

A Technology-Mediated Approach to Addressing Reading Diversity in German Classrooms

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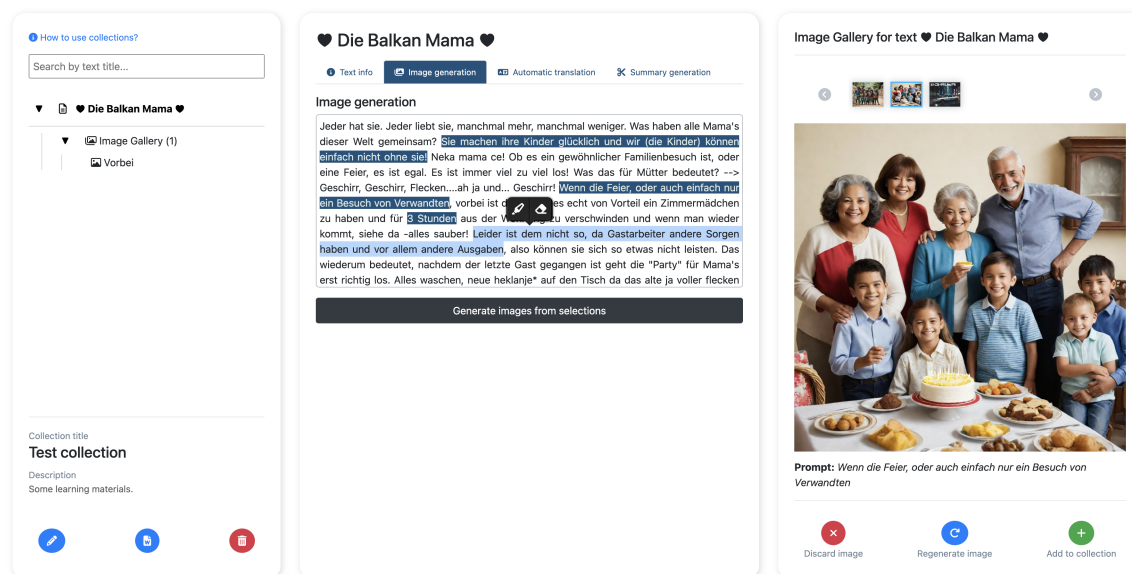


Fig. 1. To prepare a session, the teacher can explore a collection of real texts within a thematic area and with specific linguistic characteristics that will later be supplemented with various tools offered on the platform. Reading comprehension for students can be enhanced by generating images that visually represent key parts of the text based on the teacher's specific needs. In this example, the user has highlighted particular sections of the text to generate relevant images that depict a family gathering, helping to make the content more engaging and easier to understand.

CCS Concepts: • **Human-centered computing** → **User studies; Field studies; Empirical studies in HCI.**

Additional Key Words and Phrases: Language teaching, Text-to-text, Text-to-image, Generative AI, German teachers, Reading skills

1 Introduction

The ability to read and understand multiple languages is crucial in today's interconnected world, especially for European youth. Proficiency in foreign language reading enhances individuals' capacity to access international information, engage with diverse perspectives, and collaborate in complex multinational problem-solving scenarios. However, developing such skills presents significant pedagogical challenges that extend beyond the capabilities of traditional

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educational resources like textbooks [5]. The LATILL (Level-Adequate Texts in Language Learning) [4] project was initiated to address these educational needs, primarily focusing on German as a Foreign Language (GFL) and Second Language (GSL) teachers. This initiative is particularly timely given the academic commitment to improving reading comprehension within German language curricula. One of the fundamental challenges in language education is the sourcing of suitable authentic texts. Educators often turn to news articles, blogs, or literary excerpts, but these sources may have complex syntactic structures, specialized jargon, or cultural references that exceed the learners' proficiency levels. Moreover, copyright laws restrict the reproduction and distribution of many high-quality materials, limiting the diversity of texts educators can offer to their students. Recognizing these challenges, LATILL offers a personalized learning platform (see Figure 1) designed to enhance German language reading comprehension [16] among European youth. Developed around a centralized corpus of texts sourced from public domains and open-access materials, the platform addresses the limitations of traditional teaching methods. LATILL integrates various AI technologies to streamline the creation of educational resources, especially utilizing generative AI to provide real-time translations, summaries, and visual aids. This paper explores the design, implementation, and evaluation of LATILL, with a specific focus on its use of generative AI and human-computer interaction (HCI) to address these challenges. It will highlight the design decisions, the integration of AI features, and the user feedback that informed its iterative development.

2 Integration of Generative AI in Language Teaching

Generative AI (GenAI) is revolutionizing various fields, including education. By leveraging tools like ChatGPT, Copilot, and Midjourney, GenAI can create a wide range of content such as text, images, audio, and video. In the field of education, GenAI is transforming how content is created, personalized, and how teaching and learning processes are conducted. While there's a growing body of research on GenAI in education [9, 19], especially for English language learning [6, 7, 13], the application of GenAI in teaching German is still relatively unexplored. Although large language models (LLMs) for German exist, many rely on translation to and from English, limiting their potential. The LATILL project directly addresses this gap by exploring the use of GenAI to support German language learning. The integration of GenAI in education also highlights the importance of user experience and human-computer interaction (HCI). By creating intuitive and efficient interfaces, GenAI can better adapt to user needs and provide personalized learning experiences [15]. Research in HCI [10] has shown the potential of combining GenAI with project-based learning to foster critical thinking and empathy, and explored the integration of HCI and GenAI to create more user-centric applications [1, 2, 8, 14]. In the context of LATILL, GenAI is used to create personalized learning materials, such as real-time translations, simplified texts, and visual aids. These tools are designed to address the specific challenges faced by German language teachers, including the need for texts that match different proficiency levels and the need for resources that can be adapted to diverse classroom settings.

3 Design of the LATILL platform

The design of the LATILL platform was centered around close collaboration with German as a Foreign Language (GFL) and Second Language (GSL) experts. A workshop was organized to introduce these experts to the concept of user stories and gather their input, which resulted in 41 user stories that defined the platform's necessary functionalities. These stories highlighted various needs and priorities, influencing the design and development process. The primary target users are GFL and GSL teachers, including pre-service teachers, and the platform accommodates both registered and unregistered users, with students as indirect users. Key prioritized functionalities of the LATILL platform include:

- (1) A German text search tool with diverse filters based on CEFR level [11, 12, 17, 18], topic, text type, word count, and other criteria, which was identified as the highest priority.
- (2) An intuitive results viewer providing text and copyright details, a source link, text saving options, and sorting.
- (3) User accounts allowing teachers to save and organize favorite texts.
- (4) Text export and sharing in Word or PDF format, with unique links for sharing with students.
- (5) Text upload for registered users to analyze their own texts.
- (6) Educational resources and methodological recommendations for working with authentic texts.
- (7) Interface customization options, such as day/night mode, fonts, and colors, to enhance accessibility.
- (8) A strategy and material search tool to help teachers find teaching strategies and additional materials.
- (9) Task generation, while identified as a lower priority, allows teachers to automatically generate tasks based on selected texts.

The development of LATILL followed an iterative process involving rapid prototyping and evaluation [3]. Core functionalities like the text search tool, results viewer, and user accounts were refined through multiple rounds of testing and feedback. A key aspect of LATILL's design is the integration of generative AI to create personalized learning materials. This includes:

- **Machine Translation:** AI-powered tools for accurate, context-sensitive translations of German texts into students' native languages, addressing linguistic barriers.
- **Text Simplification:** AI algorithms to generate simplified versions of texts for students with lower proficiency, preserving the educational value of the original text. The platform shifted its focus from summarization to simplification, addressing conceptual appropriateness in addition to linguistic complexity.
- **Image Generation:** AI is used to create relevant illustrations or diagrams to enhance understanding and engagement. This feature was revised to give users more control over parameters (style, cultural relevance, etc).
- **Text Collections:** This feature groups authentic texts with their AI-generated content (translations, summaries, images) for efficient resource management. Originally called "text bundles," it was renamed "collections" based on user feedback for better understanding and usability.

The platform's design also addresses the need for accessible and adaptable resources. Teachers can export collections in editable formats like Word documents, providing greater flexibility in creating tailored materials. The platform prioritizes the use of public domain and open-access materials to ensure compliance with intellectual property laws, allowing educators to utilize resources confidently.

4 Lessons learned

The LATILL project's collaboration with language teaching specialists and GFL/GSL teachers provided valuable insights into the challenges and opportunities of teaching young language learners in the digital age. Key lessons from the LATILL experience, considering both researcher perspectives and teacher feedback, will inform future research projects leveraging generative AI in language education. Key lessons include:

- **Image generation needs user control and moderation:** The initial AI-generated images in LATILL often missed the mark due to a lack of contextual depth in the prompts, which were automatically derived from highlighted text. The system needs to allow teachers to set parameters for style, cultural relevance, and context to ensure the images are appropriate for the target audience and teaching goals. Also, moderation features are needed to prevent inappropriate images.

- Text simplification is more critical than summarization: While the platform initially prioritized text summarization, teachers found that text simplification, which adapts texts to different CEFR levels, was more useful. Summarized texts, while shorter, often lacked the pedagogical depth and conceptual richness needed for effective teaching. The platform's focus was re-engineered to reduce linguistic complexity while maintaining conceptual clarity, recognizing that simplification must also address conceptual appropriateness for the intended audience, not just linguistic simplification.
- Translation utility varies across contexts: The perceived utility of the translation feature varied. Some teachers, especially in more homogeneous classrooms, did not see the initial need for translation tools, while teachers in multilingual settings found the feature invaluable for bridging linguistic gaps. This highlights the need for flexible platform features that accommodate diverse educational settings and needs. Also, there is the risk of students over-relying on translations, which can hinder language acquisition.
- The "text bundles" concept was confusing: The initial "text bundles" feature was confusing for teachers. Card sorting activities revealed that the term "collections" was more intuitive and aligned better with teacher workflows. The platform was redesigned to simplify the collection-building process to improve usability.
- Content export needs to be flexible: Teachers need the ability to copy and paste materials from collections or download collections in editable formats like Word documents to allow for customization. The original static PDFs limited their ability to adapt content to their specific needs and institutional standards.

The initial "text bundles" feature and the need for flexible content export, while not directly GenAI features, are crucial for the overall success of the LATILL platform and its AI integration. The platform uses GenAI to create translations, summaries, simplified texts, and visual aids, and these AI-generated resources need to be organized coherently, which is what the "collections" feature achieves. This is not just about organization, but about making sure teachers can use the tools. Furthermore, the generated content is intended for practical classroom application, so teachers need to be able to export and adapt it to their teaching style in editable formats, and static PDFs limit this. User experience is critical for AI adoption, and if the user experience is poor, teachers won't use the platform, no matter how advanced its AI. The shift to "collections" and flexible export options came directly from user feedback, underscoring the importance of iterative design in ensuring AI-powered tools are actually usable. Finally, teachers require the flexibility to customize materials for their specific classrooms, and static outputs from GenAI are insufficient, highlighting the need for platforms that respond to teachers' needs.

5 Conclusions

LATILL demonstrates that using an agile approach with generative AI can create a personalized language learning platform. While generative AI is valuable for creating learning materials and providing feedback, human educators must guide its use. Ethical concerns, such as data privacy and bias, must be addressed. AI models require continuous evaluation and improvement based on teacher and student feedback. The use of AI should be tailored to specific educational needs. It's also essential to recognize AI limitations and supplement it with additional resources when needed. The successful use of AI requires a balanced approach that combines human and machine intelligence. LATILL uses a curated collection of texts from public domain and open-access sources, which forms the foundation of its AI features. Overall, the LATILL project underscores the transformative potential of generative AI in language education, while emphasizing the need for human oversight, ethical considerations, and continuous improvement.

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References

- [1] Mohammad Abolnejadian, Sharareh Alipour, and Kamyar Taeb. 2024. Leveraging ChatGPT for Adaptive Learning through Personalized Prompt-based Instruction: A CS1 Education Case Study. In *Extended Abstracts of the CHI Conference on Human Factors in Computing Systems*. 1–8.
- [2] Chih-Pu Dai, Fengfeng Ke, Nuodi Zhang, Alex Barrett, Luke West, Saptarshi Bhowmik, Sherry A Southerland, and Xin Yuan. 2024. Designing conversational agents to support student teacher learning in virtual reality simulation: a case study. In *Extended Abstracts of the CHI Conference on Human Factors in Computing Systems*. 1–8.
- [3] Alicia García-Holgado, Andrea Vázquez-Ingelmo, Nastaran Shoeibi, Roberto Therón, and Francisco José García-Peñalvo. 2024. Enhancing Language Learning Through Human-Computer Interaction and Generative AI: LATILL Platform. In *International Conference on Human-Computer Interaction*. Springer, 255–265.
- [4] Martina Kienberger, Alicia García-Holgado, Karen Schramm, Anne Raveling, Detmar Meurers, Bohdana Labinska, Tetiana Koropatnitska, and Roberto Therón. 2022. Enhancing adaptive teaching of reading skills using digital technologies: the latill project. In *International conference on technological ecosystems for enhancing multiculturalism*. Springer, 1092–1098.
- [5] Martina Kienberger and Karen Schramm. 2023. *Lesedidaktik Deutsch als Fremdsprache: Aktuelle Entwicklungen und Ansätze*. Peter Lang.
- [6] Locky Law. 2024. Application of generative artificial intelligence (GenAI) in language teaching and learning: A scoping literature review. *Computers and Education Open* (2024), 100174.
- [7] Jang Ho Lee, Dongkwang Shin, and Wonjun Noh. 2023. Artificial intelligence-based content generator technology for young English-as-a-foreign-language learners' reading enjoyment. *RELJ Journal* 54, 2 (2023), 508–516.
- [8] Jullia Lim. 2024. The Potential of Learning With AI-Generated Pedagogical Agents in Instructional Videos. In *Extended Abstracts of the CHI Conference on Human Factors in Computing Systems*. 1–6.
- [9] Rosario Michel-Villarreal, Eliseo Vilalta-Perdomo, David Ernesto Salinas-Navarro, Ricardo Thierry-Aguilera, and Flor Silvestre Gerardo. 2023. Challenges and opportunities of generative AI for higher education as explained by ChatGPT. *Education Sciences* 13, 9 (2023), 856.
- [10] Anders I Mørch and Renate Andersen. 2023. Human-Centred AI in education in the age of generative AI tools. *Proceedings http://ceur-ws.org ISSN 1613* (2023), 0073.
- [11] Contanze Niederhaus. 2011. *Fachsprachlichkeit in Lehrbüchern*. Vol. 10. Waxmann Verlag.
- [12] Council of Europe. Council for Cultural Co-operation. Education Committee. Modern Languages Division. 2001. *Common European framework of reference for languages: Learning, teaching, assessment*. Cambridge University Press.
- [13] Austin Pack and Jeffrey Maloney. 2023. Potential affordances of generative ai in language education: Demonstrations and an evaluative framework. *Teaching English with Technology* 23, 2 (2023), 4–24.
- [14] Minju Park, Sojung Kim, Seunghyun Lee, Soonwoo Kwon, and Kyuseok Kim. 2024. Empowering personalized learning through a conversation-based tutoring system with student modeling. In *Extended Abstracts of the CHI Conference on Human Factors in Computing Systems*. 1–10.
- [15] Wendy Roldan, Xin Gao, Allison Marie Hishikawa, Tiffany Ku, Ziyue Li, Echo Zhang, Jon E Froehlich, and Jason Yip. 2020. Opportunities and challenges in involving users in project-based HCI education. In *Proceedings of the 2020 CHI conference on human factors in computing systems*. 1–15.
- [16] Hendrik Schuff, Lindsey Vanderlyn, Heike Adel, and Ngoc Thang Vu. 2023. How to do human evaluation: A brief introduction to user studies in NLP. *Natural Language Engineering* 29, 5 (2023), 1199–1222. <https://doi.org/10.1017/S1351324922000535>
- [17] Zarah Weiss and Detmar Meurers. 2018. Modeling the readability of German targeting adults and children: An empirically broad analysis and its cross-corpus validation. In *Proceedings of the 27th International Conference on Computational Linguistics*. 303–317.
- [18] K Wisniewski. 2023. Lesen im und mit dem GER. Eine kritische Auseinandersetzung-und ein Plädoyer für erweiterte (rezeptive) Referenzniveaubeschreibungen des Deutsche. *Lesedidaktik Deutsch als Fremdsprache. Aktuelle Entwicklungen und Ansätze* (2023), 13–38.
- [19] Ali Zeb, Rafid Ullah, and Rehmat Karim. 2024. Exploring the role of ChatGPT in higher education: opportunities, challenges and ethical considerations. *The International Journal of Information and Learning Technology* 41, 1 (2024), 99–111.