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Embracing Transition: The Impact of Emerging Technologies on Language Learning Pedagogies

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Abstract

Rapid technological advances require constant innovation and the creation of new products and services, the improvement of processes and the optimization of resources. This constant evolution in all areas of society, including education, poses a persistent challenge to educators and institutions, requiring continuous adaptation of pedagogical models to accommodate technological advances while ensuring ethical and inclusive development. This paper outlines our journey as researchers, language teachers and instructional designers, focusing on the adoption of Extended Reality (XR) technologies and the development of several XR resources for our language learning courses. The resources were developed using two distinct end-user development (EUD) tools (e.g., CoSpaces, ARTutor) designed for non-programmers. This allowed for the creation of several apps specifically tailored to the needs of our language learners. Prior to their incorporation into the established corpus of learning materials, learners were provided with guidance on the technical and pedagogical functions of the apps. Subsequently, learners were encouraged to utilize them for their regular learning outside the classroom. Feedback was gathered using an adapted Technology Acceptance Model (TAM) questionnaire and several language assessment tests, which revealed a positive perception of the usability and usefulness of the resources for language learning. Data analysis using SPSSv27 highlighted the effectiveness of the resources, particularly in improving oral comprehension and production, although less impact was noted on writing skills. In addition, the study findings of the study highlight both the motivational and facilitative power of XR technologies to overcome traditional learning constraints and provide effective and engaging language

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learning experiences, as well as the transformative potential of XR and EUD tools in language teaching. The study advocates that teachers move from being passive users to proactive creators of XR-enhanced learning materials and emphasizes the importance of a balanced integration of digital and traditional resources tailored to learners' needs.

Keywords: Emerging technologies, Pedagogical affordances, End-user development tools, User experience, Educational challenges

Introduction

Rapid technological progress and the rise of technologies in all areas of society are linked to constant innovation, the improvement of processes and the optimization of resources (García-Aretio, 2019). This continuous development and integration of technologies poses a permanent challenge for teachers and educational institutions. The teaching-learning process requires continuous adaptation, an evolution that reconfigures research methodologies and revolutionises teaching-learning methods. Given this scenario, constant evaluation and revision of pedagogical models is necessary to adapt and align new teaching-learning resources to the needs and profiles of our learners, who are immersed in a digital culture and subject to the demands of sustainable development (Hubbard, 2023; Patterson et al., 2022; Ramirez-Montoya et al., 2022).

Background

This paper documents our journey as researchers, language teachers and instructional designers, detailing our changing perception of the usefulness of emerging technologies in language teaching and learning. This shift in perspective and the way we integrate technology into the teaching-learning process is driven by our belief in the motivational and facilitative power of extended reality (XR) (Godwin-Jones, 2023; Parmaxi & Demetriou, 2020). The use of XR (i.e., virtual reality (VR), augmented reality (AR) or mixed reality) can overcome the limitations of traditional technologies and provide language learners with a sense of presence and immersion in their learning activities, making the learning process more authentic, interactive and effective (Kaplan-Rakowski et al., 2023; Luo et al., 2024). An analysis of our experience with the use and creation of various learning resources enriched with VR and AR technologies leads us to observe that many commercial platforms do not effectively meet the needs of most language learners (Parmaxi et al., 2024). Consequently, building our own applications (apps) using various end-user development (EUD)

tools designed for non-programmers and generating resources tailored to the needs of our learners has opened many new possibilities and presented ongoing challenges for us (Valero-Franco & Berns, 2024). The aim of this study was to analyze the effectiveness and validity of the VR/AR resources we have created using CoSpaces and ARTutor in order to promote environments that effectively address the challenges of today's society, support the teaching-learning process (Lara-Navarra et al., 2024) and contribute to the development of effective, engaging and pedagogically sound XR-based educational experiences that can harness language learning (Parmaxi et al., 2024).

Methods

The resources created, *360°-Sightseeing Tour, Who am I? and Objects and Prepositions* (see Appendix 1) were designed to meet the needs of our tertiary level A1 German learners, aged 17–23 years, of whom 77% were female. The apps were implemented and tested in various training sessions, each lasting between 45 and 50 minutes. Once students became familiar with their technical and pedagogical functions, a total of 90 learners were allowed to access and use the apps as regular learning resources. The collected data enabled us to assess both the potential of the resources and the opportunities that EUD tools offer for creating effective teaching/learning resources. On the one hand, learner feedback on the usefulness of the created resources was obtained through an adapted technology acceptance model questionnaire (Appendix 2). On the other hand, to assess the impact of learning on students' language skills, we selected the most recent of the three apps created (*Objects and Prepositions*) and tested its impact on students' oral and written skills through different tests. In both the oral and written tests, the students had to describe a picture by identifying and indicating the position of several objects.

Results

Quantitative analysis of the data, carried out with SPSS v27, showed a positive user perception towards the created VR/AR apps. Users appreciated both the usefulness of the designed applications and their effectiveness in addressing different topics and linguistic aspects. Although not all the resources were felt to be equally useful in facilitating the learning process, most learners highlighted the usefulness of each (see Figure 1).

Since there were no significant differences in students' perceptions regarding the usefulness of the designed resources, we selected *Objects and*

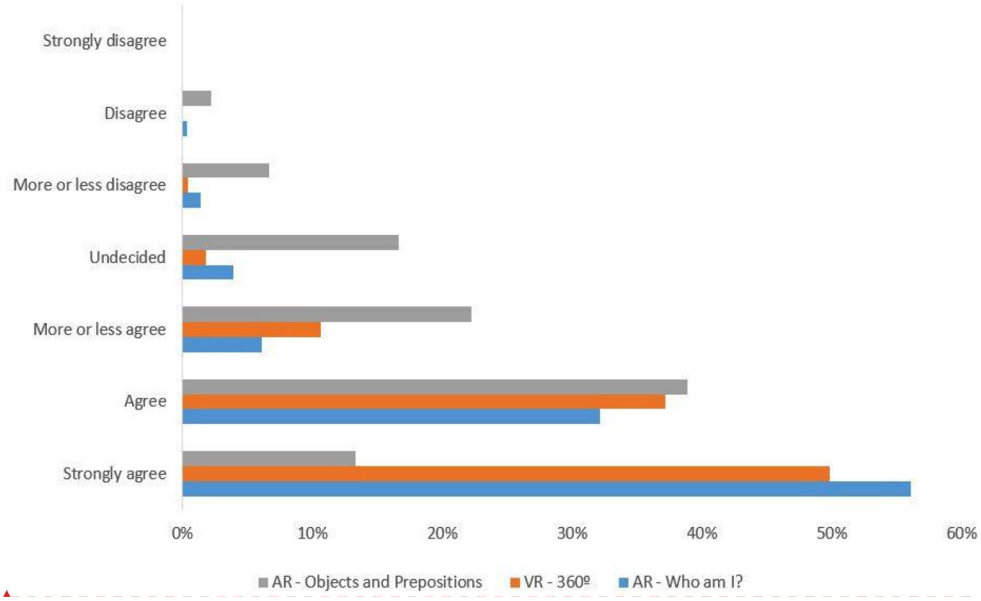

Figure 1. Usefulness of the Apps as learning resources.

Prepositions (AR), our most recent app, to analyze its impact on students' learning outcomes.

To assess the effectiveness of the developed AR app, we compared the specific learning outcomes related to reading, listening and writing that were achieved using the app versus using traditional paper-based resources alone. Although we do not have a comprehensive long-term study or a large sample size, the analysis of variance of the scores obtained according to the language skills and resources used for the study, as well as post-hoc analysis, lead us to conclude that the use of AR favors the strengthening of students' comprehension skills in particular but not their writing skills. The data also suggests that learners' writing skills improved mostly with traditional tasks such as clozes, worksheets or writing short texts, which at least the VR and AR apps designed for this study did not allow.

Finally, the results highlight the need to work with a variety of teaching materials and resources to address different language contents and skills, considering students' individual needs, learning preferences and learning profiles.

Conclusion

This study highlights the potential of EUD tools and XR technologies to redefine the landscape of language teaching, which requires teachers to adapt resources to changing educational demands and student needs. The findings

suggest that EUD tools could help teachers move from being mere technology users to proactive developers of XR-enhanced learning materials. However, in our experience, none of the resources created is inherently superior to another in its entirety. Rather, the key to effective language learning lies in the combination of all available materials, digital or traditional, tailored to the needs and characteristics of the target learners.

Future Research

Future research will focus on exploring the impact of XR on different language skills by comparing different platforms, with a larger and more diverse sample, to fully assess the long-term impact of XR technologies compared to traditional learning materials.

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Appendix

Appendix 1. Short description of the VR/AR apps created

- *360°-Sightseeing Tour:* A VR app developed with CoSpaces that focuses on vocabulary learning and improving oral and written comprehension.
- *Who am I?:* An AR app developed with ARTutor that focuses on peer-to-peer oral practice to improve vocabulary acquisition, comprehension and oral expression (Valero-Franco & Berns, 2024).
- *Objects and Prepositions:* An AR application developed using CoSpaces that allows multisensory learning with two primary objectives: learning vocabulary related to the student's everyday life and prepositions of place to describe places in greater detail.

Examples of the scenarios used in the different applications designed are shown in Figure A1.

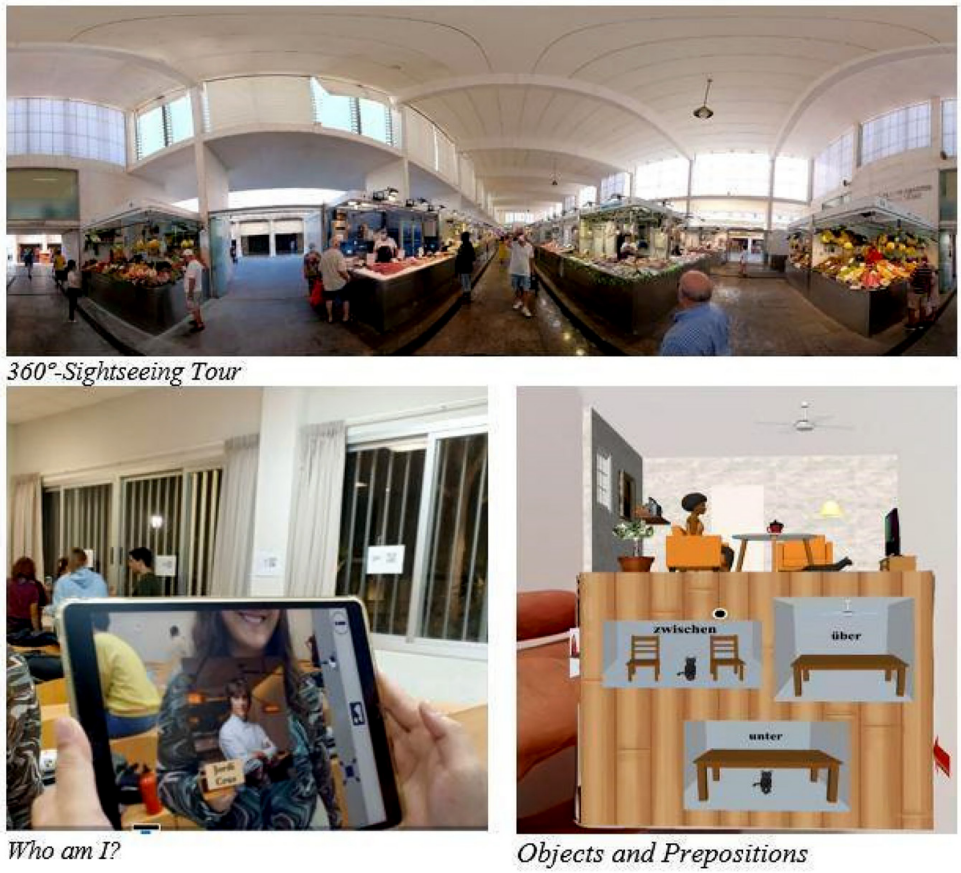

Figure A1. Examples of the different VR/AR apps created.

Appendix 2. Perceived Usefulness (PU). Selected items from the Technology Acceptance Model Questionnaire

Item	Description
PU1	Using the app helps me understand the linguistic content very quickly.
PU2	The app increases my attention to the content of the lesson.
PU3	I think after using the app, my language skills have improved.
PU4	I believe that after using the app, I will get better results in answering questions on the topic.
PU6*	After using the app, I have learned more about the topic in general.
PU7	The app helped me gain a deeper understanding of the topic.
PU8	The app facilitates my learning.
PU9	Overall, I find the app more useful for learning.

Note. *Item PU5 was removed from the original TAM questionnaire because it was redundant to PU6.