Enhancing Language Learning Through Human-Computer Interaction and Generative AI: LATILL Platform

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Abstract. Reading comprehension is crucial in German as a Foreign Language (GFL) education. Despite its importance, there has been limited scholarly engagement in enhancing reading strategies and materials that align with learners' proficiency levels, as outlined by the Common European Framework of Reference for Languages (CEFR). The LATILL project aims to address this gap by providing open educational resources tailored to the CEFR levels and a platform based on AI-tools for German as a foreign and second language teachers. A user-centred approach was adopted, utilizing Human-Computer Interaction techniques to enhance usability and the user experience of the LATILL platform. The development and deployment of the LATILL platform represents significant strides in leveraging AI and HCI to support language teaching. This work outlines the efforts to enhance the use of the platform, involving secondary school teachers of German as a foreign language from Ukraine and Spain. Two phases were conducted, one phase for testing the platform following a constructive interaction approach and a second phase for collecting feedback through focus groups.

Keywords: language teaching · text-to-text · text-to-image · focus groups · German teachers · generative AI · reading skills

1 Introduction

Enhancing reading comprehension is paramount within the framework of numerous German as a Foreign Language (GFL) curricula. The importance of this educational goal cannot be overstated, yet scholarly engagement in this area has remained modest in recent years. Kienberger and Schramm [1, 2] have delineated key research domains that merit attention. Among these are inquiries into text and corpus linguistics focusing on issues of textual comprehensibility, readability, and the alignment of texts with proficiency levels as outlined by the Common European Framework of Reference for Languages (CEFR) [3]. Representative studies in this vein include the work of Niederhaus [4], Weiss and Meurers [5], and Wisniewski [6], each contributing valuable insights into readability and CEFR level adequacy as central topics.

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Moreover, the exploration of cognitive and metacognitive processes that facilitate reading comprehension has emerged as a vital strand of research Ehlers [7] and Meireles [8]. Recent doctoral research [9–11], primarily concentrates on the reading strategies and competencies of university-level German as a Foreign Language learners from diverse linguistic backgrounds. However, given the global predominance of school-aged learners within the GFL demographic, there is a pressing need to expand research efforts to encompass this group more fully, thereby ensuring a broader and more inclusive understanding of reading comprehension challenges and strategies in the context of GFL education.

The LATILL (Level-Adequate Texts in Language Learning) project [12] aims to provide open educational resources for GFL and German as a second language (GSL) teachers that meet the need for current, authentic and, most importantly, level-appropriate reading texts and didactic materials. It is a proposal of the Erasmus + programme of the European Union (Ref. 2021–1-AT01-KA220-SCH-000029604) under the coordination of the Universität Wien (Austria) and with the participation of the University of Salamanca (Spain), Eberhard Karls Universität Tübingen (Germany), Chernivtsi National University Yuriy Fedkovych (Ukraine), and Verein Österreichisches Sprachdiplom Deutsch (Austria).

To achieve this goal, a platform for GFL and GSL teachers is being developed, the main purpose of which is to facilitate the search for authentic texts in German according to the subject, CEFR level. The platform is linked to a corpus of German texts produced as part of the project. The corpus includes text from different sources under licenses that allow modification (over 10000 texts), such as Klexikon (http://www.klexikon.de) or Das Biber (https://www.dasbiber.at); and sources that do not allow modification (over 6000 texts) such as Fluter (https://www.fluter.de). These texts are analysed using Natural Language Processing (NLP) techniques in order to determine different aspects, including subject matter and complexity according to CEFR level.

Among the functionalities of the platform, the integration of different techniques based on Artificial Intelligence (AI) to generate text bundles —sets of variations of texts, such as simplifications or illustrated texts derived from the original— that can be used in the classroom and adapted to the level of the students is noteworthy. In this sense, the platform allows the teacher to create bundles from a text located through the search tool, in such a way that a summary version of the text can be generated from it. We are also working on simplification, that is, a new text will be automatically generated with a lower CEFR level than the original one. The aim of this simplification is to facilitate the adaptation of the text to the different levels of learning that may coexist in a language teaching classroom. Other means of adaptation can be produced by generating from the original translations into different languages aimed at supporting students from different nationalities. These functionalities enrich the text search process and support an adaptive learning model.

Finally, among the features offered by the platform, the use of texts at CEFR levels A1 and A2 has been addressed. At these levels, texts are accompanied by images, so that the visual part is a fundamental element in the learning process. The search for authentic texts with associated images which are also A1 and A2 level texts is complex. To solve this problem, the LATILL platform incorporates the generation of images through AI.

The teacher can choose parts of the text and request that an image be generated to illustrate it.

Currently, the use of AI tools for the teaching context is growing, although the concept of NLP, including its advantages as a language learning medium, is not yet well known [13]. The platform developed in LATILL brings the use of these tools closer to a real-life context, supporting German as a foreign language teachers and facilitating the use of AI techniques without the need for any technical background knowledge of them [14].

The development of the LATILL platform follows a user-centred approach, applying Human-Computer Interaction techniques and methods to consider usability and user experience as key objectives. This study describes the process to improve the interaction with the generative AI tools involving secondary school teachers of German as a Foreign Language from Ukraine and Spain.

This work is organised into six sections. The next section introduces previous works related to generative AI in education. Section 3 introduces the methodology conducted to evaluate the LATILL platform based on workshops and focus groups. Sections 4 and 5 describes the main results of the focus groups and the impact in the development of the platform. Finally, last section summarizes the main conclusions.

2 Previous Works

Generative AI can create various types of content like text, images, and videos, using tools like ChatGPT for text and Midjourney for images. Therefore, its implementation in education transforms how content is created and personalized for learning, but also it can transform the teaching and assessment processes [15]. It facilitates the development of customized educational materials, interactive simulations based on the unique needs of each student [16]. In the context of foreign language teaching, there are studies focused on English as a foreign or second language [17–19]. However, there are no experiences integrating these tools in teaching German. Although there are large language models (LLM) that work in German, such as German BERT (Bidirectional Encoder Representations from Transformers), DBMDZ BERT or Multilingual BERT, most of the models that are arising rely on translating the input from German into English and vice versa for the output.

On the other hand, there is a need of improving the user experience and usability of the tools that integrates generative AI in education. HCI's focus on creating intuitive, efficient interfaces aligns with generative AI's capability to anticipate and adapt to user needs, facilitating personalized interactions. Roldan et al. [20] emphasize the importance of understanding user challenges in HCI education and the potential of project-based learning involving real users.

Combining HCI principles with generative AI gives a unique opportunity to how users interact with technology, making it more accessible, engaging, and practical, which enhances user experience and addresses educational challenges by incorporating real-world complexities into the learning process, fostering empathy and critical thinking among future designers [21].

In the literature, Jingyu Shi et al. [22] and Morris et al. [23] have significantly contributed to integrating HCI and generative AI. Shi et al. developed a comprehensive

taxonomy from an analysis of 291 papers to guide future GenAI application designs, focusing on user-centric approaches. Morris et al. proposed two design spaces to understand how HCI impacts generative AI models and vice versa, aiming to enhance HCI research and practice. Another study [24] explores the potential of integrating generative AI into operating systems for more intuitive and personalized interactions, showcasing the evolving synergy between HCI and AI technologies. These works collectively emphasize the need for user feedback in GenAI development, and the potential for creating engaging digital environments.

3 Methodology

Throughout the development of the LATILL platform, a series of workshops were conducted involving educators in Spain and Ukraine. All of them are teachers of German as a foreign language in secondary schools. These workshops were instrumental in gathering direct user feedback and guiding the platform's iterative refinement. Participants included language teachers who brought invaluable insights into the platform's usability and functionality.

3.1 Study Design and Data Collection

The LATILL project includes a teacher training programme implemented from June 2023 to June 2024 focused on encouraging GFL educators to experiment with AI-based tools available in the LATILL platform and pedagogical approaches in their lesson planning. The final goal is promoting the development of reading skills in German as a foreign language.

The teacher training included a three-day workshop for teachers that was organised in June 2023 and repeated in September 2023 aimed at engaging more participants. Moreover, the training also includes four webinars spread over the 2023–24 school year, supplemented by continuous self-study and exchange through a space in the virtual campus of the Universität Wien with resources and forums. Additionally, the LATILL platform hosts a variety of resources, including video tutorials, lectures on text complexity and teaching methods, didactic videos, and extensive teaching materials designed by the partners in Czernivtsi (Ukraine) and Vienna (Austria) to support GFL/GSL educators in enhancing their instructional approaches and reading lessons.

The workshops for teachers were focused on introducing the LATILL platform and the tools and didactic materials available there. Methodological and didactic suggestions for learner-oriented GFL/GSL lessons were presented, including reading strategies and how to teach them. In particular, the main topics were:

- Search and select level-adequate reading texts for GFL lessons.
- Tools, tips and many practical examples for didactic implementation.
- Activity-oriented reading lessons and internal differentiation.

A testing session was conducted during the first day of the workshop. The teachers were divided into groups, each group was moderated by members of the LATILL consortium. The participants shared their screens in Zoom and tried out the tools available

in the LATILL platform. No specific tasks were provided, the role of the moderators was taking notes and guide the constructive interaction between the participants. The testing was recorded for further analysis, and the audio was transcripted. The testing finished with a card sorting activity using the online tool Optimal Sort; it provided information to identify how different concepts used in the interface were understood.

A total of six testing groups were conducted. In June, the participants were divided into four groups, two moderated by domain experts from Universität Wien, who also designed and organised the workshop; one in Ukrainian by a domain expert from Chernivtsi National University Yuriy Fedkovych; and one in Spanish moderated by HCI experts from the University of Salamanca. They tested the first version of the LATILL platform. In September, two testing groups were conducted, one in Spanish and one in Ukrainian. They tested the second version of the LATILL platform.

After the three-day workshop, at the end of the third day, two focus groups were conducted to collect feedback from the platform and understand the challenges faced by GFL/GSL teachers. One focus group was conducted in Ukrainian by domain experts and one in Spanish by HCI experts. A total of four focus groups were conducted.

3.2 Participants

Participant selection for the teacher training was conducted using a snowball method. Specifically, invitations were extended to secondary education schools in both Spain and Ukraine where German is taught as a foreign language. The participants in the teacher training came from those centres that agreed to participate. Although it has proven challenging to engage teachers, this is attributable on one hand to the situation in Ukraine, and on the other, to the employment conditions of language teachers in Spain, who often transition between schools during the summer. Consequently, not all of them could commit to starting in June and continuing thereafter. Finally, a total of 15 teachers were involved in the teacher training, 10 from Ukraine and 5 from Spain.

Regarding the focus groups, a total of 10 teachers participated in this activity. All Ukrainian teachers participated. Seven teachers in the first focus group, four teachers of German as the first foreign and three teachers of Germans as the second foreign language; and three GFL teachers in the second focus group. From Spain, two teachers per focus groups, three teachers of German as first foreign and one of German as second foreign language at school.

3.3 Instrument

The testing phases did not include tasks or specific guidelines to use the platform. Participants follow a constructive interaction as test method to measure usability.

Regarding the focus groups, we used a semi-structured interview (Table 1), that was developed by project partners in Vienna and Spain. It is divided into two topics:

- Use of the LATILL online platform.
- Lesson preparation including text simplification (simplify), translations (translate) and pictures.

Table 1. Semi-structured interview for LATILL focus groups.

Topic	Key question	In-depth question
Use of the LATILL online platform	What problems have you encountered?	Which functions do you find useful? Which functions were not useful to you? What do you expect from the system?
	What did you use the online platform for?	Were there any ways of using the platform that surprised you? What functions do you miss in the platform that would be useful for your reading classes?
Lesson preparation	To what extent does the online platform support you in planning and preparing GFL reading lessons?	How do you plan to use the online platform … to find texts for your classes? … to produce scaffolds?
specific: text simplification (simplify)	What did you notice regarding the simplification of the text (differentiated texts)?	How appropriate were the language difficulty levels of the different text versions within a CEFR level?
specific: translations (translate)	What did you notice regarding the text translation?	Were there any deviations from the original text? How would you use the translations as scaffolds?
specific: pictures	What did you notice regarding the pictures?	How do you plan to use pictures as reading scaffolds?

4 Results

The focus groups made it possible to obtain two different types of information. On the one hand, the challenges faced by foreign language teachers of German in Spain and Ukraine. On the other hand, the participants tested the LATILL platform and provided useful information. These sessions, critical for gathering firsthand insights, involved detailed feedback mechanisms to capture participants' experiences and suggestions.

4.1 Challenges in GFL/GSL

The identified challenges regarding teaching German as a second or foreign language include the selection and adaptation of materials, student motivation, fostering reading skills, managing diversity in the classroom, and effectively integrating technology into the educational process:

- Difficulty in finding suitable texts: Teachers face challenges in finding texts that are appropriate in terms of theme and level for their students. This task is time-consuming, especially when they need to adapt and simplify these texts to make them accessible for different learning levels.
- Demotivation of students: Excessively difficult texts can quickly demotivate students, especially in a context where the reading habit is no longer as common among the youth. This poses an additional challenge for teachers trying to maintain interest and motivation in language learning.
- The Importance of reading in language learning: Participants highlight the importance of encouraging reading habits among students to improve their reading comprehension, vocabulary, grammar, and writing skills in German. However, they note that this habit has declined due to the use of technologies and applications, representing a challenge for teachers.
- Diversity of formats and contents: The need to work with a variety of formats and contents to keep students interested and address different learning styles is mentioned. This includes integrating texts with images and the ability to tailor material to the specific needs of students, which can be complex without the right resources.
- Adapting to different skill levels: There is difficulty in adapting lessons and materials to a heterogeneous group of students with different language skill levels. Teaching must find ways to support every learner in the classroom while meeting individual needs, which is a logistical and pedagogical challenge.
- Use of technology and platforms: While technology and educational platforms offer opportunities to enhance the teaching of German, issues also arise related to the effective integration of these tools into the professional habits of the teachers and the ability of these technologies to generate appropriate and specific content in the language.

4.2 Feedback from the LATILL Platform

The initial version of the LATILL platform was met with enthusiasm for its innovative approach to language learning (Fig. 1). However, participants identified several areas for improvement:

- Interface clarity: Users found navigation challenging and suggested enhancements to make the platform more intuitive.
- Functionality: Feedback highlighted the need for better text simplification, more relevant image generation, and accurate translation features.
- Content and categorization: The lack of up-to-date content and transparent categorization system for texts by level and topic was highlighted.

In response to the feedback, significant changes were made in the subsequent version of the LATILL platform (Fig. 2):

- Improved interface and usability: Adjustments were made to streamline navigation, making it easier for users to find and utilize platform features.
- Enhanced text simplification and translation: Efforts were made to improve the accuracy of translations and the quality of text simplifications, aiming to retain the original text's essence more effectively.

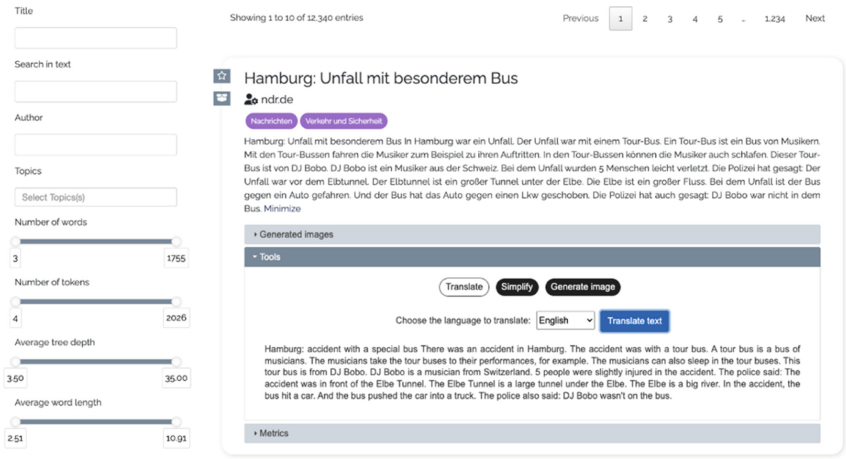

Fig. 1. First version of the platform testing in the first workshop in June 2023.

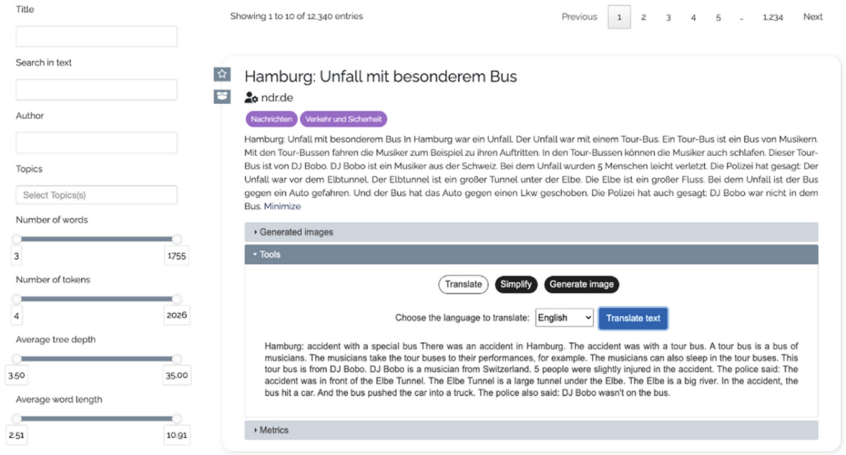

Fig. 2. Second version of the platform.

- Updated content and better categorization: The platform was updated with current topics and implemented a more precise categorization system to facilitate accessible access to texts suitable for various learning levels.

Comparing the first and second versions of the LATILL platform, the workshops revealed significant user satisfaction improvements. The modifications based on initial feedback led to a more user-friendly and effective tool for language teaching and learning. For the final version, it is crucial to continue this iterative feedback loop, focusing on:

- User interface (UI) and experience (UX): Refine the UI/UX to ensure the platform remains intuitive and accessible.

- Feature optimization: Based on user feedback, continue enhancing text simplification, translation accuracy, and image generation relevancy.
- Content expansion and categorization: Regularly update the platform's content library with engaging topics and maintain a comprehensive categorization system.

5 Impact in the Functional Prototype

Based on the user feedback and observations, here is the in-depth feature feedback on the LATILL platform:

- Use of the LATILL platform. Users appreciated the platform's concept but encountered usability challenges. Feedback highlighted the need for a more intuitive interface to facilitate easier navigation, suggesting that a more straightforward design could enhance user engagement and satisfaction.
- Lesson preparation. Educators noted the importance of efficient search functionality to find texts appropriate for different learning levels and topics quickly. A more user-friendly interface for modifying texts and creating lessons was also deemed essential, including current and engaging content.
- Text simplification. The text simplification feature received mixed reviews, with users noting it often resulted in summaries rather than simplified versions of texts. This feedback suggests the platform needs to better balance simplification with retaining the original text's essence, ensuring the simplified text remains useful for language learners.
- Text translation. While the translation feature was generally well-received, there were calls for improved translation accuracy and quality. Users noted the importance of translations that preserve the original meaning and context, highlighting a need for refinement.
- Image generation. The picture generation feature elicited mixed responses, with some users finding the generated images only sometimes relevant to the text's content. Suggestions were made for improving the algorithm to ensure images are more closely aligned with the text, allowing users to provide more context or select themes.

These detailed feedback points highlight the users' experiences and expectations, offering valuable insights for further development and refinement of the LATILL platform's features to better meet the needs of educators and learners in language teaching and learning contexts.

6 Conclusions

The LATILL platform represents a significant step forward in the application of AI in education, offering promising avenues for research and practice in language learning and teaching. The development of the platform follows a user-centered approach, involving GFL teachers from secondary schools, experts of professionalisation and further training of GFL teachers, experts of German language and HCI experts.

The findings of this study underscore the transformative potential of the LATILL platform in the realm of language education. By harnessing the power of human-computer

interaction and generative AI, the LATILL tools offer a novel approach to language teaching that is both engaging and effective. The integration of text-to-text and text-to-image functionalities within the platform not only enriches the language learning experience but also provides educators with versatile tools to enhance comprehension and engagement among learners.

The teachers used the new AI-based LATILL tools in their teaching practice and continuously reflect on this process with other pairs, creating a learning community. Moreover, the challenges identified during the focus groups have provided useful information not only for improving the tested functionality, but also for providing AI-tools that solve the problems faced by GFL/GSL teachers in their daily tasks.

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