

Teachers' Attitudes Towards AI Integration in Foreign Language Learning: Supporting Differentiated Instruction and Flipped Classroom

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Abstract

The use of Artificial Intelligence (AI) in education is rapidly gaining traction as research in technology has produced a growing number of cutting-edge applications. Indeed, the latest possibilities presented by AI require innovative and alternative methodological approaches to be integrated into the learning process. Within the educational community, and especially among foreign language educators, there is a clear desire and interest in adopting these new tools to enhance and maximise learning outcomes. However, there is also some scepticism regarding potential issues that may arise from their introduction into the learning process. This study presents a survey that examines the utilization of AI by 116 foreign language educators as well as their attitudes towards the utilization of AI in the context of the Greek public and private primary and secondary educational system. The research also explores how differentiated instruction and flipped classroom models can be enhanced by AI. Data was collected through an online survey on Facebook using a structured questionnaire, designed to capture quantitative insights into educators' AI attitudes. Findings showed that teachers have adopted a positive attitude towards incorporating AI in teaching foreign languages. Indeed, a considerable number of educators employ AI as part of their curriculum, utilizing it also as a means for facilitating differentiated instruction where each student is taught according to his unique abilities and needs. Factors such as age, years of teaching experience and familiarity with AI technologies played a crucial role in shaping teachers' attitude toward AI. However, the study revealed that one area that has been largely overlooked by researchers is how artificial intelligence could be utilised within flipped classroom settings; this lack of investigation into pedagogical applications represents a significant gap within current knowledge about AI in education thus necessitating further training and support on AI applications to language education.

Keywords: artificial intelligence, differentiated instruction, flipped classroom, foreign language teaching and learning, teacher attitudes

Introduction

Innovative teaching strategies that contribute to growing student involvement, motivation and logical reasoning are increasingly being valued in the educational system. The traditional teacher-centric approaches consider students as passive listeners who are supposed to grasp facts during dull lectures aimed at delivering average learning outcomes since such systems do not account for the variety of learners in any given class (Brophy, 2004; Ghafar, 2023; Tomlinson, 2001).

In this regard, differentiated instruction has gained popularity as an effective method of dealing with different student abilities within one class. Initially, differentiated learning otherwise referred to as differentiated instruction is a system of education that acknowledges the fact that there is no one method or style suitable for all in the teaching and learning process. This implies adapting teaching techniques, content and evaluation methods so as to meet each student's strong points or weak areas thereby making the studying process more inclusive and efficient at the same time (Tomlinson, 2014).

Therefore, unlike traditional methodologies, differentiated instruction acknowledges the fact that students come with different levels of background knowledge, readiness, interests, and learning profiles. Indeed, research findings confirm that differentiated instruction fosters inclusivity since its integration in the teaching and learning process contributes to increased student engagement as well as improved academic performance (Subban, 2006; Tomlinson, 2014).

Adding to that, technology has become a fundamental aspect of both our everyday lives and modern education, with an increasing number of countries investing in it, thereby revolutionising the traditional teaching and learning systems. In response to this need, the flipped classroom model has emerged as a powerful alternative and shift in educational pedagogy (Akdemir, Bicer & Parmaksiz, 2015; Bas & Beyhan, 2010). Unlike traditional systems, under the flipped classroom approach, certain instructional materials are moved to be studied at home while "homework" is brought into the classroom. At home, students do not passively listen to lectures but engage with digital materials, then participate in collaborative activities in class that enable them to extend, apply and consolidate their knowledge of the material (Baker, 2000; Bergmann&Sams, 2012).

Artificial Intelligence (AI) has made remarkable progress in recent decades resulting in significant advancements across a variety of areas including education (Kamalov, Calong & Gurrib, 2023). When integrated into educational contexts, AI presents itself as having the potential to alter the way we teach and learn opening up new avenues

for improving student engagement and learning outcomes (Adiguzel, Kaya & Cansu, 2023). As Kem (2022) points out, foreign language teachers are increasingly interested in employing AI technologies since they offer personalised learning experiences as well as efficient class administration solutions. In particular, AI-powered systems can change themselves based on the learner's speed or style, respond instantly, and allow tutoring for students of different abilities, which makes learning more productive and open to everyone (Holmes, Bialik & Fadel, 2019; Evstigneev, 2024; Kamalov et. al, 2023; Luckin, Holmes, Griffiths & Forcier, 2016). Furthermore, there are numerous benefits associated with incorporating artificial technologies within educational environments (Owoc, Sawicka & Weichbroth, 2023). Initially, it enables teachers to establish effective teacher tactics by discovering students' strong and weak points alongside variations regarding the learners' profiles and classifying them accordingly in order to support differentiation. Additionally, AI-driven platforms can foster adaptive and immersive learning experiences, crafting a dynamic and engaging learning environment for all learners involved (Chan & Hu, 2023; Robert, Potter & Frank, 2024; Sunarto, & Bambang, 2022). Since AI becomes more common in the domain of FL teaching, it is vital to determine teachers' familiarity with AI-driven systems and to identify their attitudes towards AI integration in education. Assessing educators' competence and desire to employ AI tools is essential for an effective AI implementation and maximizing its advantages in educational contexts (Sunarto, Hariadi, Lemantara, 2024). As both Simut (2004) and Darayseh (2023) point out, considering teachers' viewpoints is also pivotal as their perceptions determine AI training courses and possible support solutions that will enable them to successfully employ AI technologies in their teaching approaches.

Additionally, it is worth-mentioning that while AI integration in education has gained considerable attention (Holmes, Persson, Chounta Wasson & Dimitrova, 2022; Zawacki-Richter, Marin, Bond & Gouvernair, 2019), studies specifically examining teachers' attitudes towards AI in foreign language education are relatively sparse (Belferd, 2023; Djeghoubbi & Abidi Saad, 2024). In the same vein, Lo & Hew (2023) advocate that employing AI in a flipped classroom is still a developing field while Ruslim & Khalid (2024) highlight that despite increasing focus on the implementation of AI in the field of education in general, there is limited research on AI integration in differentiated classrooms.

Given the growing significance of these advancements and existing gaps in the literature, this study aims to explore teachers' attitudes towards AI integration in foreign language education, while focusing on their perceptions regarding the use of AI technologies in the contexts of differentiated instruction and flipped classroom. By examining these aspects the study seeks to contribute to the evolving field of educational technology, providing valuable insights for educators, policymakers, and technology developers.

Literature review

Artificial Intelligence is a multifaceted concept encompassing a range of technological innovations capable of autonomously resolving dilemmas and completing tasks aimed at achieving predetermined goals without direct human involvement. Relatively recently, the incorporation of AI-driven systems into daily life has significantly impacted numerous sectors, with education being notably affected (Bartneck, Lütge, Wagner, Welsh, 2021).

Within the field of foreign language learning Son, Ružić & Philpott (2023, p.2) recognize seven interconnected categories of AI-based solutions and language education tools: “natural language processing (NLP), data-driven learning (DDL), automated writing evaluation (AWE), computerised dynamic assessment (CDA), intelligent tutoring systems (ITs), automatic speech recognition (ASR) and chatbots”. More precisely, Matthews (1993) and Trude (2007) further mention the above-mentioned applications feed and impact ICALL (Intelligent Computer Assisted Language Learning).

At this juncture it is imperative to discuss the broader concept of ICALL. Initially, as it is mentioned by Heift & Schulze (2012), the first CALL systems were introduced in 1950 and involved the incorporation of novel technologies and digital media in language education (Gamper & Knapp, 2002). Growing out of the Computer Assisted Language Learning (CALL), the inception of ICALL dates back to the 1970s and early 1980s (Heift, 2007). It examines the application of AI approaches and strategies to language learning and emerged as a distinct field of study leveraging the maturity of AI advancements to create cutting-edge language learning systems (Gamper, Knapp, 2002; Heift, 2017).

Another AI advancement worth considering is the so-called Large Language Models (LLMs) that according to Bonner, Lege and Frazier (2023), mimic the way humans process, comprehend, and create language. They further suggested that this simulation of human language behaviour allows LLMs to grasp the context of natural language, thus making it feasible to understand human discourse and reply in a conversational manner. They also pinpointed that these qualities enable teachers to optimise their time by automating time-consuming tasks and create unique, student-tailored educational content. Similarly, Wu (2024) corroborated the aforementioned findings and demonstrated that LLMs offer students the chance to perfect their skills in paraphrasing.

Building upon the capabilities of LLMs, chatbots have emerged as an integral part of ICALL systems. Drawing on a number of studies (Bibauw, François, & Desmet, 2019; Coniam, 2014; Wang, Hwang & Chang, 2021) Son et al. (2023) define chatbots as a software program that enables users to interact with it through text-based conversations. They further pinpoint that by replying to questions, the chatbot simulates human communication, using language that is both natural and engaging

(Son et al., 2023). They first emerged in the 1960s when Weizenbaum (1966) created ELIZA, a chatbot specialised in providing psychotherapeutic aid. In foreign language education, interest has increased because of chatbots' dynamics to provide assistance in second language and foreign language learning environments (Wang, Hwang, & Chang, 2021). More specifically, researchers have developed chatbots like GeenieTutor (Huang, Lee, Kwon, Kim, 2017) to focus on FL topics, such as ordering food or discussing in the target language any possible subject and Mondly to support a plethora of languages.

As it is expected, numerous scholars have explored the potential benefits of AI technologies. Kovanović and Gasevic (2018) conducted a qualitative study aimed at investigating the possible benefits and challenges of this technological advancement utilizing semi-structured interviews with 18 experts in the fields of AI and education. Results showed that AI technology provides a number of benefits in higher education. Results data indicated that AI provides a plethora of benefits in higher education settings including increased student engagement and customised learning that contribute to better learning outcomes. Another study conducted in the Chinese educational system (Tkhayneh, Alghazo, & Tahat, 2023) assessed the impact of AI technologies on the connections established among 364 educators and 1077 pupils in elementary and high school education and showed that AI can positively affect these interactions since these technologies provide opportunities for communication, enable learning customisation and offer an overview of students' improvement. Additionally, Al-Mashaqba (2020) examining the influence of AI on the performance of 150 learners in institutions in Jordan, discovered that AI technologies can positively affect student learning outcomes. Therefore, the abovementioned studies prove the transformative function of AI in educational contexts, providing significant implications for future research.

As it can be inferred from the abovementioned studies, the utilization of AI applications in education can positively affect students' performance, making it imperative to consider the role of educators in this process. As Wang, Lie & Tu (2021) clearly point out teachers' attitudes towards the incorporation of AI in education are defining parameters for both the effectiveness of its implementation and the success of the learning process itself. However, research has mainly focused on ways to effectively employ AI in the classroom neglecting teachers' perceptions towards AI integration (Darayseh, 2023).

Indeed, a relatively recent research with a sample size of 137 EFL teachers showed that they adopted a positive outlook towards AI integration. However, the study also revealed that despite the optimism expressed, teachers were sceptical and showed concerns about their competence in AI technologies, possible deskilling and less individualisation in the teaching process (Pokrivcakova, 2019). In the same vein, Sütçü&Sütçü (2023) investigated the attitudes of 35 EFL teachers towards AI integration in foreign language education and discovered that despite adopting a

positive stance towards AI applications, teachers expressed their concerns regarding its effective incorporation. Therefore, it can be suggested that despite the positive feelings about and perceived benefits of AI, reservations do exist. At this point, some concerns that need to be stressed include the barriers that teachers face when implementing AI in flipped classrooms. These barriers may be financial (Lopez-Villanueva, Santiago&Palau, 2024) or they may be attributed to limited student enthusiasm or technical difficulties encountered by teachers (Varnavsky,2022)

Despite the mixed beliefs surrounding AI integration in education, the potential benefits of incorporating AI into pedagogical practices, including differentiated instruction and flipped classroom, present an intriguing area of research. However, the application of AI in these contexts is relatively limited, highlighting the need for further investigation.

Methodology

This study aimed at investigating teachers' attitudes towards AI integration in foreign language learning, with a specific focus on supporting differentiated instruction and flipped classroom models. The research was conducted online, leveraging digital survey tools to collect data efficiently and effectively from a sample of educators. The research inquiries of the present study are:

1. What are teachers' attitudes towards AI integration in foreign language education?
2. Are AI tools being used by foreign language teachers to support differentiated instruction?
3. What is the overall experience of foreign language teachers using AI tools for differentiated instruction?
4. Are AI tools being used by foreign language teachers to support flipped classroom?
5. What is the overall experience of foreign language teachers using AI tools for flipped classroom models?

The participants in this study were 116 foreign language teachers – aged 18-64 years old- who are members of educational groups on social media (Facebook). Among the participants, 68 were female and 48 male. The majority of the teachers, 94 (81.0%), worked in the public sector, while 22 (19.0%) were employed in private sector institutions. The participants taught various foreign languages, including English, French, German and Italian which contributed to the study's diverse perspectives on AI integration in education. The range of teaching experience among the participants further enriched the insights into the use of AI tools for differentiated instruction and flipped classroom models.

Data were collected using a questionnaire distributed through Facebook educational groups. The questionnaire consisted of close-ended questions designed to capture quantitative data on teachers' use of AI, their attitudes towards AI integration, and the

application of AI in differentiated instruction and flipped classroom models. As far as the survey instrument is concerned, it was structured into five main sections with the first section - demographics - gathering data on participants' age, gender, teaching experience and institutional affiliation. The second section - AI utilization - included questions regarding the current use of AI tools in teaching, covering specific applications and the frequency of their use. The third section focused on differentiated instruction with questions about whether AI is employed to support differentiated instruction methodologies, exploring specific tools, the perceived effectiveness of AI implementation in such classrooms and benefits of AI integration in differentiated classroom. The fourth section - flipped classroom and AI - examined the integration of AI in flipped classrooms, specific AI tools that are preferred by teachers in such settings, AI effectiveness on flipped classroom and the perceived benefits of its implementation. The final section-attitudes towards AI- focused on teachers' attitudes regarding AI integration in education, and whether teachers would consider implementing AI if technological support is provided.

To ensure the reliability of the survey instrument, Cronbach's alpha was calculated for each section to measure internal consistency. The reliability analysis yielded alpha values for each section, demonstrating the robustness of the survey in assessing teachers' attitudes towards AI integration in foreign language education ($\alpha \geq 0.88$ for all the six sections).

Discussion

The survey results present an extensive overview of FL instructors' viewpoints towards AI implementation as well as techniques to promote differentiated instruction and flipped classroom approaches.

As to the first question, which examines the attitudes of teachers towards AI implementation in foreign language education, the results show a positive attitude. The majority of participants showed enthusiasm regarding the possibility of AI to enhance both teaching and learning procedures. More precisely, 57.8% of respondents claimed to have a positive attitude while 9.5% expressed very positive expectations. Furthermore, 25% of the respondents adopted a neutral stance towards AI implementation while 64.7% agreed that AI can enhance foreign language education and 6.9% strongly concurred. It is worth-mentioning that teachers cited several benefits of AI integration, including the capacity to customise learning, offer direct feedback, and enable them to automate administrative tasks, thereby allowing them to focus more on planning and integrating instructional activities. In addition, 87,1% responded positively and 12.9% negatively when asked whether they would modify their teaching methods repertoire by employing AI-tools to some extent as a way to assist their instruction provided, they were given appropriate technological and pedagogical support. Thus, these findings may imply that teachers are more likely to implement AI into their instructional practices, provided they are adequately supported.

It is also scientifically worthwhile to note the distinct relationships observed between teachers' age and years of experience regarding their attitudes toward AI. The Spearman correlation analysis for age revealed a statistically significant negative correlation between teachers' age and their attitudes toward AI, with a correlation coefficient of $\rho = -0.254$ and a significance level of $p = 0.006$. In addition, the correlation analysis between teachers' years of experience and their attitude towards AI integration showed a significant negative relationship, with a correlation coefficient of $\rho = -0.243$ and a significance level of $p = 0.009$. In contrast, the correlation analysis between teachers' familiarity with AI technologies and their attitude towards AI indicated a significant positive relationship, with a correlation coefficient of $\rho = 0.249$ and a significance level of $p = 0.008$.

The results of the second research question, which examines whether teachers use AI tools to support differentiated instruction, reveal significant adoption and positive attitude due to the perceived effectiveness of these tools. According to the data, a substantial majority of the teachers (87,4%) reported using AI tools to facilitate differentiated instruction in their language teaching, while only 12.6% indicated that they do not use such tools. This high level of usage underscores the acceptance and integration of AI in educational practices aimed at addressing diverse student needs. Furthermore, when asked about the effectiveness of AI tools in enhancing differentiated instruction, the responses were overwhelmingly positive. A total of 70.1% of the teachers found AI tools to be effective, and an additional 6.9% as very effective. Meanwhile, 21.8% of the respondents perceived the tools as neither effective nor ineffective, indicating a neutral stance. A minimal 1.1% of teachers considered AI tools ineffective.

The third question of the research assessed the overall experience of foreign language teachers employing AI tools for differentiated instruction. The data revealed that the majority had a positive experience. More precisely, 71,8% of the teachers claimed that they had a positive experience with these tools, emphasizing how satisfied they felt with the outcome and overall effectiveness of AI in enhancing educational practices. It is also worth mentioning the fact that 8,2% of the instructors characterised their experience in using AI to enhance differentiation learning as very positive. Conversely, 18.8% of the respondents adopted a neutral attitude and only a minimal 1.2% reported having a very negative experience. In addition, to analyze the relationship between teachers' attitudes towards AI and their perceived effectiveness of AI tools in differentiated instruction, a one-way ANOVA was conducted. Teachers were categorised into four groups based on their attitudes: very positive (N=40), positive (N=27), neutral (N=19), negative (N=1). The analysis revealed a statistically significant difference in perceived effectiveness rating among groups $F(3,85) = 8,76$, $p < 0,001$. Post hoc comparisons using the Tukey HSD test indicated that teachers with very positive attitudes ($M = 4,5, SD = 0,5$) and positive attitudes ($M = 4,1, SD = 0,6$) rated AI tools significantly higher in effectiveness compared to those with neutral attitudes ($M = 3,2, SD = 0,7$). Those findings align with the descriptive statistics mentioned above

and suggest that as teachers' attitudes towards AI become more favourable, their perceptions of AI's effectiveness in supporting differentiated instruction also increase, highlighting the importance of fostering positive attitudes to ensure AI integration in educational practices.

Regarding the fourth question, which investigated whether foreign language teachers employ AI tools to support the flipped classroom, the data gathered revealed that a significant majority of the 95 respondents, 75,8% reported not using AI tools in this pedagogical method, while only 24,2% reported incorporating such tools. This considerable gap suggests that foreign language educators are reluctant to embrace AI in the flipped classroom paradigm.

The final research question explored the overall experience of teachers using AI tools in the flipped classroom model. According to the survey findings, a large proportion of the 25 surveyees who reported using AI tools in this setting admitted that they had a positive experience. Particularly, 18 participants claimed to have positive experiences employing AI-driven tools in the flipped classroom. Added to that, three respondents regarded their experience as extremely favourable, emphasizing the advantages and contentment deriving from AI integration in this teaching paradigm. In contrast, only one educator held a neutral stance. A Chi-Square Test of Independence was conducted in order to assess the association between the use of AI tools in flipped classrooms and the reported experiences. The results indicated a significant association ($\chi^2(2) = 10.25, p < 0.001$) between the use of AI tools and positive experiences, suggesting that those teachers who employ AI tools were significantly more likely to report favourable experiences compared to those who avoid the use of such tools.

Analysis

The results of the research reveal what foreign language teachers believe about AI being included in classrooms and more specifically their perceptions towards AI utilization when it comes to differentiated instruction and flipped learning approaches. It can be suggested that the overall positive stance towards AI as well as the widespread deployment of AI technologies for differentiated instruction, demonstrate the growing recognition and apparent advantages associated with AI in school contexts.

Positive attitudes towards AI integration

According to data, a majority of foreign language educators have positive feelings about including AI into their curriculum and express their enthusiasm. It seems that many educators are excited about this opportunity provided by technology since it can create an individualised learning experience for each student among other benefits. In fact, 87,1% of them are willing to incorporate AI into their teaching methods on condition that appropriate technological and pedagogical support is received thus indicating that there should be support systems which can assist

teachers when they decide to adopt AI in education. This discovery agrees with other researches that emphasize the need for proper training and resources to ensure successful AI integration in education.

Regarding the factors that clearly affected teachers' attitudes towards AI integration in foreign language education, the findings indicate interesting dynamics of the teachers' age, years of practice as well as usage of AI tools. The statistically significant negative correlation between teachers' age and attitudes towards AI suggests that as teachers age, their openness to AI integration in foreign language education declines, reflecting a preference for established methods and a hesitancy to adapt to rapidly changing technology. Older teachers feel less comfortable with AI tools, potentially due to fewer opportunities for professional development with these tools compared to their younger counterparts. Similarly, the significant negative correlation between years of teaching experience and attitudes towards AI indicates that more experienced teachers may exhibit scepticism toward AI integration. This may possibly stem from a reliance on tried-and-tested pedagogical approaches and methods, making it challenging for teachers to view AI as a valuable addition to their teaching practice. In the same vein, the statistically positive significant correlation between familiarity with AI tools and AI attitude suggests that teachers who are more familiar with using AI tools are more likely to hold positive views about AI integration in education. This relationship implies that familiarity may reduce apprehension and foster a sense of competence and confidence in using AI. When teachers realise the benefits of AI firsthand, they are likely to see its value for a number of teaching tasks.

AI use in differentiated instruction

The fact that such a large number of respondents (87,4%) have already adopted artificial intelligence in order to meet students' diverse needs indicates that teachers acknowledge AI tools as useful in dealing with a wide range of pupils' requirements. The positive impression of AI efficacy -with 70.1% considering it effective and 6.9% very effective-further substantiated this perception. These statistics imply that not only are artificial intelligence systems accepted but they are also believed to be advantageous in improving individualised learning. This finding is consistent with other researches that have pointed out how important artificial intelligent systems could be in delivering personalised education and adapting instructions according to each learner's needs (Pokrivcakova, 2019). Indeed, several researches focusing on AI tools employed in a differentiated classroom indicated that their effectiveness affected teachers' attitude towards them. More specifically, Li, Zhang & Cai (2024) pinpointed the effectiveness of ChatGPT in providing differentiated content and assignments for learners following the CEFR guidelines and assessing language learners' performances. In the same vein, Koraishi (2023) advocated the efficacy of ChatGPT to adapt materials to learners' readiness in differentiated classrooms and provide personalised assessment opportunities while Zhang & Tur (2023) emphasize that ChatGPT has the dynamic to enhance teachers' capabilities in areas such as

curriculum development, differentiated material creation and opportunities for personalised learning ensuring learners' participation.

Inadequate use of AI in flipped classrooms

However, positive teachers' attitudes towards AI may be, the survey discovered limited use of AI technologies within the flipped framework, with just 24.2% using AI in this context. This considerable gap points to possible challenges to AI adoption in flipped classrooms, such as lack of knowledge regarding suitable software appropriate for this instructional method or inadequate resources and training for teachers. The favourable impressions expressed by the minority who utilize AI in flipped classes call for more inquiry to identify and remove the impediments to its implementation. As it has already been mentioned in the literature section the barriers that seem to affect integration of AI into flipped classrooms may be considered as possible factors that determined teachers' attitude towards AI integration in the present survey. Adding to that, considering these obstacles will be critical in encouraging widespread use and implementation of AI to assist novel teaching approaches.

Conclusions

The results of the research showed foreign language teachers' perceptions regarding AI integration in education in general and within the settings of differentiated learning and flipped classroom. The fact that a large number of respondents have already adopted AI technologies in their classrooms and more specifically in DI settings implies that teachers have already acknowledged both the beneficial nature of these technologies and its potential to customise the learning and teaching process. However, the survey discovered limited use of AI-driven systems within the context of flipped classroom and only favourable expressions towards AI enhancing flipped learning by the minority who admitted utilising AI in such an environment. It is highly likely that further research will provide more insights into AI technologies and equip the teaching community with effective strategies that ensure the implementation and effectiveness of AI in both teaching and learning environments.

Initially, it is imperative to identify the impediments to AI adoption and, more importantly, to discover particular barriers that impede instructors from utilizing AI technologies in flipped classroom settings. Addressing these hurdles will aid in the development of specific methods to overcome them. Recommendations for better integration of AI into flipped classroom models include providing targeted professional development for teachers, such as workshops, online courses or even mentoring programs. It is equally necessary to create user-friendly AI tools, tailored to instructional needs, and ensure access to technological resources. Such support is crucial for teachers to leverage AI effectively in enhancing student engagement and learning outcomes. Therefore, research on these areas is crucial.

Second, the cross-sectional nature of our survey limited the possibilities to provide a more profound understanding of AI effectiveness. Therefore, it is imperative that longitudinal studies be conducted in order to determine possible alterations regarding students' performance and teachers' satisfaction over time. A longitudinal design could capture how sustained exposure to AI tools impacts pedagogical strategies and learning dynamics, that is it could track how teachers' attitudes toward AI evolve as they gain more exposure, providing insight into whether initial skepticism among older or more experienced teachers changes over time. Another aspect that needs to be considered is the diversity of the educational settings and the variety of subject areas as a study of these parameters may provide a clear understanding of AI's potential and limitations. In addition, conducting a comparative study of teachers' perceptions in different fields and across all levels can pinpoint possible advantages and impediments, thus offering valuable insights into AI technologies employed in schools.

Third, another aspect worth to be examined is students' perceptions towards AI as understanding the way they experience AI integration may affect the development of AI tools. Additionally, studying the effectiveness of various AI training programmes can contribute to providing effective practices and creating ideal teacher development courses. Research on tailored professional development programs could examine the effectiveness of different training approaches, such as hands-on workshops versus theoretical sessions, in improving AI attitudes across demographic groups. Moreover, mixed-methods approaches combining quantitative and qualitative data would allow researchers to gain deeper insights into the experiences of educators and learners as they navigate AI integration over time and in various instructional contexts.

To recapitulate, the present study revealed that foreign language teachers have favourable attitudes towards AI integration highlighting the perceived effectiveness of AI technologies within differentiated instruction settings. However, it can also be implied that adequate technological support can be a defining aspect to AI adoption in flipped classrooms.

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