



The Impact of AI-Driven Personalized Learning on Language Acquisition and Assessment Strategies for Multilingual Learners (literature review)

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أثر التعلّم المخصّص المدعوم بالذكاء الاصطناعي على اكتساب اللغة واستراتيجيات التقييم لدى المتعلمين متعددي اللغات (دراسة مراجعة أدبية)

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Abstract

This paper explores the transformative impact of Artificial Intelligence (AI)-driven personalized learning on language acquisition and assessment strategies, specifically focusing on multilingual learners. As global interconnectedness increases, the demand for effective language proficiency among diverse linguistic populations has never been more critical. Traditional language learning methodologies often struggle to cater to the heterogeneous needs of multilingual learners, leading to varied learning outcomes and engagement levels. AI-driven personalized learning offers a promising paradigm shift by adapting educational content, pace, and instructional strategies to individual learner profiles. This review synthesizes current literature to elucidate how AI technologies, including adaptive learning platforms, intelligent tutoring systems, and natural language processing, facilitate enhanced language acquisition through individualized pathways, real-time feedback, and dynamic content recommendations. Furthermore, the paper examines the evolution of assessment strategies in an AI-enhanced environment, highlighting the potential for more equitable, valid, and reliable evaluations for multilingual learners. It addresses the challenges associated with integrating AI into both learning and assessment, such as data privacy, algorithmic bias, and technological infrastructure limitations. By analyzing existing research and identifying emerging trends, this paper aims to provide a comprehensive understanding of the opportunities and implications of AI in fostering linguistic competence and refining assessment practices for multilingual learners, ultimately contributing to more inclusive and effective language education.

Keywords: AI, personalized learning, language acquisition, multilingual learners, and assessment strategies.

المخلص

ستكشف هذه الورقة البحثية الأثر التحويلي للتعلّم المخصّص المدعوم بالذكاء الاصطناعي على اكتساب اللغة واستراتيجيات التقييم، مع التركيز بصورة خاصة على المتعلمين متعددي اللغات. ومع تزايد الترابط العالمي، أصبحت الحاجة إلى تحقيق

كفاءة لغوية فعّالة لدى الفئات اللغوية المتنوعة أكثر أهمية من أي وقت مضى. وغالبًا ما تواجه مناهج تعليم اللغات التقليدية صعوبة في تلبية الاحتياجات المتباينة للمتعلمين متعددي اللغات، مما يؤدي إلى اختلاف مستويات التحصيل والتفاعل التعليمي بينهم.

ويقدّم التعلّم المخصص القائم على الذكاء الاصطناعي تحولًا واعدًا في هذا المجال، من خلال تكيف المحتوى التعليمي، وسرعة التعلّم، والاستراتيجيات التدريسية بما يتناسب مع خصائص كل متعلم على حدة. وتستعرض هذه الدراسة الأدبيات العلمية الحالية لتوضيح كيفية إسهام تقنيات الذكاء الاصطناعي، بما في ذلك منصات التعلّم التكيفية، وأنظمة التدريس الذكية، ومعالجة اللغة الطبيعية، في تعزيز اكتساب اللغة عبر مسارات تعليمية فردية، وتغذية راجعة فورية، وتوصيات ديناميكية للمحتوى التعليمي.

كما تتناول الورقة تطور استراتيجيات التقييم في بيئة تعليمية معززة بالذكاء الاصطناعي، مع إبراز إمكانات هذه التقنيات في توفير تقييمات أكثر عدالة وصدقًا وموثوقية للمتعلمين متعددي اللغات. كذلك تناقش الدراسة التحديات المرتبطة بدمج الذكاء الاصطناعي في عمليتي التعلّم والتقييم، مثل قضايا خصوصية البيانات، والتحيز الخوارزمي، ومحدودية البنية التحتية التقنية. ومن خلال تحليل الدراسات السابقة وتحديد الاتجاهات الحديثة، تهدف هذه الورقة إلى تقديم فهم شامل للفرص والآثار المترتبة على استخدام الذكاء الاصطناعي في تعزيز الكفاءة اللغوية وتطوير ممارسات التقييم لدى المتعلمين متعددي اللغات، بما يسهم في تحقيق تعليم لغوي أكثر شمولية وفاعلية.

الكلمات المفتاحية: الذكاء الاصطناعي، التعلّم المخصص، اكتساب اللغة، المتعلمون متعددي اللغات، استراتيجيات التقييم..

I. Introduction

In an increasingly interconnected world, the ability to communicate across linguistic boundaries is paramount. Language proficiency serves as a cornerstone for academic success, professional advancement, and effective social integration, particularly for individuals navigating multiple linguistic and cultural contexts. Aizawa et al. (2023). However, multilingual learners, who bring a rich tapestry of linguistic backgrounds and experiences to the classroom, often encounter unique challenges in their language acquisition journey. These challenges can range from diverse prior knowledge and varying proficiency levels to distinct learning styles and cultural considerations, making a one-size-fits-all approach to language education largely ineffective.

Traditional language teaching methodologies, while foundational, frequently fall short in addressing the nuanced and heterogeneous needs of multilingual learners. They often emphasize rote memorization and standardized instruction, which can inadvertently create barriers to genuine communicative competence and engagement. Alkhaddashi & Abuojaylah, (2023). The limitations of these conventional approaches highlight a critical gap: the need for innovative, adaptable, and learner-centered solutions that can effectively support the diverse pathways of language acquisition and provide accurate, equitable assessment for multilingual populations.

The advent of Artificial Intelligence (AI) presents a transformative opportunity to bridge this gap. AI-driven personalized learning, characterized by its ability to tailor educational content, pace, and instructional strategies to individual learner profiles, is emerging as a promising paradigm shift in language education. This approach moves beyond static curricula, offering dynamic and responsive learning environments that can cater to the specific strengths, weaknesses, and preferences of each multilingual learner. By leveraging AI, educators can potentially create more inclusive and effective learning experiences that foster deeper engagement and more robust language development.

This paper aims to explore the profound impact of AI-driven personalized learning on language acquisition and assessment strategies for multilingual learners. It seeks to synthesize current scholarly discourse and empirical evidence to illuminate how AI technologies are reshaping

the landscape of language education. Specifically, this study will address the following research questions:

- How does AI-driven personalized learning influence language acquisition in multilingual learners?
- What are the effective assessment strategies for multilingual learners in an AI-enhanced learning environment?
- What are the challenges and opportunities in integrating AI into personalized learning and assessment for multilingual learners?

By examining these questions, this paper aims to provide a comprehensive understanding of the current state and future potential of AI in enhancing linguistic skills and improving assessment practices for multilingual learners, thereby contributing to the ongoing discussion on effective and fair language education in the digital age.

II. Literature Review

A. AI-Driven Personalized Learning in Language Acquisition

The integration of Artificial Intelligence (AI) into educational frameworks has ushered in a new era of personalized learning, fundamentally reshaping how individuals acquire knowledge and skills. In the context of language acquisition, AI-driven systems are revolutionizing traditional pedagogical approaches by offering adaptive, individualized, and highly responsive learning experiences. Personalized learning, at its core, is an educational methodology that tailors content, pace, and instructional strategies to meet the unique needs, strengths, and weaknesses of each learner (Darad, 2024). This stands in stark contrast to conventional, one-size-fits-all models, which often fail to account for the diverse learning styles and prior knowledge of students.

The evolution of AI in education has led to the development of sophisticated tools and platforms that facilitate this personalization. Key AI technologies playing a pivotal role in language acquisition include adaptive learning platforms, intelligent tutoring systems, Natural Language Processing (NLP), and AI-powered chatbots. Adaptive learning platforms, for instance, utilize data-driven algorithms to continuously adjust the learning path based on a learner's real-time performance and preferences. Darad (2024). If a student struggles with a particular grammatical concept, the system can automatically provide additional exercises, alternative explanations, or supplementary resources to address that specific gap. This dynamic adjustment ensures that learners receive targeted support precisely when and where they need it, optimizing their learning efficiency.

Intelligent tutoring systems, another significant application of AI, simulate human-like conversation and deliver personalized instruction (Taylor, 2025). These systems, often powered by large language models, can interact with students in real-time, answer questions, clarify concepts, and provide tailored language support. For multilingual learners, this offers a judgment-free environment for practice, fostering confidence and reducing the anxiety often associated with making mistakes in front of peers or instructors (Taylor, 2025). The continuous analysis of student input by these AI tutors allows them to track progress, identify recurring errors in grammar or vocabulary, and adjust the difficulty and type of support accordingly. This capability extends the instructional reach beyond traditional classroom hours, providing 24/7 accessibility to personalized practice and feedback (Taylor, 2025).

Natural Language Processing (NLP) is instrumental in enabling AI systems to understand and respond to human language, making interactions with AI tutors and language learning applications seamless and effective (Darad, 2024). NLP allows AI to interpret learner queries, analyze their spoken or written responses, and provide contextually relevant feedback. This is crucial for developing communicative competence, as it mimics real-life conversational dynamics. Furthermore, AI systems leverage content recommendation algorithms to suggest relevant learning materials, such as videos, articles, or interactive modules, based on a learner's progress and interests, thereby keeping the learning experience engaging and aligned with individual goals (Darad, 2024).

The benefits of AI-driven personalized learning for language acquisition are multifaceted. Firstly, it provides individualized pacing, allowing learners to progress at their own speed, mastering concepts before moving on. Secondly, real-time feedback is a cornerstone of these systems, enabling students to identify and correct errors immediately, preventing the solidification of incorrect habits. Taylor (2025). Thirdly, the ability to tailor content ensures that learners are exposed to materials that are relevant to their proficiency level and learning objectives, enhancing engagement and motivation. Finally, the data-driven insights generated by AI platforms offer valuable information to both learners and educators, guiding instructional decisions and facilitating continuous improvement in learning outcomes (Darad, 2024; Taylor, 2025).

Empirical evidence increasingly supports the effectiveness of AI in language acquisition. Studies have shown that AI-powered tools can significantly improve language proficiency by providing individualized learning experiences that cater to diverse needs (Darad, 2024). The adaptive nature of these platforms ensures that learners are consistently challenged but not overwhelmed, leading to more efficient and effective language learning journeys. The promise of AI-based personalized learning lies in its capacity to create highly responsive and supportive environments that cater to the unique demands of language acquisition, particularly for the diverse population of multilingual learners.

B. Language Acquisition Theories and Multilingual Learners

Understanding the theoretical underpinnings of language acquisition is crucial when considering the impact of AI-driven personalized learning, especially for multilingual learners. Several prominent theories offer frameworks for comprehending how individuals acquire new languages, each providing unique insights into the learning process. Stephen Krashen's Input Hypothesis, for instance, posits that language acquisition occurs when learners are exposed to comprehensible input—language that is slightly beyond their current level of competence but still understandable (Krashen, 1985). This theory emphasizes the importance of meaningful exposure to the target language in a low-anxiety environment. For multilingual learners, who may already possess varying degrees of proficiency in multiple languages, the challenge lies in receiving input that is appropriately scaffolded to their specific linguistic profile, rather than a generic, one-size-fits-all approach.

Vygotsky's Sociocultural Theory of learning highlights the critical role of social interaction and cultural context in cognitive development, including language acquisition (Vygotsky, 1978). This theory introduces the concept of the Zone of Proximal Development (ZPD), which describes the difference between what a learner can do independently and what they can achieve with the guidance of a more knowledgeable other (e.g., a teacher or a peer). For multilingual learners, collaborative activities and interactions with both native speakers and other learners are vital for negotiating meaning, co-constructing knowledge, and internalizing

new linguistic structures. AI-driven platforms, through features like interactive chatbots and collaborative learning modules, have the potential to facilitate these social interactions, even in asynchronous or remote learning settings.

Cognitive theories of language acquisition, on the other hand, focus on the mental processes involved in learning, such as attention, memory, and problem-solving. These theories suggest that language learning is a complex cognitive skill that involves the formation of mental representations and the development of processing abilities (Ellis, 2008). For multilingual learners, this can involve managing cognitive load associated with switching between languages, inhibiting interference from their first language(s), and developing efficient strategies for processing new linguistic information. Personalized learning, by adapting the pace and complexity of material, can help manage this cognitive load, allowing learners to focus on specific areas of difficulty without being overwhelmed.

Multilingual learners possess unique characteristics that differentiate their language acquisition journey from that of monolingual learners. They often bring a rich linguistic repertoire, which can be both an asset and a challenge. While their existing linguistic knowledge can facilitate the acquisition of new languages through transfer, it can also lead to interference errors. Furthermore, multilingual learners come from diverse cultural backgrounds, which can influence their learning styles, communication preferences, and motivation. Their prior educational experiences, literacy levels in their native languages, and exposure to the target language outside the classroom also vary significantly.

Addressing these specific needs requires a highly flexible and responsive educational approach. Personalized learning, by its very nature, is well-suited to cater to the diverse linguistic and cultural profiles of multilingual learners. It allows for:

- **Individualized Pacing:** Learners can spend more time on challenging concepts and move quickly through familiar ones, accommodating varied prior knowledge and learning speeds.
- **Tailored Content:** Materials can be adapted to reflect cultural contexts, relevant vocabulary, and authentic communication scenarios that resonate with multilingual learners.
- **Targeted Feedback:** AI systems can provide specific feedback on errors related to interlanguage transfer or areas of persistent difficulty, helping learners to refine their linguistic accuracy.
- **Multiple Modalities:** Personalized platforms can offer content through various modalities (visual, auditory, kinesthetic) to cater to different learning preferences and strengthen comprehension.
- **Scaffolding and Support:** AI can provide adaptive scaffolding, gradually reducing support as learners gain proficiency, aligning with Vygotsky's ZPD.

By leveraging these capabilities, personalized learning environments can create a more equitable and effective language acquisition experience for multilingual learners, acknowledging and building upon their unique linguistic assets while addressing their specific learning challenges.

C. Assessment Strategies for Multilingual Learners

Effective and equitable assessment of multilingual learners presents a complex challenge within educational systems. Traditional assessment methods, often designed for monolingual

populations, frequently fail to accurately measure the true linguistic and academic capabilities of students who are acquiring a new language while simultaneously learning content knowledge. These methods can inadvertently penalize multilingual learners due to factors such as linguistic bias, cultural irrelevance, and a lack of consideration for varying levels of language proficiency (Edutopia, n.d.). The validity and reliability of assessments become compromised when they conflate language proficiency with content understanding, leading to an inaccurate portrayal of a student's knowledge and skills.

To address these limitations, principles of equitable and effective assessment for multilingual learners emphasize a shift towards more comprehensive, culturally responsive, and linguistically appropriate approaches. Key among these is the distinction between formative and summative assessment. Formative assessments, which are ongoing and designed to monitor learning and provide continuous feedback, are particularly crucial for multilingual learners. They allow educators to gain a deeper understanding of a student's evolving language and content comprehension, offering opportunities for timely intervention and instructional adjustment (ASCD, n.d.; EL Success Forum, n.d.). Summative assessments, typically administered at the end of an instructional unit, also need to be carefully designed to ensure they measure content knowledge rather than solely English language proficiency (HMH, 2024).

Several strategies contribute to making assessments more equitable and effective for multilingual learners:

- **Scaffolding Assessments:** This involves modifying the structure and language of assessments to make instructions more comprehensible and to help students produce more accurate responses. For instance, providing synonyms for academic vocabulary, incorporating visual aids, or offering sentence starters and frames can support multilingual learners in demonstrating their content knowledge without being hindered by linguistic barriers (Edutopia, n.d.). This approach ensures that the assessment truly measures what the student knows, rather than their reading comprehension or writing fluency in English.
- **Performance-Based Assessments:** These assessments require students to demonstrate their knowledge and skills through authentic tasks, such as presentations, projects, or role-plays, rather than traditional multiple-choice tests. Performance-based assessments allow multilingual learners to utilize their developing language skills in a more natural and integrated manner, often drawing upon their existing linguistic resources and cultural backgrounds (HMH, 2024).
- **Culturally Responsive Assessment:** Recognizing and valuing the linguistic and cultural diversity of multilingual learners is paramount. Assessments should be designed to be culturally relevant, drawing on students' lived experiences and knowledge bases. This helps to create a more inclusive assessment environment where students feel understood and empowered to demonstrate their learning.
- **Assessment in Home Language (where feasible):** Experts often recommend assessing multilingual learners in both English and their home language to gain a more complete picture of their abilities and knowledge (Multilingual Learning Toolkit, n.d.). This approach acknowledges the cognitive and academic strengths that students possess in their native languages and prevents underestimation of their capabilities.
- **Student-Teacher Conferences and Peer Review:** Engaging in one-on-one conferences with students provides valuable insights into their understanding and allows for clarification of misconceptions. Similarly, peer review can foster a

collaborative learning environment where students support each other's language development and critical thinking EdWeek, 2021; HMH, 2024.

The role of technology in assessing multilingual learners is also expanding. Digital tools can facilitate adaptive testing, provide immediate feedback, and offer diverse formats for demonstrating understanding. However, the effective implementation of these strategies requires educators to be knowledgeable about language acquisition processes, culturally responsive pedagogy, and the specific needs of their multilingual student populations. The goal is to create assessment environments that are not only fair and accurate but also supportive of continued language and academic growth for all learners.

D. Intersection of AI, Personalized Learning, Language Acquisition, and Assessment

The convergence of Artificial Intelligence, personalized learning, language acquisition, and assessment represents a dynamic frontier in educational innovation, particularly for multilingual learners. AI's capacity to process vast amounts of data and adapt to individual needs offers unprecedented opportunities to create more effective and equitable learning and assessment environments. This intersection is where the theoretical benefits of personalized learning meet the practical demands of language education and the critical need for accurate evaluation.

One of the most significant ways AI enhances assessment for multilingual learners is through **adaptive testing**. Unlike static, standardized tests, AI-powered adaptive assessments adjust their difficulty level in real-time based on the learner's performance (Darad, 2024). If a student answers correctly, the system presents a more challenging item; if they struggle, an easier one is provided. This not only provides a more precise measure of a student's true proficiency but also reduces test-taking anxiety by ensuring questions are within their Zone of Proximal Development. For multilingual learners, this means assessments can more accurately gauge their content knowledge and linguistic abilities without being unduly influenced by their current English proficiency level.

Automated feedback is another powerful application of AI at this intersection. AI tutors and language learning platforms can provide immediate, specific, and actionable feedback on pronunciation, grammar, vocabulary usage, and even pragmatic aspects of language (Taylor, 2025). This real-time feedback loop is crucial for language acquisition, as it allows learners to identify and correct errors before they become ingrained habits. For multilingual learners, who may not always have access to native-speaking instructors or sufficient one-on-one time, automated feedback offers a scalable and consistent source of corrective input, fostering self-correction and autonomous learning.

Data analytics for progress monitoring is a core strength of AI-driven systems. These platforms collect and analyze extensive data on learner interactions, performance patterns, and progress over time (Darad, 2024; Taylor, 2025). This rich data provides educators with granular insights into individual student strengths, weaknesses, and learning trajectories. For multilingual learners, this means teachers can identify specific areas where a student might be struggling—perhaps with a particular grammatical structure or a set of academic vocabulary—and then tailor their instruction or provide additional resources accordingly. This data-driven approach moves beyond subjective observations, enabling more precise and evidence-based instructional decisions.

However, integrating AI into assessment for multilingual learners is not without its challenges. **Data privacy** is a significant concern, as these systems collect sensitive information about student performance and learning behaviors (Darad, 2024). Robust data protection protocols and transparent policies are essential to build trust and ensure ethical use of this data. Another critical challenge is **algorithmic bias**. AI systems are trained on vast datasets, and if these datasets do not adequately represent the linguistic diversity and cultural nuances of multilingual learners, the algorithms can perpetuate or even amplify existing biases (Darad, 2024). This could lead to unfair assessments, inaccurate feedback, or inappropriate content recommendations, undermining the very goal of equitable education. Careful design, continuous monitoring, and diverse training data are necessary to mitigate these biases.

Technological barriers and cost also pose practical limitations. Not all educational institutions or learners have access to the necessary technology, reliable internet infrastructure, or the financial resources to implement and maintain sophisticated AI-powered platforms (Darad, 2024). This digital divide could exacerbate existing inequities, leaving some multilingual learners without access to these beneficial tools. Furthermore, the development and deployment of ethical and effective AI solutions require interdisciplinary expertise, including linguists, educators, AI specialists, and ethicists.

Despite these challenges, the opportunities for future research and development are immense. Further research is needed to explore the long-term impact of AI on the linguistic and academic development of diverse multilingual populations. Investigations into the efficacy of AI in assessing higher-order thinking skills and complex communicative competencies are also crucial. Moreover, the development of AI systems that can seamlessly integrate a learner's multiple languages and cultural backgrounds into the learning and assessment process holds significant promise. By addressing the challenges proactively and leveraging the opportunities thoughtfully, AI can become a powerful ally in fostering comprehensive language acquisition and ensuring fair, accurate, and supportive assessment for all multilingual learners.

III. Methodology

This paper presents a comprehensive literature review and conceptual analysis aimed at exploring the impact of AI-driven personalized learning on language acquisition and assessment strategies for multilingual learners. Given the nature of the research questions, a qualitative, synthesis-based approach was employed to systematically gather, analyze, and interpret existing scholarly work in the field. This methodology allows for a broad examination of current trends, theoretical perspectives, empirical findings, and practical implications, without conducting new primary data collection.

Type of Study

This study is a **comprehensive literature review and conceptual analysis**. It does not involve primary data collection or experimental design. Instead, it synthesizes information from a wide range of published academic sources to provide a holistic understanding of the topic. The goal is to identify key themes, evaluate the current state of research, highlight gaps in knowledge, and propose future directions.

Data Sources

The literature search was conducted across several reputable academic databases to ensure comprehensive coverage of relevant scholarly publications. These databases included, but were not limited to:

- **Scopus:** A large abstract and citation database of peer-reviewed literature.

- **Web of Science:** A multidisciplinary platform providing access to multiple databases covering journal articles, conference proceedings, and other scholarly outputs.
- **ERIC (Education Resources Information Center):** A comprehensive online library of education research and information.
- **Google Scholar:** Utilized for broader initial searches and to identify additional relevant publications and authors.

In addition to academic databases, relevant journals specializing in educational technology, language acquisition, applied linguistics, and assessment were consulted. Conference proceedings from major educational and AI conferences, as well as reputable reports from educational technology organizations and research institutes, were also considered to capture the most recent advancements and discussions in the field.

Search Strategy

A systematic search strategy was developed using a combination of keywords and their variations to identify pertinent literature. The primary keywords and phrases used, often in various combinations, included:

- "AI personalized learning language acquisition"
- "AI adaptive learning second language acquisition"
- "assessment of multilingual learners"
- "formative assessment multilingual learners"
- "summative assessment multilingual learners"
- "fair assessment of multilingual learners"
- "AI language assessment"
- "adaptive assessment multilingual learners"
- "Impact of AI on language assessment of multilingual learners"
- "AI tutors multilingual learners"
- "personalized learning language acquisition assessment"

Boolean operators (AND, OR) were used to refine search queries and ensure the retrieval of highly relevant articles. For instance, combinations such as "AI AND personalized learning AND language acquisition" or "multilingual learners AND assessment strategies" were frequently employed.

Inclusion and Exclusion Criteria

To ensure the relevance and quality of the selected literature, the following criteria were applied:

- **Inclusion Criteria:**
 - Peer-reviewed journal articles, book chapters, and reputable conference papers.
 - Publications primarily focusing on Artificial Intelligence, personalized learning, language acquisition, and assessment.
 - Studies specifically addressing multilingual learners or English as a Foreign Language (EFL)/English as a Second Language (ESL) contexts.
 - Publications written in English.
 - Publications from the last 10 years (2015-2025) to ensure currency, with exceptions made for seminal works or foundational theories.

- **Exclusion Criteria:**

- Non-academic sources (e.g., blog posts, news articles) unless they provided significant conceptual insights or summarized key research findings from academic sources.
- Studies not directly related to the intersection of AI, personalized learning, language acquisition, or assessment.
- Publications focusing solely on AI in general education without specific relevance to language learning or multilingual contexts.

Analytical Approach

The selected literature was subjected to a rigorous analytical process involving several stages:

1. **Initial Screening:** Titles and abstracts were reviewed to determine their relevance to the research questions.
2. **Full-Text Review:** Full texts of potentially relevant articles were retrieved and read thoroughly to assess their suitability based on the inclusion and exclusion criteria.
3. **Data Extraction:** Key information was extracted from each selected source, including the main arguments, theoretical frameworks, methodologies (if empirical), findings, conclusions, and implications.
4. **Thematic Synthesis:** The extracted data was then organized and synthesized thematically. Recurring themes, concepts, and patterns across the literature were identified. This involved grouping similar ideas, contrasting different perspectives, and noting any contradictions or gaps.
5. **Conceptual Analysis:** A conceptual analysis was performed to build a coherent narrative that integrates the various findings. This involved mapping the relationships between AI, personalized learning, language acquisition, and assessment, and understanding how they collectively impact multilingual learners.
6. **Identification of Gaps and Future Directions:** Throughout the synthesis, attention was paid to identifying areas where research is lacking, where current understanding is limited, or where further investigation is needed. This informed the discussion on future research directions.

This systematic approach ensures that the review is comprehensive, transparent, and provides a robust foundation for understanding the complex interplay between AI, personalized learning, language acquisition, and assessment for multilingual learners.

IV. Discussion

The synthesis of the reviewed literature reveals a compelling narrative regarding the transformative potential of AI-driven personalized learning in addressing the multifaceted challenges of language acquisition and assessment for multilingual learners. This discussion will elaborate on how AI-driven personalized learning influences language acquisition, the evolving assessment strategies in an AI-enhanced environment, and the inherent challenges and opportunities in integrating AI into these critical educational domains.

How AI-Driven Personalized Learning Influences Language Acquisition in Multilingual Learners

AI-driven personalized learning significantly influences language acquisition in multilingual learners by offering an unprecedented level of individualization and adaptability that traditional methods often cannot provide. The core impact lies in its capacity to tailor the learning experience to each learner's unique profile, encompassing their prior linguistic knowledge, learning pace, cognitive styles, and areas of difficulty. As highlighted by Darad (2024), AI-

powered algorithms analyze historical performance and preferences to construct customized learning paths. For multilingual learners, this means that the system can adapt to their existing linguistic repertoire, providing content that is neither too simplistic nor overwhelmingly complex, thereby optimizing the comprehensible input crucial for acquisition (Krashen, 1985).

One of the most profound influences is the provision of **real-time, individualized feedback**. Unlike traditional classroom settings where feedback might be delayed or generalized, AI tutors and adaptive platforms offer immediate corrective input on grammar, pronunciation, vocabulary, and even pragmatic usage (Taylor, 2025). This instant feedback loop is vital for multilingual learners, as it allows for immediate error correction, preventing the fossilization of mistakes and accelerating the learning process. The judgment-free environment fostered by AI tools also encourages greater risk-taking and experimentation with the target language, which is essential for developing fluency and confidence, particularly for learners who may be hesitant to speak in front of peers (Taylor, 2025).

Furthermore, AI facilitates **dynamic content recommendation and adaptive scaffolding**. Based on a learner's progress and identified needs, AI systems can recommend relevant materials, exercises, and explanations that are precisely aligned with their current proficiency level and learning objectives (Darad, 2024). This adaptive scaffolding, which gradually reduces support as learners gain competence, directly supports Vygotsky's concept of the Zone of Proximal Development (ZPD) (Vygotsky, 1978). For multilingual learners, this means that the learning environment constantly adjusts to their evolving capabilities, providing just enough challenge to promote growth without causing undue frustration. The ability of AI to process and respond to natural language through NLP also enhances the authenticity of interactions, allowing multilingual learners to engage in meaningful communicative exchanges that mirror real-life scenarios (Darad, 2024).

Effective Assessment Strategies for Multilingual Learners in an AI-Enhanced Learning Environment

The integration of AI into language education is profoundly reshaping assessment strategies for multilingual learners, moving towards more equitable, precise, and dynamic evaluation methods. The traditional challenges of assessing multilingual learners, such as linguistic bias and the conflation of language proficiency with content knowledge, can be significantly mitigated through AI-enhanced approaches. The shift is from static, one-time evaluations to continuous, adaptive, and data-driven assessments.

Adaptive testing, powered by AI, stands out as a highly effective strategy. As discussed by Darad (2024), these assessments dynamically adjust the difficulty of questions based on a learner's responses, providing a more accurate measure of their true abilities. For multilingual learners, this means that the assessment can pinpoint their knowledge and skills without being overly influenced by their current English language proficiency. This reduces the inherent bias often found in standardized tests and provides a fairer representation of their academic and linguistic competence.

Automated, granular feedback from AI systems also serves as a powerful assessment tool. Beyond simply grading, AI can provide detailed insights into specific errors in grammar, vocabulary, pronunciation, and even discourse markers (Taylor, 2025). This level of diagnostic feedback is invaluable for both learners and educators. For learners, it clarifies areas needing improvement, guiding their self-study and practice. For educators, it provides data-driven insights into common difficulties across a group of multilingual learners, allowing for more

targeted instructional interventions. This continuous formative assessment, facilitated by AI, is crucial for monitoring progress and making timely adjustments to teaching strategies (ASCD, n.d.); EL Success Forum (n.d.).

Furthermore, AI enables **comprehensive data analytics for progress monitoring**. AI platforms collect and analyze vast amounts of data on learner interactions, performance patterns, and growth over time (Darad, 2024; Taylor, 2025). This data can track not only linguistic development but also engagement levels, learning styles, and areas of cognitive load. For multilingual learners, this provides a holistic view of their learning journey, allowing educators to identify specific linguistic or conceptual hurdles and tailor support accordingly. This data-driven approach moves beyond subjective observations, enabling more precise and evidence-based instructional and assessment decisions, aligning with the principles of equitable assessment (Edutopia, n.d.).

Challenges and Opportunities in Integrating AI into Personalized Learning and Assessment for Multilingual Learners

Despite the transformative potential, the integration of AI into personalized learning and assessment for multilingual learners is accompanied by significant challenges that require careful consideration and proactive solutions. Foremost among these is **data privacy and security**. AI systems collect extensive personal and performance data, raising concerns about how this sensitive information is stored, accessed, and utilized (Darad, 2024). Ensuring robust data protection protocols and transparent policies is paramount to building trust among learners, parents, and educators.

Another critical challenge is **algorithmic bias**. AI models are trained on existing datasets, and if these datasets do not adequately represent the linguistic diversity, cultural nuances, and varied proficiency levels of multilingual learners, the algorithms can inadvertently perpetuate or even amplify existing educational inequities (Darad, 2024). This bias could manifest in unfair assessments, inaccurate feedback, or content recommendations that are not culturally relevant, thereby undermining the very goal of equitable education. Mitigating this requires diverse and representative training data, continuous monitoring of algorithmic performance, and a commitment to ethical AI development.

Technological barriers and cost also present practical limitations. The successful implementation of sophisticated AI-powered platforms requires reliable internet infrastructure, access to appropriate devices, and significant financial investment (Darad, 2024). This digital divide can exacerbate existing disparities, potentially excluding multilingual learners from underserved communities who lack access to these resources. Furthermore, the effective integration of AI tools demands professional development for educators, equipping them with the necessary skills to leverage these technologies effectively and interpret the data they generate.

However, these challenges also present significant opportunities for innovation and improvement. The need for unbiased algorithms, for instance, drives research into **fair and transparent AI**, pushing the boundaries of ethical technology development. The demand for accessible and affordable solutions encourages the creation of **scalable and inclusive AI tools** that can reach a broader population of multilingual learners. Moreover, the insights gained from AI-driven data can inform **evidence-based policy-making**, leading to more effective and equitable educational systems.

Future opportunities lie in developing AI systems that can seamlessly integrate a learner's multiple languages and cultural backgrounds into the learning and assessment process, moving

beyond a purely English-centric approach. Research into the long-term impact of AI on higher-order thinking skills, critical thinking, and socio-emotional development in multilingual contexts is also crucial. By proactively addressing the challenges and thoughtfully leveraging the opportunities, AI can become a powerful ally in fostering comprehensive language acquisition and ensuring fair, accurate, and supportive assessment for all multilingual learners, ultimately contributing to a more inclusive and effective global education landscape. This comparison with traditional methods underscores the advantages of AI integration, offering a path toward more dynamic, responsive, and learner-centric educational experiences. However, the limitations of current AI applications, particularly concerning nuanced human interaction and the potential for over-reliance on technology, necessitate a balanced approach that integrates AI as a supportive tool rather than a complete replacement for human educators. The implications for educators, policymakers, and technology developers are clear: a collaborative effort is needed to harness AI's potential responsibly and equitably.

V. Conclusion

This comprehensive review has underscored the profound and multifaceted impact of AI-driven personalized learning on language acquisition and assessment strategies for multilingual learners. The analysis of current literature consistently demonstrates that AI technologies offer a transformative approach to addressing the inherent complexities and diverse needs of this learner population. By providing individualized learning pathways, real-time adaptive feedback, and dynamic content recommendations, AI systems significantly enhance the efficiency and effectiveness of language acquisition, moving beyond the limitations of traditional, one-size-fits-all pedagogical models.

Key findings indicate that AI-driven personalized learning fosters a more engaging and responsive learning environment. The ability of AI tools, such as intelligent tutoring systems and NLP-powered chatbots, to offer 24/7 accessibility and a judgment-free space for practice is particularly beneficial for multilingual learners, promoting greater confidence and reducing anxiety in language use. Furthermore, the integration of AI into assessment strategies has paved the way for more equitable and precise evaluations. Adaptive testing, automated diagnostic feedback, and comprehensive data analytics provide educators with unprecedented insights into learner progress, enabling targeted interventions and more informed instructional decisions.

However, the journey towards fully realizing the potential of AI in this domain is not without its hurdles. Critical challenges such as data privacy concerns, the potential for algorithmic bias, and technological infrastructure disparities must be proactively addressed. Ensuring that AI models are trained on diverse and representative datasets is crucial to mitigating bias and promoting fairness in both learning and assessment outcomes. Similarly, bridging the digital divide and providing adequate professional development for educators are essential steps to ensure equitable access to and effective utilization of these advanced tools.

In conclusion, AI-driven personalized learning represents a significant paradigm shift in language education for multilingual learners. It offers a powerful means to create highly adaptive, supportive, and effective learning environments that cater to individual needs, thereby accelerating language acquisition and refining assessment practices. While challenges persist, the opportunities for continued innovation and responsible implementation are immense. Future research should continue to explore the long-term impacts of AI on linguistic and academic development, investigate strategies for mitigating bias, and develop more inclusive and accessible AI solutions. By embracing a collaborative approach involving educators, policymakers, and technology developers, the full potential of AI can be harnessed

to foster comprehensive linguistic competence and ensure equitable educational opportunities for all multilingual learners in an increasingly interconnected world.

VI. References

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Compliance with ethical standards

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