CULTURAL AND REGIONAL PERSPECTIVES

Could virtual reality be the next approach for international students learning Maltese?

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Abstract

This study examines the potential of virtual reality (VR) technology in language learning, specifically for the Maltese language. Despite the popularity and advancement of VR, its use in teaching minor languages like Maltese has not been extensively explored. The concern is that the lack of technological resources may lead to the extinction of the Maltese language in the digital world. The study utilizes a primarily qualitative research methodology, with a minor quantitative component, to collect data from twenty-five teachers regarding the use of VR in Maltese language learning contexts. The findings reveal both the potential benefits and challenges of using VR in teaching Maltese as a second language (ML2). Although the participants have not used VR for teaching Maltese due to the absence of Maltese VR apps, they have experience with VR in English. They praise VR for its ability to create an immersive and engaging learning environment with entertaining features. However, the study also highlights several challenges associated with VR, including high costs, the bulkiness of headsets, and technical issues. It underscores the pressing need for additional research and development in this field to ensure the preservation of the Maltese language in the digital era.

Keywords Virtual reality (VR) · Educational VR technology · Second language acquisition · VR apps for language learning · An immersive VR environment · Maltese as a second language learning

Abbreviations
L2   Second language, which could also imply a third, fourth, fifth, etc., or any foreign language
ML2   Maltese as a second or foreign language
SLA   Second language acquisition
VR   Virtual reality

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Introduction

Virtual reality (VR) technology is used to create simulated environments and can be categorized into three types: non-immersive VR, semi-immersive VR, and fully immersive VR (Huang et al., 2021; Liberatore & Wagner, 2021). Non-immersive VR manipulates the user's physical environment to create a computer-generated environment, but the user is not fully immersed in the virtual setting (Liberatore & Wagner, 2021). Semi-immersive VR offers a partial VR experience where the user is partially immersed in the virtual environment while maintaining awareness of their physical surroundings (Lorusso et al., 2020). Fully immersive VR aims to provide a completely immersive experience where the user feels entirely present in the virtual environment, although current technology has not yet achieved this goal (Hamilton et al., 2021).

VR is a crucial tool in the second language acquisition (SLA) learning process (Chen et al., 2022; Zheng et al., 2022). It creates virtual environments that allow students to operate or test scenarios that would be difficult or impossible to access in real life. VR motivates and encourages students' active participation and interaction, providing an opportunity to transform practical experience into knowledge and skills. Therefore, VR has the potential to become an integrated part of the SLA process, allowing learners to acquire knowledge, develop competencies, and practice skills.

The literature highlights the advantages of using VR for teaching a second language (L2) (Dhimolea, et al., 2022; Zheng et al., 2022). One of the main advantages is that students are immersed in an environment where they can practice their listening and speaking skills in conditions that closely resemble real-life settings. Additionally, VR makes this advantage widely accessible, as any student with a VR headset can benefit from it.

Problem statement

Despite the popularity and advancement of VR, its use in teaching minor languages like Maltese has not been extensively explored. The concern is that the lack of technological resources may lead to the extinction of the Maltese language in the digital world (Żammit, 2022). Malta has become a popular tourist destination in Europe, despite the ongoing COVID-19 pandemic, with around 1 million tourists in 2021 (Malta Immigration, 2021). For third-country nationals looking to live in Malta, it is important to integrate into Maltese society by learning about Maltese culture and languages, including Maltese and English (Euromed Rights, 2022). To expedite the process of learning Maltese, it is necessary to explore innovative methods. This research focuses on investigating the potential of VR technology as a tool for learning Maltese as a second language (ML2).

While there have been numerous studies on the impact of VR on SLA, most of them have focused on widely spoken languages like English, Spanish, or Chinese (Peixoto et al., 2021). The lack of research on the use of VR in teaching minor languages like Maltese presents a significant gap in the literature. This study aims to fill this gap by exploring the potential of VR as a tool for teaching Maltese as a second language.

In the study by Żammit (2023), the focus was on exploring the effectiveness of VR in language learning, particularly for teaching ML2. The research employed a mixed-methods approach, incorporating qualitative and quantitative analyses, with the participation of 25 Maltese teachers. The findings highlighted the potential advantages of VR in enhancing ML2 instruction, such as immersive learning environments and increased engagement

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among students. However, challenges related to cost, equipment, and technical issues were also identified. The study emphasized the need for integrating VR technology into Maltese teaching practices to create more engaging learning experiences.

In contrast, the current study delves deeper into the potential of VR technology specifically for the Maltese language. While acknowledging the growing popularity of VR and its potential benefits for language learning, this study raises concerns about the limited exploration of VR in teaching minor languages like Maltese. Additionally, another notable distinction between Żammit (2023) and the current study, is that the current study's emphasis is on the pedagogical implications of using VR tools in Maltese language learning. The research underscores that these implications are not yet entirely understood, highlighting the need for further investigation to elucidate the practical outcomes of VR tool use from a pedagogical perspective. By addressing this aspect, the current study contributes to filling a crucial gap in the literature and provides valuable insights for educators and policymakers involved in language education.

The research methodology in the current study primarily adopts a qualitative approach, supplemented by a minor quantitative component, to collect insights from 25 teachers concerning the use of VR in Maltese language learning contexts. Despite the absence of VR applications tailored for teaching Maltese, the participants expressed positive views based on their experience with VR teaching English. Similar to the previous study, the current research identifies the immersive and engaging nature of VR as a potential advantage, alongside challenges such as cost, headset bulkiness, and technical issues. Importantly, it underscores the urgent need for further research and development to ensure the preservation of the Maltese language in the digital age. Therefore, while both studies explore the potential of VR in language learning with a focus on Maltese, they differ in their research methodologies, depth of analysis, and emphasis on the need for further research and development in this area.

Research goal and objectives

This study aims to examine the potential of using VR tools in teaching Maltese to international students. It is unique in its focus on the use of VR in teaching ML2 and contributes to the academic literature in this area. The study also discusses the use of VR in language learning from the teacher's perspective. The objectives of the research include investigating the current state of ML2 learning and identifying specific challenges that could be addressed through VR technology. The study also aims to explore the potential of VR technology in enhancing the learning experience of ML2 students and developing practical strategies for integrating VR applications into ML2 teaching.

Research questions

The following were the three research questions of this study:

1. What are the present challenges encountered by ML2 learners and how could VR help mitigate these obstacles?
2. How might VR technology improve the learning experience of ML2 students?
3. What techniques do educators anticipate for the pragmatic incorporation of VR applications into ML2 instruction, based on their comprehension of the pedagogical process and the potential of VR as an instructional instrument?

Literature review

VR in the classroom

VR is increasingly being used in education to cater to the diverse learning styles of students (Garduno et al., 2021). Understanding the advantages and disadvantages of VR in the classroom is crucial for its effective implementation (Cook et al., 2019; Radianti et al., 2020).

VR provides immersive learning experiences, allowing students to interact with and be engaged in simulated environments (Hamilton et al., 2021). This is particularly beneficial for kinesthetic learners and language learners who may not have the opportunity to interact with native speakers (Hu-Au & Lee, 2017; Panagiotidis, 2021). Teachers can use tools like the Google Expeditions application and cardboard viewers to bring VR into the classroom, creating fictional spaces where students can learn and practice languages (Cardullo & Wang, 2022). VR also enhances memory retention and helps students remember new words (Yoshimura & Borst, 2021).

In addition to language learning, VR allows students to learn about nonverbal communication and build confidence in a safe and controlled environment (Hamilton et al., 2021; Parmaxi, 2020; Zheng et al., 2022). Students can engage in realistic interactions and scenarios, such as ordering food or asking for directions, without the fear of making mistakes (Panagiotidis, 2021). VR also enables students to create avatars and practice language skills with their peers (Hu-Au & Lee, 2017). It provides opportunities for complex text scenarios, multiple experiences, and experiments, saving costs and resources compared to real-life situations (Panagiotidis, 2021). VR also facilitates communication with individuals from different locations (Hu-Au & Lee, 2017).

Furthermore, VR adds entertainment value to education, capturing students' attention and making learning an active experience (Liu et al., 2020). It removes distractions and stimulates immediate engagement, allowing learners to interact with others and achieve learning objectives in an entertaining environment (Lege & Bonner, 2020). VR helps students understand vocabulary, grammar, comprehension, and pronunciation from a first-person perspective (Liu et al., 2020). It also overcomes geographic barriers, allowing students to access lessons from anywhere and inviting professionals from distant locations to join in lessons (Garduno et al., 2021; Lege & Bonner, 2020).

However, there are risks and negative effects associated with the use of VR in the classroom. VR may devalue human connection and hinder the development of important communicative skills (Hamilton et al., 2021; Radianti et al., 2020; Yoshimura & Borst, 2021). Students may only have access to preprogrammed answers in the VR software, limiting their ability to ask spontaneous questions (Lege & Bonner, 2020). Students with learning disabilities may face challenges as real-time support from teachers becomes harder to provide in a VR setting (Lege & Bonner, 2020).

VR has the potential to positively impact education, but it should be balanced with non-VR techniques and integrated with traditional teaching methods (Graeske & Sjoberg, 2021; Radianti et al., 2020). While VR offers numerous benefits, it is important to consider its limitations and potential negative effects (see Fig. 1), such as the devaluation of human connection and limited real-time support (Hamilton et al., 2021).

Studies have shown that VR can lead to addiction, as students may continue to use it even when it is no longer necessary for educational purposes (Cook et al., 2019;
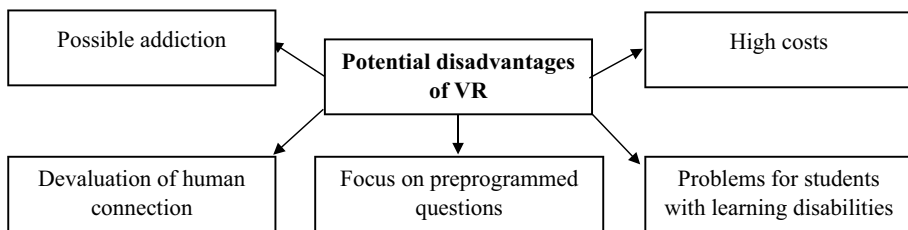
Fig. 1 Disadvantages of VR

Yoshimura & Borst, 2021). Additionally, VR is expensive and requires significant time and financial resources to develop effective language applications (Cook et al., 2019).

Another disadvantage of VR is its potential negative impact on eye health, especially with prolonged use (Cook et al., 2019). Furthermore, a health concern associated with VR is motion sickness, which occurs when the brain receives conflicting signals about movement in the virtual environment and the user's body (Eunhee et al., 2020). This can result in symptoms such as nausea, dizziness, headaches, perspiration, fatigue, sore eyes, and loss of balance (Eunhee et al., 2020). These effects may not always be immediate and can persist for hours after leaving the virtual environment. Moreover, VR has been found to decrease users' creativity and problem-solving abilities (Liu et al., 2020). Despite these drawbacks, it is argued that the advantages of VR outweigh its flaws.

VR in language learning

The academic literature indicates that VR tools are widely used in language learning, providing a fully immersive experience in an L2 (Dewaele et al., 2019; Hamilton et al., 2021). VR is considered a viable option for language practice, particularly for languages like Maltese. This is because it can be difficult to interact with native speakers, who tend to prefer communicating in English with non-native speakers, even when non-native speakers attempt to communicate with them in Maltese (Żammit, 2021). VR headsets have been used in educational institutions to create immersive environments for language learning, allowing students to interact, move, talk, and make decisions as if they were engaging with native speakers (Liu et al., 2020).

The main benefit of VR in language learning is improving speaking skills, and companies have already developed VR games for language learning, such as *Mondly VR*, *Noun Town: VR Language Learning*, and Immerse (Hodgson et al., 2019). However, most software developers have not yet considered minority or unique languages like Maltese. Technical issues and the difference between virtual and real-life settings pose challenges to creating truly immersive language learning games (Graeske & Sjoberg, 2021; Liu et al., 2020). Nevertheless, VR technology is expected to continue improving, and more companies may develop high-quality products in this niche market (Cipresso et al., 2018; Garduno et al., 2021).

VR provides a unique and immersive experience for language learning, particularly for adult learners. It allows students to practice their speaking skills in authentic settings, such as restaurants, shops, and estate agencies in different countries (Garduno et al., 2021). VR apps like *Mondly VR* and *ImmerseMe* enable conversations with virtual characters and provide instant feedback on pronunciation and suggestions for learning new words (Hamilton

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et al., 2021). VR apps also offer opportunities for students to develop listening and speaking skills in a business context, which can contribute to career growth (Liu et al., 2020). However, the implementation of VR in language learning should be done carefully and gradually to ensure readiness from both teachers and students (Polap, 2018).

Methodology

The study aims to explore the potential of VR as a means of Maltese language instruction. The research design used is exploratory descriptive research, which is optimal for understanding how people perceive a particular problem (Borgstede & Scholz, 2021). The study primarily employs a qualitative research method, supplemented by a minor quantitative component. The qualitative technique of a focus group was used to analyze teachers' opinions, experiences, and awareness of using VR in teaching Maltese as a second language (ML2). The focus group was conducted online via Zoom due to the COVID-19 pandemic. The researcher asked several questions related to the challenges in ML2 learning, the potential of VR technology to enhance the learning experience, and strategies for integrating VR applications effectively. The conversations with the focus group participants were recorded.

The participants in the focus group were 25 teachers who taught ML2 evening classes to adults and taught primary, middle, or secondary school students in their full-time jobs. They were purposely sampled and recruited through social media using a snowball sampling technique (Dudovskiy, 2022). The participants had at least two years of experience in education and demonstrated a certain level of familiarity with VR.

The majority of the participants, 21 out of 25, had some knowledge of VR, but this was not derived from formal training or professional use. Instead, it came from personal experiences and observations. Specifically, these 21 participants had observed the application of VR in English language classes during their travels abroad. These experiences provided them with insights into the potential of VR as an educational tool, particularly in language instruction. In addition to classroom settings, these participants also encountered VR in cultural and educational institutions abroad, such as museums. These experiences further broadened their understanding of the diverse applications of VR. Fourteen of these 21 participants mentioned that their children played VR games. This exposure to VR in a recreational context allowed them to appreciate its potential for engagement and interactivity, which are qualities that can be beneficial in an educational setting. These varied experiences contributed to the participants' overall understanding of VR, its capabilities, and its potential applications in education. This knowledge, albeit informal, could serve as a valuable foundation should they decide to integrate VR into their Maltese teaching practices in the future.

In addition to the qualitative phase, a minor quantitative phase was conducted using an online survey administered to the 25 focus group participants. The survey aimed to provide quantitative evidence for the potential effectiveness of VR tools in ML2 teaching. The survey included questions about age, beliefs about the effectiveness of VR tools in education and language learning, and rating the potential effectiveness of VR tools in ML2 classroom settings on a 10-point scale.

After collecting the necessary qualitative and quantitative data, a thematic analysis was conducted to identify the most crucial topics in the conversations with teachers (Maguire & Delahunt, 2017). The NVivo software was used to process the qualitative data and identify

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Table 1 Respondents' opinions on the effectiveness of VR tools in learning

	Number of respondents	% of respondents
Strongly agree	19	76%
Agree	6	24%
Disagree	0	0%
Strongly disagree	0	0%

Table 2 Reported effectiveness of VR tools in facilitating language learning

Opinion	Number of respondents	% of respondents
Strongly agree	14	56%
Agree	11	44%
Disagree	0	0%
Strongly disagree	0	0%

themes and codes (McNiff, 2022). The quantitative data were manually processed in MS Excel, and ANOVA was used to analyze the relationship between teachers' age and their opinion of the potential effectiveness of VR tools in ML2 classroom settings.

The study's reliability is based on the consistency of responses to diverse data theme codes, and member checking was conducted with the participants to increase the validity of the findings (Carlson, 2010). Prior to data collection, the study was approved by Malta's University Research Ethics Committee (UREC), and the committee's reference number is EDUC-2022-00082. Ethical considerations were taken into account during the online meetings with teachers.

Findings

Survey results

From the survey results, it was evident that educators were confident about the potential of VR tools in education. A significant 76% of respondents believed in the effectiveness of VR tools in learning (see Table 1).

However, the potential of VR instruments to facilitate language learning was less evident, with only 56% of respondents reporting a belief in their effectiveness (see Table 2). Despite this, none of the respondents rejected the idea that VR instruments could be applied to facilitate language learning. This suggests that while there may be some skepticism or uncertainty, there is also an openness to the potential of VR in the language learning context.

The respondents were asked to evaluate the potential effect of VR tools on students' learning outcomes using a 10-point scale. The mean value of 6.80 suggests that most teachers who participated in this research were confident that the application of VR tools could significantly influence their students' learning outcomes. This confidence was reflected even though none of the respondents had yet applied VR tools in the Maltese classroom, indicating a minimal risk of bias in this question.

The ANOVA tests (see Table 3) were conducted to investigate the current state of ML2 learning and identify specific challenges that could potentially be addressed through the use of VR technology. These tests were used to determine if there were significant differences between the means of the values, which could indicate varying levels of effectiveness of VR tools in different aspects of ML2 learning.

The ANOVA tests and survey results indicate that VR tools have the potential to enhance ML2 teaching. The study's findings suggest that VR tools are effective in classroom settings and can be used to improve ML2 instruction. These findings can be used to develop strategies for integrating VR applications into ML2 teaching, taking into account the potential benefits and challenges of using VR technology in ML2 learning.

NVivo thematic analysis

The thematic analysis using NVivo revealed several key themes related to the application of VR in ML2 classes. These themes, along with the number of codes associated with each, are as follows:

VR is a completely immersive learning experience (25 codes): This theme highlights the immersive nature of VR, which can provide a fully engaging learning experience for ML2 students.

VR removes any physical barriers (22 codes): This theme emphasizes the ability of VR to transcend physical limitations, offering opportunities for remote learning and exploration.

VR provides real or virtual tours (20 codes): This theme underscores the potential of VR to provide interactive and immersive tours, enhancing the learning experience.

VR combines both teaching and fun (16 codes): This theme suggests that VR can make learning more enjoyable, thereby increasing student motivation and engagement.

VR is a futuristic tool in the educational sphere (14 codes): This theme reflects the perception of VR as a forward-looking technology with significant potential in education.

VR needs further development (11 codes): This theme indicates that while VR has considerable potential.

VR provides realistic functional settings (7 codes): This theme addresses the challenges and complexities associated with creating realistic and functional VR experiences.

VR addresses the needs of language learners of all ages (7 codes): This theme suggests that VR can be beneficial for language learners of all age groups, demonstrating its versatility.

VR creates challenges in lessons (6 codes): This theme acknowledges the challenges of integrating VR into lessons and the need to overcome them.

Table 3 Results of ANOVA

ANOVA						
Source of variation	SS	df	MS	F	P value	F crit
Between groups	89.25641	1	89.25641	31.70812	9.89047E-06	4.279344
Within groups	64.74359	23	2.814939			
Total	154	24				

VR Benefits in Different Learning Contexts (23 codes): This theme emphasizes the versatility of VR as a tool that can enhance learning in various contexts.

These insights from the survey results and thematic analysis can be used to develop practical strategies for integrating VR applications into ML2 teaching. The themes provide a comprehensive understanding of the potential benefits and challenges of using VR in ML2 classrooms, guiding the formulation of effective strategies for its integration.

Immersive learning experience

The main challenge identified in ML2 learning is the need for immersive, interactive experiences that engage students and enhance their learning outcomes. All 25 participants agreed that VR's immersive nature can be leveraged to enhance student engagement in ML2 lessons. Teachers 2 and 3 noted that VR headsets with sensors and controllers could increase student participation in Maltese lessons by providing an environment where they can explore, learn, socialize with other users, play, and read.

> Thanks to VR headsets with sensors and controllers, I assume that my students might participate more in Maltese lessons, as they can be granted total freedom to explore and engage in a virtual environment where they can explore, learn, socialize with other users, play, and read.
> (Teacher 2, middle school)
> My pupils may be more engaged and driven to learn Maltese in a virtual environment since they adore games, magic, and fantasy.
> (Teacher 3, primary school)

Removing physical barriers to language learning

Furthermore, VR immersion provides a language learning environment where students can move, communicate, make decisions, and interact with the world around them. Teachers 9, 15, and 16 claimed that VR enables students to practice their speaking skills at a level that is unachievable in the classroom or online.

> VR can provide interactive experiences that can help students improve their Maltese language skills. VR encourages communication, and that is what our foreign students mostly need when learning Maltese. Currently, we cannot give them this kind of experience in the classroom or online.
> (Teacher 9, middle school)
> VR addresses the needs of language learners of all ages. When students put on the headset, they can practice at a level that is just unachievable in the classroom or online.
> (Teacher 15, secondary school)
> VR can help with two major issues in learning languages: motivation in seniors and involvement in elementary students. On the surface, it gives that little boost, that thrilling and enjoyable element, but it also allows … deeper connections with people through participation, role-play, and practice that is free of all the disruptions found in the classroom and online learning.
> (Teacher 16, primary school)

According to 22 teachers in the focus group, VR is effective in removing physical barriers to language learning. Teacher 1 argued that students who live far away from Malta, such as Australia, the UK, and Canada, where there is a significant Maltese community, can use VR to practice speaking in Maltese.

> Fluency in a foreign language frequently demands a completely immersive approach. I know several adults, especially those living in Australia, the UK, and Canada, who would like to learn Maltese but are unable to visit or reside in Malta, making it impossible to practice with native Maltese speakers. As an alternative, students residing abroad might use VR headsets to practically immerse themselves in Maltese language learning.
> (Teacher 1, secondary school)

Real or virtual tours

Twenty teachers stated that VR headsets allow learners to become immersed in a fictional environment of real-world scenarios where students can experience the Maltese language and culture. Furthermore, Teacher 17 mentioned that students can take a virtual sightseeing tour using VR that provides the social involvement and connectedness that distance learning does not deliver.

> I feel that VR can bridge the gap between the traditional classroom and the Teams online classroom. It could help students practice and interact with one another on a more advanced level than just face to face on the screen. It gives social involvement and connectedness that distance learning does not deliver.
> (Teacher 17, primary school)

According to 20 participants, VR can provide a real or virtual tour based on lessons intended to help students build language skills and apply them in authentic contexts, as Teacher 7 explained:

> A VR game can give the one-of-a-kind, immersive experience that many learners of Maltese seek—namely, the opportunity to use their language skills in an authentic context. If these games include multiple players, it would be simple to develop a community language center for language learners.
> (Teacher 7, secondary school)

Teacher 9 mentioned that VR may generate realistic situations in which learners can interact with objects and other learners.

> By wearing 3D glasses or using avatars, students can interact with objects and other learners in some scenarios. These environments can include 3D objects, scenery, and simulations from the real or fictional world.
> (Teacher 9, middle school)

It should be highlighted that 17 teachers, including Teachers 8 and 19, said that VR allows students to focus on language acquisition.

> A VR app can help students master grammatical forms such as the use of 'hemm' (there is / there are) while asking them to describe what they observe in the VR world.
> (Teacher 8, middle school)

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> A VR app, in my opinion, promotes realistic scenarios that reduce mental burden, allowing students to focus on language acquisition rather than attempting to envision a scenario.
> (Teacher 19, secondary school)

Combining teaching and entertainment

Sixteen educators claimed that VR combines both teaching and entertainment elements. This aspect of VR could be employed to design engaging and interactive language learning activities that can help students memorize new words and engage more in the learning process through a multisensory learning approach, by applying these in real-life scenarios, whereas learning from books might take longer, as Teachers 3, 5, 13, 23, and 25 reported.

> Students can be engaged in certain situations and learn faster, as VR allows entry to previously inaccessible areas when unaccompanied by adults, such as hospitals and restaurants, and then they can role-play.
> (Teacher 3, primary school)
> A VR app can transport teachers and students to locations they would be unable to visit in person owing to a lack of time, temporal and geographic distance, or safety concerns. For example, after reading Dun Karm's poem about Wied Qirda, a VR app could transport us to Qirda Valley during the battle between the Zebbug people and the French army in 1798, which is otherwise impossible owing to temporal distance and an unsafe environment. Hence, thanks to VR, students can be in the midst of the battle, providing them with a first-hand experience that goes beyond simply reading poems, viewing photographs, or watching movies on how the French army was defeated by the Zebbug people. Depending on the novel students are reading, VR can take them on a sailing trip around Gozo or Comino, on an underwater walking tour, on a tour of the moon, or to the national poet, Dun Karm Psaila's house in Zebbug, where they could see him writing poems and talking to his bird, or on a fantasy tour.
> (Teacher 5, secondary school)
> VR can also inspire students to solve riddles like Sherlock Holmes. Students can participate in solving mysteries such as ghost stories, the missing children of the Hypogeum, the elongated extraterrestrial skulls discovered at the Hypogeum, or the secret pathway in St Gregory's Church in Zejtun that was packed with human bones. And what about the curious carvings throughout the countryside in the shape of holes in the ground which we were told were Punic graves, or the parallel grooves going from nowhere to nowhere which we were told … are cart ruts, and even pans carved into the shore that are still used as saltpans nowadays. Therefore, VR can inspire students to confront some of our time's biggest mysteries and to solve them while learning Maltese.
> (Teacher 13, middle school)
> When students use VR, they can practice a language in a realistic functional setting, such as job interviews, recreational barbeque events, shops, restaurants, airport customs, etc.
> (Teacher 23, secondary school)
> Students can use VR software that has shopping scenarios where they are physically given a shopping list, say, to follow a recipe and bake a birthday cake, and then they are instructed to go and fetch these products, place them in their shopping trolley, and go to the cashier. They can purchase the goods and hold a conversation.

(Teacher 25, secondary school)

Teacher 24 mentioned that students can learn Maltese by playing VR games such as billiards or paintballing. Therefore, VR can help students combine their lessons with their interests.

> Pupils can learn Maltese by playing VR games like billiards or paintballing. Students will surely remain motivated and engaged in the lessons by playing such games.
> (Teacher 24, primary school)

Futuristic tool in the educational sphere

Fourteen teachers reported that VR is a futuristic tool in the educational sphere. Teacher 17 mentioned that VR can bridge the gap between the traditional classroom and the online classroom. Additionally, VR is highly likely to become one of the most essential tools in language learning with the help of VR language games such as 'Mondly', as mentioned by Teacher 5.

> Several businesses have begun to invest time and money in developing language learning VR games. Mondly, for example, is a VR game that lets players … improve their language abilities in various realistic scenarios. Users can talk to a bus passenger, order meals at a restaurant, and check into a hotel. Although this game has its challenges, spanning from technical issues to critiques of a difficult language learning curve, it would be fantastic if we could have Mondly in Maltese.
> (Teacher 5, secondary school)

Further development

The use of VR in language learning also presents its challenges. For instance, 11 teachers reported that VR needs further development, with issues such as the lack of a consistent Wi-Fi connection to download substantial resources onto students' devices at the same time being a potential technical challenge in many schools. Moreover, six educators mentioned that VR could create a challenge during lessons, and one needs to find the best balance between VR and traditional teaching techniques.

VR technology is not yet advanced enough to provide a smooth and realistic simulation of speaking activities. Teacher 6 claimed that these difficulties are also seen in the process of building a fully immersive language learning game, manifesting as audio issues, such as difficulty with voice recognition, which can quickly spoil a user's experience.

> Technology is not yet advanced enough to provide a smooth, realistic simulation of speaking activities. Technical challenges will impede VR games for years to come, and given the difficulty of building a fully immersive language learning game, those issues will be amplified. Any audio issues with voice recognition will quickly spoil the user experience.
> (Teacher 6, secondary school)

Realistic functional settings

One of the mentioned challenges is the need for realistic, functional settings where students can practice language skills. Seven teachers reported that VR could provide realistic,

functional settings where students can practice language skills. They acknowledged that while VR has the potential to create immersive and interactive environments, achieving a high level of realism and functionality can be challenging. This includes the creation of realistic graphics, intuitive user interfaces, and seamless interactions within the VR environment. Despite these challenges, the theme also recognizes the value of overcoming these obstacles to fully harness the educational potential of VR. This theme suggests that with continued development and innovation, VR can provide increasingly realistic and functional experiences that enhance learning outcomes.

For instance, Teacher 21 mentioned that VR even enables teachers to instruct a classroom of 20 students, who can practice a language in a realistic setting such as in shops and restaurants. Through such VR-simulated environments, students can practice ML2 language skills in a context that closely resembles real-life situations.

> Teachers can even place pupils in audio-isolated areas, even though they are in the same room and can see other people. As you can imagine when kids are practicing role-play in a packed room and are distracted by what other students or the teacher are saying, teaching a classroom of 20 students, as I do, is difficult. Being able to separate the audio allows students to concentrate on their language output and interactions with other persons in role-playing. However, when the teacher talks, everyone can hear him or her. Even though they are still in the same place with the other pupils, the teacher can join that group and have a private chat. These things are significantly more difficult to accomplish in actual situations.
> (Teacher 21, primary school)

Furthermore, Teacher 2 noted that there are also VR apps for business students who are worried about their meetings or presentation skills.

> My students, who are business people, are worried about their meetings or presentation skills, or even how to handle business encounters, but with VR, they can practice anything from interviews to dealing with customs at the airport or purchasing a bus ticket.
> (Teacher 2, teacher of adults as a part-time job)

Six educators mentioned that VR could create challenges during lessons, and one should find the best balance between VR and traditional teaching techniques.

> There really is no denying that VR has academic value since it produces exceptional and unforgettable learning experiences. However, like with other technology, the challenge of introducing VR into our lessons is to find the best balance. VR cannot replace real-life teachers, but when educators combine VR with traditional teaching techniques, this hybrid strategy can modify the learning process that we know.
> (Teacher 1, secondary school)

Diverse needs of language learners of all ages

The study findings align with the literature review findings, indicating a strong interest among educators in utilizing VR technology. One of the primary reasons for this enthusiasm is that VR has the potential to meet the diverse needs of language learners across different age groups. This suggests that VR applications can be tailored to cater to the specific requirements and preferences of various learners, including elementary school students and adult business language learners.

According to seven educators, VR apps can help students develop their listening and speaking skills in a business context, which is beneficial for their career growth.

Teacher 2 explained that VR provides a "fully immersive environment" where students can "move in, interact with, and experience a social and cultural environment" where the target language is spoken. This immersive experience makes language lessons more memorable. Teacher 5 adds that students are more likely to "remember new material" when using VR compared to traditional teaching tools alone.

VR games like 'Mondly' have been mentioned by both the participants and the literature as useful tools for language learning (Hodgson, et al., 2019). Most ML2 teachers believe that VR will become an effective educational medium, and there will be a growing demand for it.

Overcoming VR challenges

The use of VR in education presents both challenges and potential solutions. One challenge is the need for a consistent Wi-Fi connection, which could be addressed by schools investing in improving their Wi-Fi infrastructure. Another challenge is finding the right balance between VR and traditional teaching techniques, which could be addressed through teacher training.

Adopting VR in language learning may pose challenges due to its cost and potential technical problems, such as bulky headsets and internet connection issues.

> Fortunately, HTC (Hi-Tech Computer) is developing a VR headset that is so lightweight that it feels like wearing glasses instead of the clunky, weighty, and unpleasant goggles we currently have.
> (Teacher 5, secondary school)
> A possible technical challenge at many schools is a lack of a consistent Wi-Fi connection to download all of the large resources on student devices at the same time. However, some VR app developers have already discovered a solution to this problem by making virtual tours available for download on the teacher's laptop/smartphone/tablet. That device then acts as a local server for all connected student laptops/tablets.
> (Teacher 22, secondary school)

Furthermore, a disadvantage of VR, the resulting devaluation of human connection, is presented in academic sources (Radianti et al., 2020; Yoshimura & Borst, 2021), but this study's participants did not note this aspect. This is significant because communication skills are essential for most language learners. It is worth noting that the participants did not mention the effect of VR on students' health (Cook et al., 2019; Eunhee et al., 2020; Yoshimura & Borst, 2021). This could also indicate the participating educators' lack of experience with VR.

Strategies envisioned by participants for integrating VR into Maltese language teaching

In response to the third research question on strategies, 22 out of 25 teachers collaborated and shared their insights. The strategies they envisioned for integrating Virtual Reality (VR) into Maltese language teaching are as follows: Participant 6 expressed enthusiasm about the potential of VR in language teaching. They suggested, "We could adapt existing

VR applications designed for other languages and incorporate Maltese language content." They also saw the potential for creating immersive language experiences, stating, "Imagine a virtual marketplace where students have to use Maltese to interact with virtual characters."

Participant 10, on the other hand, emphasized the cultural aspect of language learning. They said, "We could use VR to virtually explore Maltese culture and history, providing a context for language learning." They also mentioned the potential of VR for collaborative learning, stating, "VR could facilitate collaborative learning by allowing students to interact with each other in a virtual environment." Both participants 6 and 10 agreed on the potential of gamification in language learning.

Participant 5 noted, "My children are so engaged when they play VR games. We could incorporate similar elements into Maltese language learning." Participant 17 echoed this sentiment, saying, "The engagement and interactivity that VR games offer could be beneficial in an educational setting." When it came to professional development, Participant 3 was adamant: "We need professional development programs that equip us with the skills to effectively use VR in our teaching."

These varied experiences and perspectives contributed to the participants' overall understanding of VR, its capabilities, and its potential applications in education. This knowledge, albeit informal, could serve as a valuable foundation should they decide to integrate VR into their Maltese teaching practices in the future. However, participants 3 and 17 agreed that formal training and resources would also be necessary to fully realize the potential of VR in Maltese language teaching.

Discussion

The utilization of VR tools in language learning represents a promising avenue for enhancing educational practices; however, the full extent of its pedagogical implications remains insufficiently explored. While VR offers immersive and engaging experiences for learners, the translation of these experiences into tangible educational outcomes is complex and multifaceted.

Currently, there exists a gap in our understanding of how VR technology impacts language learning processes and outcomes from a pedagogical perspective. Although preliminary research suggests positive effects such as increased engagement and motivation among learners, the specific mechanisms through which VR influences language acquisition and proficiency levels are not yet fully elucidated. Therefore, there is a critical need for further empirical investigations to clarify the practical implications of integrating VR tools into language teaching methodologies. By systematically examining the effects of VR technology on language learning outcomes, educators and researchers can gain valuable insights into its potential benefits and limitations, thereby informing the development of evidence-based instructional practices and educational policies in the field of language education.

This section delves into the multifaceted potential of VR in enhancing Maltese language learning. By providing a multisensory approach, VR could inspire students to, for instance, solve riddles, and apply their language skills in real-life scenarios. This immersive and interactive environment aligns with the constructivist theory of learning, which suggests that learners construct knowledge based on their experiences (Aiello et al., 2012). Huang et al. (2010) also noted the potential of VR's immersive and interactive environment to

support this constructivist approach. However, the effectiveness of VR in language learning is still a subject of exploration.

The acceptance of VR in this context can be interpreted through the Theory of Diffusion of Innovations (Frei-Landau et al., 2022), which posits that the adoption of innovations is influenced by perceived advantages, compatibility, and complexity. The current study found a moderate confidence level in the potential impact of VR tools on Maltese learning outcomes, which can be linked to the Technology Acceptance Model that emphasizes perceived usefulness and ease of use (Fussell & Truong, 2022; Lo et al., 2022).

This study suggests that while VR tools can enhance certain aspects of language learning, such as vocabulary acquisition and pronunciation, their effectiveness in other areas, such as grammar comprehension and conversational fluency, may vary, thus necessitating a comprehensive approach that combines VR with traditional language learning methods. This aligns with the multimodal theory of learning, which posits that learning is most effective when multiple modes of communication are used, and that different modes can complement and enhance each other in the learning process (Bouchey et al., 2021; Dawson, et al., 2023).

The study acknowledges the challenges and potential of VR, emphasizing the need to address health issues (Halbig, et al., 2022) and technical and pedagogical challenges (Fransson, et al., 2020). The potential of VR to create immersive, engaging learning experiences was highlighted, along with its ability to create authentic language learning environments. This aligns with the Communicative Language Teaching approach (Lee et al., 2023; Zheng et al., 2022) and the Universal Design for Learning framework (Beck Wells, 2022; Sumardani & Lin, 2023), both of which emphasize the importance of creating engaging, interactive, and inclusive environments. The participants recognized that the successful integration of VR into language learning requires careful planning, adequate resources, and continuous professional development. Further research is needed to explore how these strategies can be effectively implemented in practice.

Addressing challenges in distance learning and providing a level of practice unachievable in traditional classrooms or online platforms is one of the key benefits of VR mentioned in this study. Its versatility as a learning tool is consistent with the concepts of lifelong learning and motivation across different age groups (Dilanchian et al., 2021; Fischer et al., 2023; Lim et al., 2024). For students residing abroad, VR headsets could offer an immersive experience in Maltese language learning, transcending geographical barriers by connecting language learners with native speakers in different locations. This concept aligns with telecollaboration in language learning (Liaw, 2022; Zheng et al., 2022), which connects language learners with native speakers in different locations (Ironsi, 2023).

Several themes were explored in this study to highlight the potential of VR in language learning. One such theme is the provision of immersive and authentic language learning experiences through real or virtual tours, aligning with the concept of situated learning (Hamilton et al., 2021; Oyelere et al., 2020). Even when physical or temporal constraints make certain contexts inaccessible in reality, VR has the potential to simulate these contexts. Another theme is the combination of teaching and entertainment, reflecting VR's potential to make language learning more engaging and enjoyable, consistent with the concept of edutainment (Deshmukh et al., 2023) and the concept of gamification in language learning, which suggests that games can enhance motivation and outcomes (Pinto et al., 2021; Zhang & Hasim, 2023).

In the context of this study, the potential of VR in Maltese language learning is evident. Strategies proposed by the participants, such as adapting existing VR applications for Maltese language content and using VR to explore Maltese culture and history, align

with relevant literature and theories. These include the concept of situated learning, which suggests that learning is most effective when embedded in meaningful, real-world contexts (Hamilton et al., 2021; Oyelere et al., 2020), and the sociocultural theory of language learning, which emphasizes the social and cultural aspects of language learning. This aligns with the idea of using VR to explore Maltese culture and history, thereby providing a context-rich environment for language learning (Żammit, 2022).

The study highlights the potential of VR in enhancing the learning experience of the Maltese language by making it more engaging and enjoyable. This aligns with the concept of intrinsic motivation in learning, as suggested by Lin and Wang (2021) and Huang et al. (2019). The perception of VR as a futuristic tool in education is a reflection of the rapid advancement of technology and its increasing role in education. This is consistent with the Technological Pedagogical Content Knowledge framework, as discussed by Adipat (2021), Hayes et al. (2021), and Lee et al. (2023).

The Technological Pedagogical Content Knowledge framework underscores the importance of professional development programs, emphasizing the integration of technology, pedagogy, and content knowledge in effective teaching, as noted by Ponce et al. (2021). These programs play a crucial role in equipping teachers with the necessary skills to effectively use VR in their teaching practice.

While the potential of VR in Maltese language teaching is evident, its effective implementation requires careful planning, adequate resources, and continuous professional development. This ensures that the benefits of VR are fully realized in the educational sphere, thereby enhancing the learning experience for students.

The theme of overcoming VR challenges acknowledges the technical and pedagogical challenges of integrating VR into education. Potential solutions, such as improving Wi-Fi infrastructure in schools and providing teacher training, were suggested to address issues like the need for a consistent Wi-Fi connection and the balance between VR and traditional teaching techniques. This aligns with the Technological Pedagogical Content Knowledge framework which emphasizes the integration of technology, pedagogy, and content knowledge in effective teaching (Lee et al., 2023). The efforts that the participants mentioned to improve the hardware aspect of VR, such as the development of lightweight VR headsets, address issues related to the bulkiness of current VR headsets. This is crucial for technology acceptance, as the Technology Acceptance Model identifies perceived ease of use as a key determinant. (Al-Adwan et al., 2023; Rosli et al., 2022).

Ultimately, while VR presents exciting possibilities for Maltese language learning, its successful integration into the classroom is a complex process that requires thoughtful consideration and ongoing effort. With continued research and development, VR has the potential to transform Maltese language learning, offering immersive, engaging, and effective learning experiences.

Study limitations

It should be clarified that there are also some limitations of this research. For instance, the study participants had some knowledge of VR from their personal experiences but had not used it in their ML2 classroom. Therefore, their opinions might be subject to biases, as their evaluations of the potential effectiveness of VR tools are not based on first-hand experience. The sample was small because there are only a few ML2 teachers in Malta, as ML2 is a new subject, and until now, it has not been a compulsory

subject. In fact, it is not taught in all schools in Malta, such as church schools. Moreover, this study depended on the subjective comments of the teachers, which were not tested. Therefore, the results of this study cannot be generalized.

Another limitation is that the students' perspectives were not taken into consideration in this research because this study was conducted exclusively from the educators' perspectives. One more limitation is that the results are relevant only to VR apps that focus on language learning.

Recommendations

This study's results illustrate that teachers need to first test and experience VR before offering it to students, limit the time that VR is used by students, and be ready to answer student questions that are not covered by the VR application. By following these recommendations, teachers are highly likely to find and maintain an optimal balance when applying VR during lessons. Simultaneously, the evidence provided in this research illustrates that if applied correctly, VR tools have impressive potential to facilitate language learning. The study also implies that younger teachers should be engaged in the process since they are more likely to become effective change agents as they gain experience.

Importantly, VR has not been thoroughly investigated in the academic literature, and this study's educators are unlikely to have enough knowledge on the consequences of this technology for students. At the same time, the participants agreed that VR might become a crucial part of the educational process in the future because it provides a fully immersive environment for students of different ages with different learning aims and capabilities. However, this study did not focus on the problem of the influence of VR on students' health. This topic might become significant for further research because it could help in finding a balance between using VR and applying other offline teaching techniques.

Another topic that could also be pursued in the future is the development of VR Maltese language games, particularly given the current scarcity of such resources. Furthermore, the study participants expressed concerns about language mistakes often found in VR apps, which could confuse students. Hence, future studies might focus on VR issues from the student's perspective, and the results of such studies could help in developing VR Maltese language apps. Another area that warrants investigation in the future is the application of VR for students with learning disabilities or refugees while learning ML2. Exploring information about the key barriers and enablers, as well as practical implications, could also be beneficial in further research on the application of VR in language learning.

Furthermore, it is of paramount importance to emphasize that the pedagogical implications of using VR tools to facilitate language learning are not entirely understood; therefore, further research to clarify what practical outcomes of VR tool use can be expected from the perspective of pedagogy is highly encouraged. The current research was conducted with teachers who had not utilized VR tools in their classrooms. Therefore, it was not possible to determine specific pedagogical implications of this instrument. Simultaneously, the available evidence provides a compelling reason to believe that information about this issue could be valuable from both theoretical and practical perspectives.

Conclusion

This study, with its unique focus on the application of Virtual Reality (VR) tools in teaching Maltese as a second language (ML2) to international students, contributes new knowledge to the field of language acquisition. Conducted from the perspective of 25 Maltese teachers, it provides valuable insights into their perspectives and opinions on the potential of using VR tools in Maltese language teaching.

The study found that VR tools are not widely used in language learning, possibly due to uncertainty surrounding their effectiveness or a lack of VR apps like in this case, the teaching and learning of a minor language, such as Maltese. However, a significant 76% of respondents strongly agreed that VR could be a useful tool for Maltese language acquisition, helping to dispel doubts about the effectiveness of VR in language learning.

Interestingly, the study revealed age-related differences in perceptions of VR, with younger educators more likely than older respondents to believe that VR tools can enhance students' language learning achievements. This finding can inform strategies for promoting the use of VR tools among educators of different age groups.

Despite identifying some challenges with VR, such as technical problems, bulky headsets, and potential health risks, the study found that VR provides an opportunity for students to immerse themselves in a fictional environment and practice their speaking skills at any time and location.

The findings can guide the development of practical strategies for integrating VR applications into Maltese teaching, a valuable contribution to the practice of Maltese language teaching. This study provides a comprehensive understanding of the potential benefits and challenges of using VR in Maltese classrooms.

Ultimately, this study contributes to new knowledge about the use of VR in language teaching, specifically in the context of teaching Maltese as a second language. It provides valuable insights for educators, policymakers, and researchers in the field of second language acquisition. This comprehensive exploration of the potential and challenges of VR in this context makes it a valuable contribution to the field of second language acquisition.

Declarations

Conflict of interest The author declares that she has no conflict of interest.

Informed consent Before their enrollment in the study, each research participant signed the informed consent form provided by the researcher.

Research involving human participants and/or animals The study involves human participants and it is approved by the University of Malta's University Research Ethics Committee (UREC), and the committee's reference number is EDUC-2022-00082.

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