

Applying the artificial intelligence muse: secondary school teachers' innovative approaches in Maltese language teaching and learning

Jacqueline Żammit 

Department of Languages and Humanities in Education, Faculty of Education, University of Malta, Msida Malta

ABSTRACT

As artificial intelligence (AI) continues to transform education, its application in language learning offers new opportunities for personalised, adaptive and engaging instruction. This study investigates the use of generative AI in Maltese language teaching among 47 secondary school teachers working with students aged 13–16 in Malta. This study, informed by sociocultural theory and constructivist learning principles, found that generative AI fostered student engagement and supported emotional and cognitive development. The teachers reported that AI-driven personalised feedback improved students' Maltese language proficiency by providing immediate, targeted corrections. AI-generated resources, including interactive storytelling and contextual language activities, also increased learners' motivation and participation. Furthermore, educators highlighted AI's capacity to identify individual learning needs, enabling differentiated instruction across varying proficiency levels. The findings demonstrate the potential of generative AI to strengthen Maltese language teaching and provide practical insights for promoting more effective, inclusive and engaging language learning experiences.

ARTICLE HISTORY

Received 13 June 2024
Accepted 27 March 2026

KEYWORDS

Maltese language teaching and learning; secondary school education; AI-driven pedagogy; multicultural classrooms; adaptive language models

Introduction

In recent years, the use of generative artificial intelligence (AI) in educational settings has garnered significant attention, particularly in language instruction. Generative AI, with its advanced capabilities in natural language processing and adaptive learning, offers transformative potential for language education (Kohnke et al., 2023; Lee et al., 2024).

Empirical studies have shown that AI-driven tools can improve language acquisition outcomes through personalised feedback, adaptive content delivery and interactive learning environments. For example, Lee et al. (2024) and Kohnke et al. (2023) reported measurable gains in learner engagement and proficiency when AI-generated feedback and adaptive tasks are integrated into classroom practice. Darling-Hammond et al. (2020) similarly provided empirical evidence that real-time, AI-mediated feedback supports

CONTACT Jacqueline Żammit  jacqueline.zammit@um.edu.mt  University of Malta

 Supplemental data for this article can be accessed online at <https://doi.org/10.1080/1475939X.2026.2715526>

© 2026 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group.

This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial-NoDerivatives License (<http://creativecommons.org/licenses/by-nc-nd/4.0/>), which permits non-commercial re-use, distribution, and reproduction in any medium, provided the original work is properly cited, and is not altered, transformed, or built upon in any way. The terms on which this article has been published allow the posting of the Accepted Manuscript in a repository by the author(s) or with their consent.

deeper linguistic awareness and accelerates learning. These empirical findings are particularly relevant in multilingual and multicultural classrooms, where learners' linguistic backgrounds and proficiency levels vary widely (Karakas, 2023).

Taken together, the existing literature highlights three key issues relevant to this study: (1) the growing pedagogical potential of generative AI in language education, (2) the particular challenges and opportunities associated with minority and less commonly taught languages such as Maltese, and (3) the central role of teachers' pedagogical knowledge and training in shaping meaningful AI integration.

Accordingly, the study was guided by the following research questions:

- (1) How are secondary school teachers integrating generative AI tools in teaching Maltese?
- (2) How do teachers perceive the impact of AI-driven personalised feedback on students' Maltese language proficiency?
- (3) What specific AI-generated content and strategies have been most effective in increasing student motivation and participation in Maltese language lessons?

Problem statement

The Maltese language, a minority language with a unique linguistic heritage, spoken by around half a million people, mostly in the Maltese islands, has faced significant challenges in adapting to the digital age (Żammit, 2023, 2024). Early iterations of AI chatbots, such as ChatGPT-3 and GPT-2, and similar models like BERT, T5, Bing AI and Replika, frequently generated non-existent words in Maltese and exhibited poor grammar and sentence structure, rendering them ineffective for educational purposes (Żammit, 2024, 2025). Recent advancements, including ChatGPT-4Omni and other state-of-the-art AI chatbots such as GPT-Neo and BlenderBot, have shown considerable improvements in handling minority languages, as highlighted by Betal (2023) and Darling-Hammond et al. (2020), including the Maltese language. However, despite these technological advancements, a gap remains in the pedagogical training of teachers, who were not prepared during their formal education to integrate generative AI into the Maltese language classroom effectively.

Study aims

This study explores how secondary school teachers, who have attended Continuing Professional Education sessions, courses or conferences on the use of AI in language teaching and learning, are leveraging generative AI tools to enhance the teaching and learning of Maltese. By examining the innovative strategies employed by these educators, this research seeks to provide insights into best practices and the transformative potential of AI in Maltese language education.

Literature review

Application of AI in language teaching and learning

Recent advances in AI are revolutionising language teaching and learning by offering innovative solutions to enhance educational outcomes. AI technologies, particularly generative AI,

provide personalised learning experiences and adaptive feedback, which are crucial in language acquisition (Kohnke et al., 2023; Lee et al., 2024). Studies have demonstrated that AI-driven tools can significantly improve student engagement and language proficiency by offering real-time, customised feedback and interactive learning environments (Kohnke et al., 2023; Lee et al., 2024). Moreover, AI integration addresses the cognitive and emotional challenges students face in multicultural classrooms (Karakas, 2023).

Recent studies have further highlighted the pedagogical potential of generative AI tools such as ChatGPT in educational contexts. For example, Nikolopoulou (2024) examined the integration of ChatGPT in higher education and identified its value in supporting student-centred pedagogical practices, reflective learning and formative feedback. Complementing this perspective, Law (2024), through a scoping review of generative AI in language teaching and learning, reported that tools such as ChatGPT can enhance learner engagement, support personalised learning pathways and assist teachers in designing adaptive language tasks. These findings align with the present study's results, which indicate that generative AI tools can play a meaningful role in supporting language learning when pedagogically grounded and critically implemented.

Types of AI in language classrooms

Various types of AI have emerged as potent tools in language education, each catering to distinct facets of language acquisition and proficiency enhancement. Among these, adaptive language models have garnered significant attention for their efficacy in handling less commonly taught languages, such as Maltese. State-of-the-art models like GPT-4Omni and GPT-Neo exemplify this trend through substantial improvements in generating personalised learning content and by delivering instant feedback, thus fostering language development (Martínez-Cruz et al., 2023).

In addition to adaptive language models, AI chatbots have emerged as invaluable assets in facilitating conversational practice and honing students' speaking and listening skills. Platforms like ChatGPT, Bing AI and BlenderBot simulate real-life interactions, providing learners with tailored responses that adapt to their proficiency levels (Darling-Hammond et al., 2020).

Moreover, intelligent tutoring systems (ITS) represent a pivotal advancement in AI-driven language education, offering personalised instruction tailored to individual learner needs. By dynamically assessing student performance in real-time, ITS adjust task difficulty, thereby catering to the diverse proficiency levels within a classroom. This personalised approach not only optimises learning outcomes but also fosters a supportive and inclusive learning environment (Betal, 2023).

Complementing these AI tools are automated essay scoring and feedback systems, which play a crucial role in enhancing students' writing proficiency. These systems meticulously evaluate written assignments, providing detailed grammar, syntax and content feedback (Fraillon et al., 2020).

Theoretical framework: sociocultural theory and constructivist learning principles

This subsection outlines the theoretical foundations underpinning this study and explains how established learning theories inform the interpretation of the empirical evidence

discussed above. Within educational theory, constructivist learning is commonly understood as encompassing both cognitive constructivism, associated with Piaget, which emphasises individual meaning-making, and sociocultural or social constructivism, associated with Vygotsky, which foregrounds the social and cultural mediation of learning. Together, these perspectives account for complementary dimensions of learning processes relevant to language education.

Sociocultural theory, pioneered by Vygotsky, represents the social dimension of constructivist learning by emphasising the role of social interaction, cultural tools and mediated activity in cognitive development (Vygotsky, 1978). In AI-enhanced language learning environments, generative AI technologies can be conceptualised as mediational tools that support interaction, scaffolding and collaborative meaning-making between teachers and students (see Figure 1).

Building on constructivist learning theory, Jonassen's constructivist learning principles focus on the pedagogical implementation of constructivism in technology-rich learning environments (Jonassen, 1999). From this perspective, AI tools facilitate learner autonomy by enabling personalised learning pathways and opportunities for self-directed engagement (Kohnke et al., 2023).

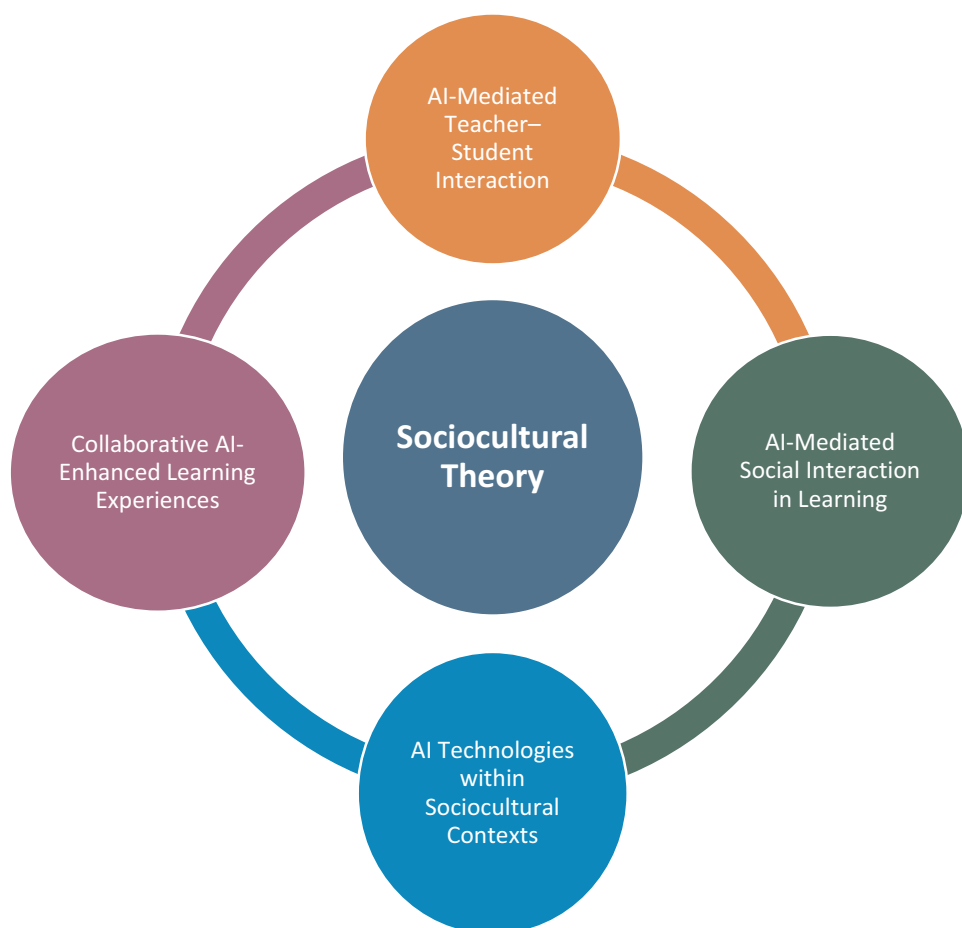


Figure 1. Conceptual framework of AI integration in Maltese language education.

Figure 1 presents an original conceptual framework developed by the researcher, synthesising cognitive constructivism (Piaget), sociocultural theory (Vygotsky) and technology-oriented constructivist learning principles (Jonassen) to illustrate how generative AI technologies mediate learning processes in Maltese language education. While informed by existing theoretical literature, this framework is not adapted from a specific prior study but represents an original model tailored to the context of this research. By integrating individual, social and technological dimensions of constructivist learning, the framework provides a coherent theoretical lens for examining how AI supports personalised, scaffolded and socially mediated language learning experiences.

Constructivist learning principles emphasise the active construction of knowledge by learners through exploration and reflection (Jonassen, 1999). In the context of AI and language learning, constructivist principles highlight the importance of learner autonomy and agency. AI tools can empower learners to take ownership of their learning by providing personalised learning pathways and opportunities for self-directed exploration (Kohnke et al., 2023) (see **Figure 1**). By engaging with AI-generated content and receiving tailored feedback, students can actively construct their linguistic knowledge and skills in meaningful ways (Darling-Hammond et al., 2020).

The relationship between sociocultural theory and AI in language education

In recent years, scholars have delved into the intricate interplay between sociocultural theory, constructivist learning principles and the integration of AI in language learning contexts (Darling-Hammond et al., 2020; Karakas, 2023; Kohnke et al., 2023). A pivotal aspect explored in contemporary research is the facilitation of collaborative learning environments through AI tools. Studies have demonstrated how AI platforms, grounded in sociocultural theory, engender social interaction and peer feedback, thereby fostering collaborative knowledge construction (Karakas, 2023). This collaborative ethos aligns with constructivist principles by emphasising the importance of social interaction in cognitive development (Vygotsky, 1978). Through AI-mediated collaboration, learners engage in meaningful interactions, co-constructing knowledge in authentic contexts.

Moreover, research underscores the role of learner autonomy and agency in AI-driven language learning environments. Kohnke et al. (2023) highlighted how AI tools empower learners to take ownership of their learning journey, supporting self-directed exploration and personalised learning pathways. By providing learners with agency, AI-enabled language learning environments facilitate personalised, scaffolded learning experiences tailored to individual learner needs.

Personalised learning and feedback

Personalised learning and feedback represent cornerstones of effective language education, with AI technologies playing a pivotal role in delivering tailored learning experiences. Through sophisticated algorithms, AI tools can meticulously analyse individual learning patterns and customise content and feedback to address learners' needs (Kohnke et al., 2023). This personalised approach is particularly significant in language education contexts characterised by diverse learner populations and varying proficiency levels and learning paces.

The efficacy of AI-driven personalised feedback has been underscored by educators who report its transformative impact on student language proficiency (Karakas, 2023). Compared to traditional teaching methods, AI-enabled feedback mechanisms offer immediate and specific corrections, enabling learners to pinpoint and rectify language errors promptly.

Beyond corrective feedback, AI supports personalised learning through adaptive pathways tailored to individual learner needs. By adjusting content difficulty and pacing in response to learners' progress, AI technologies optimise learning outcomes while fostering learner autonomy and agency (Kohnke et al., 2023).

Enhanced student engagement

Enhanced student engagement is a hallmark benefit of integrating AI in language education, with AI-generated content supporting interactive and immersive learning experiences. Studies indicate that AI-generated content, such as interactive storytelling and contextual language exercises, can significantly enhance student motivation and participation in language classes (Darling-Hammond et al., 2020).

AI-generated stories and role-playing scenarios enable learners to practise language skills in engaging and immersive contexts (Lee et al., 2024). Through interactive narratives and simulated real-life scenarios, learners can apply language concepts in context, thereby deepening their understanding and retention of linguistic content.

AI-generated content also supports engagement by offering adaptive learning experiences tailored to individual learner preferences and needs. By adjusting content presentation and difficulty levels, AI technologies cater to diverse learning styles and proficiency levels, ensuring appropriate challenge and support (Kohnke et al., 2023).

Differentiated instruction

AI's capacity for differentiated instruction is particularly relevant in language acquisition, especially in multicultural classrooms characterised by diverse learner populations. By leveraging sophisticated algorithms, AI tools can discern and accommodate individual learner needs, thereby fostering inclusive and supportive learning environments.

In multicultural classrooms, where students' backgrounds, learning styles and proficiency levels vary widely, differentiated instruction is paramount for optimising learning outcomes (Betal, 2023). AI technologies support this process by providing tailored learning pathways that cater to learners' needs and abilities. Through adaptive content delivery and personalised learning experiences, AI helps ensure that every learner receives the appropriate level of challenge and support, thereby maximising their potential for academic success.

AI-driven differentiated instruction extends beyond content customisation to encompass individualised assessment and feedback. By assessing student performance in real-time, AI tools identify areas of strength and areas for improvement, allowing educators to deliver targeted interventions and support (Karakas, 2023).

Challenges and considerations

While AI offers significant promise in language education, its integration presents several challenges. Foremost among these is the scarcity of pedagogical training for educators on

the effective use of AI tools in the classroom (Fraillon et al., 2020). Many teachers lack the skills and knowledge to leverage these technologies optimally, which can limit the effectiveness of AI-enhanced instructional practices.

The effectiveness of AI in language education depends on the accuracy and reliability of AI models, particularly for less commonly taught languages (Son et al., 2023). Early AI models struggled to handle languages with complex linguistic structures, such as Maltese, often producing non-standard words and grammatically incorrect output (Żammit, 2023, 2024, 2025). While recent advancements have mitigated some of these issues, ongoing research and development remain necessary.

Ethical considerations surrounding the use of AI in education also require careful attention. Concerns related to data privacy, algorithmic bias and equitable access underscore the need for ethical frameworks to guide the development and deployment of AI technologies in language education (Nguyen et al., 2023). Addressing these concerns requires collaboration among educators, policymakers and other stakeholders.

At the time of data collection, no officially established national guidelines governed the use of generative AI in Maltese secondary schools. Teachers, therefore, relied primarily on institutional policies, professional judgement and general ethical guidance when integrating AI tools into classroom practice.

Methodology

The study design, data collection and analysis were guided by the research questions outlined in the Introduction. A qualitative research design was adopted to capture teachers' in-depth experiences, perceptions and pedagogical reflections on the use of generative AI in Maltese language teaching, as this approach is particularly appropriate for exploratory studies seeking to understand meanings, processes and contextualised practices (Creswell & Poth, 2018). Given the exploratory nature of the study and the relative novelty of generative AI in this context, semi-structured interviews were therefore considered the most appropriate method for eliciting rich, contextualised insights that could not be adequately captured through standardised survey instruments.

Participants

The study included 47 secondary school teachers of Maltese from various educational institutions across Malta. The participants were recruited through an email invitation sent to the heads of all secondary schools in Malta. A purposive sampling approach was used to select participants based on specific criteria relevant to the research objectives (Suri, 2011). The criteria included teaching experience, gender and type of school. This approach ensured a comprehensive exploration of AI utilisation in Maltese language teaching and learning within diverse pedagogical contexts. The participants ranged from newly qualified teachers to those with extensive teaching experience, allowing for a nuanced understanding of AI integration in different educational environments.

The participants ranged in age from 24 to 59 years ($M \approx 38$ years). All participants reported prior exposure to generative AI through professional development initiatives, with the majority having completed short AI-focused workshops (6–10 hours), while a smaller group attended extended Continuing Professional Education (CoPE) courses

(20–30 hours). The duration of classroom application of AI tools ranged from six months to three years, with most participants reporting between 6 and 12 months of active AI use in Maltese language teaching, particularly among newly qualified teachers (see Appendix in the online supplemental materials).

Among the 47 participants, 28 were female and 19 were male, with teaching experience ranging from Newly Qualified Teachers (NQTs) to those with 28 years of experience. Notably, 13 teachers were NQTs, representing a significant portion of the sample. These teachers were primarily selected because they mostly used AI in teaching Maltese. The teaching contexts included state schools, church schools and independent schools, with a notable presence of female teachers in state and church schools and a more balanced gender distribution in independent schools. A significant number of highly experienced teachers were employed in state or church schools, while both very new and moderately experienced teachers worked in independent schools.

This diverse mix of participants facilitated a comprehensive exploration of the utilisation of AI in Maltese language teaching and learning, allowing for a nuanced understanding of the varied pedagogical contexts and instructional needs within the educational landscape (Darling-Hammond et al., 2020). The demographics of this study provide insightful conclusions about the adoption of AI in teaching Maltese. Out of the 47 teachers of Maltese who decided to participate in this study, 22 were NQTs or new teachers with one to three years of teaching experience. Among these 22 new teachers, 13 were teaching at independent schools, five were employed at church schools, and 4 were working in state schools (see Appendix in the online supplemental materials). Since these younger teachers tended to use AI in their teaching practices and were generally in favour of AI integration, it can be inferred that independent schools are more likely to be early adopters of AI technology in Maltese teaching and learning. This trend suggests a correlation between the presence of younger, less experienced teachers and the implementation of innovative teaching tools such as AI.

Furthermore, the higher prevalence of NQTs in independent schools indicates that these institutions may be more open to new teaching methodologies and technologies, contrasting with the more experienced teacher demographics in state and church schools, where traditional methods might be more entrenched. Furthermore, it was observed in this study that more experienced teachers in state and church schools were not as much in favour of AI in Maltese language teaching. They had reservations about the effectiveness and applicability of AI tools in Maltese instruction, often preferring traditional teaching methods they had used successfully over the years. This resistance highlights a potential challenge in the widespread adoption of AI in education, emphasising the need for targeted professional development and support to help more experienced educators integrate new technologies into their teaching practices. The author did not act as a tutor, trainer or facilitator in any of the AI-related training sessions attended by the participants.

Data collection

Semi-structured interviews served as the primary method of data collection, facilitating in-depth exploration of participants' experiences, practices and perceptions concerning the integration of AI in teaching the Maltese language. These interviews were chosen for their flexibility, enabling an in-depth exploration of specific topics while fostering unexpected

insights (Gerson & Damaske, 2020). The interviews were conducted over three months, from March to May 2024.

Interview protocol

The semi-structured interview protocol was developed by the researcher and informed by empirical studies on AI-enhanced language learning and qualitative interview design, particularly research focusing on teachers' perceptions of AI integration, personalised feedback and technology-mediated language instruction (e.g. Gerson & Damaske, 2020; Kohnke et al., 2023; Lee et al., 2024). These studies guided the formulation of questions to ensure alignment with the study's aims and research questions, while allowing sufficient flexibility to capture participants' experiences in depth. The following were the 10 interview questions that were planned to be asked during the interviews to explore the integration of generative AI in teaching the Maltese language:

- (1) Can you describe your experience with integrating generative AI tools into your Maltese language teaching practices?
- (2) What motivated you to explore the use of generative AI in teaching the Maltese language?
- (3) How do you perceive the impact of AI-driven personalised feedback on students' proficiency in Maltese?
- (4) Can you share any specific AI-generated content or strategies that have been particularly effective in your Maltese language lessons?
- (5) What challenges have you encountered in incorporating generative AI into your teaching and how have you addressed them?
- (6) In your opinion, what are the key benefits of using generative AI in language education, particularly for teaching Maltese?
- (7) How do you balance traditional teaching methods with AI-driven approaches in your Maltese language classroom?
- (8) Have you observed any differences in student engagement or motivation since implementing AI tools in your teaching of Maltese?
- (9) What recommendations would you offer to educators considering integrating generative AI into their Maltese language teaching practices?
- (10) Looking ahead, how do you envision the future of AI in Maltese language education, especially concerning the teaching of less commonly taught languages like Maltese?

These 10 open-ended interview questions were designed to elicit detailed responses from the participants regarding their instructional practices, challenges encountered, perceptions and insights into the integration of generative AI in teaching the Maltese language and, therefore, align with the study's aims and research questions.

These questions were carefully crafted to explore key themes identified in the literature and to provide a framework for comprehensive data collection. The interviews were conducted online via secure video conferencing platforms to ensure participant comfort (Seidman, 2019). Through an iterative process of questioning, probing and clarification, the aim was to capture the depth and breadth of participants' experiences while ensuring consistency and rigour in data collection (Guest et al., 2006).

Data analysis

Following the transcription of the audio-recorded interviews, thematic analysis was conducted using a methodological approach inspired by Nowell et al. (2017). This approach, which aligns with Braun and Clarke's (2006) thematic analysis framework, facilitated a rigorous exploration of the qualitative data collected in this study.

The analysis commenced with the familiarisation of the transcribed data, allowing researchers to immerse themselves in the rich narratives provided by the participants. Initial codes were then generated through an iterative process of open coding, wherein significant phrases, concepts and patterns were systematically identified and labelled.

Subsequently, the initial codes were organised into overarching themes and sub-themes, guided by the conceptual coherence and relevance to the research objectives. This process of thematic coding involved constant comparison and refinement, ensuring that the identified themes accurately captured the essence of the data.

Once the themes were delineated, they underwent a process of review and refinement, involving discussions among the research team to ensure accuracy and consistency in interpretation. Each theme was carefully defined and named to encapsulate its core meaning, supported by verbatim excerpts from the interviews.

Finally, the findings were synthesised into a coherent and comprehensive narrative, providing valuable insights into the integration of generative AI in teaching the Maltese language. Throughout the analysis process, NVivo 14 software was utilised to facilitate data management and coding, enhancing the transparency and rigour of the analysis.

Methodological considerations

Some methodological approaches were adopted to ensure the rigour and credibility of the study findings. Firstly, member checking was employed, allowing participants to review and validate the interview transcripts' accuracy, enhancing the data's trustworthiness (Smith & McGannon, 2018). This iterative process of validation ensured that participants' voices were accurately represented and that any discrepancies could be addressed promptly.

In addition to member checking, peer debriefing sessions were conducted to facilitate discussions among researchers and refine the emerging themes. By engaging in collaborative dialogue, researchers could critically examine their interpretations and ensure that diverse perspectives were considered, thus enhancing the credibility and comprehensiveness of the analysis (Hesse-Biber, 2010).

Furthermore, reflexivity was maintained throughout the study to acknowledge and mitigate the potential influence of the researcher's biases on the data collection and analysis process (Finlay, 2002). Researchers continuously reflected on their assumptions, values and experiences, thereby promoting transparency and rigour in the research process. Consequently, these methodological considerations served to strengthen the validity and reliability of the study findings, ensuring that the research outcomes were robust and defensible.

Ethical considerations

Permission for this study was obtained from the Faculty Research Ethics Committee at the University of Malta. Before participation, all participants were provided with informed consent forms detailing the nature and purpose of the study, and written consent was obtained from each participant. Ethical principles, including confidentiality, anonymity and informed consent, were rigorously upheld throughout the study.

The participants' confidentiality was safeguarded by using numbers instead of names to ensure anonymity in reporting the findings. Any identifiable information disclosed during the interviews was anonymised to protect the privacy of the participants. Moreover, the participants were assured of their right to withdraw from the study at any time without repercussion.

Pre-registration practices in qualitative research

Pre-registration practices, although widely encouraged in quantitative research for enhancing transparency and reproducibility, often pose challenges when applied to qualitative studies. Qualitative research methods, characterised by their flexibility and iterative nature, typically involve exploratory approaches to data collection and analysis. Consequently, the use of pre-registration codes is less common in qualitative research, where researchers may adjust their research questions, methodologies and analytical strategies based on emergent findings and theoretical insights (Nosek et al., 2018). This adaptability is intrinsic to the qualitative research process, allowing researchers to explore complex phenomena in depth and capture nuanced perspectives from participants. While pre-registration codes may not apply to qualitative studies, researchers uphold methodological rigour by adhering to ethical guidelines, transparently documenting research processes and engaging in rigorous data analysis techniques such as thematic coding and triangulation.

Results

The Results section is organised according to the key themes that emerged from the thematic analysis of the interview data, in alignment with the study's research questions. The analysis of the interviews yielded useful insights into the integration of generative AI tools in teaching the Maltese language, aligning with the study's aims and research questions. Figure 2 shows the key themes of the Interview data thematic analysis. To enhance transparency, the presentation of results includes the frequency (*n*) of teachers' responses associated with each identified theme and code. These frequencies reflect the number of participants who explicitly referred to a given theme during the interviews and are reported in the tables and the accompanying narrative. Figures 2 to 4 provide visual summaries of the findings, while detailed interpretations are presented in the corresponding subsections.

Integration of generative AI tools

Forty participants out of 47 shared diverse experiences regarding the integration of generative AI tools into their Maltese language teaching practices. Many highlighted the ease of incorporating AI-driven platforms into existing lesson plans, citing the intuitive

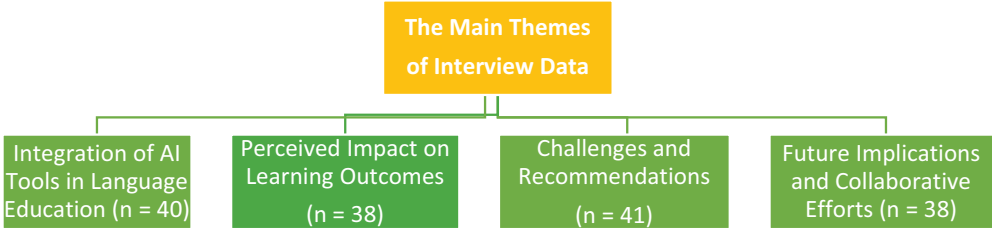


Figure 2. Themes emerging from the thematic analysis. Note. Frequencies of teachers’ responses associated with each theme are reported in [Tables 1–3](#).

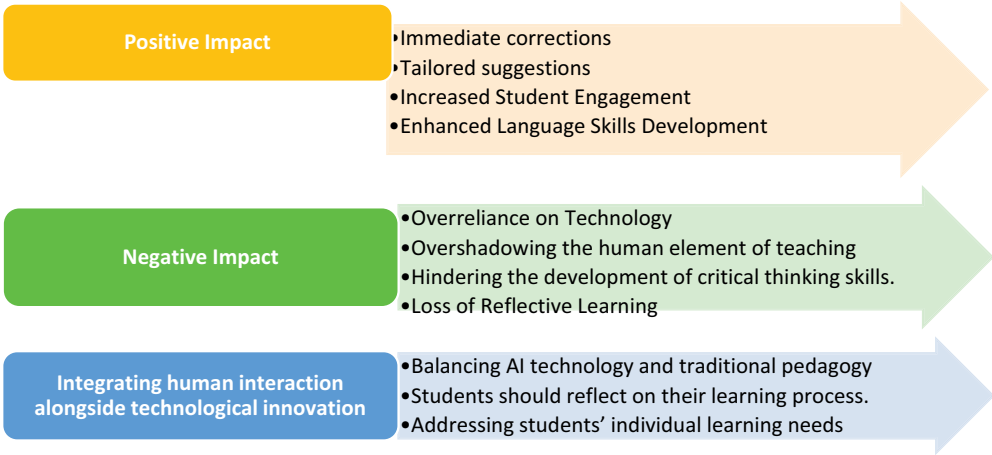


Figure 3. Teachers’ perceptions of the impact of AI-driven personalised feedback on students’ Maltese language proficiency. Note. Frequencies indicate the number of teachers reporting positive ($n = 38$) and negative ($n = 9$) perceptions.

nature of these tools as a significant advantage. Participant 17 remarked, ‘Using AI tools feels like a natural extension of my teaching methods, providing students with interactive learning experiences tailored to their individual needs’.

Within these accounts, 13 participants also expressed reservations about integrating AI into Maltese language education. Participant 7 voiced concerns about overreliance on technology, stating, ‘While AI tools offer convenience, they risk overshadowing the human element of teaching. We must ensure that students receive personalised attention and guidance beyond what machines can provide’.

This discrepancy in perspectives underscores the complexity of integrating AI in Maltese language education and highlights the importance of considering diverse viewpoints in shaping pedagogical practices. While some educators embrace AI as a valuable resource for enhancing learning experiences, others caution against potential drawbacks and emphasise the need for a balanced approach that prioritises human interaction alongside technological innovation.



Figure 4. Teachers' perspectives on the future implications of AI in Maltese language education. Note. Frequencies indicate the number of participants expressing each viewpoint ($N = 38$).

Perceived impact of AI-driven feedback

The perceived impact of AI-driven personalised feedback on students' Maltese language proficiency emerged as a dominant theme, with 38 participants overwhelmingly reporting positive outcomes. They highlighted the transformative role of AI algorithms in providing immediate corrections and tailored suggestions, significantly accelerating students' language learning progress. Figure 3 provides a visual summary of the distribution of positive and negative teacher responses regarding AI-driven personalised feedback, while the narrative below elaborates on these perceptions through thematic interpretation and illustrative quotations.

Participant 21 eloquently expressed, 'The instant feedback provided by AI helps students identify and correct errors in real-time, fostering a sense of autonomy and ownership over their learning journey'. This sentiment underscores the empowering

effect of AI-driven feedback, enabling students to actively engage with their language learning process and take ownership of their linguistic development.

However, Participant 22 shared a contrasting perspective, expressing reservations about the overreliance on AI-driven feedback in Maltese language education. She noted, 'While AI feedback can be helpful, it may inadvertently hinder students' critical thinking skills by providing instant answers without encouraging deeper reflection'. This viewpoint underscores the importance of striking a balance between leveraging AI technology and fostering independent problem-solving skills among students.

Furthermore, participants emphasised the efficiency of AI-driven feedback in addressing individual learning needs, facilitating targeted interventions that catered to students' specific areas of improvement. This tailored approach not only enhanced students' language proficiency but also bolstered their confidence and motivation to learn Maltese.

Effectiveness of AI-generated content

The effectiveness of AI-generated content, including interactive storytelling and contextual language exercises, was a recurring theme among participants, with 26 teachers highlighting its significant impact on student motivation and participation. These resources were praised for their engaging nature, with educators noting their ability to captivate students' interest and facilitate meaningful Maltese language practice. Participant 18 remarked, 'AI-generated content breathes new life into Maltese language lessons, sparking curiosity and igniting students' passion for learning'.

Participant 12 emphasised the transformative potential of AI-generated content, stating, 'Incorporating interactive storytelling and contextual language exercises has revolutionised my teaching approach. Students are not just passive recipients of information; they are active participants in their language learning journey'. This sentiment emphasises the dynamic and interactive nature of AI-driven resources, which empower students to engage actively with the learning process and take ownership of their linguistic development.

Furthermore, 16 participants highlighted the versatility of AI-generated content in catering to diverse learning styles and preferences. Participant 30 commented, 'With AI-generated resources, I can tailor learning experiences to suit individual students' needs and interests. Whether it is visual learners, auditory learners, or kinaesthetic learners, there is something for everyone'. This adaptive approach to content delivery not only enhances student engagement but also fosters a supportive and inclusive learning environment where every student can thrive.

Challenges and recommendations

While 38 participants acknowledged the benefits of AI integration, they also candidly discussed the challenges associated with its implementation, including navigating technical issues and ensuring equitable access to technology. [Table 1](#) outlines the difficulties reported by some participants regarding AI integration in Maltese language education.

Despite these obstacles, the participants remained optimistic about the transformative potential of AI in Maltese language education and offered practical recommendations to address them (see [Table 2](#)).

Participant 19 commented:

Table 1. Challenges for AI integration in Maltese language education.

Theme	Specific Challenge	Frequency
Technical Issues and Troubleshooting	Difficulties in navigating technical issues related to AI integration	21
	Challenges with software compatibility, system glitches and connectivity issues	16
	Lack of technical support and resources hindering the smooth implementation of AI tools	18
Equitable Access to Technology	Disparities in access to technology among students	14
	Not all students have equal access to devices and internet connectivity outside the classroom	19
	Limited access to technology posed challenges for implementing AI-driven learning experiences uniformly	13
Pedagogical Training and Professional Development	Educators lacked comprehensive training in effectively integrating AI tools into their teaching practices	29
	Many educators felt ill-equipped to leverage AI technology to its full potential owing to a lack of pedagogical training	26
	Professional development opportunities focusing on AI integration are limited or non-existent	22

Note. Frequencies indicate the number of participants who referred to each challenge during the interviews. Participants could report multiple challenges ($N = 47$).

Table 2. Participants’ recommendations for AI-generated content in Maltese language education.

Category	Recommendation	Frequency
Technical Challenges and Recommendations	Technical support and resources to address compatibility issues with devices	20
	Technical support and resources to address internet connectivity issues	17
Integrating AI-generated content into pedagogical practices	Teacher training programmes to familiarise educators with AI-generated resources	31
	Teacher training programmes to equip teachers with the skills to integrate AI tools seamlessly into lessons	28
Equity and Access	Ensuring equitable access to AI-generated content for all students, regardless of socioeconomic background	22
	Creative solutions, such as providing access to technology outside the classroom	15

Note. Frequencies represent the number of participants who mentioned each recommendation. Participants could provide multiple recommendations ($N = 47$).

Incorporating AI into Maltese language teaching requires a strategic approach. We need to invest in comprehensive teacher training programs that familiarise educators with AI tools and equip them with the pedagogical skills to effectively integrate these technologies into their teaching practices.

Participant 41 echoed Participant 19’s sentiment, by emphasising the importance of ongoing professional development and support. ‘As technology evolves, so must our teaching practices’, she remarked. ‘Schools need to provide teachers with access to robust technical support and resources to ensure smooth implementation and troubleshooting’.

Furthermore, the participants highlighted the need for proactive measures to address disparities in access to technology among students. ‘Not all students have equal access to technology outside of the classroom’, observed Participant 9. ‘It is essential to consider these disparities and explore creative solutions to ensure that all students can benefit from AI-driven learning experiences’.

Table 3. Effectiveness of AI-generated content in Maltese language education.

Category	AI-Generated Content / Outcome	Frequency (n)
Enhanced Student Engagement	Interactive storytelling increased student motivation	26
	Contextual language exercises increased participation	23
Improved Learning Outcomes	Students' improved Maltese language proficiency	38
	Immediate feedback supported faster error correction	35
Adaptability to Diverse Learning Styles and Preferences	AI-generated resources supported visual, auditory and kinaesthetic learners	16
	Content adaptable to individual student needs and proficiency levels	19

Note. Frequencies indicate the number of participants who referred to each outcome during the interviews. Participants could report more than one outcome ($N = 47$).

Future implications

Looking ahead, 38 participants expressed optimism about the future of AI in Maltese language education, envisioning continued advancements in AI technology and pedagogical practices. The participants emphasised the need for collaborative efforts between educators, researchers and technology developers to harness the full potential of AI in fostering positive emotional and cognitive engagement among students. [Figure 4](#) visualises the participants' perspectives on the future implications of AI in Maltese language education, highlighting anticipated advancements in AI technology and collaborative efforts between educators, researchers and technology developers.

[Table 3](#) summarises the participants' perceptions of the effectiveness of AI-generated content in Maltese language education, categorising responses based on student engagement, learning outcomes and adaptability to diverse learning styles.

'The possibilities with AI in Maltese language education are endless', remarked Participant 17. Participant 19 agreed and argued, 'As technology continues to evolve, we have a unique opportunity to revolutionise Maltese teaching and learning and make it more accessible and engaging for students'.

Participant 24 echoed this sentiment, by highlighting the importance of ongoing collaboration and innovation. 'By working together, educators, researchers and technology developers can drive meaningful change in Maltese education'. He added, 'We need to constantly adapt and refine our approaches to ensure that AI is used effectively to support student learning and development'.

Discussion

The analysis of the interviews yielded interesting observations regarding the incorporation of generative AI technologies in the instruction of the Maltese language, presenting intricate viewpoints that enhance the holistic comprehension of this developing educational environment. The key findings align closely with the study's aims and research questions, shedding light on various aspects of AI integration in Maltese teaching and learning.

The sentiment that AI-driven platforms ease integration into lesson plans and enhance engagement resonates with findings in recent studies (Abimbola et al., [2024](#); Zainuddin, [2023](#)). These studies emphasise the intuitive nature of AI tools and their ability to provide

interactive learning experiences tailored to individual student needs, therefore supporting the idea that AI can effectively supplement traditional teaching methods.

Concerns raised by some educators regarding overreliance on technology and the potential loss of the human element in teaching reflect ongoing debates in the field (Adiguzel et al., 2023; Kaleido et al., 2024). Recent research highlights the importance of maintaining a balance between technology-driven instruction and human interaction to optimise learning outcomes. Studies underscore the need for educators to actively mitigate the risk of AI overshadowing personalised attention and guidance in the learning process.

The contrast between perspectives underscores the complexity of integrating AI in language education, a theme echoed in contemporary research (Memarian & Doleck, 2024; Tayan et al., 2024) which emphasises the multifaceted nature of this integration process, acknowledging both the potential benefits and challenges associated with AI adoption. Educators are increasingly called upon to navigate this complexity by critically assessing the role of technology in language instruction and adopting strategies that preserve the human-centric aspects of teaching while leveraging the advantages of AI tools.

Consistent with previous studies (Abimbola et al., 2024; Zainuddin, 2023), this study indicates overwhelmingly positive outcomes associated with AI-driven feedback. The immediate corrections and tailored suggestions provided by AI algorithms are recognised as transformative, significantly accelerating students' language learning progress. This aligns with the notion that AI technology can effectively supplement traditional teaching methods by providing personalised support (Tayan et al., 2024).

The sentiment expressed by Participant 21 concerning the empowering effect of AI-driven feedback on students' autonomy and ownership over their learning journey echoes similar observations in the literature (Adiguzel et al., 2023). By enabling students to identify and correct errors in real time, AI feedback fosters active engagement with the learning process.

However, our study also uncovers a contrasting perspective, highlighting concerns about the potential drawbacks of overreliance on AI-driven feedback. This resonates with the importance of maintaining a balance between technology-driven instruction and the promotion of critical thinking skills (Kaleido et al., 2024). The caution expressed by some participants underscores the need for educators to carefully consider the pedagogical implications of AI integration, ensuring that technological innovations complement rather than replace human-centric teaching approaches.

Moreover, this study underscores the efficiency of AI-driven feedback in addressing individual learning needs, aligning with research on the benefits of personalised interventions in language education (Memarian & Doleck, 2024). By facilitating targeted interventions tailored to students' specific areas of improvement, AI feedback can enhance students' language proficiency, confidence and motivation in learning Maltese.

Similar to other studies (e.g. Abimbola et al., 2024; Zainuddin, 2023), the study findings indicate a significant impact of AI-generated content on student motivation and participation. The engaging nature of these resources, including interactive storytelling and contextual language exercises, resonates with literature highlighting the importance of engaging learning materials (Adiguzel et al., 2023). Several participants recognised the ability of AI-generated content to captivate students' interest and facilitate meaningful language practice, thereby fostering a dynamic learning environment.

The sentiment expressed by the participants regarding the transformative potential of AI-generated content echoes similar observations in the literature (Memarian & Doleck, 2024). By shifting the focus from passive consumption to active participation, AI-driven resources empower students to take ownership of their language learning journey. This aligns with recent research emphasising the role of technology in promoting learner autonomy and agency (Kaleido et al., 2024).

This study also highlights the versatility of AI-generated content in catering to diverse learning styles and preferences, thus supporting existing literature (e.g. Tayan et al., 2024). The adaptive nature of these resources can allow educators to tailor learning experiences to individual students' needs, by fostering a supportive and inclusive learning environment. This aligns with calls for personalised and differentiated instruction to address the diverse needs of learners (Ungerer & Slade, 2022).

By aligning with studies such as Zainuddin (2023) and Abimbola et al. (2024), the study findings indicate that the participants recognised both the benefits and challenges associated with AI implementation. The challenges discussed, such as navigating technical issues and ensuring equitable access to technology, resonate with literature highlighting the complexities of integrating AI into educational settings (Memarian & Doleck, 2024). Despite these obstacles, most participants remained optimistic about the transformative potential of AI in Maltese teaching and learning, echoing sentiments expressed by Kaleido et al. (2024).

The recommendations provided by participants in our study align with the current literature on effective strategies for AI integration. The emphasis on comprehensive teacher training programmes underscores the importance of equipping educators with the necessary skills and knowledge to effectively utilise AI tools in their teaching practices (Tayan et al., 2024). Ongoing professional development and support are recognised as essential components of successful AI implementation, reflecting the dynamic nature of technology in education (Adiguzel et al., 2023).

An important insight emerging from the findings concerns the relationship between teachers' AI-related training and their reported classroom practices and perceptions. Teachers who had participated in more structured and extended professional development experiences, such as Continuing Professional Education courses, generally described greater confidence in integrating AI tools pedagogically and articulated more nuanced reflections on balancing AI use with human-centred teaching practices. In contrast, teachers whose training was limited to short workshops or informal self-directed learning tended to focus primarily on the practical affordances of AI tools, such as efficiency and engagement, while expressing greater uncertainty about pedagogical integration. This variation suggests that the extent and nature of AI-related training may play a critical role in shaping classroom implementation and also teachers' critical awareness of the pedagogical implications of AI use. At the same time, this relationship represents a limitation of the present study, as systematic comparisons between levels of training and classroom enactment were not an explicit focus of the research design. Future studies would benefit from examining this relationship more explicitly, for example, through comparative or longitudinal designs that explore how different forms of professional development influence teachers' sustained AI practices and pedagogical beliefs over time.

Furthermore, our study highlights the importance of addressing disparities in access to technology among students, a theme echoed in recent research (Son et al., 2023).

Educators recognise the need for proactive measures to ensure that all students, regardless of their socioeconomic background, can benefit from AI-driven learning experiences. This aligns with calls for equity and inclusivity in educational technology initiatives (Ungerer & Slade, 2022).

By agreeing and building on studies including Zainuddin (2023) and Abimbola et al. (2024), this study indicates a sense of optimism among educators regarding the future of AI in Maltese language education. The envisioned advancements in AI technology and pedagogical practices resonate with literature highlighting the transformative potential of AI-driven technologies in fostering positive engagement among students (Adiguzel et al., 2023). Educators recognise the evolving landscape of Maltese learning and the unique opportunity presented by AI to revolutionise teaching and make it more accessible and engaging for students.

The emphasis on collaborative efforts between educators, researchers and technology developers reflects a growing consensus in the literature (Ungerer & Slade, 2022). By working together, stakeholders can drive meaningful change in Maltese language education and ensure that AI is effectively utilised to support student learning and development. This aligns with calls for interdisciplinary approaches to educational technology initiatives, emphasising the importance of shared expertise and resources (Son et al., 2023).

Moreover, this study highlights the need for ongoing adaptation and refinement of AI-driven approaches to meet the evolving needs of students and educators. These echo sentiments expressed in recent research on the dynamic nature of technology in education (Kaleido et al., 2024). As educators continue to explore innovative ways to integrate AI into their teaching practices, collaboration and innovation will be key drivers of progress in the field.

This study contributes to the growing body of literature on AI integration in language education by offering insights into the future implications of AI technology. By fostering collaboration, innovation and ongoing adaptation, educators can harness the transformative potential of AI to enhance the teaching and learning of the Maltese language, shaping the learning experiences of students for years to come.

Importantly, the findings of this study can be directly mapped onto the integrated theoretical framework underpinning the research. From a cognitive constructivist perspective (Piaget), teachers' accounts of AI-driven personalised feedback and adaptive learning pathways reflect learners' active construction of linguistic knowledge through individualised meaning-making. From a sociocultural perspective (Vygotsky), the use of generative AI as a mediational tool aligns with participants' descriptions of scaffolded interaction, collaborative learning and dialogic feedback processes that supported student engagement in multicultural classrooms. Finally, Jonassen's constructivist learning principles are reflected in teachers' pedagogical use of AI to design authentic tasks, promote learner autonomy and facilitate technology-supported exploration and reflection. Taken together, these findings empirically substantiate the proposed conceptual framework (Figure 1), demonstrating how generative AI can operationalise constructivist learning principles at individual, social and technological levels within Maltese language education.

Study limitations

While this study offers useful insights into the integration of generative AI tools in teaching Maltese, some limitations should be acknowledged. The study's reliance on

a purposive sampling approach might have limited the generalisability of the findings. Although efforts were made to select participants with diverse backgrounds and experiences, the sample comprised secondary school teachers from educational institutions across Malta. As such, the findings may not be representative of all educators or educational contexts, particularly those outside the Maltese language teaching domain.

The use of semi-structured interviews as the primary method of data collection may have introduced bias or subjectivity in the interpretation of participants' responses. While efforts were made to maintain consistency and rigour in data collection and analysis, the subjective nature of qualitative research inherently involves interpretation and reflexivity. Additionally, the reliance on self-report data may have led to social desirability bias, wherein the participants provided responses they deemed favourable rather than reflecting their true perceptions or experiences.

Furthermore, the study did not adopt a mixed-methods design and therefore did not include quantitative instruments such as surveys or questionnaires to complement the qualitative findings. While the interview data provided rich insights into teachers' perceptions and practices, the inclusion of quantitative measures could have strengthened the findings by enabling broader generalisation and statistical comparison. This represents a limitation of the present study.

The study's focus on AI integration in teaching the Maltese language may limit its applicability to other language education contexts or instructional settings. While the insights gained from this study contribute to a deeper understanding of AI integration in language education, the specific nuances and challenges associated with teaching Maltese may not necessarily generalise to other languages or educational contexts.

The study's cross-sectional design limits the ability to draw causal inferences or track longitudinal changes in educators' perceptions and practices regarding AI integration. While the data collected offer a snapshot of participants' experiences and perspectives at a specific point in time, longitudinal studies could provide valuable insights into the sustainability and long-term impact of AI integration initiatives in language education.

The study's focus on educators' perspectives may overlook the perspectives and experiences of students, who are the primary beneficiaries of AI-driven language instruction. Future research could benefit from incorporating student voices to gain a more comprehensive understanding of the impact of AI integration on student learning outcomes, engagement and experiences in language education.

Despite these limitations, this study provides valuable insights into the complexities of AI integration in teaching the Maltese language and thus contributes to this research gap and offers practical implications for educators, researchers and policymakers seeking to leverage AI-driven technologies to enhance Maltese language education. Future research endeavours should aim to address these limitations and build upon this study's findings to further advance the field of AI in Maltese language education.

Further research

Further research in the field of AI integration in Maltese language education offers promising avenues for deeper exploration and understanding. Longitudinal studies could provide valuable insights into the sustained impact of AI initiatives in Maltese language instruction. By tracking educators' evolving practices and perceptions over

time, such studies could illuminate the long-term effectiveness and challenges of integrating AI tools into Maltese language teaching. Understanding how educators' attitudes, strategies and pedagogical approaches adapt and develop in response to ongoing AI integration efforts can inform the development of more effective implementation strategies and support mechanisms.

Future research could benefit from adopting a mixed-methods approach that combines qualitative interviews with quantitative surveys or questionnaires. Such designs would allow researchers to triangulate teachers' reported practices and perceptions with quantitative indicators of frequency, confidence or perceived effectiveness of AI use, thereby providing a more comprehensive understanding of generative AI integration in language education.

Additionally, delving into students' perspectives through qualitative interviews, surveys or focus group discussions could offer a more holistic view of the effects of AI integration on learning outcomes and engagement. Investigating students' experiences, preferences and perceptions regarding AI-driven language instruction can provide useful insights into the effectiveness of different AI tools and approaches from the learners' standpoint. Understanding how students interact with and benefit from AI-generated content, feedback mechanisms and personalised learning experiences can inform the design and implementation of more student-centred AI interventions.

Comparative studies across different languages and educational settings could further enrich our understanding of AI integration in language education. By examining common challenges, best practices and contextual factors influencing the success of AI-driven language instruction across diverse linguistic and cultural contexts, researchers can identify transferable insights and tailored strategies for optimising AI implementation. Comparative research can shed light on the unique affordances and limitations of AI technologies in different language learning environments, informing more nuanced and contextually relevant approaches to AI integration.

Evaluating the effectiveness of teacher training programmes in preparing educators for AI integration represents another crucial area for further investigation. Investigating the impact of professional development initiatives on educators' confidence, competence and attitudes towards AI-driven pedagogies can inform the design of more targeted and comprehensive training programmes. Understanding the specific knowledge, skills and support mechanisms needed to effectively integrate AI tools into language teaching can help bridge the gap between theory and practice, ensuring that educators are equipped to harness the full potential of AI technologies in language education.

Furthermore, exploring alternative pedagogical approaches for AI integration, ethical considerations and fostering cross-disciplinary collaborations between educators, researchers and technology developers are also vital areas for advancing knowledge and practice in this evolving field. By exploring innovative instructional strategies, ethical guidelines for AI use and collaborative frameworks for technology development and implementation, researchers can contribute to the development of more inclusive, equitable and responsible AI-driven language education practices. Through these endeavours, scholars can contribute to evidence-based practices that enhance language teaching and learning outcomes while ensuring inclusivity, equity and responsible use of AI-driven technologies in educational contexts.

Conclusion and future directions

This study explored the use of generative AI tools in Maltese language teaching and learning. Interviews with 47 secondary school teachers in Malta revealed that teachers are successfully integrating AI into their teaching practices. AI-driven platforms are used for interactive learning materials, instant feedback and personalising experiences. However, concerns about overreliance on technology and the need for human interaction remain. AI-driven personalised feedback is highly beneficial for students' Maltese language proficiency, with immediate corrections and tailored suggestions accelerating learning progress. AI-generated content, such as interactive storytelling and contextual language exercises, is particularly effective in boosting student motivation and participation. The study highlights the transformative potential of AI in Maltese language acquisition, but challenges such as teacher training, AI capabilities and ethical considerations need to be addressed. The alignment between the study's findings and the integrated constructivist framework demonstrates the explanatory value of combining cognitive, sociocultural and technology-oriented perspectives when examining AI-enhanced language learning.

In conclusion, the findings of this study also point to several important directions for future research in the field of AI-enhanced language education. As AI technology continues to advance, coupled with the development of comprehensive teacher training programmes, the effectiveness of AI-driven language instruction is poised to reach new heights. Future research endeavours should prioritise the development of AI tools specifically tailored to address the needs of minority languages, such as Maltese, ensuring that AI tools can deliver accurate and culturally relevant content to learners (Kohnke et al., 2023).

Furthermore, there is a pressing need to delve into the long-term impact of AI on student learning outcomes and emotional engagement (Kaleido et al., 2024). By exploring how AI-mediated language learning experiences influence students' linguistic proficiency, cognitive development and socio-emotional well-being over time, researchers can gain valuable insights into the transformative potential of AI in shaping the future of language education.

Author contributions

J. Žammit conceived and designed the study, collected and analysed the data, interpreted the results and wrote the manuscript.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Notes on contributor

Jacqueline Žammit is a renowned academic and practitioner in the field of Maltese pedagogy, with a particular focus on teaching Maltese as a foreign language. She holds a PhD in the acquisition of Maltese as a foreign language, a Master of Arts Degree with Distinction in Maltese Linguistics and a first-class BEd (Hons) Degree in Maltese and Early and Middle Years from the University of Malta. In her current role, Dr Žammit serves as a researcher and design consultant in teaching and learning Maltese as a foreign language. She has taught Second Language Acquisition pedagogies and introduced Maltese as a foreign language at several universities, including those of Edinburgh, Cork and Antwerp. Dr Žammit is an active contributor to academic discourse, publishing articles in

refereed journals, presenting at conferences and writing books about Maltese as a Foreign Language. Her areas of specialisation and research interests are diverse, encompassing second language acquisition, Maltese as a foreign language, computer-assisted language learning, inter-language, interculturalism, plurilingualism, sociolinguistics, psycholinguistics, cross-cultural communication and adult education.

ORCID

Jacqueline Żammit  <http://orcid.org/0000-0002-3961-5286>

Data availability statement

The qualitative data supporting the findings of this study are not publicly available owing to ethical and confidentiality considerations. Anonymised data may be made available from the author upon reasonable request and subject to ethical approval requirements.

Ethical considerations

Educators underscored the importance of addressing ethical considerations related to AI integration in language education, such as data privacy, algorithmic bias and the responsible use of AI-driven tools.

They emphasised the need for ethical guidelines and frameworks to guide the development and implementation of AI technologies in educational settings, ensuring that they align with pedagogical principles and support positive learning outcomes.

References

- Abimbola, C., Eden, C. A., Chisom, O. N., & Adeniyi, I. S. (2024). Integrating AI in education: Opportunities, challenges, and ethical considerations. *Magna Scientia Advanced Research and Reviews*, 10(2), 6–13. <https://doi.org/10.30574/msarr.2024.10.2.0039>
- Adiguzel, T., Kaya, M. H., & Cansu, F. K. (2023). Revolutionizing education with AI: Exploring the transformative potential of ChatGPT. *Contemporary Educational Technology*, 15(3), ep429. <https://doi.org/10.30935/cedtech/13152>
- Betal, A. K. (2023). Enhancing second language acquisition through artificial intelligence (AI): Current insights and future directions. *Journal for Research Scholars and Professionals of English Language Teaching*, 7(29). <https://doi.org/10.54850/jrspelt.7.39.003>
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101. <https://doi.org/10.1191/1478088706qp0630a>
- Creswell, J. W., & Poth, C. N. (2018). *Qualitative inquiry and research design: Choosing among five approaches* (4th ed.). Sage Publications.
- Darling-Hammond, L., Flook, L., Cook-Harvey, C., Barron, B., & Osher, D. (2020). Implications for educational practice of the science of learning and development. *Applied Developmental Science*, 24(2), 97–140. <https://doi.org/10.1080/10888691.2018.1537791>
- Finlay, L. (2002). Negotiating the swamp: The opportunity and challenge of reflexivity in research practice. *Qualitative Research*, 2(2), 209–230. <https://doi.org/10.1177/146879410200200205>
- Fraillon, J., Ainley, J., Schulz, W., Friedman, T., & Duckworth, D. (2020). Introduction to the IEA International computer and Information literacy study 2018. In J. Fraillon, J. Ainley, W. Schulz, T. Friedman, & D. Duckworth (Eds.), *Preparing for life in a digital world: IEA International Computer and Information Literacy Study 2018 international report* (pp. 1–14). Springer. https://doi.org/10.1007/978-3-030-38781-5_1
- Gerson, K., & Damaske, S. (2020). *The science and art of interviewing*. Oxford University Press. <https://doi.org/10.1093/oso/9780199324286.001.0001>

- Guest, G., Bunce, A., & Johnson, L. (2006). How many interviews are enough? An experiment with data saturation and variability. *Field Methods*, 18(1), 59–82. <https://doi.org/10.1177/1525822X05279903>
- Hesse-Biber, S. (2010). Qualitative approaches to mixed methods practice. *Qualitative Inquiry*, 16(6), 455–468. <https://doi.org/10.1177/1077800410364611>
- Jonassen, D. (1999). Designing constructivist learning environments. In C. M. Reigeluth (Ed.), *Instructional-design theories and models: A new paradigm of instructional theory* (Vol. 2, pp. 215–239). Lawrence Erlbaum Associates Publishers.
- Kaledio, P., Robert, A., & Frank, L. (2024). The impact of artificial intelligence on students' learning experience. <https://doi.org/10.2139/ssrn.4716747>
- Karakas, A. (2023). Breaking down barriers with artificial intelligence (AI): Cross-cultural communication in foreign language education. In G. Kartal (Ed.), *Transforming the language teaching experience in the age of AI* (pp. 215–233). IGI Global. <https://doi.org/10.4018/978-1-6684-9893-4.ch012>
- Kohnke, L., Moorhouse, B. L., & Zou, D. (2023). ChatGPT for language teaching and learning. *RELC Journal*, 54(2), 537–550. <https://doi.org/10.1177/00336882231162868>
- Law, L. (2024). Application of generative artificial intelligence (GenAI) in language teaching and learning: A scoping literature review. *Computers and Education Open*, 6, 100174. <https://doi.org/10.1016/j.caeo.2024.100174>
- Lee, D., Arnold, M., Srivastava, A., Plastow, K., Strelan, P., Ploeckl, F., Lekkas, D., & Palmer, E. (2024). The impact of generative AI on higher education learning and teaching: A study of educators' perspectives. *Computers and Education: Artificial Intelligence*, 6, 100221. <https://doi.org/10.1016/j.caeai.2024.100221>
- Martínez-Cruz, R., López-López, A. J., & Portela, J. (2023). ChatGPT vs state-of-the-art models: A benchmarking study in keyphrase generation task. *ArXiv*, 2304(14177). <https://doi.org/10.48550/arXiv.2304.14177>
- Memarian, B., & Doleck, T. (2024). Teaching and learning artificial intelligence: Insights from the literature. *Education and Information Technologies*, 29(16), 21523–21546. <https://doi.org/10.1007/s10639-024-12679-y>
- Nguyen, A., Ngo, H. N., Hong, Y., Dang, B., & Thi Nguyen, B.-P. (2023). Ethical principles for artificial intelligence in education. *Education and Information Technologies*, 28, 4221–4241. <https://doi.org/10.1007/s10639-022-11316-w>
- Nikolopoulou, K. (2024). Generative artificial intelligence in higher education: Exploring ways of harnessing pedagogical practices with the assistance of ChatGPT. *International Journal of Changes in Education*, 1(2), 103–111. <https://doi.org/10.47852/bonviewIJCE42022489>
- Nosek, B. A., Ebersole, C. R., DeHaven, A. C., & Mellor, D. T. (2018). The preregistration revolution. *Proceedings of the National Academy of Sciences*, 115(11), 2600–2606. <https://doi.org/10.1073/pnas.1708274114>
- Nowell, L. S., Norris, J. M., White, D. E., & Moules, N. J. (2017). Thematic analysis: Striving to meet the trustworthiness criteria. *International Journal of Qualitative Methods*, 16(1). <https://doi.org/10.1177/1609406917733847>
- Seidman, I. E. (2019). *Interviewing as qualitative research: A guide for researchers in education and the social sciences* (5th ed.). Teachers College Press.
- Smith, B., & McGannon, K. R. (2018). Developing rigor in qualitative research: Problems and opportunities within sport and exercise psychology. *International Review of Sport & Exercise Psychology*, 11(1), 101–121. <https://doi.org/10.1080/1750984X.2017.1317357>
- Son, J., Ružić, N., & Philpott, A. (2023). Artificial intelligence technologies and applications for language learning and teaching. *Journal of China Computer-Assisted Language Learning*, 5(1), 94–112. <https://doi.org/10.1515/jccall-2023-0015>
- Suri, H. (2011). Purposeful sampling in qualitative research synthesis. *Qualitative Research Journal*, 11(2), 63–75. <https://doi.org/10.3316/QRJ1102063>
- Tayan, O., Hassan, A., Khankan, K., & Askool, S. (2024). Considerations for adapting higher education technology courses for AI large language models: A critical review of the impact of ChatGPT. *Machine Learning with Applications*, 15, 100513. <https://doi.org/10.1016/j.mlwa.2023.100513>

- Ungerer, L., & Slade, S. (2022). Ethical considerations of artificial intelligence in learning analytics in distance education contexts. In P. Prinsloo, S. Slade, & M. Khalil (Eds.), *Learning analytics in open and distributed learning: Potential and challenges* (pp. 105–120). Springer. https://doi.org/10.1007/978-981-19-0786-9_8
- Vygotsky, L. S. (1978). *Mind in society: Development of higher psychological processes*. (M. Cole, V. Jolm-Steiner, S. Scribner, & E. Souberman, Eds.) Harvard University Press. <https://doi.org/10.2307/j.ctvjf9vz4>
- Zainuddin, N. (2023). Technology enhanced language learning research trends and practices: A systematic review (2020–2022). *The Electronic Journal of E-Learning*, 21(2), 69–79. <https://doi.org/10.34190/ejel.21.2.2835>
- Žammit, J. (2023). Harnessing the power of ChatGPT for mastering the Maltese language: A journey of breaking barriers and charting new paths. In A. Adadi & S. Motahhir (Eds.), *Machine intelligence for smart applications. Studies in computational Intelligence* (Vol. 1105, pp. 161–178). Springer. https://doi.org/10.1007/978-3-031-37454-8_8
- Žammit, J. (2024). Capturing the full potential of Maltese language learning through ChatGPT. *Technology in Language Teaching & Learning*, 6(1), 1–22. <https://doi.org/10.29140/tltl.v6n1.1082>
- Žammit, J. (2025). Secondary school teachers' experiences with generative AI in Maltese language teaching. *Technology, Knowledge, and Learning*, 30(2), 2103–2121. <https://doi.org/10.1007/s10758-025-09861-7>