

Left Alone With AI: Evaluating Student Preparedness for Fully Automated Language Instruction

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Abstract

The increasing integration of artificial intelligence (AI) in education has posed a question for scholars: are learners prepared for fully AI instruction without teacher intervention? There has been some research investigating whether AI-supported agents can act as teachers, and some researchers have even raised the question of whether teachers might still be necessary in the future. In this hypothetical case of fully AI-mediated lessons, are younger learners ready to learn solely through AI technology? This study addresses this concern by examining whether high school students can learn Spanish as a foreign language effectively solely with AI and how this compares with traditional teacher-led education. Based on student agency and self-directed learning theories (Candy, 1991; Knowles, 1975), the study employed a crossover design in an international school. Participants worked on two units (reflexive verbs and past tense) under two conditions: teacher-led instruction and autonomous learning with a custom AI-supported app. Data were collected through pre- and posttests, a confidence survey, and semi-structured student interviews. Quantitative findings revealed significant learning gains in both instructional conditions, but there was not statistically significant superiority of either method. Qualitative findings, however, indicated that students continued to value teachers for clarification, feedback, emotional support, and personalized explanations. The results suggest that while AI technologies can effectively support language learning and engagement, students still preferred the human teacher interaction. This study presents original empirical data on AI integration, learner autonomy, and the future of education. Findings support hybrid methodologies that integrate technological agency with teacher support.

Keywords: artificial intelligence in education, self-directed learning, learner autonomy, language learning, educational technology

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Introduction

Artificial intelligence (AI) is rapidly transforming everyday life and it has evidently affected education. AI is no longer considered a supplementary aid in administrative tasks, it is now widely used in educational settings in several ways: generating content, personalizing learning, assessing student performance, and simulating teacher interactions (Case et al., 2025). As schools worldwide increasingly integrate AI-driven tools into classrooms, it seems necessary to ask how far autonomous systems will reach in educational settings.

Recent advances in AI, and its growing integration in school settings, have generated debates about the future role of teachers. Some scholars argue that, given the appropriate context, AI systems might eventually replace teachers, particularly in contexts where personalization, scalability, and efficiency are prioritized (Edwards & Cheok, 2018). Others, however, caution that education involves far more than content delivery. Human teachers provide emotional support, mentorship, ethical guidance, and motivation that may not be replicable through technology alone. AI has demonstrated promising results in tutoring, providing feedback, and for individualized practice. However, the extent to which learners are prepared to learn with less teacher interaction and more AI-mediated instruction remains largely unknown.

This notion becomes especially important nowadays where students are increasingly exposed to technology from an early age and some regions are suffering from teacher shortages. Many young learners are highly familiar with digital devices and online learning platforms. This in turn might lead researchers to suggest that technology could take a more prominent role where teachers are scarce, leaving students to deal with digital tutors. In such hypothetical case, more student autonomy might be needed. It seems to be that, although autonomous learning depends on several variables like motivation and self-regulation, more technologically savvy students may be more ready for self-directed learning. It therefore, becomes important to investigate whether students could learn autonomously in a computer-led classroom without teachers. Not much attention has been given to this topic, therefore, the present study addresses this gap questioning if students can effectively learn without direct human instruction.

This project then investigates whether high school students can effectively learn Spanish as a foreign language solely through AI-supported instruction, without pedagogical intervention from teachers. Based on self-directed learning theories (Candy, 1991; Knowles, 1975), this study compares student performance, confidence, and perceptions. The intervention employs two instructional conditions: traditional teacher-led instruction and fully AI-mediated learning through a custom-designed educational application (app).

With a crossover experimental design, this research examines whether learning performance differs between both instructional approaches. Students' perceptions regarding the experience of learning independently with AI are also collected. Through both quantitative and qualitative data, the study contributes empirical evidence to ongoing discussions about AI, learner agency, and the future of teaching. Findings from this study aim to add up to the question of whether current learners might be prepared to be left alone with educational AI systems, or whether human teachers continue to be irreplaceable in the classroom.

Literature Review

Introduction

Technology and artificial intelligence (AI) are reshaping the modern school system. This literature review covers case studies integrating AI in education, critical questions about teacher roles, and concerns about learner agency and equity. This review is organized around four major topics discussing AI as pedagogical tools and as potential substitutes for teachers: technology in schools; AI in education; learner agency and self-directed learning; and some critical perspectives on the integration of AI in schools. Some convergences, unresolved tensions, and concrete gaps that motivate the present study are revised below.

Technology in Educational Settings

The integration of technology in educational contexts has become increasingly essential to assist in administrative tasks, and to create more relevant, creative, and collaborative learning environments (Felszeghy et al., 2019; Siegle & Hook, 2023). For instance, scholars like Cheng et al. (2018) and Varela (2026) state that appropriate technological integration can significantly enhance student motivation and engagement. In line with this, others claim that technology has transformed how education is delivered and experienced (Hemajothi & Kumar Jain, 2022), making teaching and learning more accessible, personalized, and engaging (Krstić et al., 2022; Zou et al., 2025).

Although technology seems to enhance the teaching the learning experience, it can still pose complications for its seamless implementation. For example, Ntorukiri et al. (2022) refer to the challenges that need to be sorted by institutions for its adoption and integration, from structural adaptations, to devices, and staff training. This perspective aligns well with a growing concern about meeting contemporary educational demands. In this sense, the rapidly evolving technological landscape suggests that traditional pedagogical methods require substantial updating. This in turn suggests that the successful implementation of technology in education depends critically on adequate training across all stakeholder groups (Felszeghy et al., 2019; Siegle & Hook, 2023). At the student level, Couch (2023) emphasizes that technology-enhanced learning presents both opportunities and challenges, where students must navigate through difficulties to achieve academic success.

Artificial Intelligence Applications in Educational Contexts

The application of Artificial Intelligence (AI) in education has expanded considerably since the end of 2022 (Milićević et al., 2024). Some implementations range from virtual teaching assistants to specialized support for diverse learner populations. A notable early example emerged at Georgia Tech in the United States, where the AI teaching assistant “Jill Watson” was deployed to support student learning (Maderer, 2016). Students interacted so well with the digital assistant, to the level of believing that Jill was in fact a person, not a chatbot. This pioneering application demonstrated the potential for AI systems to augment educational delivery in actual school settings.

Research has also explored AI applications for literacy and specialized educational needs. For instance, Qidwai et al. (2020) investigated the use of robotic assistants to support students with autism, while Kohnke (2023) examined AI-powered robots designed to facilitate language learning. In a similar fashion, the IBM AI Watson Tutor seemed to improve comprehension

with real-time support and customized learning (Annuš, 2024). The large potential for adaptability that AI agents have, proved to be very effective in such cases. Those interventions therefore suggest that AI technologies may be particularly valuable in contexts requiring personalized, patient, and consistent instructional support.

The proliferation of AI in education and the potential to foster teaching and learning, has prompted fundamental questions about the evolving role of human educators. Gentile et al. (2023), for instance, pose the provocative question of whether teachers remain necessary in an age of increasingly sophisticated educational technology. This sparked stimulating important debates about the balance between technological assistance and human pedagogical expertise. Based on the abundant amount of research on AI in education, it seems that AI can automate some instructional functions and offer support via adapted learning. However, the fact that it could hypothetically replace the ethical and humanistic pedagogical work of teachers remains an issue for investigation (Kohnke, 2023; Maderer, 2016; Qidwai et al., 2020).

Critical Perspectives on AI and the Future of Teaching

The rapid advancement of AI capabilities has prompted serious examination of the future role of human teachers. Edwards and Cheok (2018) posed a question of whether robot instructors could address teacher shortages in countries like the USA or UK for instance. This positions AI not merely as a supplementary tool but as a potential solution to actual staffing challenges. This perspective provokes interesting thoughts related to the future of teaching and learning.

In a rather futuristic and hypothetical view, Newton and Newton (2019) advanced the discussion by proposing ethical frameworks for the deployment of humanoid robots as teachers. They even referred to a code of conduct to govern such implementations. Their work acknowledges both the potential benefits, the need for careful ethical consideration, and the possible needed adaptations to deploy AI in teaching roles.

The question posed by Gentile et al. (2023) regarding whether teachers remain necessary synthesizes these concerns. This seems to challenge the educational community to articulate the contributions of human educators in an era of increasingly capable AI systems. This ongoing debate reflects fundamental tensions between the advancement of technology and the efficiency, personalization and human connection in the classroom. There are questions that still need to be answered regarding the intricacies of educational relationships that extend beyond content delivery like mentorship, socialization, and emotional support for example.

Student Agency and Self-Directed Learning

Technological integration in educational settings, AI applications, and the general changing landscape affecting administration, teachers, and students, bring up new debatable topics. Before discussing teacher substitution from the point of view of AI capabilities, the role of the students need to be considered. This way, if students were to be left “alone” with robot teachers, then they would need to be autonomous enough to deal with everyday classroom situations. Therefore, the development of learner autonomy represents a crucial educational outcome with implications extending beyond formal schooling. Luke and Hogarth (2011) and Chakraborty (2024) emphasize that self-directed learning capabilities are essential skills for both academic success and professional effectiveness in adulthood. This perspective positions student agency not merely as a pedagogical preference but as a fundamental competency for lifelong success.

In times when AI agents seem to be more increasingly integrated into everyday teaching and learning, autonomous learners may be more a need than a luxury.

Theories for self-directed learning emphasize the central role of student responsibility and control. Knowles (1975) and Candy (1991) established foundational principles suggesting that learners must assume primary responsibility for their educational processes. This perspective was reinforced by contemporary research (Khat, 2017) confirming that student ownership of learning correlates with improved outcomes. This idea seems to be closely related to internal motivation to learn (Loeng, 2020) and the fact that for successful intake, learners should be motivated and focused (Schmidt, 2012; Varela, 2020).

This learner independence has received empirical support, specially in connection to technology familiarity. Geng et al. (2019) found that students demonstrate greater independence in their learning when they have substantial experience with technology use. This suggests a mutually reinforcing relationship between technological competence and autonomous learning behaviors. Hence, in a hypothetical world of fully technology mediated learning, tech savvy students could have an advantage in terms of adaptability and performance in comparison to the rest.

Despite the recognized importance of self-directed learning, Morris and Rohs (2021) identify a critical gap in the research literature. They noted that investigation of self-directed learning among younger learners remains vital yet surprisingly scarce, which highlights the importance of conducting research in that area. Therefore, it seems crucial to investigate how AI assistants might affect younger learners' ability to plan, monitor and evaluate their own learning. This leads to the main focus of research of this study, asking whether young learners might be ready to learn solely through technology in the (now) hypothetical case that AI agents could replace teachers completely.

Hence, this study focused on whether younger learners could learn solely with technology working autonomously without teacher guidance.

Methodology

Context

The study was conducted in a very large private international school in Qatar that serves students from Kindergarten through 12th grade (k-12), offering the International Baccalaureate program. The school showcases state of the art facilities that enhance learning through technology, and is very well-equipped with technology devices. Teachers integrate technology widely at the school, and students are accustomed to working individually, and independently with tablets and computers for learning from an early age.

Participants

The study involved 23 students aged 15–17 enrolled in two Spanish as a foreign language courses (14 and 9 students, respectively), with 10 females and 13 males. Participants were highly familiar with computer, tablets and technology for learning. This study used a convenience sample, with each class remaining intact (11 and 12 students respectively) and participating twice: once as the control group (teacher-led) and once as the experimental group (technology-only) in a crossover design. This methodology was chosen to reduce inter-

individual variability and to increase statistical power. As a form of repeated-measures experimentation, it also addressed some threats to internal validity through order control (Connelly, 2014).

Two teachers and the researcher were involved in this study. The teachers were the usual instructor participants had in their course of study to ensure familiarity of class delivery, participants focus and commitment; and to avoid unexpected behavior. The control group lessons were taught by the usual class teacher, while the experimental group had the usual teacher as invigilator ensuring that everything worked as planned and that students were on task. The invigilator teacher did not offer any guidance or help to students in the experimental group as they were supposed to learn independently and solely with instructions provided in the app. The invigilator made sure students did not navigate away from the app and did not use any other resources than the ones allowed in the process.

Materials

A custom app was developed specifically for this study using Artificial Intelligence (AI) for coding and for generating text, practice questions, and for self-grading quizzes. The app was installed in tablets by the researcher. The app aimed to mirror the traditional lesson structure and methodology normally used by teachers in the classroom. There were two units, one on Spanish reflexive verbs, and the second one on Spanish simple past tense. The app included introductions, definitions, guided practice, interactive activities, videos, games, and online search tools, ensuring relevance to the curriculum. The main goal of this was to ensure familiarity with the learning process, so that participants knew exactly what to do, and to avoid class delivery and instructions as factors that could negatively influence learning and performance. This resulted in both the traditional and the AI-based lessons having identical structure, method used, target vocabulary, and practice activities. Students had also access to an online translator in case they had issues with new words.

Two digital tests were specially created for this study to test knowledge prior to and after the each units. One test checked knowledge on Spanish reflexive verbs while the other checked Spanish simple past tense. Each test covered all topics taught in each corresponding unit. The test was emailed to all participants prior to the beginning of the unit. Each pretest was completed by the participants immediately before starting each unit (pretest), and immediately after finishing it (posttest). The test had 20 questions worth 5 points each and they all referred to topics covered in the lessons. The two units in the app (Spanish reflexive verbs and Spanish simple past tense) were part of the curriculum, so students had to learn them as part of their regular course of studies.

In order to measure participant's confidence when learning through the AI-driven app or the traditional method, a 10-item Likert-scale survey (1 = strongly disagree, 4 = strongly agree) was administered. The confidence test included statements like "I am good at Spanish" and "I can learn Spanish better with traditional methods." All participants took the test at the end of each unit.

Finally, at the end of the study, individual interviews with four students were conducted to capture students' perceptions. Each student was randomly selected and responded to five questions eliciting information about their experiences with the project. Participants answered questions like: "What do you think is a negative aspect of working alone with an AI created app?"

Procedure

Prior to the study, all ethical procedures were carefully observed to protect participants' integrity, rights, and wellbeing. The researcher obtained formal authorization from the school to conduct the study, and parents provided informed consent for their children's participation. The topics covered in the project followed the curriculum of the school, therefore, the content taught during the intervention fit perfectly into the course of studies normally followed by the students. The day and duration of the lessons followed the school's schedule. This meant that each unit was spread over three lessons in one week. The whole duration of the study took place over two weeks in six lessons. The study began when the researcher explained the purpose and procedures of the study to each group and emphasized that participation was voluntary. Students were informed that they could withdraw at any moment without any consequences or penalties. The lessons took place as they normally would (at the same time and place and with the usual teacher in the classroom), the only difference was the means of instruction and the fact that students using the AI-app were asked to work completely independently.

After randomly assigning which group would act as the control (teacher-led instruction) and experimental (app-based, self-directed learning) for the first unit of instruction, both groups took the pretest for unit one. After all students had finished the pretest, the usual teacher started teaching the first lesson to the control group, while the experimental group, guided by the usual class teacher, started working independently on unit one on the app. Each unit was taught over three classes in one week. At the end of the three classes, the groups took the posttest and the confidence test. For unit two, the groups changed the learning method: the control group became the experimental group, and the group that acted as the experimental group for unit one, became the control group in unit two. The same logistics was employed for unit two, i.e., pretest, teaching intervention, posttest and confidence test. At the end of the second unit four individual interviews were conducted to collect qualitative data about the intervention.

Results

The results below are organized by content unit, showing the percentage scores of each pretest and posttest, the individual group gains, and difference between groups.

Results of Unit One (Spanish Reflexive Verbs) for Both Groups

Pretest and Posttest Results for Unit 1 for the Control Group (n = 11)

A paired-samples t-test indicated that students' average test scores in the control group improved substantially from pretest ($M = 59.11$) to posttest ($M = 84.20$). Gain scores (pre-post) showed a percentage improvement of 25.09 points ($SD = 3.75$), with all participants showing positive learning gains. This increase was statistically significant, $t(10) = 4.36$, $p < .01$. The magnitude of the effect was large ($d = 1.31$), indicating substantial learning gains across participants.

Pretest and Posttest Results for Unit One for the Experimental Group (n = 12)

The paired-samples t-test for the experimental group percentage scores also showed considerable improvement from pretest ($M = 52.9$) to posttest ($M = 90.0$). Gain scores (pre-post) showed an improvement of 37.1 points ($SD = 6.50$), with all participants having positive

learning gains. There was a statistically significant improvement, $t(11) = 19.75$, $p < .001$, with an extremely large effect size ($d = 5.71$).

Comparison of Gain Between the Two Groups for Unit One

Table 1 below shows a percentage test-score gain comparison between groups after unit one. Figure 1 below shows a graphical representation of the difference in percentage scores of pre and posttest for each group for unit one.

Table 1

Test-Score Gain Comparison Between Groups After Unit One

Group	Pretest	Posttest	Gain	SD	n
Control	59.11	84.2	25.9	3.75	11
Experimental	52.9	90.0	37.1	6.5	12

Figure 1

Group Percentage Score Difference for Unit One (Spanish Reflexive Verbs)



In order to check whether there was a statistically significant difference between the gains of both groups after the intervention for unit one, the mean gains of both groups were compared using an independent-samples t-test with Welch's correction. The test revealed a statistically significant difference in gain scores between groups, $t(17.4) = -5.97$, $p < .001$, $d = 2.16$. The experimental groups showed larger gains, with a large effect size.

Results of Unit Two (Spanish Simple Past Tense) for Both Groups

For the second unit, Spanish simple past tense, the groups swapped teaching methods. This time the control group for unit one became the experimental group, and vice versa.

Pretest and Posttest Results for Unit 2 for the Control Group (n = 12)

A paired-samples t-test indicated that students' test scores in the control group substantial improvement from pretest ($M = 24.5$) to posttest ($M = 90.0$). Gain scores (pre-post) showed an improvement of 65.6 points ($SD = 1.83$), with all participants demonstrating positive learning gains. This increase was highly statistically significant, $t(11) = 124.24$, $p < .001$, with an extremely large effect size ($d = 35.85$), showing considerable learning gains across participants.

Pretest and Posttest Results for Unit 2 for the Experimental Group (n = 11)

A paired-samples t-test indicated that students' test scores in the control group substantial improvement from pretest ($M = 23.2$) to posttest ($M = 90.0$). Gain scores (pre-post) showed an improvement of 66.8 points ($SD = 3.14$), with all participants having positive learning gains, $t(10) = 70.54$, $p < .001$, and an extremely large effect size ($d = 21.27$).

Comparison of Gain Between the Two Groups for Unit Two

Table 2 below shows a percentage test-score gain comparison between groups after unit two. Figure 2 below shows a graphical representation of the difference in percentage scores of pre and posttest for each group for unit two.

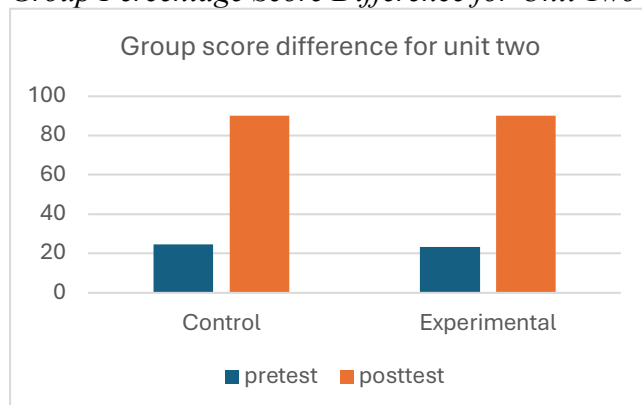
Table 2

Test-Score Gain Comparison Between Groups After Unit Two

Group	Pretest	Posttest	Gain	SD	n
Control	24.5	90.0	65.6	1.83	12
Experimental	23.2	90.0	66.8	3.14	11

Figure 2

Group Percentage Score Difference for Unit Two (Spanish Simple Past Tense)



To test the statistical significance of the difference between the gains of both groups after unit two, the mean gains of both groups were compared using an independent-samples t-test with Welch's correction. The test showed that the difference in gain scores between the control group ($M = 65.6$, $SD = 1.83$) and the experimental group ($M = 66.8$, $SD = 3.14$) was not statistically significant, $t(16.4) = -1.11$, $p = .28$, with a moderate effect size ($d = -0.47$).

Results of the Confidence Test for Both Groups

The results of each confidence test administered at the end of each unit were combined discriminating between the group learning with the AI-app, and the results obtained from the participants learning through the traditional method.

To measure the significance of the confidence test results, AI-app group ($M = 30.61$, $SD = 3.76$) and the traditional teaching group ($M = 32.39$, $SD = 2.76$), an independent-samples t-test with Welch's correction was run. The test indicated that the difference in scores between both groups was not statistically significant, $t(20) = -1.30$, $p = .21$, although a moderate effect size was observed ($d = -0.53$).

Table 3 below shows the means and standard deviations of the confidence test for both groups. Figure 3 below shows a graphical representation of the mean difference.

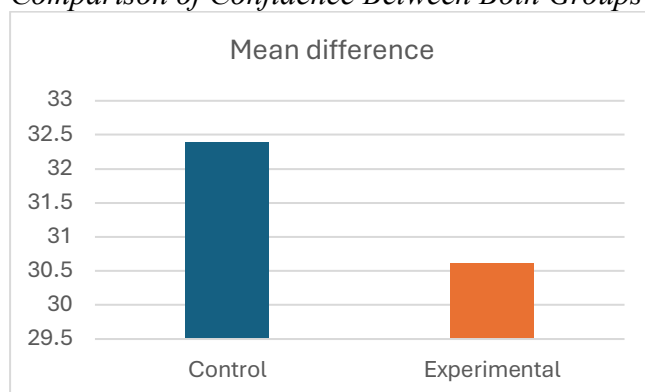
Table 3

Confidence Test Comparison Between Groups

Group	mean	SD	n
Control	32.39	2.76	23
Experimental	30.61	3.76	23

Figure 3

Comparison of Confidence Between Both Groups



Thematic Analysis of the Interview Questions

Following Braun and Clarke's (2006) framework, a thematic analysis was conducted to analyze participants' responses to the interview questions. Four main themes emerged from the responses: (1) mixed engagement with AI-app learning, (2) preference for traditional methodologies, (3) interest in interactive and listening-based activities, (4) disregard towards the push towards AI-based learning, and (5) perceptions towards learning and memorization.

Mixed Engagement With AI-App Learning

Students offered different responses in terms of AI-app learning, some reported positive experiences and others neutral or negative ones. This inconsistency suggests that motivation was not necessarily increased through the integration of AI, and its effectiveness seems to depend on individual preferences.

Preference for Traditional Methodologies

The most prominent theme was the preference for teacher-led instruction using traditional methods. Participants seemed to value explanations of the teacher, for its clarity and depth. They also pointed out that verbal interaction supported better comprehension. This suggests that participants consider that digital tools should complement rather than replace teacher instruction.

Interest in Interactive and Listening-Based Activities

Students seemed to prefer interactive activities focusing on engagements, for instance, listening activities and sentence reorganization. They seemed to dislike true/false type of questions in reading activities stating that they preferred more active rather than passive exercises.

Disregard Towards the Push Towards AI-Based Learning

Participants did not show any particular preference towards a change from traditional to digital learning methods, specially if learning happens solely with technology.

Perceptions Towards Learning and Memorization

Responses on memorization effectiveness were divided, but there was clear preference towards the use of traditional learning methods. For instance, the use of pen and paper was preferred for learning and memorization of new topics.

Overall Interpretation

The AI-app seemed to offer valuable interactive learning experiences but did not seem to replace teacher-led instruction according to students' perception. A blended approach, combining digital tools with teacher-led methodologies, appeared as preferred and suggested, with interactive and engagement activities as favorites.

Discussion

The results suggest that while technology seemed to enhance engagement through interactivity, visuals, and multimedia, students still prefer to rely on teachers for personalized feedback and relevant explanations. This aligns with prior research emphasizing the importance of teacher roles in language learning (Gentile et al., 2023; Liu et al., 2025) and the need for adequate integration and training in technology use (Siegle & Hook, 2023). The high engagement with the app and the fact that students seemed to dive into the activities with not difficulties, supports findings that students accustomed to technology are more independent in digital learning environments (Geng et al., 2019). However, the preference for teacher guidance indicates that fully self-directed learning in younger learners needs strong support and guidance by adults, consistent with Morris and Rohs (2021) and Xie et al. (2026).

Conclusion

This study demonstrates that technology-driven tools, such as AI-apps, can engage students in language learning but are most effective when complemented by teacher guidance. Students value interactivity but seem to prefer personalized feedback and error explanation, underscoring the enduring role of supportive and empathetic educators. This seems to reinforce the notion that, while digital technologies could bring interest and entertainment, teaching methodologies and motivation play a crucial role in acquiring and retaining knowledge (Varela, 2020, 2026).

Limitations include the small, convenience-based sample and the short duration (one week per unit), which may not capture long-term effects. The crossover design reduced individual

differences but may have introduced carryover effects. Future research could explore larger samples, longer interventions, and specific performance metrics to contrast learning outcomes.

To conclude, it appears that some features of AI, such as automating administrative tasks or generating personalized activities, could further support teachers. Results from this project may have direct implications for the language classroom. Instructors and curriculum designers could adopt a hybrid approach to teach languages, integrating AI for engagement and adaptative learning, and teachers for guidance and support. These findings contribute to the growing literature on balancing technology and human instruction in language education (Case et al., 2025; Gordon et al., 2025).

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