a helpful supplement
- No, traditional learning is more effective

Table 9

Response	**Frequency**
Yes,completely	**6**
No,but it's a helpful supplement	**22**
No,traditional learning is more effective	**2**

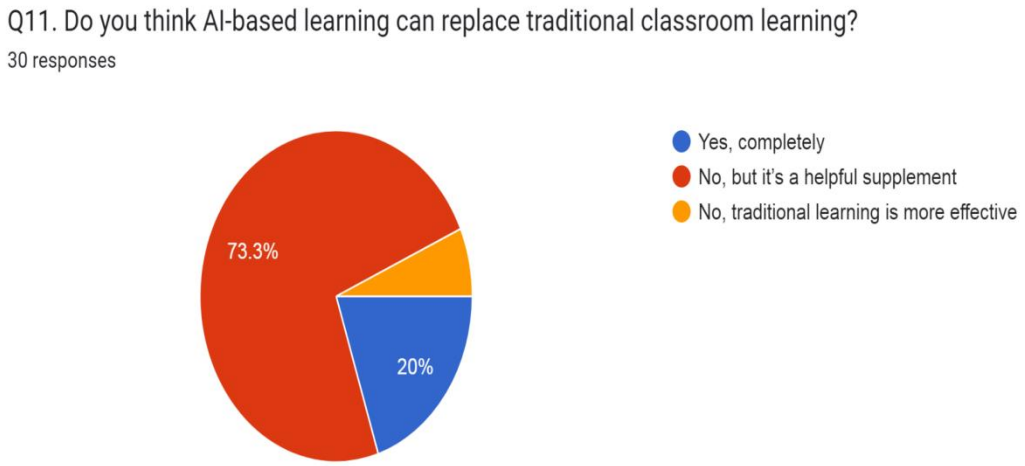


Figure 14

Q12. In your opinion, what improvements should be made to AI-based tools to support English learning better?

Respondents suggested several improvements for AI-based tools. Many emphasized the need for more accurate and detailed feedback, especially in grammar and writing tasks. Others recommended enhancing personalization features, increasing interactivity—particularly in speaking and pronunciation—and addressing technical problems like bugs or app crashes. Some called for integrating real-time human interaction or classroom alignment. A participant noted, *"The tools should explain my mistakes, not just correct them."* These suggestions highlight the need for more adaptive, reliable, and context-aware learning experiences.

Section 4: Future of AI in Language Learning

Q13. Would you recommend using AI-based tools for learning English?

- Yes, strongly recommend
- Yes, but only in some cases
- No, I would not recommend them

Table 10

Response	Frequency
Yes,strongly recommend	16
Yes,but only in some cases	13
No,I would not recommend them	1

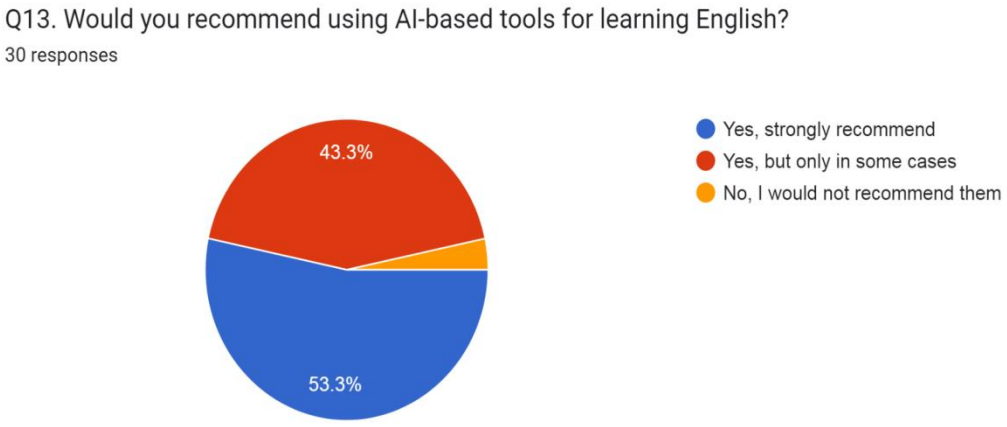


Figure 15

Q14. How do you think AI will influence English language learning in the next five years?

Respondents expressed optimistic views about the future role of AI in English language learning. Many believe AI will offer increasingly personalized and adaptive learning experiences, making education more efficient and engaging. Others noted that AI will likely enhance speaking and writing practice through advanced feedback and real-time interaction. A few participants also mentioned the potential of AI to support independent learning, especially outside traditional classroom settings. Overall, the responses reflect a strong expectation that AI will continue to transform language education in meaningful ways.

Closing Statement

The responses gathered from this questionnaire provide valuable insights into how AI-based adaptive learning tools are perceived and used by English language learners. Participants generally acknowledged the usefulness of AI in enhancing personalized learning, improving specific skills, and supporting autonomous study. While many expressed enthusiasm for AI's future in education, some also pointed out areas needing improvement, such as better feedback and technical stability. These findings contribute to a better understanding of the evolving role of AI in English language learning and suggest directions for further development and research.

Conclusion

The data collected through the questionnaire reveals insightful patterns regarding the awareness, usage, and perceptions of AI-based adaptive learning systems among Master's students studying English. The demographic data shows a diverse range of learners with varying levels of English study experience, yet a common trend emerges regarding the acceptance and integration of AI tools in their learning processes.

A significant majority of respondents reported familiarity with AI-based tools, and many actively use platforms like Duolingo and Grammarly to complement their traditional studies. This regular engagement with AI tools suggests a shift in language learning paradigms, where digital and adaptive technologies are becoming integral in self-directed learning environments. Students primarily use these tools for practicing vocabulary and grammar, improving pronunciation, and obtaining personalized learning paths, which confirms the core advantages proposed by current educational technology theories.

Responses regarding the effectiveness of AI tools in personalizing the learning experience were largely positive, though many learners noted limitations. While the majority found AI tools helpful in adapting content to their skill level, some expressed concerns about the depth of personalization and accuracy of feedback. These challenges reflect ongoing technological constraints and highlight areas for development, such as incorporating more nuanced linguistic feedback and improving AI's responsiveness to individual learner profiles.

The questionnaire also explored learners' attitudes toward the broader educational impact of AI. Most participants viewed AI tools as supplements to, rather than replacements for, traditional classroom instruction. This perspective underscores the continued importance of human interaction, teacher guidance, and collaborative learning, which AI cannot fully replicate. Nonetheless, the enthusiasm for AI's potential to enhance learning autonomy and accessibility was evident, especially in the context of preparing for language proficiency exams and improving specific skills at the learner's own pace.

The challenges reported by learners, such as technical issues and occasional lack of motivation, suggest that the design and implementation of AI tools must prioritize user experience and engagement. Moreover, participants recommended improvements including better integration of cultural content, enhanced speaking practice modules, and more

interactive and clear feedback mechanisms. These insights provide valuable guidance for educators and developers aiming to refine AI-based language learning solutions.

From a pedagogical standpoint, the findings imply that AI tools can be effectively integrated as part of blended learning approaches, offering personalized practice opportunities outside the classroom. For learners, these tools can foster greater independence and targeted skill development. For developers, the results emphasize the need for continuous technological innovation to address the nuanced needs of diverse learners.

Despite the promising results, this study's scope is limited by its sample size and the self-reported nature of the data, which may introduce bias or limit generalizability. Future research should consider longitudinal studies, larger and more diverse populations, and experimental designs to assess the long-term effectiveness of AI-assisted language learning. Investigating AI's role in facilitating collaborative learning and emotional engagement may also offer deeper insights into optimizing these tools.

In summary, the questionnaire results demonstrate a positive reception toward AI-based adaptive learning systems, affirming their role as valuable supplements to traditional English language education. Learners appreciate the flexibility, personalization, and accessibility these tools offer, while also calling for enhancements to better meet their evolving needs. This study contributes to a growing body of research advocating for the thoughtful integration of AI technologies in language learning and highlights critical directions for future development and investigation.

GENERAL CONCLUSION

GENERAL CONCLUSION

This dissertation has investigated the integration and impact of AI-based adaptive learning systems in the context of English language learning, focusing on the perceptions, experiences, and challenges faced by Master's students. Through a combination of theoretical analysis and empirical data obtained via a structured questionnaire, the study has provided comprehensive insights into the current role and future potential of AI technologies in language education.

The findings reveal that AI tools such as Duolingo, Grammarly, LingQ, and ELSA Speak are widely recognized and utilized by learners for various purposes including vocabulary acquisition, grammar practice, pronunciation improvement, and exam preparation. These platforms offer personalized learning experiences by adapting content and feedback according to individual learner needs, which promotes learner autonomy, engagement, and motivation. The adaptive nature of these systems aligns well with contemporary pedagogical theories that emphasize learner-centered and differentiated instruction. However, the data also highlight several challenges and limitations. Users reported technical issues, occasional inaccuracies in feedback, and a perceived lack of cultural sensitivity and natural interaction in some AI platforms. These limitations suggest that while AI tools are valuable supplements, they are not yet fully capable of replicating the nuanced and responsive nature of human instruction, especially in areas requiring complex communicative skills and emotional support. The study participants largely agreed that AI should complement, rather than replace, traditional classroom learning, emphasizing the indispensable role of teachers in facilitating interaction, providing contextualized feedback, and fostering collaborative learning environments.

The study further underscores the importance of continued development and refinement of AI-based learning systems. Incorporating more sophisticated, context-aware

algorithms and enhancing user interface design could improve learner satisfaction and educational outcomes. Moreover, AI tools must be designed with greater attention to diverse learner backgrounds and pedagogical needs to ensure inclusivity and cultural relevance. From an academic perspective, this dissertation contributes to the growing body of literature on educational technology by offering empirical evidence of learners' attitudes toward AI-based adaptive systems in English language learning. It validates the theoretical frameworks that advocate for the integration of technology to foster personalized learning while simultaneously identifying practical barriers that require attention. Nevertheless, the study's limitations—such as a relatively small sample size, the focus on a single academic context, and reliance on self-reported data—necessitate caution in generalizing the results. Future research employing larger, more diverse samples and mixed methodologies would provide deeper insights into the longitudinal effects of AI tools on language acquisition and learner motivation.

In conclusion, this dissertation affirms that AI-based adaptive learning systems represent a promising frontier in English language education. They provide scalable, flexible, and personalized learning opportunities that align with the evolving needs of learners in a digital age. Yet, their optimal use depends on thoughtful integration with human instruction, ensuring that technological advancements enhance rather than diminish the rich, interactive, and socially embedded nature of language learning. Embracing this balanced approach will be essential for educators, developers, and policymakers aiming to harness AI's full potential to transform language education in the coming years.

Recommendations

Based on the findings of this study, several recommendations can be made to educators, policymakers, and developers of AI-based adaptive learning systems. First,

blended learning integration is essential. Educators should aim to incorporate AI tools within traditional classroom contexts rather than using them as standalone solutions. AI can effectively complement teacher-led instruction by offering individualized practice, immediate feedback, and supplementary content tailored to the specific needs of learners, thereby enhancing the overall educational experience.

Additionally, training and awareness initiatives are necessary to maximize the potential of AI-based learning platforms. Institutions should provide training sessions and workshops to familiarize both students and educators with the capabilities and limitations of these tools. Such awareness is critical for promoting meaningful engagement and improving learning outcomes by ensuring users can leverage the technology effectively.

Developers of AI learning systems should focus on curriculum alignment. It is important that AI tools are designed to correspond with existing curriculum goals and language standards. Furthermore, contextualizing content culturally and linguistically will increase the relevance of these platforms, thereby fostering greater learner engagement and motivation.

To enhance the practical utility of AI tools, more sophisticated feedback and interactivity mechanisms should be integrated. Features such as advanced voice recognition, adaptive pronunciation correction, and AI-assisted writing tools need to simulate human-like interaction more closely, providing learners with nuanced and context-aware responses that facilitate deeper learning.

Lastly, accessibility and support are paramount. AI platforms must offer user-friendly interfaces, reliable technical support, and multilingual options to ensure they are accessible to a diverse range of learners, including those with special educational needs.

This inclusivity will help broaden the reach and effectiveness of AI-based adaptive learning systems.

Implications for Practice

The findings of this research have several important implications for the practice of English language education. The role of the teacher is evolving as AI reshapes traditional educational models. Teachers are increasingly transitioning from the role of content deliverers to that of facilitators and guides. To adapt, educators must develop digital literacy skills and focus on fostering learners' critical thinking, communicative competence, and autonomous learning abilities.

AI tools also empower learners to take greater control of their language learning journeys. Encouraging students to engage with AI platforms beyond the classroom promotes self-directed learning and continuous practice, which are crucial for language acquisition and retention.

Moreover, educational institutions and policymakers should consider policy development that supports the pedagogically sound adoption of AI tools. This includes establishing frameworks for ethical use, data privacy protections, and evaluation criteria to ensure AI technologies are implemented responsibly and effectively within educational settings.

Suggestions for Future Research

While this study has yielded valuable insights, further research is necessary to expand and validate its findings. One important direction is to conduct longitudinal studies that examine the long-term effects of AI-based adaptive learning on English language proficiency, learner motivation, and knowledge retention. Such research would help determine whether observed benefits are sustained over time.

Additionally, comparative case studies could explore the effectiveness of different AI tools across a variety of educational contexts and learner profiles. This would assist in identifying best practices and the specific strengths or limitations of individual platforms. Employing experimental designs involving control and experimental groups would also be beneficial. Such research could more accurately measure the causal impact of AI tools on discrete language skills, such as speaking fluency, listening comprehension, or writing accuracy.

Further, exploring the affective dimensions of learning—such as learner motivation, emotional engagement, and attitudes toward AI technologies—can deepen understanding of the psychological factors influencing successful language acquisition.

Finally, future research should include teachers' perspectives on AI integration. Understanding the opportunities and challenges educators face when incorporating AI into pedagogy will provide a more holistic picture and inform more effective implementation strategies.

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Appendices

Appendix A: The questionnaire used in the study for students

Dear student

I am conducting a study on AI-based adaptive learning systems for learning English as part of my master's research. This questionnaire aims to gather insights from students about their experiences and perceptions of using AI tools in English language learning.

Thank you for your time and valuable input!

Section 1: Demographic Information (General background of the student)

Q1. What is your gender?

• Male

• Female

• Prefer not to say

Q2. How many years have you been studying English?

• Less than 1 year

• 1–5 years

• 6–10 years

• More than 10 years

Q3. What is your primary reason for learning English? (Check all that apply)

• Academic purposes

• Career advancement

• Communication in daily life

• Travel or study abroad

• Other: _____

Section 2: Awareness and Usage of AI-Based Adaptive Learning Tools

Q4. Are you familiar with AI-based adaptive learning tools for English learning?

• Yes, I use them regularly

• Yes, but I have not used them personally

• No, I am not familiar with them

Q5. If yes, which AI-based learning platforms have you used? (Check all that apply)

• Duolingo

• Grammarly

• LingQ

• ELSA Speak

• Other (please specify): _____

Q6. How often do you use AI-based tools to learn English?

• Daily

• Weekly

• Occasionally

• Never

Q7. What is the main purpose of using AI-based tools? (Check all that apply)

• Practicing vocabulary and grammar

• Improving pronunciation and speaking

• Personalized learning experience

• Preparing for exams (e.g., IELTS, TOEFL)

• Other: _____

Q8. Do AI-based tools help personalize your learning experience?

• Yes, very effectively

• Yes, but with some limitations

• No, they do not personalize well

Q9. Have you noticed improvement in your English skills after using AI-based tools?

• Yes, significant improvement

• Some improvement

• No noticeable change

—Section 4: Challenges and Limitations

Q10. What challenges have you faced when using AI-based tools for learning English? (Check all that apply)

• Difficulty understanding how to use the tool

• Lack of personalized content

• Inaccurate or unclear feedback

• Technical problems (e.g., app crashes, connectivity)

• Feeling unmotivated or disconnected

• Other: _____

Q11. Do you think AI-based learning can replace traditional classroom learning?

• Yes, completely

• No, but it's a helpful supplement

• No, traditional learning is more effective

Q12. In your opinion, what improvements should be made to AI-based tools to support English learning better?

Section 5: Future of AI in Language Learning

Q13. Would you recommend using AI-based tools for learning English?

• Yes, strongly recommend

• Yes, but only in some cases

• No, I would not recommend them

Q14. How do you think AI will influence English language learning in the next five years?

……

……

Closing Statement

Thank you for completing this questionnaire. Your feedback will greatly contribute to understanding the role of AI in English language learning. If you have any additional comments or suggestions, please share them below:

……

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Résumé

Cette dissertation explore le rôle des systèmes d'apprentissage adaptatif basés sur l'intelligence artificielle (IA) dans l'enseignement de l'anglais. Ces technologies personnalisent l'apprentissage en fonction des profils individuels : rythme, forces, faiblesses et engagement. L'étude adopte une méthode mixte et implique 30 étudiants de Master 1 en langue anglaise. Un questionnaire structuré a permis de recueillir des données sur les préférences d'apprentissage, la qualité du feedback, la motivation, ainsi que l'amélioration du vocabulaire et de la grammaire. Les résultats montrent que les systèmes basés sur l'IA favorisent l'engagement, la rétention du vocabulaire, la précision grammaticale et la fluidité orale. Toutefois, des défis subsistent, tels que le manque d'infrastructure numérique, l'accès inégal aux technologies et le besoin de formation. Ces résultats offrent des perspectives utiles pour l'intégration des technologies intelligentes dans l'enseignement de l'anglais.

Mots-clés : IA, apprentissage adaptatif, enseignement de l'anglais, personnalisation, technologie éducative, perceptions des apprenants.