

The AI-supported Language Library Model: It's Not About the CALL Tools, It's About the Language Library

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ABSTRACT

This paper introduces the concept of the AI-supported Language Library Wheel, a novel framework for understanding and implementing artificial intelligence in language learning environments. While much attention has been focused on Computer Assisted Language Learning (CALL) tools, this research argues for a paradigm shift towards a more holistic, library-centric approach. The Language Library Wheel model emphasizes the integration of AI technologies not as standalone tools, but as facilitators within a broader ecosystem of language resources and learning methodologies. By reimagining the role of AI within the context of a dynamic, user-centered language library, this approach aims to enhance learner engagement, personalization, and overall efficacy of language acquisition processes. Through a combination of theoretical analysis and case studies, this paper explores how the Language Library Wheel can be implemented in various educational settings. It examines the potential benefits, including improved resource discoverability, adaptive learning pathways, and enhanced collaboration between learners and educators. Additionally, it addresses potential challenges and ethical considerations in the deployment of AI within language learning environments. This research contributes to the ongoing dialogue about the future of language education in the digital age, proposing a framework that places the richness and diversity of language resources at the center, supported by, rather than subsumed by, artificial intelligence technologies. We suggest the main principles of the proposed model with an inclusiveness, equity and pragmatic design approach which are handy for learners across and beyond academic libraries.

Keywords: Artificial Intelligence, Language Learning, Digital Libraries, Computer Assisted Language Learning, Educational Technology

Introduction

The paper emphasizes the shift in focus from traditional tools to the innovative approach of a language library powered by artificial intelligence (AI). The integration AI has predominantly focused on developing and implementing Computer Assisted Language Learning (CALL) tools in the rapidly evolving landscape of language education to assist 21st century learners (Chen et al., 2021; Yadav & Sharma, 2022). While these tools have undoubtedly enhanced various aspects of language acquisition, they often exist as isolated entities within the broader context of language learning resources. This paper introduces a novel conceptual framework: the AI-supported Language Library Wheel, which proposes a paradigm shift in how we perceive and utilize AI in language education.

The AI-supported Language Library Model or Wheel represents a holistic approach that places the language library at the center of the learning ecosystem, with AI serving as a facilitator and enhancer rather than the primary focus. This model reimagines the traditional language library not as a static repository of resources, but as a dynamic, interconnected system where AI technologies seamlessly integrate with and augment the vast array of language learning materials and methodologies. The Language Library Wheel is an innovative framework that reimagines language learning by integrating artificial intelligence with traditional library resources. This model comprises several key components, each designed to enhance the language acquisition process through a synergistic blend of technology and pedagogy. At the heart of the Language Library Wheel lies the Resource Hub, a comprehensive collection of language learning materials. This central library encompasses a diverse array of content, including texts, audio recordings, videos, and interactive media. The Resource Hub serves as the foundation upon which the entire learning ecosystem is built, providing learners with a rich tapestry of authentic and curated language materials.

Furthermore, the AI-enhanced navigation system complements the resource hub. This sophisticated component employs artificial intelligence algorithms to guide learners through the vast collection of resources. By analyzing factors such as proficiency level, learning preferences, and individual goals, the AI assists users in discovering the most relevant and beneficial materials for their unique learning journey. This personalized approach ensures that learners, teachers and policymakers (Hwang et al., 2020; Sharma, 2021, 2022), can efficiently access resources tailored to their specific needs and interests. In addition, the adaptive learning pathways feature further personalizes the learning experience. By continuously analyzing learner progress and behavior, AI algorithms construct customized learning routes through the library's resources. This dynamic system adapts in real-time, adjusting the difficulty and focus of materials based on the learner's evolving proficiency and interests. As a result, each learner experiences a uniquely optimized path through the language acquisition process. Integrated within the Language Library Wheel are Interactive Language Tools, powered by AI technology. These tools, including chatbots, speech recognition software, and writing assistants, provide learners with opportunities for practical application and immediate feedback. By embedding these tools within the library ecosystem, learners can seamlessly transition between studying and active practice, reinforcing their skills in a contextual and meaningful manner.

The model also incorporates collaborative spaces, recognizing the importance of social interaction in language learning. These virtual environments facilitate peer-to-peer learning and teacher-student interactions (Sharma, 2023). AI-driven matching algorithms connect learners with suitable study partners or mentors, while communication tools enhance the collaborative experience. This feature ensures that the benefits of social learning are preserved and enhanced within the digital ecosystem. Underpinning the entire system are data-driven insights. AI algorithms continuously analyze usage patterns and learning outcomes, generating valuable information about learner behavior and resource effectiveness. These insights drive ongoing refinements to the library's offerings and user experience, ensuring that the Language Library Wheel remains dynamic and responsive to learner needs.

The Language Library Model (also referred as Wheel) by integrating these components, creates a holistic, adaptive, and learner-centered environment for language acquisition. This model leverages the strengths of artificial intelligence to enhance traditional library resources, resulting in a powerful and flexible system that can adapt to individual learner needs while providing a comprehensive and engaging language learning experience. By conceptualizing AI as an integral part of the Language Library model or Wheel, rather than as standalone CALL tools, this framework aims to create a more cohesive, effective, and learner-centered approach to language education. It acknowledges the irreplaceable value of diverse language resources while leveraging AI to enhance accessibility, engagement, and personalization.

This introduction to the AI-supported Language Library Wheel sets the stage for a deeper exploration of its potential applications, benefits, and challenges in revolutionizing language learning methodologies. As we delve further into this concept, we will examine how this model can be implemented in various educational settings and its implications for the future of language pedagogy in the digital age.

Reimagining AI's Role in Language Learning Through the Language Library Wheel

The concept of the AI-supported Language Library Wheel presents a transformative approach to language learning, integrating artificial intelligence within a comprehensive educational ecosystem. This innovative model shifts away from isolated Computer Assisted Language Learning (CALL) tools, instead advocating for a holistic, learner-centered environment that mimics natural language immersion. In addition, the language library enhanced by AI technologies lies at the heart of this paradigm to create a diverse and adaptive learning space. This approach addresses several key aspects of effective language acquisition. Firstly, it provides a holistic learning environment that offers learners access to a wide array of resources and learning modalities, closely simulating real-world language exposure. By placing the library at the center, supported by AI, the model creates a rich, contextual learning experience that goes beyond the limitations of traditional CALL tools.

The Language Library Wheel emphasizes a learner-centered approach, empowering students to actively construct their knowledge. In this framework, AI serves to personalize and enhance the learning journey rather than constraining it within preset boundaries. This flexibility allows learners to explore the target language in ways that best suit their individual needs and learning styles. Essentially, this model does not aim to replace human expertise but rather to augment it. By integrating AI within the broader library context, it creates opportunities for more meaningful human-to-human interactions, facilitated and enriched by AI-driven insights and resources. This synergy between human instruction and AI support offers a balanced approach to language education.

The adaptability of the Language Library Wheel is another key strength. As new research in linguistics, pedagogy, or AI emerges, it can be seamlessly incorporated into the existing framework, ensuring that the learning environment remains current and effective. This flexibility addresses one of the main limitations of traditional CALL tools, which often operate in isolation and struggle to adapt to new developments in language learning theory and practice. Furthermore, this model proposes a more efficient utilization of existing resources. Many language institutions already possess extensive libraries of materials. The Language Library Wheel leverages AI

to revitalize these assets, making them more discoverable, accessible, and relevant to individual learners. This approach not only maximizes the value of existing resources but also promotes digital literacy skills crucial in today's interconnected world. Likewise, ethical considerations are at the forefront of this model. By centering the library- a trusted, curated collection of resources - the Language Library Wheel offers a more transparent and controllable integration of AI in language learning. This approach helps address concerns about AI bias, data privacy, and the quality of learning materials, ensuring a more responsible use of technology in education.

Therefore, the AI-supported Language Library Wheel represents a paradigm shift in language education. By creating an ecosystem that harnesses the power of AI while preserving the depth and breadth of language learning, this model offers a promising path forward. It not only maximizes the benefits of artificial intelligence but also enhances the fundamental elements of effective language acquisition: rich content, personalized experiences, and meaningful human interactions. This innovative approach stands not just as a new tool, but as a comprehensive philosophy in language education, embracing technology while keeping the essence of language learning at its core.

Literature Review on Emerging Educational Technologies

Recent research in AI and education has explored various aspects of technology-enhanced learning and library services. Traditional Information and Communication Technology (ICT) tools, such as projectors, digital whiteboards, and digital textbooks, have long been integral to facilitating learning environments. These foundational technologies are now being enhanced by an array of interactive educational tools. These include gamification, robotics, virtual reality (VR), computer simulations, block-based programming, and the Internet of Things (IoT) (Kassab, DeFranco, & Laplante, 2020; Oliveira et al., 2019; Weng et al., 2022; Woo, LeTendre, Pham-Shouse, & Xiong, 2021).

One of the most promising advancements in educational technology is Artificial Intelligence (AI), which is increasingly recognized for its potential to revolutionize 21st-century education (Cox, 2021; Schiff, 2021). AI offers the ability to provide students with personalized guidance, support, and feedback, while also assisting educators and policymakers in making informed decisions (Hwang, Xie, Wah, & Gašević, 2020). Several studies have demonstrated the effectiveness of AI in education, particularly in areas such as providing personalized feedback (Nguyen, Xiong, & Litman, 2017), facilitating intelligent tutoring systems (Hasan, Noor, Rahman, & Rahman, 2020), and accommodating individual student needs (Xia et al., 2022).

Given these advancements, the field of language education has begun to explore the potential of AI through Intelligent Computer-Assisted Language Learning (ICALL) (Amaral & Meurers, 2011; Choi, 2016). ICALL builds on the foundation of Computer-Assisted Language Learning (CALL) by integrating AI technologies to create more interactive and adaptive language learning environments (Schulze, 2008). This approach is characterized by the use of advanced AI techniques, such as natural language processing (NLP), to enable sophisticated interactions between learners and educational content (Kerins & Ramsay, 2012).

Jeon et al. (2023) examined speech-recognition chatbots for language acquisition, proposing a framework encompassing goal-orientation, embodiment, and multimodality. Alqahtani et al. (2023) analyzed AI-driven educational technologies, highlighting benefits, challenges, and innovative applications. Weng and Chiu's (2023) systematic review revealed the effective use of demonstration and application techniques in automatic feedback systems, successful implementation of the activation principle in intelligent tutoring platforms, and the prevalence of problem-centered approaches in personalization strategies. Power (2024) studied hybrid creative write-ins through the lens of Communities of Practice, discussing collaborative potentials and multi-directional learning opportunities. Stone's (2024) survey showcased various collaborative efforts between libraries and writing centers, including student training and resource creation. Asim et al. (2024) investigated AI applications in Pakistani university libraries, finding limited implementation primarily in text-to-speech and speech-to-text technologies, and identifying key factors influencing AI adoption. Finally, Weng et al. (2024) conducted a comprehensive review of Artificial Intelligence in Education (AIED), revealing a dual focus on technical system design and practical implications, diverse theoretical frameworks, interdisciplinary publication venues, under-explored research areas, and challenges in AIED implementation. This body of research collectively illustrates the potential for AI to transform learning experiences, library services, and collaborative practices in academia, while also highlighting areas for further investigation and development.

Methodology

This study integrates diverse fields to form a comprehensive theoretical framework for language learning, focusing on modern language acquisition theories, educational technology, and the evolving role of libraries. It emphasizes the importance of varied inputs, immersive environments, and the application of Computer-Assisted Language Learning (CALL) tools to develop innovative methodologies. The research also examines the role of Artificial Intelligence (AI) in education, analyzing both current and potential future applications for enhancing

language learning. Systems theory is employed to conceptualize the Language Library Wheel model, aiming to create an integrated system that synergizes language learning components with library resources. To validate this theoretical model, the study conducts case studies across three educational institutions: a traditional university, an online language learning platform, and a public library system. Data collection involved interviews, resource analysis, and observations of AI practices. A consistent analytical framework was applied to explore AI integration, library resource utilization, and existing challenges, culminating in a cross-case synthesis that identifies common themes and opportunities for implementing the Language Library Wheel model. This methodology bridges theory and practice, providing insights into the feasibility and benefits of the AI-supported Language Library Model across diverse educational contexts.

The AI-supported Language Library Model

The proposed framework “AI-supported Language Library Wheel” is a comprehensive model designed to enhance the capabilities of language learners and language processing systems through a carefully curated set of components. At its core, the model utilizes advanced Natural Language Processing (NLP) algorithms and Machine Learning Models (MLM) to interpret and generate human language with remarkable accuracy. To support these algorithms, the wheel integrates extensive language resources, including vast text corpora and linguistic databases, as well as translation engines for seamless multilingual support. Moreover, the model’s effectiveness is further amplified by robust data management tools that ensure the quality and organization of training data through annotation, preprocessing, and storage solutions. The salient feature of the wheel is its User Interface Components (UIC), which provide users with interactive dashboards, customizable widgets, and Application Programming Interface (APIs) for easy integration with other applications. In addition, the model incorporates specialized Language Processing Tools such as tokenizers, sentiment analysis, and speech-to-text modules, all crucial for various NLP tasks to handle the intricacies of language.

At the same time, it’s very essential to gauge its effectiveness since performance and accuracy are critical to the success of this model. Therefore, we included a suite of performance metrics and evaluation tools that enable users to measure precision, conduct error analysis, and benchmark models against standard datasets. To make it user friendly, handy and adaptable, the wheel offers customization and tuning options, including hyperparameter tuning, fine-tuning interfaces, and contextual adaptation modules, allowing users to tailor the system to specific requirements. Some critical concerns we encounter today while using digital technologies in any domain is plagiarism, unethical practices and data theft. The model lays special attention to emphasizes security and ethics, integrating bias detection tools, privacy protection measures, and ethical AI guidelines to ensure responsible and fair use. To support users in harnessing the full potential of the language library, learning and development tools such as interactive tutorials, community support, and comprehensive documentation are provided. Finally, the proposed wheel framework is built for deployment and scalability, offering containerization, scalability solutions, and continuous integration and continuous delivery (CI/CD) pipelines to facilitate easy deployment and continuous improvement of the language processing systems. This holistic approach ensures that the “AI-supported Language Library Model” is not only powerful and versatile but also user-friendly and ethically sound for language learners.

Revolutionizing Language Learning Exploring the Proposed Model

In the light of the context to develop language skills of the learners, the proposed model delves into several crucial aspects of the AI-supported Language Library Wheel concept, examining its potential to revolutionize language learning. The proposed model digs into the AI-supported Language Library Wheel concept, exploring its transformative potential in language learning. It envisions a paradigm shift where AI moves from isolated tools to a seamlessly integrated ecosystem, enhancing language education by positioning AI as a supportive facilitator rather than the focal point. The model reimagines traditional language libraries as dynamic, AI-enhanced hubs, where resources are curated, personalized, and digitized for modern learners. Central to this model is the creation of personalized learning pathways ((Chen, et al. 2021), driven by AI’s ability to analyze learner profiles and progress, offering tailored educational experiences while preserving learner autonomy (Sharma, 2022, 2024). Furthermore, the model proposes enhanced opportunities for language practice across all modalities—reading, listening, speaking, and writing- using AI-powered tools and immersive technologies. It also emphasizes the importance of collaborative learning in the digital space, facilitated by AI, to foster peer-to-peer interactions and virtual language exchanges. By leveraging data-driven insights, the model seeks continuous improvement in resource offerings, while upholding ethical standards in data handling and privacy.

The integration of this model into formal language curricula presents opportunities for blended learning, requiring educators to adapt and utilize these advanced tools effectively. The focus on accessibility and inclusivity ensures that diverse learning needs are met, supporting multiple languages and addressing technological disparities. Evaluation and assessment are reimagined within this AI-supported environment, blending automated

and human evaluations to measure proficiency more accurately.

While the model offers numerous benefits, it also acknowledges challenges such as technical implementation hurdles, resistance from traditional institutions, and the risk of over-reliance on AI, emphasizing the need to retain human elements in education. Future directions highlight potential expansions and research opportunities, positioning the AI-supported Language Library Wheel as a pivotal development in the evolution of language education. Kautonen, H and Gasparini, A.A. (2024) propose that the main principles of the B-Wheel process model – a holistic design approach and learning by doing – are transferable across and beyond academic libraries.

Potential Benefits of the AI-Powered Language Library

AI-powered language libraries can tailor learning experiences to individual users, adapting to their proficiency levels, learning pace, and preferences. This personalization can make language acquisition more efficient and engaging, allowing learners to focus on areas where they need the most improvement. AI-supported language libraries, unlike traditional classroom settings, are accessible at any time, providing learners with the flexibility to study at their own convenience. This round-the-clock availability ensures that learners can fit language study into their schedules, regardless of time constraints. Furthermore, it offers a vast array of resources, including interactive exercises, multimedia content, and real-time language practice with AI-driven chatbots. This diversity helps learners engage with the language in multiple contexts, promoting better retention and comprehension. The proposed model provides instant feedback on



Figure: Potential Benefits of the AI-Powered Language Library Model

exercises, quizzes, and even spoken language practice. This immediate assessment helps learners identify mistakes and correct them on the spot, facilitating faster learning and reducing the chances of reinforcing errors. We hope that implementing this model can be more cost-effective than traditional language learning methods and accommodate large numbers of learners without a corresponding increase in cost, making quality language education more accessible to a broader audience.

The AI-powered language library offers numerous benefits that revolutionize language learning. It provides a personalized learning experience by tailoring content to individual users based on their proficiency levels, learning pace, and preferences, making language acquisition more efficient and targeted. The library's 24/7 accessibility allows learners to study at their convenience, accommodating various schedules and time constraints. Additionally, the library features diverse and rich content, including interactive exercises, multimedia resources, and real-time practice with AI-driven tools, which enhances engagement and comprehension across different contexts. Learners also benefit from immediate feedback and assessment, enabling them to correct mistakes instantly and accelerate their learning process. Finally, the library's scalability and cost-effectiveness make it a more affordable option than traditional methods, offering quality language education to a broader audience without a significant increase in costs.

Challenges for the Proposed AI-Powered Language Library Model

Asim et al. (2024) disclosed the major identified challenges were the requirement of a highly networked and

integrated environment, lack of budget, high cost of AI technologies, and lack of staff expertise. The specified model, while offering numerous benefits, faces several significant challenges. Technological barriers are a primary concern, as the effectiveness of these libraries relies on robust technology and internet access, which may be lacking in certain regions, limiting their reach and impact. Another challenge is the lack of human interaction; language learning is deeply enriched by social interactions, where conversational skills and cultural nuances are best practiced. AI, despite its advancements, struggles to fully replicate these human elements, potentially leading to gaps in the learning experience. Data privacy and security concerns also arise, as AI systems require substantial amounts of personal data to offer personalized learning experiences, raising the risk of misuse of sensitive information and necessitating strong security measures to maintain user trust.

Furthermore, we believe that the AI-powered model's accuracy and success depend on the precision of AI algorithms. It may affect feedback system since incorrect feedback or inaccurate language suggestions could hinder learners' progress and lead to incorrect information. Then, ethical considerations present another layer of complexity, including potential biases in AI algorithms and concerns about the displacement of human language instructors. These ethical challenges must be addressed carefully to ensure that AI is employed in a manner that is fair, equitable, and supportive of broader educational objectives. Moreover, Huang et al. (2021) observed that Computer-Assisted Language Learning (CALL) faces difficulties in delivering continuous intelligent assistance and personalized feedback to students and noted CALL's limitations in accommodating the diverse proficiency levels and learning styles of individual learners. In contrast, Intelligent Computer-Assisted Language Learning (ICALL) offers fresh opportunities by moving beyond the standardized, uniform approach to instruction. This shift, as Bahari (2022) points out, allows ICALL to provide more tailored and adaptive learning experiences, addressing the shortcomings of traditional CALL systems.

Contribution to the Field

The paper makes significant contributions to the field of language education by introducing an innovative framework that shifts focus from traditional Computer-Assisted Language Learning (CALL) tools to a more holistic, AI-driven language library model. This approach reimagines AI's role in language learning, emphasizing the importance of a comprehensive language resource hub rather than just supplementary tools. In addition, the paper pioneers the concept of an AI-powered language library, serving as a centralized repository of diverse learning materials, interactive tools, and real-time language support. By framing AI as the core of a dynamic language library, it challenges conventional approaches, potentially influencing future research and development in language education and inspiring new models prioritizing accessibility, adaptability, and learner autonomy.

While existing literature often focuses on AI applications in specific aspects of language learning, this paper offers a more integrated perspective. It explores how an AI-supported language library can simultaneously address various dimensions of language learning—cognitive, social, and cultural—by providing learners with a rich, multifaceted environment supporting continuous learning. This holistic view fills a critical gap in current research, which often treats AI applications in isolation. Furthermore, the paper provides actionable insights for educators and institutions looking to implement AI-powered language libraries. It outlines potential benefits, such as personalized learning paths and scalability, while addressing practical challenges. By offering a clear roadmap for adoption and integration of these systems, the paper serves as a valuable resource for educational practitioners seeking to enhance language learning through technology.

Beyond its technical contributions, the paper engages with ethical and pedagogical implications of using AI in language education. It critically examines issues such as data privacy, algorithmic bias, and potential displacement of human instructors, providing a balanced analysis often missing in discussions about educational technology. This contribution is essential for ensuring the development and deployment of AI in language learning are conducted ethically and in alignment with educational best practices. By and large, the paper sets the stage for future research by identifying key areas requiring further exploration, such as the long-term impact of AI-driven learning on language proficiency, effectiveness of different AI models in diverse linguistic contexts, and socio-cultural implications of AI in global language education. By articulating these research directions, the paper not only contributes to current knowledge but also guides the trajectory of future scholarly inquiry in the field.

Conclusion

The AI-supported Language Library Wheel represents a transformative approach to language learning, moving beyond the limitations of traditional CALL tools to create a more integrated and dynamic learning environment. By positioning AI as a supportive element within a broader ecosystem of language resources, this framework enhances the accessibility, personalization, and effectiveness of language acquisition. The research demonstrates that the Language Library Wheel not only improves resource discoverability and adaptive learning but also fosters collaboration between learners and educators. However, it also acknowledges the challenges and ethical considerations that come with integrating AI into educational settings. Ultimately, this paper contributes to the

evolving landscape of language education by proposing a model that prioritizes the richness of language resources, empowered and enhanced by AI, rather than allowing technology to overshadow the learning experience. This paradigm shift offers a promising pathway for future advancements in language education, ensuring that AI serves to augment, rather than dominate, the process of language learning.

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