

**Immersive virtual reality for language education:
Examining teacher perspectives and implementation ideas
for university foreign language learning environments**

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ABSTRACT

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Virtual reality (VR) has shown potential as a tool for improving the quality of language education (LE). High-immersion VR (iVR) in particular has emerged as promising for its affordance of authentically recreating real-life scenarios and inducing a higher sense of physical presence in the immersive virtual environment (iVE). Acknowledging the role of teachers as crucial actors in the process of implementing a new technology in a pedagogically-relevant way, this study focused on understanding how foreign language (FL) teachers perceive iVR and four tested iVR apps. A workshop on iVR for LE was used as a first step in a design-based research (DBR) approach to investigate 8 university FL teachers' perspectives before and during the workshop. Insights were gathered on perceived affordances and limitations of tested iVEs, together with implementation-related aspects. Main identified assets of tested iVEs were that they allow to practise the language without the drawbacks of real life situations, can provide multimodal and gamified experiences, help develop interaction and presentation skills, and support vocabulary acquisition. Among identified challenges to iVR implementation were a lack of familiarity with the technology, technical issues and a lack of resources. Participants thought iVEs might help with current perceived challenges in the classroom, for example by providing opportunities to interactively practise the language, reducing foreign language anxiety and promoting authentic communication in online meetings. Finally, identified types of support teachers would need to implement iVR in their own teaching belonged to the categories of external and internal resources. These results will provide suggestions for future steps in critical evaluation and implementation of iVR solutions for LE.

Keywords: immersive virtual reality, VR, language learning environments, teacher perspective, foreign language education

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1 INTRODUCTION

Acquiring proficiency in foreign languages is key in today's globalised world, characterised by diverse and multilingual environments. However, learning a language is also a "time-consuming and complicated process" (Qiu et al., 2021, p. 1). Consequently, identifying the most effective means to enhance language acquisition stands as a long-term objective in educational research. Given the transformative role technologies have in our everyday life, including the educational field, it is natural to turn to new technologies with the aim to develop innovative solutions to improve the quality of language learning. One of the most promising technological tools that has been finding application in the educational field in the past decade is virtual reality (VR). Even though this technology is only relatively new, it is thanks to its rapid developments in the past decades that VR devices, especially immersive ones, have become portable, lightweight and more affordable (Bonner & Reinders, 2018).

As a result, the number of studies focusing on VR for educational purposes has increased in the past few years, indicating that its perceived very positively by learners (Chen et al., 2020; Liaw, 2019; Yang et al., 2020), it can enhance vocabulary learning (Alfadil, 2020; Dhimolea et al., 2022; Xie et al., 2019), and reduce foreign language anxiety (FLA) (Kaplan-Rakowski & Gruber, 2023; Thrasher, 2022). However, further research is needed to discover its full potential as well as its downsides as an educational tool, shedding light on the aspects of immersive virtual environments (IVEs) that can be especially significant when it comes to learning, and, more specifically, to learning languages. The relevance of VR for language learning (LL) revolves around its affordance of mimicking the real world, allowing "instant time and space travel, connecting geographically distant people, trying out situations without real life impacts" (Nuesser et al., 2024, p. 4). Due to the possibility of designing meaningful virtual environments based on authenticity (Qiu et al., 2021), including simulations of 3D real-time situational interactions in natural language settings (Dobrova et al., 2017), VR can, in fact, provide a valid

alternative to authentic environments without investing time and money to travel to foreign countries (Alfadil, 2020). By providing an accessible alternative to authentic environments where learners can practise the FL, it tackles the issue of lack of practising opportunities that makes developing speaking abilities difficult (Chen & Hwang, 2022).

However, previous research has also highlighted challenges connected to the use of VR in educational settings. Qiu et al. (2021) mentioned how there is a lack of research focusing on the development of educational materials and resources, in addition to a lack of established standards in relation to the use of VR as a pedagogical tool. Moreover, relatively little research has investigated how teachers can best prepare to teach languages through VR (Cowie & Alizadeh, 2022). Yet, as emphasised by Lan (2020), the importance of focusing on the development of pedagogical solutions is crucial for VR not to end up being just “another fancy technology” (p. 3). Therefore, the role of teachers, as professionals in the field of education, emerges as essential for most effectively bridging the gap between theory and practice. Teacher conceptualisation of this new technology becomes a necessary step for integrating it effectively and meaningfully in the education system (Cicek et al., 2021).

By providing insights on university foreign language (FL) teachers' perspective of VR as a tool for language education (LE), this thesis aims to contribute to the conceptualisation of VR from a teacher perspective and the reflection on issues connected to VR implementation in a higher educational setting. While previous research has touched upon the use of VR at this level of education, the emphasis on university teachers remains crucial due to the role of higher education institutions as innovative agents within society (Marks & Thomas, 2022). Additionally, investing in VR technology at the university level would be a cost-effective endeavour contributing to the diffusion of this technology (Marks & Thomas, 2022).

To introduce this study, the main relevant concepts and their underlying theoretical framework and literature review will be presented first. Second, the research methodology will be illustrated. Then, the research findings will be

presented and discussed. Finally, limitations and implications of the study will be presented, together with possibilities for future research.

2 TOWARDS UNDERSTANDING VIRTUAL REALITY FOR LANGUAGE EDUCATION

2.1 Language Learning

2.1.1 Definition Of Foreign Language Learning And Teaching

Foreign language learning and teaching refer to “the learning or teaching of a non-native language outside of the environment where it is commonly spoken.” (Moeller & Catalano, 2015, p. 327). The distinction between foreign and second language learning is not always made in research, where second language learning can refer to the learning of any language that is acquired after the first, regardless of the context of acquisition (Mitchell et al., 2013). However, where such a distinction is made, it refers to the fact that, when learning a second language, “the learner resides in an environment where the acquired language is spoken” (Moeller & Catalano, 2015, p. 327).

2.1.2 Language Learning Theories And Approaches

Since the end of the 19th century, language learning has been understood through the dedicated field of applied linguistics based on a multiplicity of theories and approaches, characterised by different views on the nature of language, the language learning process, the language learner and the connection between language learning theory and social practice (Mitchell et al., 2013). Such theories essentially focused on different aspects of the complex process that is language learning (Moeller & Catalano, 2015).

Behaviourist psychology, structuralism and audio-lingual approaches regarded language learning as a process of imitation and emphasised the role of repetition, rote learning and feedback (Moeller & Catalano, 2015). Chomsky gave account for the aspect of creativity in language learning by introducing interactionism and Universal Grammar, explaining the process of language acquisition as a result of innate learners’ capacities and the role played by the immediate environment (Moeller & Catalano, 2015).

The concept of comprehensible input as a necessary condition for language learning to occur is central to this theory, and also to Krashen's Second Language Acquisition theory (SLA), according to which learners' proficiency in the second language progresses through fixed stages of development (Krashen, 1989). The importance of input and output in terms of interplay between receptive and productive skills was emphasised by Long (1985), who suggested that language learning is developed based on negotiations and co-constructions of meaning through interactions with speakers of different proficiency levels.

The most common and widely accepted theory is the Sociocultural Theory (SCT), developed by Vygotsky and according to which learning occurs through participation in cultural activities within the social community. Post-structuralist theories further developed this idea by defining language as "a social practice in which experiences are organised and identities negotiated" and learning as not only a cognitive process, but also a socio-culturally situated practice (Norton, 2013, p. 2). Finally, the importance of including the cultural element in language classes and fostering intercultural competence has emerged as an increasingly relevant aspect (Moeller & Catalano, 2015).

Foreign language teaching approaches and methods can be categorised based on whether they focus more on fluency or accuracy, stress the importance of spoken or written language, or are more student- rather than teacher-centred (Djumabaeva & Amazmatova, 2022). All approaches can be suitable, depending on the learners, the learning context and objectives, especially with the aim to add variety to FL classes (Djumabaeva & Amazmatova, 2022). However, among the different methods, communicative language teaching (CLT) has received widespread support and resonance in theory and application in a variety of settings (Moeller & Catalano, 2015). This approach is student-centred, sees the teacher as a facilitator in the learning process, prioritises fluency over accuracy and aims to develop all communicative skills equally, leading to the development of competences that are expendable outside the classroom (Djumabaeva & Amazmatova, 2022). Further learner-centred approaches that are occasionally categorised as competency-based language teaching (CBLT),

with a focus on the acquisition of competences required to effectively communicate in real life situations, are task-based language teaching (TBLT) and the content-based instruction (CBI), akin to the European-born approach to foreign language teaching that is Content and Language Integrated Learning (CLIL) (Gabillon, 2020).

In the past decades, the importance of agency and positive emotions in relation to identity in learning have also gained prominence. Agency, defined as the “socioculturally mediated capacity to act” (Ahearn, 2001), can be fostered in learning environments to support students’ learning journey, their identities and positive emotions (Larsen-Freeman, 2019). Similarly, positive emotions have been found to bring a long series of benefits, including a broadening effect, as opposed to the narrowing effect of negative emotions (MacIntyre & Gregersen, 2012). The role of negative emotions has been widely investigated, especially foreign language anxiety (FLA), defined as the anxiety experienced when using or learning a foreign language (Horowitz et al. 1986). Its main components are communication apprehension, test anxiety and fear of negative evaluation (Horowitz et al. 1986) and second language acquisition (SLA) theories highlighted how it plays a significant role as an affective factor in language learning, potentially impairing the learning process (Krashen, 1989). It can impact student performance, academic achievement, and overall well-being, influencing other crucial affective factors in learning, including motivation, attitude and willingness to communicate (Botes et al., 2020; Horowitz et al., 1986; Oteir & Al-Otaibi, 2019; Papin, 2022; Teimouri et al., 2019). Willingness to communicate (WTC) is defined as a willingness to engage in conversation at a certain time with a particular individual or group using a second language (MacIntyre et al., 1998). The positive effects of positive emotions instead have gained attention in language educational research only recently, due to their relevance in educational contexts, connected to the fact they trigger learners’ explorative and playful disposition towards new experiences that is conducive to enhanced learning (MacIntyre & Gregersen, 2012).

2.1.3 Current Challenges In Foreign Language University Classrooms

The present study will gather information on challenges currently faced in the foreign language classroom at a Finnish university. Challenges in foreign language classes at the university level, as reported by two recent studies, include lack of confidence in speaking and reduced implementation of student-centred approaches. Ismeti (2022) conducted a study on university teachers and students in Kosovo and reported that teachers' focus is still mostly on grammar and language accuracy rather than communication, while students struggle with different skills, and, when it comes to communicating in the foreign language, they struggle with finding the courage to speak. Yılmaz and Sahan (2023), instead, analysed German-as-a-foreign-language university students' motivation, and indicated that it was supported by an envisioned future in the foreign country, cultural enrichment, personal interest and also new technologies. Conversely, their motivation was negatively affected, among other factors, by linguistic challenges and feelings of inadequacy.

2.2 Virtual Reality as a Learning Environment

2.2.1 Definition Of Low-Immersion And High-Immersion Virtual Reality

Even though the first VR devices appeared already in the 1960s, this technology has witnessed an increase in popularity in the past decades due to rapid developments and increased affordability (Genz et al., 2021). As a result of the evolution of this technology, the concept of VR has also undergone changes. The main distinction is between non-immersive/low-immersion VR and immersive/high-immersion VR, based on the degree of immersion allowed by different types of devices (Chen, et al., 2022).

Low-immersion VR refers to a “computer-generated three-dimensional virtual space experienced through standard audio-visual equipment, such as a desktop computer with a two-dimensional monitor”(Kaplan-Rakowski & Gruber, 2019, p. 552). In addition to desktop-VR, low-immersion devices include smartphones and tablet computers (Qiu et al., 2021). High-immersion

VR (iVR), instead, is defined as a “computer-generated 360° virtual space that can be perceived as being spatially realistic, due to the high immersion afforded by a head-mounted device” (Kaplan-Rakowski & Gruber, 2019, p. 552). This category includes CAVE and different types of head-mounted display devices (e.g. Oculus Quest, but also Google Cardboard).

Head-mounted display (HMD) VR devices are stand-alone devices that, once worn, separate the user from the real environment and allow for a high degree of immersion in the virtual world. Their popularity has increased in recent years due to the availability of more lightweight, portable and affordable models (Tai & Chen, 2021). Since 2015 more accessible head-mounted devices, such as Google Cardboard, have been widely adopted and used in virtual reality-assisted language learning (VRALL) research (Dhimolea et al., 2022). They require the use of a smartphone to display graphic content and can benefit from the use of headphones for a more immersive experience (Bonner & Reinders, 2018).

Another option for highly immersive VR experiences is the stationary system cave automatic virtual environment (CAVE). The CAVE is a “multi-person, room-sized, high-resolution, 3D video and audio environment” (Kenyon, 1995, p. 149). Its projection system uses a “real-time viewer-centred head tracking perspective with a large angle of view, interactive control, and binocular display” and entails the use of a dedicated room-space and stereoscopic glasses (Creagh, 2003, p. 499). This VR system can be highly immersive, but it is also quite costly and extensive, and, therefore, less feasible to implement in educational settings compared to other types of VR (O’Brien et al., 2009).

The use of devices, such as a computer screen or VR headsets, allowing for different levels of immersion, gives an essentially different quality to user experiences, with possible implications for education. iVR allows for greater levels of immersion based on the fact that, through visual, auditory and haptic devices, the illusion of being physically present in the 360-degree virtual space is created at the sensory level in response to the user's movements (Mulders et al., 2020). Thanks to the illusion of presence, supported by a first-person

perspective and a lack of physical barriers between the user and the stimuli in the VE, the virtual body is perceived as real, and a high sense of embodiment can be achieved (Kaplan-Rakowski & Gruber, 2019; Peeters, 2019; Slater, 2017).

2.2.2 Learning Theories Underpinning The Use Of Virtual Reality For Education

The use of iVEs as learning tools finds support in a multiplicity of learning theories. According to the Sociocultural Theory of cognitive development (Vygotsky, 1978), learning is a process of creation that occurs through collaboration in socio-cultural environments. Through the concept of “zone of proximal development” (Vygotsky, 1978), it is argued that a student, with guidance from teachers or more experienced peers, can solve a task they would not be able to solve on their own. It is the possibility of filling this gap of knowledge / competence with the support offered by scaffolding practices in social interactions that allows the student to develop their own competence. Mediation and scaffolding can be provided by VR environments. Experiential and experimental theories of learning (Bruner, 1986; Wells, 1987), stating that learning occurs by doing, through direct experience, discovery and exploration of the environment, can also find fertile grounds in interactive IVEs.

The situated cognition theory (Brown et al., 1989) posits that “learning occurs in a situated activity that has social, cultural, and physical contexts” (Ataizi, 2012). The development of linguistic and intercultural skills takes place in the context of interaction within the community of practice, that is a group of people bonding over shared interests (Lave & Wenger, 1991). By allowing virtual immersion in foreign languages, cultures and specific real life scenarios, VR provides opportunities for situated learning to occur, with scaffolding for learning being provided by interactions with peers and virtual objects in context (Wang, Petrina, & Feng, 2017). Furthermore, the idea of virtual encounters across cultures and languages recalls plurilingual and pluricultural approaches, which define students as social agents building on their backgrounds and repertoires during exchanges (Piccardo, 2019).

The connection between mind and environment can also be understood through embodied cognition theories, according to which cognitive activity “grounded in bodily states and activities” (Atkinson 2010, p. 599) and bodily states and interactions with the environment contribute to cognitive development. More specifically, the principle of embedded cognition suggests that “the cognitive capacities of an individual are enhanced when provided with the opportunity to interact with features of a suitably organised physical or social environment” (Shapiro & Spaulding, 2024). The principle of extended cognition, instead, argues that the resources within the environment and society that improve cognitive abilities are integral parts of a broader cognitive framework which extends beyond the nervous system (Clark & Chalmers, 1998). Lastly, enactive cognition posits that “cognition emerges from, or is constituted by, sensorimotor activity” (Shapiro & Spaulding, 2024). These different aspects of embodied cognition can be supported by providing iVEs which include interactions with virtual objects and agents and create an illusion of physical presence in the virtual space through multisensory stimulation.

2.2.3 Immersion And Learner’s Agency in the Virtual Environment

Immersion is the main defining concept of iVR experiences. It has been referred to through two dimensions: as a technical affordance of iVR or as a mental and emotional state of participants in a iVE (Mantelli, 2021). As participant experience, it has also been referred to as “presence”, which can be defined as the “subjective experience of being in one place environment, even when one is physically situated in another” (Witmer & Singer, 1998, p. 1). Other aspects of presence that are useful to understand the concept refer to users reacting to stimuli and events happening in the VE as if they were real, and remembering the experience in the VE in terms of visiting a place rather than just seeing computer-generated images (Slater & Wilbur, 1997).

A great contribution to understanding the concept of immersion in iVR was brought by Winkler et al. (2020), who identified eleven factors leading to immersion in iVEs, organised across three different categories. The first category of physical and physiological aspects includes: (a) visual and auditory

involvement, (b) translation of actions from reality to VR, (c) transportation and (d) distracting aspects of VR (Winkler et al., 2020). The second category is that of cognitive and affective aspects, referring respectively to focused attention and losing track of time, and affective involvement and control (Winkler et al., 2020). Finally, the third category includes shared experience and aspects of social interaction, in terms of interactions among users and their perception of other avatars (Winkler et al., 2020).

The fact users can perceive themselves as if they were emotionally and physically present in the VE has implications for language learning. Theoretical grounds for a beneficial use of VR for language learning revolve around the VR affordance of realistically and immersively recreating authentic real life situations and interactions (Nuesser et al., 2024). Other key affordances of VEs for LL are connected to its multimodal nature, suitable for learners with different learning styles, the possibility of adjusting content based on progress through adaptive learning paths, and facilitating peer interactions through collaborative learning spaces (Song et al., 2023).

By increasing a learner's sense of control over the environment and autonomy in the learning process, iVR allows for a learner-centred experience (Makransky & Lilleholt, 2018). Huang et al. (2019), who applied the self-determination theory model to learning in VR, found that the psychological needs of autonomy and relatedness are positively related to intrinsic motivation while experiencing a VE. The feature of interactivity, giving users the possibility to make choices in the environment, meets the need for autonomy (a concept akin to agency), and results in satisfaction and increased positive emotions (Huang et al., 2019).

In order to maximise the potential of this technology for LE, applications should be developed according to iVR affordances for learning. Based on an understanding of language learning as "situated and interactive, emphasizing the importance of creating real or realistic learning environments", Nuesser et al. (2024, p. 2) identified the most impactful features of iVEs for language learning. These features are (a) 360-degree view, as conducive to presence, (b) the possibility of interacting with VR objects, providing interaction with the

immediate learning environment, (c) tactile and haptic simulation to foster embodiment, and (d) a coherent storyline to stimulate emotional connection (Nuesser et al., 2024). In their review, focusing on papers published between 2013-2022, Nuesser et al. (2024) observed that most iVEs do not fully exploit the affordances of iVR for LE, and emphasised the need for compelling storylines and a multiuser function for more engaging and realistic learning experiences.

2.2.4 Theories To Understand Teacher Perceptions of Virtual Reality Environments

Based on the fact that iVEs reproduce the real world realistically in terms of spatiality, multisensory stimuli and interaction with the environment, the concept of “affordance” has been used to understand the implications of using iVR in education. The term derives from Gibson (2015)’s ecological psychology and cognitive theory, which defines as affordance “what [the environment] offers the animal, what it provides or furnishes, either for good or ill” (p. 119). Affordances are “relative to species, physiology, development, and culture”, in the sense that they are perceived in relation to an agent (Aagaard, 2018, p. 2). However, they are inherently suggested by the elements of the environment, in relation to their physical qualities. While Gibson regards affordances as “real and permanent features of the environment” (Aagaard, 2018, p. 2), in the fields of design and technology their definition has been partially revisited. For instance, Aagaard (2018) defined affordances as multistable and magnetic entities. The first concept refers to the fact that an object’s affordances can change depending on the moment, the user and the context, while the second describes how affordances “actively invite specific actions (and repel others)” (Aagaard, 2018, p. 4).

Other theories, by looking at the ways in which technology and innovation are perceived in relation to their potential adoption, can help understand potential users’ attitudes towards such technologies and innovations. For instance, the Diffusion of Innovation Theory (Rogers, 1995) aims to explain how novel ideas and innovations are adopted and, to do so, identifies five characteristics that influence adoption: (1) relative advantage, (2)

compatibility, (3) complexity, (4) trialability, and (5) observability. Relative advantage refers to the extent to which an innovation is perceived as superior compared to the current method it is intended to replace. Compatibility quantifies how well an innovation is found to be suitable for potential users, in terms of existing values, experiences, and needs. Perceived difficulty of understanding and using an innovation is referred to as complexity. Trialability refers to the degree to which an innovation can be tested on a small scale before committing to its full implementation. How tangible the results of an innovation are to potential users is understood as observability.

According to Rogers (1995), innovations are more likely to be adopted if they are recognised to have a clear and undeniable benefit, are easy to use, can be experimented with, and offer readily observable positive outcomes. Research indicates that high relative advantage and compatibility are associated with higher chances of innovation adoption (Greenhalgh et al., 2004). When it comes to technological innovation from a university teacher perspective, Ashrafzadeh and Sayadian (2015) reported the highest mean score for relative advantage and the second highest for complexity among the five attributes of the Diffusion of Innovation Theory, indicating a recognition of the advantages of technology adoption, but also a personal challenge of teacher in terms of understanding and using technological innovations.

More specifically in relation to the adoption of technological solutions, the Technology Acceptance Model (TAM) (Davis et al., 1989) explains how different factors, such as external variables, perceived usefulness and perceived ease of use can affect technology adoption. While external variables affect perceived usefulness and perceived ease of use of a technology, perceived ease of use can affect perceived usefulness, and both these factors contribute in turn to affecting behavioural intention of using a technology, which can result in the actual system use. Since perceived ease of use and perceived usefulness of a technological tool play a crucial role in determining whether a technology will end up being adopted, based on this model, training emerges as an important element in the equation. In fact, previous research suggests that lack of proper training can negatively affect the way teachers perceive a new technological tool

(Lederer et al., 2000).

2.3 Previous Research On Virtual Reality For Language Education and Teacher Perspectives

2.3.1 Benefits Of Immersive Virtual Reality For Language Education

Previous research conducted on iVR has suggested several potential benefits of this technology for LL, in terms of cognitive and affective gains, with an emphasis on positive user perceptions. Overall, iVR is perceived quite positively (Chen et al., 2020; Liaw, 2019; Yang et al., 2020) and more positively compared to low-immersion VR (Dolgunsöz et al., 2018; Kaplan-Rakowski & Wojdyski, 2018). It is also preferred over traditional methods, such as but not limited to text-book based ones, due to its enhanced enjoyment, safety, amusement, and ease of communication (Peixoto et al., 2021; Yudintseva, 2023). Additionally, the use of iVR can result in motivation, satisfaction, enjoyment, enthusiasm, confidence, creativity (Huang et al., 2019; Liaw, 2019; Li et al., 2020; Peixoto et al., 2021; Rho et al., 2020; Tai & Chen, 2021; Yudintseva, 2023) and engagement (Fu et al., 2019; Parmaxi, 2020; Rho et al., 2020; Symonenko et al., 2020).

The fact iVR has been found to be more engaging and motivating compared to traditional methods (Peixoto et al., 2021) means it is likely to positively affect learning outcomes in the long run (Lähtevänoja et al., 2022). However, the current lack of longitudinal research poses a limitation to these findings, since the motivation caused by the use of a novel tool, not being inherent to the tool itself, is bound to fade with time (Lähtevänoja et al., 2022).

In regard to affective gains, an important benefit lies in VR's potential to foster confidence and willingness to communicate (WTC) (Ebadi & Ebadijalal, 2022; Papin, 2022), as well as reduce foreign language anxiety (FLA) (Kruk, 2015; Melchour-Couto, 2018; Parmaxi, 2020; Xie et al., 2019; York et al., 2021). When tested as one of three computer-mediated communication modalities, iVR was found to be just as effective as the other modalities to reduce FLA (York et al., 2021) However, the iVE was perceived as the easiest environment

for communication, the most enjoyable and effective for language learning (York et al., 2021). Additionally, the anonymity effect ensured by communicating through avatars in a VE was found to be strongly correlated with self-efficacy beliefs (Melchour-Couto, 2018). Most recent studies, employing quantitative or mixed methods physiological measurements, indicated that learners' FLA levels are lower in iVEs compared to the classroom environment (Thrasher, 2022) and Zoom (Kaplan-Rakowski & Gruber, 2023).

In regard to enhanced effectiveness of iVR technology compared to low-immersion or non-immersive VR, research in different subject areas and educational levels reported no significant differences between different VR technologies (Lähtevänoja et al., 2022). However, most recent studies showed that iVR was more effective, and this might be due to the role played by technological advancements in this technology (Lähtevänoja et al., 2022). This might be due to the fact that the mere use of iVR does not lead to improved learning outcomes and, therefore, the role of different pedagogical approaches should be considered and investigated (Lähtevänoja et al., 2022).

Chen et al. (2022) demonstrated that using VR and iVR for language education (LE) had a moderate effect on both linguistic and affective gains compared to non-VR conditions. However, non-immersive devices had a greater impact on linguistic gains than immersive devices (Chen et al., 2022). Nevertheless, it needs to be pointed out that proving the effectiveness of iVR in enhancing learning outcomes has still been inconclusive, perhaps due to the fact that not all studies use rigorous methodology (Dhimolea et al., 2022). It was also noted that effective learning through iVR requires repeated use (Dhimolea et al., 2022). This might be due to the fact that, in order to enhance learning outcomes, it's crucial to ensure learner access and regular exposure to iVR technology, especially considering potential barriers, such as unfamiliarity with the devices and the novelty effect (Mulders et al., 2020).

The area in which iVR has proven to be beneficial is vocabulary learning (Alfadil, 2020; Dhimolea et al., 2022; Xie et al, 2019). This is due to the fact that iVR supports self-directed learning and influences the educational process, enhancing speed, greater effectiveness, positive attitudes, increased

engagement, and heightened motivation among students (Palmeira et al., 2020). Based on embodied cognition theories, previous research has focused on kinesthetic approaches to vocabulary learning in iVEs. iVR was found effective in supporting sign language learning, through increased engagement, confidence and memory retention (Rho et al., 2020). Its potential for enhancing learning mostly lies in its affordance to promote long-term retention. More specifically, iVR groups showed lower immediate learning gains compared to control groups using traditional and non-kinesthetic VR methods (Ebert, et al., 2016; Vázquez et al., 2018), yet scoring significantly better in retention tests. In particular, relevant manipulation movements in iVR led to greater learning gains compared to watching only and performing an irrelevant movement (Fuhrman et al., 2020). On the other hand, Nicolaidou et al. (2021), though reporting effectiveness of iVR in terms of engagement and learning outcomes, did not find iVR to be more effective nor engaging than mobile applications.

When it comes to specific LL skills, speaking, listening and writing are the ones that have been more widely researched (Chen et al., 2022). In relation to spoken productive skills, iVR was found to enhance speaking skills and students' willingness to communicate (Ebadi & Ebadijalal, 2022; Papin, 2022) and be beneficial for preparing oral presentations through active learning (Xie et al, 2019). Incorporating gestures into VR-assisted public speaking practice can positively influence performance (Valls-Ratés et al., 2022), as well as reduce public speaking anxiety in the FL (Gruber & Kaplan-Rakowski, 2020). However, the use of VR does not necessarily result in oral proficiency gains (Yudintseva, 2023). This might be due to the fact that a positive effect of this technology on learning probably requires the use of suitable instructional techniques and learning content design grounded in VR affordances (Li & Wong, 2021; Yudintseva, 2023).

With reference to listening skills, iVR can lead to higher levels of listening comprehension and retention, since the iVE can be conducive to prior knowledge activation and effective inference drawing (Tai et al., 2021) However, investigating the difference between interactive and passive listening exercises

in iVR yielded no significant differences between these two modalities (Peixoto et al., 2023).

The use of VR to enhance students' writing skills resulted in improved writing performance, particularly in fluency and elaboration (Fu et al., 2019), higher writing quality compared to the non-VR control group (Lan et al., 2019) and statistically significant improvement in expository writing skills (Chen et al., 2020). Additionally, students reported positive attitudes and emotions (Chen et al., 2020), higher levels of engagement (Lan et al., 2019) and motivation (Fu et al., 2019).

Uses of VR to foster intercultural learning led to enhanced intercultural communicative competence (DeWitt et al., 2022; Liaw, 2019) and intercultural sensitivity (Li et al., 2020). Moreover, iVR was found to foster positive emotions (Liaw, 2019) and positive attitudes towards other cultures (DeWitt et al., 2022). Participants' perceived motivation also positively influenced the increase in intercultural sensitivity (Li et al., 2020)

Task-based language learning, which enables learners to develop language skills through the solution of a real-life task, is supported by experiential learning and can be fostered by iVEs (Saito & Hoshino, 2008). Observation of English-as-a-foreign-language (EFL) students playing an information gap game in HMD VR suggested that the use of an immersive VR game results in engagement, collaboration and learner-driven task resolution, with the iVE providing enhanced presence (Smith & McCurrach, 2021).

The gamification aspect should not be ignored. It can, in fact, be incorporated in VEs, for example by providing feedback (a "system's response to the actions of the user", Sherman & Craig, 2018, p. 116), scores, and a function to track learners' progress, with positive impact on the affective and cognitive dimensions of learning. A systematic review on the use of gamification in higher education reported that learning English through gamified experiences was generally described by students as "motivating, enjoyable, cooperative, competitive, participatory, engaging, exciting, and interesting" based on the fact they felt they were actively participating in the learning process (De La Cruz et al., 2023). Gamification also had positive effects

on learning outcomes (De La Cruz et al., 2023). Fu et al., (2019), using an iVR game for the development of writing skills, reported improved writing performance and the majority of students perceived the game as beneficial and engaging.

Finally, the possibility for individualisation of tasks also makes VR a promising tool for differentiated learning (Alfadil, 2020; Vesisenaho et al., 2019). Interestingly, the use of iVR has demonstrated greater benefits for less successful learners compared to traditional methods, as evidenced by Legault et al. (2019), whose study showed improved learning in iVR for low-performing students compared to traditional methods, and no difference between different methods for high-performing students. iVR applications' potential to be more effective for low-performing students suggest they might more adequately cater to those students whose needs and learning styles are not effectively supported by more traditional LL methods.

2.3.2 Challenges Of Immersive Virtual Reality For Language Education

Previous research on the use of iVR in LE has also revealed challenges, such as accessibility (Yang et al., 2020) and technical difficulties (Parmaxi, 2020; Yuditseva, 2023). Additionally, integrating VR effectively in a pedagogical setting presents challenges (Parmaxi, 2020), considering that the lack of suitable activities can result in insignificant outcomes (Yuditseva, 2023). To fully harness the potential of this technology and mitigate any associated disadvantages, VR platform and content developers should consider the specific traits of their target audience (Hua & Wang, 2023).

A very important aspect when planning educational activities and choosing or developing VR content is that the higher complexity of the learning situation in immersive VR has the potential of inducing a cognitive overload, which would result in performance and learning inhibition (Frederiksen, et al., 2019; Meyer et al., 2019). Cognitive load refers to the level of mental effort, including the demand on working memory, needed for a specific task (Chen et al., 2021). If a learner's cognitive capacity is overwhelmed, it can lead to cognitive overload, which hinders learning (Meyer et al., 2019). Cognitive load

can be intrinsic, extraneous and germane (Huang et al., 2020). Multimodality and the abundance of stimuli in the iVE can lead to extraneous cognitive load, resulting in distraction (Chen et al., 2020; Hsu, 2022; Tai & Chen, 2021), hindered learning, and slower speech production (Yudintseva, 2023). In order to avoid cognitive overload, iVR content should be as simplified as possible (Meyer et al., 2019). Moreover, pre-training could be used as a way to reduce the cognitive load while using VR (Meyer et al., 2019).

The possible occurrence of physiological side effects, such as motion sickness and psychological distress, is another downside of iVR (Cowie & Alizadeh, 2022; Yudintseva, 2023; Vesisenaho, et al., 2019). Motion sickness, also known as VR sickness or cybersickness, includes symptoms such as eye fatigue, disorientation and nausea, which may occur while using VR, potentially disrupting users' experiences (Chang et al., 2020). Cybersickness can be caused by aspects of hardware and VR content, such as display type and mode, latency between user's movements and motion in the VE, graphic realism and control over navigation, as well as human factors, such as prior experience with VR and being prone to motion sickness (Chang et al., 2020).

2.3.3 Teacher Perspectives on Virtual Reality

Studies beyond the sector of language instruction suggest that, compared to students, educators are often more hesitant to adopt VR (Zhang, 2021), and this might apply to the language teaching field as well (Fransson et al., 2020). However, accounts from previous research on teacher beliefs and perceptions of VR for teaching languages reported some positive attitudes. For instance, Peixoto et al., (2019) indicated that teachers believe VR can help motivate students and enhance the development of their listening skills. In the context of Maltese L2, Żammit (2023) reported positive teacher perceptions of VR in terms of its efficacy as an educational tool and its capacity to enhance language learning, stressing the significance of incorporating VR technology into teaching methodologies to offer more captivating and immersive learning experiences.

Surveys have been conducted to investigate school teacher attitudes towards VR for educational purposes. Cooper et al. (2019) reported that

pre-service teachers' were overall more aware of the VR affordances of immersion and engagement, and less aware of its potential to support collaborative learning. In their perception, VR as a teaching and learning tool, allows for (a) connecting with students and people outside and inside the school, (b) virtually travelling to new countries, (c) exploring inaccessible locations, and (d) simulating experiences. Their concerns were mostly on (a) low self-efficacy to use VR in their teaching, (b) safety and monitoring-related issues, (c) financial costs, (d) integrating VR safely and effectively (Cooper et al., 2019). Moreover, there was a significant difference in pre-service teachers' levels of self-efficacy to teach using VR when compared to using other digital technologies (Cooper et al., 2019). Khukalenko (2022) instead conducted a large-scale survey on subject teachers' attitudes towards VR in education. The study revealed that teachers had moderately positive perceptions of VR and, while there wasn't a significant correlation between instructional methods and the extent of VR integration, a trend emerged where less VR integration was linked with more conventional teaching methods (Khukalenko, 2022).

Some challenges of iVR implementation were identified by Cowie & Alizadeh (2022), who conducted a study on university teacher perspectives. Identified challenges were: (a) technical issues, such as the time-consuming activity of setting up and managing many devices, the need for suitable equipment to support VR use (e.g. in terms of wi-fi connection and adequate classroom space), and the need of using individual accounts for the initial set up; (b) ethical concerns, in relation to fact that data, such as login information and user biometric data, are shared with the VR provider companies; (c) health concerns, in terms of cybersickness and potential harm caused by the use of inadequate spaces; and (d) the necessity of guiding pedagogical considerations when integrating VR.

Another problematic aspect connected with iVR implementation in educational contexts is a lack of VR content, considering that developing own content can be a costly endeavour and that the content available on the market is usually developed for self-learning and might not easily be adapted to classroom situations (Jensen & Konradsen, 2018). Therefore, in order for iVR to

be a genuinely valuable pedagogical tool, teachers should be given the option to create and customise their own VR content (Jensen & Konradsen, 2018). In fact, when new technologies, such as iVR, are tested in educational settings, collaboration between EdTech businesses and teachers to jointly develop technology and tailor content to enhance teaching methods would be advantageous (Fransson et al., 2020). The key focus in curriculum design likely lies in the pedagogical elements employed to attain learning goals, and technology should serve to enrich students' learning journeys rather than solely keeping up with technological trends (Zhang, 2021). As a result, teachers should plan VR integration using what Southgate (2020) referred to as “signature pedagogies” (i.e. personal teaching approaches) to unlock VR affordances in relation to specific learning outcomes (Cowie & Alizadeh, 2022).

3 RESEARCH QUESTIONS

The aim of this research is to investigate university FL teacher perspectives on iVR for LE, in order to understand whether iVR could be implemented in FL higher education settings, and how. Insights on previous experiences and attitudes towards VEs and current understanding of four selected iVR applications as educational tools are gathered. The focus is on iVR implementation-related aspects, perception of tested apps as a support to current challenges faced in FL university classrooms, and support needed to effectively implement iVR.

A workshop on iVR for LE provides the opportunity for hands-on iVR testing and group discussions on the potential assets and liabilities of this technology. The following research questions will be addressed:

1. How do university foreign language teachers perceive:
 - (a) virtual reality environments before the workshop as a tool for teaching languages?
 - (b) tested immersive virtual reality apps as a tool for teaching languages?
2. How do university foreign language teachers perceive immersive virtual reality as a support with current perceived challenges in university foreign language classrooms?
3. How do university foreign language teachers perceive the support needed for implementing immersive virtual reality in their teaching?

4 RESEARCH METHODS

4.1 A Design-Based Research Design

This study followed a design-based research (DBR) approach, which is defined as “a type of participatory research in which researchers and practitioners collaborate towards a common goal, namely creating new understanding of an educational intervention or issue through the progressive refinement or improvement of a design” (Rodríguez, 2017, p. 364). It has a dual purpose of designing a learning environment while developing the theory that informs it, or, in other words, “generating new theoretical understanding” (Rodríguez, 2017, p. 365). In this regard, DBR can be described as applied research, since it aims to offer theoretical understanding and practical solutions (McKenney & Reeves, 2014). The type of knowledge that can be generated by DBR are categorised, according to McKenney and Reeves (2014), into declarative (describing products or ideas), procedural (involving the development of practices) or observable (concerning empirical evidence). One of the strengths of this methodology is that it can “support the development of research processes with strong practical adaptability”, since it allows, through its iterative nature, for improving products and processes, as well as experimenting with new resources and innovative educational methods (Tinoca et al., 2022, p. 1).

To further describe this approach, it is important to mention that two of its most distinctive features are iteration, which qualifies the research process as cyclical, and interventionism, in the sense that it is implemented in naturalistic settings, since it is “concerned with the local impact of interventions and is expected to inform local practices” (Rodríguez, 2017, p. 368). Additionally, DBR is characterised by the use of mixed methods, based on the belief that solving educational problems requires the inclusion of a multiplicity of perspectives (Rodríguez, 2017). Finally, DBR as a research approach is collaborative, because it relies on the collaboration between researchers and implementers, as fulfilling

“complementary roles” in the pursuit of a common goal (Rodríguez, 2017, p. 369).

This study employs a DBR approach in the sense that it aims at providing a first step to understand FL teachers’ perspectives and ideas for building towards the development of a protocol to effectively incorporate iVEs in FL educational settings at the university level. It aims to do so by: (a) collecting FL university teachers' perspectives of tested VR apps, in relation to identified affordances, assets and liabilities, (b) eliciting implementation ideas to possibly meet identified current teacher and student needs in the foreign language classroom, and (c) defining the types of support teachers would need to be able to implement iVR. However, for the purposes of this thesis project it is not deemed possible to implement several iterative cycles of the DBR process, but the outcomes of this study will be regarded as potential design principles for the DBR iteration. The main data collection event, around which this study was designed, is a workshop on virtual reality for language education. In this workshop, university FL teachers tested four virtual reality apps, either developed for language learning purposes, or that can be used as a tool for teaching languages.

4.2 The Workshop As A Research Context

The workshop as a research context has a dual nature, since it aims to provide participants with an authentic educational experience based on their interests, and at the same time it is designed from a research perspective with the purpose to “produce reliable and valid data about the domain in question” (Ørngreen and Levinsen, 2017, p. 72). The workshop was chosen as a research context due to its potential as a hands-on environment for exploration of technological innovations (Ørngreen and Levinsen, 2017). Additionally, its above-mentioned dual purpose allows for iteration in a way that resembles the iterative process of design-based research (Ørngreen and Levinsen, 2017). In this sense, it can be seen as a first step in a DBR project, involving recursiveness

and iteration, whose ultimate goal would be to develop innovation by building a bridge between theory and practice.

Due to its short-term nature, the workshop as a research context does not allow for prolonged investment. However, Ahmed and Asraf (2018, p. 1507) argued that the intense form of “workshop engagement”, occurring both among participants and between the participants and the facilitator, is comparable to prolonged engagement because “it allows researchers to obtain thick and rich data in the course of the interaction”. In this sense, the workshop emerges as a promising venue for data collection, in spite of its brief duration.

4.3 Research Participants And Research Context

The participants in this study were recruited among foreign language teachers currently employed at the language centre of the University of Jyväskylä, ultimately based on their availability and interest in participating in the study. No criteria were used to identify potential participants other than their current state of FL teachers at the university and the language(s) they teach. Target language constraints were a result of limitations in the number of languages supported by the apps that had been selected for testing during the workshop. Language centre teachers were identified as a suitable group to include a higher number of potential participants, as well as a larger variety of target languages.

The choice of using a convenience sampling method (Tracy, 2013) was made mainly as a result of the limited resources available for carrying out the study. Even though it is not possible to determine how accurately the sample represents the population of FL university teachers, it was concluded that the participants’ personal contributions, as members of the university FL teaching community, would be valuable and relevant to meet the purposes of the study and answer the research questions.

The recruitment process took place in different steps. First contact with the language centre teachers was established through a brief email, outlining the main information about the workshop and the use of collected data for a master’s thesis research project. A poll was shared via email to gather

participants' availability, and a consent form, research notification and privacy notice, with all relevant information about the research project, were included as attachments.

The final number of participants was eight. At the time of the data collection, each of the participants was currently teaching either English, English and a language other than English (LOTE), or a LOTE. In relation to the tested apps, each participant tested three of them, based on the target languages available in each app at the time of the workshop. Further details on the characteristics of the participant group are shown in Table 1.

Table 1

Characteristics of the participant group

Characteristic	No. of participants
Age	
20 - 30 years	1
30 - 40 years	4
40 - 50 years	1
50 - 60 years	2
Gender	
Female	6
Male	2
Experience as a university FL teacher	
Up to 1 year	1
Up to 5 years	1
Between 5 and 10 years	5
More than 25 years	1
Languages taught	
English	3
LOTE	2
English and LOTE	3

Use of technologies for teaching

Sometimes	1
Often	5
Always	2

The workshop was organised at the University of Jyväskylä, using the Oculus Quest 2 headsets available. Since only five devices were available to be used simultaneously, the participants were divided into two four-people groups, and two separate dates were arranged for the workshop, on the 5th and 7th of June, 2023. While I acted as a workshop facilitator, I was supported by a member of the university staff, acting as a tech assistant in the workshops. Participants were assigned to each group based on their availability.

Due to the low number of teachers teaching a LOTE, such target languages will be withheld for confidentiality reasons. A pseudonym, and, more specifically, an identification code (the letter “P” for “participant”, followed by a randomly chosen number between 1 and 8), was assigned to each participant in order to protect their identity when analysing data and reporting findings.

4.4 VR Applications

The VR apps used in this study were chosen based on a first set of practical criteria, based on the fact that they needed to be supported by the VR equipment available at the university, and they needed to be accessible through demo, or be purchased by the university. In addition to this, the aspect of the target languages available in each app was taken into account to allow teachers of different languages, including LOTEs, to participate.

Another important aspect concerned the type of iVE, whether specifically developed for language learning or that could be used for that purpose – as it was the case with Wonda VR, which allows for different uses outside of language learning. In the case of apps specifically developed for language learning, an additional aspect was the learning focus – whether on

interaction and speaking skills, vocabulary, oral presentation skills, etc. The idea was to include apps as varied as possible in terms of features and VEs, and to offer teachers an overview of the kind of apps currently available on the market.

Finally, two other factors that were taken into account were the presence of elements that could be appealing from a teacher perspective (eg. teacher dashboard) and the advertised suitability of the apps for learners with different proficiency levels, including more advanced learners, to meet the needs of university students.

As previously mentioned, each participant tested three apps. More specifically, two of the apps (ImmerseMe and Wonda VR) were tested by all participants. Due to the fact that VirtualSpeech was available only in English, only English teachers tested this app. Similarly, only LOTE teachers tested Noun Town, due to the fact that the app was not available in English when the workshop took place. In the case of participants who were teaching both English and a LOTE, the third tested app was chosen based on the language they mainly teach. In the end, half of the participants tested VirtualSpeech as their third app, while the other half tested Noun Town.

ImmerseMe can be accessed on mobile, tablet, desktop, and VR headsets. It offers simulations of everyday conversations in culturally authentic locations, created using 360° photographic images. It includes more than 250 lessons on various topics, with conversation scripts and real life scenarios. It offers three proficiency levels (beginner, intermediate, and advanced) and up to five different learning modes (pronunciation, typing, spelling, translation and immersion). The app also provides feedback on pronunciation, a delay mode, and, especially relevant to teachers, a teacher dashboard, which allows to monitor progress and assign personalised tasks. More in detail, student progress on the platform can be monitored by generating a report that provides information such as student score, student active time on the app, whether the lesson was completed, the number of total responses given, the level of accuracy in the responses, and the date when the lesson was completed. Additionally, personalised tasks can be assigned to individual students. This allows for differentiation by specifying, for example, whether a student needs to

complete a conversation a single time, or rather go through all possible pathways within a lesson. It is also possible to select among the different modes available (pronunciation, typing, spelling, translation or immersion), with the possibility of setting a target for the number of points a student is required to earn, as well as an estimated time for completion. Previous studies using this app have shown that it can help students develop their communicative skills (Bendeck Soto et al., 2020) and willingness to communicate (Papin, 2022).

Wonda VR is a VR learning and collaboration platform, accessible on mobile, tablet, desktop, and VR headsets. It offers different environments, namely an institutional hub, private spaces, and private or public 3D / 360° experiences, and allows for editing, sharing and accessing immersive learning experiences based on 2D, 3D and 360° media. Users can upload their own 360° pictures and videos to explore a real world setting of their choice, or use templates. Each experience can be customised by adding pictures, videos, icons, hotspots, content cards, quizzes and score cards to monitor progress. The workshop environment available in the app can be used to host online meetings and workshops in VR, where participants can share their screen, draw free-hand and add videos, pictures, slides, and quizzes. Thanks to the possibility of saving visitor progression, gamified experiences can be created through personalised quizzes. Users can also create their own avatar and access multiplayer sessions. This app was used in a study by Räsänen and Lampela (2023), as a way to add presence to a distance educational collaboration between Finnish L1 students at a Finnish high-school and university Finnish FL students in the United States.

Noun Town is a language learning immersive VR game, accessible on desktop and VR headsets. It employs a fully gamified approach: players are on a grayscale island which gradually gains colour as tasks are completed. It focuses on vocabulary and conversation (i.e. simple phrases and sentences). The environment is fully interactive, so that users can pick up virtual objects and verbally interact with chatbots. It provides feedback on pronunciation. The game itself is singleplayer. However, it has a Discord server where players can chat about the game.

VirtualSpeech is a collection of self-paced online courses, including exercises, developed for learning soft skills in English, mainly for business and education. It focuses on oral presentation skills, communication in general, and public speaking. It comprises courses, exercises and videos, with 13 courses and 25 exercises being available for VR headsets. The exercises are based on simulations of different scenarios, such as lectures, classes, job interviews, presentations, etc. Users can upload their own slides and interact with chatbots, host private meetings or join available workshops. It provides feedback on performance, in regards to speech analysis (volume, speed, filler words, eye contact). A recording function to listen to one's own recorded speech and a dashboard to check one's progress are also available. A previous study reported positive perception of this app as a tool for developing oral presentation skills and fostering learner confidence (Alsaffar, 2021).

4.5 Data Collection

4.5.1 Means Of Data Collection

The means of data collection were chosen taking into account the Goal-Method framework for design science research (DSR) workshops. This framework was developed by Thoring et al. (2020) with the purpose of offering guidelines to researchers seeking to design or evaluate either artifacts or business innovations through workshops. Table 2 (based on Thoring et al., 2020, p. 5040) describes suitable assessment approaches for different research objectives. This framework was chosen based on the fact that the present workshop dealt with testing and evaluating technological tools.

Table 2

Selected data collection methods based on the suitability levels indicated by the Goal-Method framework for design science research workshops (Thoring et al., 2020).

Goals	Methods				
	Video recording	Audio recording	Survey & questionnaire	Group discussion	Artifact analysis

People's Behaviour (during the workshop)	**			*	
People's Dialogues (during the workshop)	**	**		*	
People's Interactions (during the workshop)	**			*	
People's Perception and feelings			**	**	
People's Opinions and Ideas	*	*	**	**	*

Note. **good suitability, *medium suitability.

The aim of the study was to examine participants' perceptions, opinions and ideas in relation to tested apps, and possibly look at participants' behaviour and interactions. Therefore, individual questionnaires and video data of both app testing and group discussion were chosen as data collection methods due to their good degree of suitability for the research goals, based on the framework by Thoring et al. (2020). The main advantage of group discussions, compared to one-on-one interviews, is that they allow "more complex level of discussions" and immediate discussion of different opinions (Thoring et al., 2020, p. 5041). To minimise the possible disadvantage of participants being influenced by other participants during the discussion, or not feeling comfortable taking a stance in front of other participants, individual questionnaires were also administered. This ensured that each participant had the opportunity to express their personal opinion in relation to each app before the group discussion, and in relation to both attitudes towards implementing tested apps and support needed for iVR implementation after the group discussion.

4.5.2 Process Of Data Collection

Two weeks before the workshops, participants were asked to fill in a pre-workshop questionnaire (see Appendix 1), comprising two sections. The first section was about their previous experience with VR and other

technologies for teaching, as well as their attitudes towards VR for teaching languages (five open-ended questions, and two 5-point Likert-scale questions). The second section was about current needs in teaching languages at university level (two open-ended questions), focusing respectively on teacher and student challenges. The main purpose of this questionnaire was to gather information about each participant's: (a) conceptualisation of virtual reality prior to the workshop; (b) background in terms of previous use of virtual reality applications and devices, as well as their expectations and concerns about VR and their willingness to use VR for teaching languages; (c) reported use and perception of technologies for teaching; and (d) current teacher and student challenges in the language classroom. The question about previous experience with VR was formulated in such a way that it did not only include HMD iVR, but also avatar-based video games and virtual worlds, for the purpose of investigating participants' previous experiences with different kinds of VEs.

The workshops took place in a room at the university premises provided with fixed cameras and different types of audio recording devices, which were used to record both workshops. Both workshops were structured as follows:

1. Introduction (15 min).
2. VR testing and individual app evaluation (80 min).
3. Break (15 min).
4. Group discussion (1 hour).

Upon arrival, each participant signed a paper copy of their consent form. During the introductory phase, I introduced myself and my research project, had a short ice breaker activity, explained the workshop timetable, and gave a brief overview of each VR app that was going to be tested. After that, the testing phase started, taking place simultaneously for all participants. After testing each app, participants filled in a post-testing questionnaire (see Appendix 2).

The post-testing questionnaire was adapted from the UX in iVR (User Experience in Immersive VR) questionnaire developed by Tcha-Tokey et al. (2016), and included ten 5-point Likert scale questions. The aim of these questions was to investigate participants' experience with each tested app, in relation to eight categories. These categories are: (1) engagement, (2) presence,

(3) immersion, (4) usability, (5) emotion, (6) skill, (7) experience consequence, and (8) judgement. Each subscale definition, as shown in Table 3, was provided by Tcha-Tokey et al. (2016) on the basis of previous research on iVR. The questionnaire also included two open-ended questions to collect pros and cons of each app as identified by the participants.

Table 3

Definition of each subscale included in the post-testing questionnaire, investigating users' experiences in the immersive virtual environment

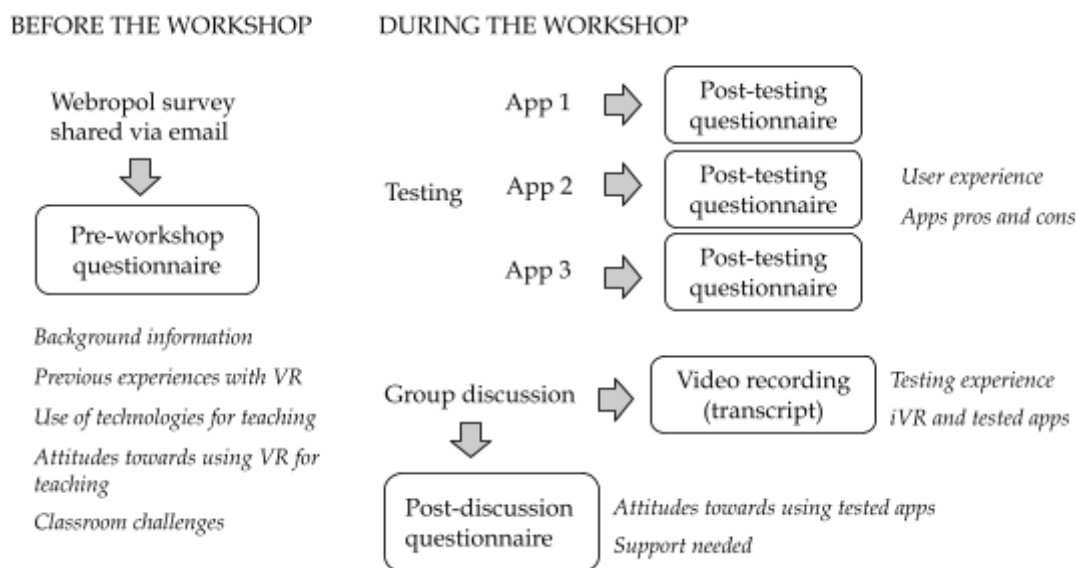
Questionnaire item	Subscale	Definition
1. I was involved in the virtual environment experience.	Engagement	"the energy in action", the connection between a user and their activity in the VE, in terms of behaviour, emotion and cognition (p. 36)
2. My interactions with the virtual environment seemed natural.	Presence	the user's "sense of being there", within the VE (p. 36)
3. I became so involved in the virtual environment that I was not aware of things happening around me.	Immersion	illusion that user's sensory stimuli are replaced with virtual sensory stimuli
4. I thought there was too much inconsistency in the virtual environment.	Usability	user's ease of learning and ease of using the VE
5. I enjoyed being in the virtual environment.	Emotion	user's feelings in the VE (e.g. enjoyment, anxiety...)
6. I felt nervous in the virtual environment.		
7. I felt confident using the gamepad to move around the virtual environment.	Skill	"knowledge the user gains in mastering their activity in the VE", user's attitude towards, and degree of comfort within, the VE (p. 36)

8. I suffered from fatigue or dizziness during my interaction with the virtual environment.	Experience consequence	physiological reactions the user can experience in the VE (e.g. fatigue, dizziness, headache, cybersickness)
9. I found that the virtual environment was confusing.	Judgement	user's overall judgement of the experience in the VE
10. I found that the virtual environment was motivating.		

Note. Based on Tcha-Tokey et al. (2016), p. 36.

Between the end of the testing phase and the beginning of the group discussion, participants had a break. The group discussion followed a semi-structured interview protocol, in the sense that it revolved around a set of semi-structured questions in which participants were encouraged to freely discuss any thoughts they had about the testing experience and VR apps. The questions, which were asked and shown on the PowerPoint presentation used in the workshop (see Appendix 3), aimed at gathering participants' opinions on different topics related to tested apps and the testing experience. More in detail, they focused on: (a) tested apps' strengths and weaknesses, as well as improvement suggestions; (b) benefits and challenges of using iVR for language teaching and learning; (c) aspects of language teaching / learning best supported by the use of iVR; (d) perception of iVR affordances in relation to current challenges in the language classroom; (e) implementation ideas, and (f) types of support perceived as essential for teachers to be able to implement iVR in their teaching.

At the end of the group discussion, the participants filled in a post-discussion questionnaire (see Appendix 4). This questionnaire consisted of two open-ended questions about participant attitude towards implementing the tested apps, and one open-ended question about the kind of support participants would personally need to be able to implement iVR in their own teaching. To sum up, Figure 1 in the next page illustrates the data collection process, by showing when and how data was collected before and during the workshops.

Figure 1*Data collection process***4.6 Data Analysis**

With the aim of exploring participants' perspectives of a technological tool, in terms of experiences, attitudes, understanding and evaluation, this study gathered and analysed essentially qualitative data. More specifically, the transcriptions of video observed group discussions from the two workshops and open-ended responses in individual questionnaires were analysed thematically, while likert-scale responses in individual questionnaires were analysed using descriptive statistics. Observation notes taken after each workshop and while watching the video recordings were not included in the analysis per se. However, they were used to contextualise participant discussions and gather additional information about the workshop proceedings whenever possible.

Responses of the individual pre-workshop questionnaire were analysed to understand how university FL teachers perceive VR prior to the workshop (RQ1a), while group discussions and individual open-ended responses gathered during the workshop were analysed to examine how participants perceived tested apps and iVR affordances (RQ1b). To understand whether iVR can help teachers with current challenges in the university FL classroom (RQ2),

perceived challenges of university teachers and students (from a teacher perspective) were first identified in individual pre-workshop questionnaires. Then group discussions and individual open-ended responses were analysed to discover whether iVR could help teachers face those challenges, based on participants' perspectives. Finally, to understand what kind of support university FL teachers would need to implement iVR in their teaching (RQ3), group discussions and individual post-discussion questionnaire responses were analysed.

Table 4 illustrates how different data sources were used to answer each research question, and summarises how they were analysed. The more detailed analysis protocol is explained in the following sections about thematic analysis and descriptive statistics.

Table 4

Summary of data sources and methods of analysis of each research question.

Research questions	Data sources	Data analysis
1. How do university foreign language (FL) teachers perceive:	(a) Individual pre-workshop questionnaire (open-ended and likert-scale questions)	Thematic analysis of:
(a) Virtual Reality (VR) environments before the workshop?	(b) Workshop data: video data of VR testing, video data and transcripts of group discussions, individual post-testing questionnaire (likert-scale and open-ended questions)	(1) open-ended questions in pre-workshop, post-testing, and post-discussion questionnaires (2) video data and transcripts of group discussions, artifacts
(b) tested VR apps as a tool for teaching languages during and after testing them?	(b) Individual post-discussion questionnaire (open-ended questions)	Descriptive statistics of likert-scale questions
2. How do university FL teachers perceive VR as a support with perceived current challenges in university foreign language classrooms?	Individual pre-workshop questionnaire (open-ended questions)	Thematic analysis
	Workshop data: video data and transcripts of group discussions, artifacts	
	Individual post-discussion questionnaire (open-ended	

	questions)	
3. How do university FL teachers perceive the support needed for VR implementation in their teaching?	Workshop data: video data, group discussion transcripts, artefacts, individual post-discussion questionnaire (open-ended questions)	Thematic analysis

4.6.1 Thematic Analysis

In general, thematic analysis is one of the most frequently used methods of analysis of qualitative data, due to its flexibility and approachability. It was defined by Maguire and Delahunt (2017, p. 3352) as “the process of identifying patterns or themes within qualitative data”. Braun and Clark (2006, p. 5) described it as a “flexible and useful research tool, which can potentially provide a rich and detailed, yet complex account of data”. I opted for this method of analysis due to its features of approachability and flexibility, and because I recognised the identification of emerging themes in the type of data I collected as an effective way to address my research questions, seeking to provide a detailed description of teacher perspectives of iVR for teaching languages.

Since the topic of this study is still under-investigated to some extent, due to its novelty, the aim was to offer a rich account of the data set rather than provide a detailed description of one particular aspect. Therefore, multiple aspects were included in the final account of findings. Moreover, the analysis focused on semantic themes, and comprised a description phase, entailing the identification of patterns of semantic content, and an interpretation phase, through which I tried to reflect broader meanings and implications, as indicated by Braun and Clark (2006).

The data analysis process included the following steps: (1) Transcription of the video recordings; (2) Familiarisation with the data; (3) Initial coding; (4) Exploration and development of themes; (5) Evaluation of the themes and subthemes; (6) Refinement of the themes and subthemes. Overall, the utilised approach was cyclical and iterative, as described by Braun and Clarke (2006), in

the sense that it involved returning to the data and refining codes, themes and subthemes through repeated cycles of analysis.

Transcripts were originally generated using an AI tool (Whisper.AI), and subsequently reviewed manually for accuracy. The process of transcription was recognised as interpretive rather than transparent, as advised by Davidson (2009). The choice of producing cleaned-up/intelligent transcriptions reflected the intent of prioritising readability, due to an identified focus on conveying meanings. Coding was inductive, or data-driven, in the sense that codes and subsequent themes were derived from the data. Passages identified as significant to answer the research questions were first highlighted for further investigation. Then codes were assigned tapping into coding strategies referred to as “elemental methods” by Saldaña (2016), such as in-vivo and descriptive coding, to represent as vividly and closely as possible the participants’ perspectives. The generated codes were then explored and analysed to identify categories and, based on those, develop themes and subthemes. Tables and maps were used to visually organise and represent codes, themes and subthemes, and explore relationships among them. Theme prevalence was established based on the concept of keyness, by answering the questions: (a) does this theme appear often / is it mentioned by all participants?; and/or (b) does it capture an important element to answer the research questions? (Braun & Clarke, 2006, p. 82). Some questions were asked more than once across different data sources, and this led to repeated occurrences of the same code, which were not treated as separate occurrences when establishing code frequency, but were rather used as a means of data triangulation.

To answer the first research question, participants’ attitudes on VR before the workshop were categorised as (1) advantages, (2) disadvantages, and (3) lack of awareness; in regard to participants’ perspectives on iVR and tested apps during the workshop, they were conceptualised around the themes of (1) affordances and benefits, (2) app limitations and challenges to implementation, (3) app implementation, and (4) suggestions for improvement.

To answer the second research question, the process was twofold. The first step entailed the identification of current teacher and student language

learning/education challenges, as reported by the participants, and their categorisation as relevant or non relevant to the research question. As an example, teacher challenges mentioned by the participants included uncertain working conditions and finding work/life balance. However, these challenges weren't included among the ones observed in this study because they do not pertain to classroom activities, and couldn't, therefore, be affected by the use of any specific technology for learning. Subsequently, relevant challenges were categorised as pertaining to (1) affective dimension, (2) productive skills, (3) engagement, (4) learning environments, and (5) differentiation. The second step required searching for subthemes of iVR affordances to find evidence in participants' accounts that could indicate that iVR might offer support with the identified current challenges.

Finally, to answer the third research question, the themes of (1) internal resources and (2) external resources were used. Table 5 on the next page comprehensively illustrates the themes and subthemes developed in this study.

Table 5

Themes and subthemes

Theme	Subtheme
Perspectives before the workshop	
1. Advantages	1.1 Unlimited possibilities & support to learning 1.2 Enjoyment 1.3 Motivation
2. Disadvantages	2.1 Time & effort 2.2 Costs 2.3 Physiological reactions 2.4 Ethical concerns
3. Lack of awareness	
Perspectives during the workshop	
1. Affordances and benefits	1.1 Safe space 1.2 Engagement and enjoyment 1.2 Online meeting place 1.3 Multimodality 1.4 Hands-on learning 1.5 Gamification

	1.6 Unlimited possibilities 1.7 Novelty
2. App limitations and challenges to implementation	2.1 Lack of flexibility of speech recognition vs. lack of feedback 2.2 Lack of suitability for target learners 2.3 Lack of collaborative spaces 2.4 Lack of familiarity / self-efficacy from teachers and students 2.5 Technical issues 2.6 Costs and availability of devices and licences 2.7 Physiological reactions
3. Implementation	3.1 Vocabulary 3.2 Communication skills 3.5 Multilingual learning 3.6 Self-assessment 3.7 Creativity
4. Improvement	4.1 Non-verbal communication 4.2 Authenticity 4.3 Storyline 4.4 Meaningful interaction

Classroom challenges

1. Affective dimension	1.1 Communication anxiety 1.2 Lack of confidence
2. Productive skills	2.1 Spoken production / interaction skills 2.2 Turn-taking practices 2.3 Pronunciation 2.4 Written production 2.5 Formal and informal writing styles 2.6 Character learning
3. Engagement	3.1 Students not finding time for their studies 3.2 Student motivation 3.3 Students distracted by phones
4. Learning environments	4.1 Finding interactive no-pressure learning situations 4.2 Providing authentic communication situations 4.3 Learning/teaching communication skills in online classes

Types of support

1. External support	1.1 Information, training and assistance 1.2 Equipment and materials 1.3 Monetary compensation
2. Internal support	2.1 Time 2.2 Practice

4.6.2 Descriptive Statistics

The 5-point Likert-scale questionnaires provided data about participants' attitudes towards using VR for language teaching and their experience with and evaluation of tested apps during the workshop. The categorical data was converted into numerical values, becoming interval data to be analysed using descriptive statistics (Sullivan & Artino, 2013). More specifically, participants expressed: (a) degrees of likelihood to use VR for teaching languages in the pre-workshop questionnaire (Very unlikely=1, Unlikely=2, Neutral=3, Likely=4 and Very likely=5), and (b) degrees of agreement with each item measuring an aspect of the testing experience in the post-testing questionnaires (Strongly disagree=1, Disagree=2, Neither agree nor disagree=3, Agree=4 and Strongly agree=5).

Since data was collected from a very small sample (eight or four participants, depending on the app), data was analysed solely using descriptive statistics. The scale was described using frequencies, percentages, means and standard deviations. The mean of participant responses for each item in relation to each of the tested apps and the variability in participant responses to each item were examined.

4.7 Ethical Solutions

In regard to ethical solutions implemented in this study, a series of measures was enforced prior and during data collection, in compliance with the EU's General Data Protection Regulations (GDPR). First of all, privacy and research notices were sent via email to the participant prior to the workshop, informing them about their personal rights, the purpose of the study, and the treatment of collected data (information on data collection, use, storage, protection and accessibility). Additionally, consent forms for data collection and use were signed in person by each participant right before the workshop, and all agreement papers were stored securely.

Moreover, data was processed, stored and analysed securely. Most of the questionnaire responses were collected via Webropol, while the post-testing

questionnaires, which were collected in paper form, were digitised and then securely disposed of. The video data were recorded using university cameras and the recordings were privately uploaded on the secure university cloud. All software used to generate transcripts and analyse data were run locally so that no data would be uploaded and exposed to security threats. When analysing text data and reporting findings, anonymisation practices were enforced, and all details that could lead to identification were removed (e.g. connection between participants and the language they teach, when language other than English, LOTE).

Additionally, my behaviour during the workshop was informed by the idea of finding balance between the clinician and ethnographic approaches mentioned by Ørngreen and Levinsen (2017). In other words, I tried to achieve my research goals while being respectful of the participants' boundaries at all times, and I tried to make their workshop experience as helpful as possible in relation to the participants' aim of learning about iVR for LE. Additionally, I showed interest in the participants, maintaining a non-judgmental and respectful attitude towards them and their opinions. I was welcoming during our interactions and highly appreciated their involvement (Lewis & Graham, 2007). Finally, I made it clear that they could withdraw from the study at any time, with no consequences (Lewis & Graham, 2007).

4.7.1 Researcher Positionality

As emphasised by Holmes (2020), researcher reflexivity and positionality are a crucial part of conducting ethical research. Since I believe my background has contributed to shaping my perspective in this study, it is important to share some information about myself. I received a masters' degree in Foreign languages, and I have gained language teaching experience in a variety of contexts. For example, I worked as an Italian language assistant and teacher in comprehensive schools and childcare centres in Sydney, Australia. In Rome, Italy, I taught Italian to adult migrants for approximately one year, and I worked as an English-as-a-foreign-language (EFL) highschool teacher for three years. However, it wasn't until I began my higher education studies at the

University of Jyväskylä that I started familiarising myself with virtual reality for education. I first developed my knowledge from a theoretical perspective by reading academic articles on the subject, and then I gained some hands-on understanding by testing iVR devices and applications myself, using the equipment available at the university. I did not have any previous experience with virtual reality, whether lowly or highly immersive, nor did I have gaming experience. Therefore, even though I have a relatively-solid background as a language learner and teacher, I would describe myself as a novice user when it comes to VR. My purpose for conducting this study is grounded in my personal interest, as a language teacher, in exploring the possibilities of VR technologies, and it was guided by the idea of enriching the global discussion by including more teachers' voices.

Due to my education and work background, and the fact I familiarised myself with the same apps tested by the participants just a few months before the workshop took place, I felt close to the participants' experiences. This was the case, even though I have no teaching experience in the context of higher education, and I was an outsider to this specific group. My expertise in language education and my knowledge of VR specifically played an important role in informing my study design, the data collection process and my interpretation of the data.

In relation to the context of the workshop, where most of the data collection took place, my role as a facilitator entailed assisting participants and moderating group discussions. This resulted in a direct involvement in interactions, which most certainly influenced the data collection process. Additionally, my active participation in the workshop prevented me from acting as an observer. However, the possibility of video recording the workshops allowed me to observe most of the activities from an external perspective at a later time. Lastly, I believe that, experiencing iVR implementation first-hand, as a workshop organiser and facilitator, helped me gain a deeper understanding of the phenomenon itself.

5 RESULTS

In this section the results of this study will be presented in relation to:

- (1) participants' attitudes towards VR prior to the workshop;
- (2) participants' perception of tested apps, in general and as a support with perceived challenges in university foreign language classrooms;
- (3) participants' perceived support needed to implement immersive virtual reality in their own teaching.

5.1 Previous Experience And Attitudes Towards Virtual Reality For Teaching Languages Before The Workshop

In terms of the participants' previous experience with VR, four out of eight participants reported limited or no prior experience with iVR (see Table 6). More in detail, the two participants who reported limited experience, briefly tried an iVR game or app. However, one of these two participants shared during the workshop that they have extensive experience with video games ("I was basically born with a gaming controller in my hand"). Two participants reported prior experience with low-immersion virtual worlds and games, in their free time and/or in educational and professional settings. Two participants reported familiarity with iVR games, acquired in their free time.

Table 6

Participants' previous experience with virtual reality

	Number of respondents	% of respondents
Experience with iVR games	2	25%
Limited experience with iVR	2	25%
Experience with low-immersion VR	2	25%
No previous experience	2	25%

Participants were asked how they would describe their previous experiences. Half of the participants described them in positive terms, one expressed mixed feelings (VR is “fun”, but entails “too much work” and is “too susceptible to technology problems to use regularly”), and one reported some disappointment (VR was “more interesting in theory than in practice”). Two, having reported no prior experience with VR whatsoever, did not answer this question.

Table 7

Participants' willingness to use virtual reality for teaching languages prior to the workshop

	Number of respondents	% of respondents
Very likely	3	37.5%
Likely	1	12.5%
Neutral	2	25%
Unlikely	2	25%
Very unlikely	-	-

As shown in Table 7, participants responded to the question “Based on what you already know about VR, would you like to use it for teaching languages?” by rating their willingness on a scale from 1-Very unlikely to 5-Very likely. Their stances in relation to the idea of using VR in their teaching provided further insights on their attitudes towards it. By looking at their willingness to use VR for teaching languages, it was in fact possible to shed more light on the reasoning behind participants' stances and gather insights on their attitudes towards VR even when there was no previous experience to support it. For instance, two participants responded with neutrality. However, based on their accounts of expectations and concerns about using VR, one neutral stance might be interpreted as a middle ground position, while the other reportedly expressed a lack of awareness in relation to possible applications of VR in the specific area of LE. Three participants, who had limited or no previous

experience with VR, showed a positive or very positive attitude towards the prospect of implementing it for teaching languages.

In the case of other participants, their willingness to use VR for teaching languages was aligned with a perception of VR as either mostly associated with struggles and challenges, with no actual benefits resulting from its potential implementation, or with enthusiasm, built on positive previous experiences.

5.2 Perceptions Of Tested Applications As A Tool For Language Teaching And Learning

5.2.1 Individual User Experiences And Willingness To Implement Tested Apps

Individual responses to the likert-scale items in the post-testing questionnaire described how participants perceived each tested iVE (namely ImmerseMe, Noun Town, VirtualSpeech, and Wonda VR) in relation to different subscales. In regard to the subscales of engagement, presence and immersion, participants displayed overall a good level of engagement with the iVEs, while scores for presence and immersion showed a higher degree of variation across participants and apps.

In relation to the subscale of emotion, half of the participants reported an enjoyable experience within all iVEs, while two participants did not enjoy using any of the apps. In terms of negative emotions, three participants reported feeling nervous in the iVEs. However, one participant specified that feeling nervous in the iVE was a positive aspect of the experience, since they reportedly “would have been nervous in real life too” in that kind of scenario (a simulation of a lesson with a virtual audience). This suggests that VirtualSpeech might be immersive enough to trigger an authentic emotional response.

Responses for the subscale skill showed that participants who were familiar with gaming and/or iVR felt confident when using all tested apps, as opposed to participants with no previous experience with iVR and games, whose degree of perceived confidence varied across apps.

By looking at responses for the subscale experience consequence it can be noted that the iVE that caused more cybersickness was the virtual tour of a customisable 360-degree video environment. This was probably due to the fact participants had no control over their movements in the iVE for the duration of the tour (Chang et al., 2020).

Lastly, participants evaluated tested iVEs as mostly not confusing. However, in relation to the quality of being motivating, while two participants, who had previous experience with gaming and iVR, perceived all the environments as such, some participants only found certain environments to be motivating – namely either ImmerseMe, or Wonda VR and VirtualSpeech, while others responded to this item with a neutral or negative stance, depending on the app.

Participants' experience with Noun Town was the most controversial as it differed radically across participants. Three out of the four participants who tested it had a negative experience in terms of emotions and skill. The iVE was also perceived by these participants as not immersive, not conducive to a sense of presence, confusing and not motivating. On the other hand, one participant found it extremely engaging, immersive also in terms of presence, enjoyable and motivating, reporting a high degree of confidence while navigating the app. Perceived app usability was low on average. The difference between the three participants who had an overall negative experience and the one participant who had a positive experience was that the first had limited or no experience with iVR, while the second had experience with iVR games.

After the workshop seven out of eight participants expressed a positive attitude towards implementing one or more of the tested iVR apps in their own teaching (see Table 8). However, it must be noted that one of the responses categorised as positive appears to express a rather middle-ground position, due to the fact that several conditions to iVR implementation in the classroom are mentioned. Comparing these results to participant pre-workshop attitudes to VR, it can be noted that: (1) the positive attitude of participants towards VR for teaching languages before the workshop remained overall unchanged after the workshop; (2) the attitude of the participant whose neutral stance before the

workshop concealed a middle-ground position towards the use of VR remained somewhat unchanged after the workshop; 3) one of the two participants who were unlikely to use VR for teaching languages before the workshop changed their attitude, while the other did not.

Table 8

Participants' willingness to implement tested iVR apps in their own teaching

Question	Attitudes	No. of responses	Summary of responses
If given the opportunity, would you use one or more of the apps you have tried today in your classes?	No	1	<i>Probably no.</i>
	Yes	7	<p><i>Yes, I might like to use ImmerseMe.</i></p> <p><i>Especially VirtualSpeech (...) [or] Wonda VR. (...) Yes, I think I would, especially in the future, when these [iVR devices] become more common and easier to manage.</i></p> <p><i>I would assign them at home if students have the equipment. In class, only to a limited extent, and only if I have help with tech issues. (...) But only once I am more comfortable with the technology.^a</i></p> <p><i>Yes.</i></p> <p><i>Yes I think I would!</i></p> <p><i>I would happily use all of them - and I think I will, if I can without expensive licenses.</i></p> <p><i>I could very well see myself using VirtualSpeech or Wonda VR in my teaching/as homework for students.</i></p>

Notes. ^aThis was interpreted as a middle-ground response.

By observing these three participants' responses to the individual likert-scale questionnaire for the three tested apps, it can be noted how the two participants whose attitudes remained unchanged had an overall negative experience with the iVR testing. In fact, they found the VEs not very engaging, confusing and not motivating. They also experienced negative emotions and a lack of enjoyment while using the apps. Additionally, perceived usability levels of the apps were neither high nor low, and the VEs were perceived as not very immersive or conducive to a sense of presence. Finally, these participants did

not feel confident when navigating the apps. On the other hand, the participant whose attitude changed after the workshop found the apps overall quite engaging, with good usability. Moreover, this participant did not report cybersickness or any negative emotions, and, in fact, enjoyed using all the apps. Varying degrees of self-efficacy in the VEs were reported. Finally, this participant found two of the three tested apps motivating.

Based on these differences in the workshop experiences of these three participants, it can be argued that, while an overall negative iVR testing experience confirmed participants' previously negative and in-between attitudes, an overall positive iVR testing experience had a positive impact on a previously negative attitude.

5.2.2 Perceived Affordances For Language Learning

Before the workshop, positively-connotated expectations expressed by the participants regarded a potential of enjoyment and possible benefits deriving from the use of VR, such as enhancing students' motivation towards learning, and constituting an asset for a teacher's expertise. One participant shared how, with proper investments, VR would allow teachers to "demonstrate matters in ways that you cannot in real life", not being bound by the constraints of physical space. Such possibilities would include topics such as virtual travelling, the use of multimedia features to support learning, and facilitated distance communication with native speakers.

During the workshop, it emerged that one of the most valuable features of tested iVEs for language learning (LL), according to six out of eight participants, is that they provide a safe space where students can interactively practise the language without the drawbacks of real life situations. The possibility of making mistakes with no judgement would in fact make the experience stress-free, due to the fact interaction takes place with chatbots, or avatars. Two participants explicitly stated it would be the greatest benefit of iVEs, to help students gain confidence and motivate them to use the foreign language (FL) more often. Additionally, iVEs allow for endless repetition, providing the ideal environment to carry out the "muscle training" language

learning requires. The concept of iVE as a safe space is discussed in the following excerpt, which also illustrates how participants' understanding of iVR for language education (LE) was built through dialogue during the workshop.

- P1: (...) so I think that would be the biggest benefit that students could safely and in a non-pressure environment actually try out these things. And in the interactive sense altogether, that it's way easier to go to a cafe in the virtual reality than in the real world and start speaking – [FL 1], or – [FL 2] or whatever, because there's no kind of drawback. You're not going to actually get embarrassed because it's just a virtual person and not someone in the real world.
- P4: But in the real cafe, you would get the coffee.
- P1: True, true. But you would also have to pay.
- P4: Yeah, I would have to pay and I would have to speak, but I could also solve the problem of not knowing a word, or something like that, by pointing at the pastry I want.
- P1: That's true.
- P4: So still I would say that I would prefer even a simulation of a cafe.
- P1: But then this could be kind of a first step.
- P4: But of course the pressure is there whenever there's other people.
- P1: So perhaps when you practise with something like this, then the next step would be having the kind of play of going to a cafe and then you'd be more at ease.

While P1 saw the iVE as a possible first step to practise with speaking/doing a presentation in an immersive, safe space and, by doing so, build confidence in preparation to using the language in the real world, P4 expressed preference for real life situations, regardless of the inevitable pressure they entail. By supporting their view, P4 highlighted a very important perceived limitation of the tested iVEs, namely the fact they, in their current form, fail at fully incorporating body language and gestures, which are a crucial element of communication in real life interactions.

In addition to the no-pressure aspect of iVEs, other identified benefits connected with the affective dimension of learning were engagement and enjoyment. The iVR experience was in fact described by the participants as “engaging”, “engaging and fun”, and “engaging for some students”. Noun

Town in particular, being a highly gamified environment, was described by one participant as almost addictive.

The multimodal nature of the iVE is mentioned as an added value for three main reasons. First, providing multidimensional stimuli is likely to support learners with different learning styles, and one way that was explicitly mentioned was the introduction of the kinesthetic aspect. Second, providing context to learning through the recreation of real environments and real life scenarios creates the conditions for contextualised learning to occur. Third, by offering multimodal input and context, learners are provided with scaffolding to guide them in their learning.

So you could pick items and listen to how they're pronounced and then find some additional information about them, and then you have to say it aloud, and then it would get the colour if you got it right. And you could do that obviously as many times as you want, so I thought that that was a really nice way of learning new words, because you are in an environment where hopefully the things belong in that environment and context, so you see them, you hear them, you can read them, and then you practise them, so I think that was a really effective way of learning new words when you compare it to learning from a book. (P7, about Noun Town, group discussion)

The gamification aspect was also addressed. Games and gamified experiences can in fact support learners' engagement at the behavioural, cognitive and emotional level. They can motivate some students to practise the language more often, lead to language learning as a byproduct, and foster positive emotions connected to the FL: "And then because it is so gamified, then it's more motivating because you're not learning languages but you're playing, so that it's different" (P6).

The novelty this technology introduces was another positive factor: "They [iVR apps] are engaging and bring something new to teaching. So I think it would be a refreshing experience both for me and for students" (P5). However, as noticed by one of the participants, novelty does not last forever: "I think this [using iVR apps] was fun and I think that my students would find it fun also. But then in turn, there is also a time or place for everything. And if I did this every day with my students, they probably would get bored" (P1).

Based on their immersive nature, the inclusion of multimodal input and the fact they provide access to authentic scenarios where students can

interactively practise the language, iVEs were found to be supportive of a learning-by-doing approach to LE. This is identified as an added value compared to more traditional learning methods.

I'd be happy to give that up, like "practise these scenarios". Instead of looking at a book and reading texts and stuff or watching a video or something. That would be much better if they could actually practise. (P7)

One participant mentioned that, thanks to the multisensory stimuli, they experienced a sense of physical presence in the iVE: "I was surprised how natural it felt when we were in the room at the same time, and you could hear the other person talking. It's an additional meeting place, sort of, and it doesn't feel too forced or weird"(P5). On these grounds, it was also hypothesised that holding an online meeting in iVR rather than a video-conferencing platform would lead to an increased sense of being there: "I would imagine that's much better than some Zoom session, where it actually feels like there's a person there. Yeah. Even if it's only like, head and..." (P7). Additionally, the use of 360-degree images portraying actual people and places in ImmerseMe was appreciated because it was found to be more realistic and "natural" compared to computer generated interfaces and avatars.

When asked about ways in which iVR technology could best support language learning, participants mentioned the possibilities arising from the lack of restrictions in terms of time and space boundaries the iVEs afford. For instance, lessons on vocabulary would be effectively supported by an iVR game such a Noun Town, where a large amount of virtual objects and the context where they belong are easily accessible through iVR. Similarly, virtually travelling to foreign countries and immersing themselves in specific scenarios would greatly support language learning and familiarisation with the target culture.

P5: Well, first thing that came to my mind is that you could create an environment that mimics a country where the language is spoken. So your students could virtually visit these countries and get experiences speaking with local people or like seeing the culture and places and customs and things like that. So, getting more familiar with the context of the language.

P7: And just not even a country, but just the situation where you are. Are you in a classroom or a restaurant? Or I think that would help in certain

practices where we're exercising some things, or some conversations, or something, that would be helpful.

In conclusion, iVR affordances and benefits were that it is a safe space to practise the language and can serve as an immersive online meeting place; it can enhance engagement and enjoyment; it's novel, multimodal and gamified; it allows virtual travel and hands-on learning.

5.2.3 Perceived Limitations And Challenges To Implementation

Not only advantages, but also concerns and problematic aspects associated with the use of iVR emerged, both before and during the workshop. Pre-workshop concerns included cybersickness, referred to as "side-effect of VR", "headaches and dizzy feelings" and "feeling ill after a while". Additionally, a need for financial investments for acquiring equipment and developing software was identified. The time investment, as well as the effort, that learning how to use an unfamiliar technology would entail were also mentioned. Integrating VR in teaching would require "a lot of work" from teachers, who would need support to implement it and tackle technological barriers. One participant also mentioned a reason for ethical concern, based on the fact that integration of VR in university curricula might contribute to exacerbating global inequalities.

Problematic aspects reflected during the workshop were categorised as either inherent limitations of tested apps, or challenges connected to different aspects of their implementation. The lack of flexibility of input recognition in ImmerseMe was identified as a significant limitation, due to the fact it restricts users' ability to express themselves creatively in the FL: "It's really restricted. You're supposed to just basically translate or repeat. It's kind of a disappointment thinking of virtual reality, and then you basically have what you could have on a page of a textbook" (P4); and "I think you would really have to teach according to what that thing accepts and what it doesn't. And that I feel might be a bit frustrating when they [the students] say something that's actually correct and then it doesn't get accepted" (P8).

Additionally, it was pointed out that if students' free spoken production is not recognised by the app, the actual suitability of conversation exercises for

more advanced learners will be affected. This is particularly relevant in the context of higher education, where students are expected to reach advanced proficiency in the FL, especially if the language is English. On the other hand, in apps relying on AI to provide a virtual interlocutor, such as VirtualSpeech, free production is accepted. However, the downside that was found in that case was that no real-time feedback was being provided as a response to users' spoken production, and that was regarded negatively by the participants, who considered feedback as an important element in the learning experience.

Another relevant aspect concerns the possibility of collaborating with other students in the iVE. The importance of this aspect emerged when participants asked whether the different apps had a multi-user option, and expressed disappointment learning that, among the tested apps, only Wonda VR did. For some teachers it would be strange for students to be in the same classroom without interacting with each other. Additionally, it was pointed out how even a game, such as Noun Town, would further benefit from a multiplayer option, since competition with peers would make the experience even more engaging and motivating.

If the potential of iVR was overall acknowledged during the workshops, not all participants saw an added value of the tested apps at the present time. The main reasons supporting their perspectives were disappointment towards the type of content available in the iVEs, the perceived lack of relevance of tested apps for the target learners (specifically adults who go on exchange periods abroad), and the several technological problems that might occur when using iVR devices. One participant expressed doubts about iVR added value based on the consideration that bringing authenticity to LE is possible nowadays, thanks to other technologies that are less innovative, but also easier to integrate.

(...) it would be awesome if you can put it [VR headset] on, and then you're in the centre of – [*name of famous city where LOTE is spoken*] and you have to ask people to find out where – [*name of a landmark in that city*] is. But right now, it would feel so much more realistic if I prepare an exercise where half of them [students] are the locals, half of them are the tourists, the locals get a metro map, and then the first people have to go ask the local people. And then they can look on the Internet, open – [*name of local public transport company*] app, look at the bus timetable. So there is so much already on the Internet that I think makes it very realistic, where I think the technology would have to run super

smoothly and people would have to be super acquainted with it in order for that to be worth the effort, because I feel like it's so much... Yeah, technology was quite difficult to figure out. (P8, group discussion)

Navigating the iVEs was not a pleasant experience for all participants at all times. Negative emotions, such as frustration, were in fact observed and also reported. Such emotions were triggered by technical problems and difficulties navigating the apps during the iVR testing. Technological issues, such as wi-fi connection failures, sudden drop of device batteries, or devices and apps not working as they should, are seen as time-consuming problems that make the use of iVR in the classroom difficult.

Being able to master the iVR tools in order to provide students with a smooth experience and ensure that no time is wasted due to technical problems emerged as priority aspects for some of the participants. The lack of familiarity of both students and teachers with iVR devices, and low teacher self-efficacy, were identified challenges to iVR implementation in teaching: "I would say that doing this with students would be a nightmare. No way to help them. No way to know what they're doing" (P4); "I think each teacher using it [iVR] needs to spend enough time. And this probably increases with age exponentially, to be able not to make a fool of themselves in the classroom and to waste the students' time" (P2); "Not all of us are digital natives, not even the young ones. So it might be really frustrating for a student who doesn't know anything about this kind of thing. And then see others navigate like it's likely their everyday life" (P4).

Additionally, the availability and prices of devices and licences was also identified as a limitation to the integration of iVR for educational purposes. Some of the participants stated that they would assign their students tasks in the apps as homework. However, this would pose the challenge of ensuring that students can access devices and apps outside of the classroom.

Finally, six out of eight participants reported some level of physiological reactions when using the iVR devices, such as headache, dizziness, motion sickness or eye-strain. Discomfort connected to the use of VR glasses was also mentioned, as glasses were heavy and needed to be tight to be able to see clearly.

To sum up, the limitations of tested applications included: (a) lack of flexibility in speech recognition and lack of feedback, (b) lack of suitability to target learners, and (c) lack of collaborative spaces. The emerging categories for challenges to iVR implementation were: (a) lack of perceived added value, (b) technical issues, (b) lack of familiarity and self-efficacy of teachers and students; (c) costs and availability of iVR equipment and licences, and (d) cybersickness.

5.2.4 Tested Apps: Implementation Ideas And Suggestions For Improvement

Participants found the tested apps suitable for different educational purposes. As the only highly customisable iVE with a space for collaboration among tested ones, Wonda VR was seen both as a meeting place for authentic and immersive communication situations with FL native speakers, and as a setting for different kinds of collaborative projects, involving creativity, multilingual learning, and presentations. Virtual poster sessions could be organised for students to share their audiovisual work, or student lessons could be planned, implemented and discussed in the iVE:

Instead of a traditional presentation, I could ask my students to plan a little lesson in there and then for the other students to visit the other lessons and have discussions and so on. So maybe it would be a bit more interactive and immersive at least. (P1, on Wonda VR during group discussion)

Uses for the other tested apps were mostly, but not exclusively, defined by their intended purpose. ImmerseMe was found primarily useful to beginner and intermediate students, to learn culturally-specific vocabulary and routine phrases associated with typical scenarios, especially in a LOTE whose routine interactions are characterised by a high degree of specificity and repetitiveness:

ImmerseMe worked really well, because – [LOTE] has really complicated vocabulary for restaurants and shopping, and stuff like that. It's completely different from the normal everyday language. So it worked really well, because they gave you what they are saying and then you have to reply. And because it always goes the same way. They're like robots anyway in those situations in – [country where the LOTE is spoken], so... But you just have to learn what to say. (P7, group discussion)

Some participants thought that, based on the fact it provides realistic scenarios to practise conversation, ImmerseMe could be employed as a tool for self-reflection on students' own willingness to communicate and proficiency in

the FL. Potential inhibiting factors could be better understood based on the fact they can be better represented in the iVE rather than just described. However, not all participants found ImmerseMe very immersive, and thought that the desktop version would be just as beneficial as the immersive one. This would make its implementation more flexible, because not relying too heavily on students' access to iVR equipment.

Participants thought that VirtualSpeech can help students develop their presentation skills, by uploading and using their own slides and speaking freely in front of a virtual audience. Another idea for implementation entailed recording speech and interactions taking place in the iVE, so that audio recording or transcript can be later analysed.

Finally, one participant thought that Noun Town provided a very effective and engaging way to autonomously learn vocabulary, especially for beginner students. This was based on the fact the environment allows for endless repetition and offers context for the new lexicon and scaffolding in different forms of audio and visual input.

Some of the participants mentioned that they would implement tested apps by assigning tasks in the iVEs as homework for their students. On one hand, this might be a result of the perceived difficulties of integrating iVR in the classroom at the present time. The classroom has in fact been described as a complex system where several factors are at play and need to be taken into account for effective implementation. Additionally, the exact ways in which iVR could be implemented requires careful consideration, and participants often did not go into details in this regard. On the other hand, though, opting for a use of iVR in students' own time, might also suggest that the use of iVR is especially significant when it comes to practising outside of the classroom, probably due to the essentially individual nature of the iVR experience in most of the tested apps.

The discussion on tested applications and iVR affordances gave rise to what was categorised as suggestions for improvement. Such suggestions were a result of reflected affordances and identified limitations of tested apps. One participant expressed the opinion that iVR should capitalise on the affordance

of providing multisensory experiences by focusing on the visual and affective dimensions of interactions:

When it [iVR] gets better, as I guess it will, might help with, turn taking and affects. So how you respond to the affects that you notice in your interlocutor (...). So it would be really good if it were developed for that purpose. And the same with students who get anxious in communication situations. (...) So somehow I feel it's better for this to concentrate on those things where emotions are involved. You want to see the visual reaction of the person you're talking to, and stuff like that. (P2, group discussion)

Further suggestions included: (a) providing scenarios with increased authenticity, allowing for free production and feedback; (b) designing more elaborate and creative tasks to be carried out in the iVE; and (c) adding a storyline. One participant also noted how immersion should be supported by designing apps so that increased and meaningful interaction with the iVE becomes possible, such as manipulating objects based on instructions. If interactions with the iVE are not sufficient or not meaningful enough, the added value brought by immersiveness is counteracted by the problems connected to the use of this technology and its perceived complexity.

5.3 Immersive Virtual Reality As A Support With Current Classroom Challenges

Current teacher and student challenges as perceived by participants were first identified based on pre-workshop questionnaire responses, while the workshop data provided information to discover whether any of the perceived affordances of virtual reality could help teachers with their current challenges, and how.

Teacher and student challenges recognised as relevant to answer the research question were categorised as related to: (a) affective dimension of language learning, (b) productive language skills, (c) lack of engagement, (d) learning environments, and (e) differentiation (see Table 9). Some of the main identified affordances of tested iVEs might provide support to such challenges. These affordances include the type of content offered, the aspects of

gamification, multimodality, novelty, immersion, sense of presence, and a perception of the iVE as a safe space to practise.

Table 9

Teacher and student challenges in university foreign language classrooms based on participants' perceptions

Themes	Subthemes
Affective dimension	Communication anxiety Lack of confidence
Productive skills	Spoken production / interaction skills Turn-taking practices Pronunciation Formal and informal styles in writing Written production Character learning
Engagement	Students struggling to find time for their studies Student motivation Student motivation to learn a LOTE Students distracted by phones
Learning environments	Finding interactive no-pressure learning situations Providing authentic communication situations Learning/teaching communication skills in online classes
Differentiation	Student desire for problem solving activities Heterogeneous and large student groups Student need for more challenging course content

In relation to the affective dimension of language learning, students reportedly struggle with overcoming communication anxiety and uncertainty in the FL,

especially in speaking. Another challenge is developing language production skills, mainly spoken. There might be a connection between these two challenges, considering that foreign language anxiety (FLA) can hinder learning, for instance by affecting students' willingness to communicate (WTC) and limiting their opportunities to practise the FL. The learning environment and its features can also play an important role in fostering students' confidence and supporting their learning. Being described as a safe space for practising the FL, iVEs might help students build confidence and improve their speaking skills. More specifically, based on participant evaluation of the tested apps (see previous section), students might be supported in developing their vocabulary, pronunciation, conversation and presentation skills.

Another identified challenge from a teacher perspective is a lack of student engagement in learning activities inside and outside of the classroom. As shown in a previous section about iVEs' affordances, some of the participants thought that tested apps were engaging and might help students feel more motivated towards learning tasks inside and outside the classroom. Main factors potentially contributing to increased engagement in students are connected to the gamification aspect, the multimedial features of the iVEs, and the novelty of this technology applied to the context of LE.

Identified challenges pertaining to the category of learning environments refer to online learning and perceived authenticity of communication situations. They were reported in the following terms: "Online classes are not ideal. Learning communication skills does not work well online at the moment with the tools that we have" (P7) and "Providing authentic communication situations (especially multilingual ones) for our students, who are predominantly Finns" (P6). In response to that, one participant suggested that inviting a FL native speaker to virtually join the FL class could be a way of bringing authenticity in classroom communication situations. Additionally, meeting in the iVE might improve the quality of distance communication. Immersion and a sense of presence in the iVE might facilitate online interactions and the iVE might become an alternative meeting place where distance

communication feels more natural. In such an environment, students' communication skills might be more successfully facilitated.

Finally, the need for differentiated learning in the FL classroom emerged based on participants' mention of the difficulty of dealing with "heterogenous and large groups of students" (P8), and the fact that "some [students] are not sufficiently challenged by course content. Some express a desire for more problem-solving activities"(P2). These specific aspects were not mentioned by the participants. However, one participant said that tested apps might be employed as a differentiation tool. Thanks to the gamification aspect, their use could perhaps be more appealing to those students who are interested in gaming and struggle finding motivation to learn with more traditional approaches. In addition to that, the apps would allow for assigning extra tasks to students who might need additional work.

5.4 Support Needed To Implement Immersive Virtual Learning Environments

When asked about the kind of support teachers would need to be able to implement iVR effectively in their teaching during the group discussions, two semi-serious responses were offered during the group discussions: "a personal assistant who would take care of all the technology" and "younger teachers". Such responses might suggest some reluctance towards implementing iVR, or some sense of inadequacy in relation to the task of developing the necessary skills to fulfil a task that is perceived as too demanding. It is important to recognise the effort that would be required from teachers to implement iVR, also considering that the task might be more burdensome for those who are less well-versed when it comes to this type of technology. One participant said in the post-discussion questionnaire that better apps would be needed for them to consider implementing iVR. This response highlighted how the quality iVR content is a critical element when it comes to establishing the relevance of this technology for LE purposes. However, most of the participants displayed engagement towards the matter of iVR implementation, and expressed their

needs in relation to the prospect of implementing iVR in their own teaching. Based on their responses, the theme of support was categorised in terms of either external or internal resources.

5.4.1 External And Internal Resources

External types of support referred to the areas of: (1) information, training and assistance and (2) equipment and materials, with a third category of monetary compensation.

First, the area of information, training and assistance included: (a) information on device locations, their availability and how to reserve them, (b) instructions on how to use the apps, (c) access to different types of training (workshops, demo sessions, app training to achieve specific learning objectives), (d) availability of teaching resources (database of ready-made tasks, learning units, lesson plans), and (e) availability of IT support, to timely tackle technical issues arising during classes, especially at first. In regard to point (d), one participant emphasised how having a database of ready-made teaching materials would actively help teachers by decreasing the workload of developing their own resources from scratch. In relation to point (c), another participant specified how helpful it would be to receive guidance in the development of pedagogically grounded solutions for iVR integration in specific contexts.

Second, the category of equipment and materials encompassed: (a) being granted access to iVR equipment and app licences, (b) granting students access to apps and devices, (c) the availability of a teacher dashboard and/or a screen to monitor students' activity in the iVE, and (d) investing on bandwidth for faster wi-fi connection, in order to limit technical issues caused by low connectivity when several devices are connected at the same time.

In relation to point (c), being provided with a "teacher dashboard that gives an insight into what students are doing / if they are working on a task", and possibly a screen to be able to see what the students are seeing in their VR glasses, were mentioned as a type of support in the workshop. Moreover, it needs to be pointed out that the app ImmerseMe does have a teacher

dashboard, which was presented at the beginning of the workshop, when all the apps were briefly introduced, as a potentially very significant tool from a teacher perspective. Unfortunately though, half of the participants in the workshop did not have the chance to explore its functions. It is possible that this teacher dashboard might have partially fulfilled the function of the one envisioned by the participants. However, the functions of a teacher dashboard as described by the participants encompass but also go beyond what the one in ImmerseMe can do.

Finally, one participant mentioned that monetary compensation should be allocated for teachers who decided to implement iVR in their own classes. This was proposed in consideration of the fact that adequate familiarisation with the iVR technology would require additional working hours and potentially a significant increase in teachers' workload. The mention of this type of support highlights once again the effort teachers would be required to put into the implementation of iVR, as an unfamiliar technology.

When it comes to internal resources, the main type of support mentioned by the participants was time. During the group discussions, one participant highlighted how developing the necessary competence to be able to implement iVR smoothly and effectively in a classroom environment would represent "potentially a very significant time investment". Others also stressed the need for time to learn how to use and integrate the iVR technology in their teaching. One participant expressed the desire to do so in the comfort of their home, having borrowed the university devices. Tightly connected to time, practice emerged as another expression of internal support, identified as essential to adequately familiarise with the apps and devices.

6 DISCUSSION

6.1 Examination Of Results

This thesis investigates university foreign language (FL) teachers' perspectives of iVR as a tool for language education (LE), in relation to perceived educational challenges and types of support needed for its implementation, seeking to understand whether iVR could be implemented in FL higher education settings, and how.

Perspectives of VR before the workshop exhibited predominantly positive attitudes, but negative or neutral attitudes towards using VR for teaching languages also emerged. Reluctance towards implementing VR was mainly due to time-consuming technical issues and lack of familiarity with the technology, leading to an investment in terms of time and effort to develop self-efficacy in using it for teaching. After learning more about iVR in the workshop, seven out of eight participants said they would use tested apps. Most positive attitudes remained unchanged, as well as one negative and one middle-ground attitude. However, one participant changed their mind about the idea of using VR in their own teaching, from a negative to a positive attitude, recognising the potential of iVR as an engaging tool, in spite of identified limitations and challenges.

The findings indicate that most of the participants recognised some affordances and benefits in the use of tested iVR apps over pre-existing tools for language learning. Perceived relative advantage, or usefulness, was grounded in iVEs characteristics, qualities and recognised affordances. The feature of multimodality was seen as a potential support for language learning, because it can support learning through different learning styles and scaffolding. However, multimodality has been addressed by previous research as a possible cause of cognitive overload, resulting in reduced rather than enhanced learning (Chen et al., 2020; Hsu, 2022; Meyer et al., 2019; Tai & Chen, 2021). In alignment with previous studies on gamified experience for language learning in higher education (De La Cruz et al., 2023) and including iVR (Fu et al., 2019), the

participants identified the aspect of gamification, especially prominent in Noun Town, as beneficial for learning. Novelty was also addressed as a positive aspect. Previous research has highlighted how its role needs to be acknowledged when evaluating the impact of iVR, due to the recognition of its fleeting nature as a positive aspect, and the fact it can be an initial obstacle in the context of implementation (Mulders et al., 2020). After all, the negative side of novelty is lack of familiarity, which has been repeatedly addressed by the participants as a challenge, for both teachers and students. Moreover, the use of iVEs for language learning was recognised by teachers as potentially conducive to engagement and positive emotions, while iVEs were recognised as immersive online meeting places or safe spaces for practising and building confidence in the foreign language.

Findings on university classroom challenges partially aligned with previous studies, in relation to the need of supporting the affective dimension of learners and their need for more engaging teaching practices (Ismeti, 2022; Yilmaz & Sahan, 2023). Some of the affordances and advantages offered by iVEs were identified as potentially relevant to address identified challenges. A conceptualisation of the iVE as a safe space to practise could meet the need of supporting students' in the affective dimension of learning, while providing opportunities for practising the language. Previous research has shown how iVR can reduce foreign language anxiety (FLA), also addressing a lack of practice environments that makes the development of FL speaking skills challenging (Chen & Hwang, 2022). iVR was also seen as a way of addressing the challenge of providing students with differentiated learning options. Legault et al. (2019) showed that the use of iVR improved the learning of low-achieving students, who might be struggling as a result of traditional methods being not suitable for them. In this sense research supports the perception of iVR as a promising tool for differentiated learning and enhancement of low-performing students. Finally, the perception of iVEs as an additional meeting place for online learning and meetings with native speakers was found to potentially be supportive of teachers in the challenges of facilitating the development of communicative skills in online classes and

providing students with authentic communication situations. In this regard, a recent study conducted between Finland and USA showed how Wonda VR can be used to bring more presence to distance learning and intercultural communication (Räsänen & Lampela, 2023). The identified student challenges pertaining to written communication were not addressed by the participants, probably due to the fact that most of the apps had a predominant focus on spoken production. However, research suggests that the development of writing skills too might be supported by the use of iVR (Chen et al., 2020; Fu et al., 2019; Lan et al., 2019).

In terms of implementation, and mostly in alignment with their intended use (when specified), tested apps were found to be supportive of vocabulary acquisition (Noun Town and ImmerseMe), development of basic interaction skills (ImmerseMe), presentation skills (VirtualSpeech, Wonda VR), communication skills, collaboration, creativity and multilingual learning (Wonda VR). Participants thought that vocabulary acquisition can be supported by VR not only through multimodal scaffolding and manipulation of virtual objects in context, but also by allowing for rote learning through repetition. ImmerseMe's ability to support only basic and not more advanced interaction was connected to its limited recognition of alternative forms of speech to express the same communicative function. The fact Wonda VR is an open and highly customisable VR space allowed for a multiplicity of possible applications for learning. Some participants expressed good compatibility of tested apps with their current course tasks. However, the brief duration of the workshop mostly prevented them from going into much detail with regards to ways in which the apps could be implemented, for example in relation to specific learning objectives.

As support to teachers' perspective, previous studies showed that iVR can enhance vocabulary learning (Alfadil, 2020; Dhimolea et al., 2022; Xie et al., 2019) and support the development of speaking skills (Ebadi & Ebadijalal, 2022; Yuditseva, 2023). Even though previous research has been inconclusive in terms of establishing whether iVR can enhance learning (Dhimolea et al., 2022), there are clear indications that it supports affective gains. This is true in terms of

fostering positive emotions, such as enjoyment and satisfaction and confidence (Peixoto et al., 2021; Rho et al., 2020; Tai & Chen, 2021; Yudintseva, 2023), and reducing negative ones, such as FLA (Kaplan-Rakowski & Gruber, 2023; Thrasher, 2022), as well as promoting motivation and engagement (Fu et al., 2019; Parmaxi, 2020; Rho et al., 2020; Symonenko et al., 2020).

Participants identified also challenges to iVR implementation and limitation of tested apps. This technology was perceived as complex and not easy to use by some participants, and this was at the core of many addressed challenges to its implementation. Findings showed that the lack of familiarity with iVR technology is perceived as having a disruptive impact, posing initial learning barriers for both students and teachers. Addressing as a type of support the availability of ready-made teaching materials, as well as training on how to use iVR apps for specific learning objectives, showed how finding ways to integrate iVR into courses, in combination with time constraints for learning and planning, is perceived as a challenge. Moreover, the importance of having a smooth experience with the technology was stressed by some participants. Classroom time is regarded as sacred, so the technology needs to work well, start quickly and not create problems. In relation to this, availability of technical support is seen by some as key to be able to promptly deal with any problem that might occur. In addition to technical support, other emerging needs were professional development and time for learning and familiarisation with the iVR equipment and apps. These results on teachers' concerns aligned with Alfalah (2017), who investigated university IT teachers' perceptions towards adoption of VR as a learning tool.

Cybersickness and/or discomfort were reported by six out of eight participants. Passive navigation during the virtual tour in Wonda VR was one identifiable cause of its occurrence, based on a categorisation by Chang et al. (2020). Other aspects that might have affected participants' experiences in terms of physiological reactions to the iVEs include other features of the VR content and/or hardware. It can be expected that devices will become more ergonomic and comfortable in the future, and that applications will be further developed in such a way that physiological reactions, such as motion-sickness, can be

limited to some extent. However, at present this is a generally recognised teacher concern, for example by Cowie and Alizadeh (2022)'s study on teacher perspectives on VR implementation. Some drawbacks that emerged in Cowie and Alizadeh (2022), such as specific ethical concerns about the provision of data for app use, or explicit mentions to the need for guiding principles in terms of pedagogical approaches, were not acknowledged by the participants, probably due to the very brief and limited workshop experience.

When it comes to identified tested apps' limitations, the lack of flexibility of speech recognition, the lack of feedback and the low suitability of half of the apps for advanced learners were addressed. Real-time feedback is in fact considered as a relevant aspect of the learning experience, while a lack of flexibility in accepted forms of speech is seen as limiting to provide effective support to students' creative uses of language. Flexibility and creativity are essential features of language use (Duff & Brown-Schmidt, 2012), so it is important to recognise these aspects in the context of language learning, especially in the case of more advanced learners.

Given the popularity of a conceptualisation of language learning as a socially-constructed process, language teaching approaches and methods tend to stress the importance of collaboration in learning, so it was only natural that participants would ask about collaborative spaces in the iVEs. Aligning with Nuesser et al. (2024)'s views, the participants as well would have preferred a multiuser function in the apps, for more engaging and realistic learning experiences. The fact that most of the tested apps did not have a collaborative space was seen as problematic in light of potential classroom implementation. This limitation of tested apps reflects Jensen and Konradsen (2018)'s considerations on the fact that it might be difficult to adapt available VR content to classroom instruction, due to its use being mostly intended for self-learning. The quality of VR content, as expressed by the participants, as well as the possibility for customisation, as suggested by Jensen and Konradsen (2018), emerge as extremely relevant for using iVR in an educational setting.

A participant suggestion for app improvement entailed capitalising on iVEs affordances by focusing on non-verbal communication and affects in

conversation. Additionally, the suggestion of including narrative content and meaningful interactions with the iVEs recalls Nuesser et al. (2024) recommendations for optimal iVEs for language learning. While incorporating a storyline supports learners' emotional investment in the virtual events, the possibility of manipulating virtual objects increases the levels of interactivity with the iVE, as it was the case with Noun Town.

A final consideration arose by observing participants' behaviour during the VR testing. It was possible to notice that their experience was mostly an individual one, in spite of occasional interactions with other participants, due to the fact that wearing a headset disconnected participants from the real world (Kaplan-Rakowski and Gruber, 2021). The fact that iVR headsets act as a barrier needs to be actively acknowledged since it affects the options for implementation in classroom settings. If isolation promotes user engagement and minimises distractions (Kaplan-Rakowski & Wojdowski, 2018), it also makes it challenging for learners to collaborate, unless the iVE provides a space for that. Overall, the use of iVEs as collaborative spaces appears to be especially relevant when it comes to reducing the distance between individuals who are located at geographically distant locations, providing them with immersive and authentic communication opportunities, while the idea of the VE as a safe space where learners can practise the language autonomously suggest a predominantly individual use of iVR.

6.2 Evaluation Of The Study

The small sample size makes the generalisability of the study findings limited, based on the specific cultural and educational context. Even though the participants had different attitudes towards VR, they all participated on a completely voluntary basis, showing enough interest in learning more about iVR to take part in the workshop. Therefore, their attitude might not accurately reflect that of all teachers.

Some of the limitations of this study regard the testing experience and the workshop itself. If testing multiple apps provided the participants with

different kinds of iVEs and input for reflection, the limited amount of time allocated for the testing within a fairly brief one-time workshop did not allow for in-depth exploration and proper familiarisation with the apps and devices. This resulted in the participants gaining more of an overview rather than a detailed picture of iVEs, which might have affected their understanding and, in turn, their opinions and discussions. This was especially true for those participants who lacked previous iVR experience and would have needed more time to properly familiarise themselves with the devices and apps. Moreover, the workshop itself was a very brief experience, which did not allow more in-depth discussions and further elaboration on implementation possibilities for the tested apps. Additionally, not all participants had the chance to explore relevant features of the tested apps, such as the teacher dashboard in ImmerseMe or the speech analysis function in VirtualSpeech. In relation to the chosen apps, another limitation may be inherent in the apps themselves, as effective tools for language education and as representative of the current potential of iVEs, both in terms of content and design.

When it comes to the research design, some flaws were detected. For instance, individual questionnaires, while allowing participants to express themselves individually and privately, might have limited the level of elaboration of thoughts and ideas, when more in-depth individual reflections, collected for example through individual interviews, would have perhaps allowed to gather a more detailed account of individual perspectives. However, in this study, the group discussion was selected to be the data collection method because it allowed participants to think together, share their ideas and build their understanding in collaboration with fellow teachers.

In the case of a workshop as a research context, researcher investment cannot be described as prolonged, due to the brief nature of the event, and this might affect the study's credibility. Prolonged investment is, in fact, used in qualitative research to ensure a study's credibility and trustworthiness, due to the fact it allows the researcher to gain a deeper understanding of the research participants and context. To tackle this issue, Ahmed and Asraf (2018) argued that the intensity of the engagement among participants and facilitators during

a workshop can be compared to prolonged investment based on the fact that thick and rich data can be collected during workshop interactions.

Additionally, to enhance the credibility of the study, “multiple types of data seen through multiple lenses” were gathered, providing verification of data by means of triangulation, referred to as a “key way to achieve credibility” (Tracy, 2013, p. 236). Finally, detailed descriptions were provided as a support to subjective instances, with the aim to enable the reader to develop informed judgments about the research (Peel, 2020).

6.3 Practical Applications And Future Research

This study provided insights on university FL teachers’ perspectives on iVEs as tools for language education. The findings provide assessment of currently available iVR apps in light of their potential implementation in FL courses, and offer input to improve the quality of future iVR content for language learning. However, considering the limitations of this workshop, future research could employ multi-session workshops, to allow FL teachers to adequately familiarise themselves with the technology, yielding to a deeper understanding of the affordances of iVR for language education. Future research could focus on evaluating different apps and tools, since new ones are being developed and released, and how university FL teachers could integrate them into their teaching to improve their curriculum and lessons. Tested apps could be chosen and solutions could be tested and evaluated to identify which settings can lead to the best results for students (Smutny, 2022).

By connecting identified iVR affordances with current challenges faced by the participants in their FL courses, this study also suggested a potential of iVR as a tool to tackle such challenges. Understanding the present study as a first step within a larger DBR project on iVR for university FL learning environments, an iVR intervention could then be developed based on the present study’s findings in order to investigate the potential impact of this technology on tackling the challenges that were addressed by the participants.

Potential collaborators in this future research endeavour could be those workshop participants who showed willingness to implement iVR in their own teaching. A viable option would be to begin with focusing on the most mentioned challenge of university FL students being found in need of support to develop their speaking and interaction skills, with one of their main challenges being related to communication anxiety and finding opportunities, as well as the courage, to consistently use the language. The identified affordance of iVEs as safe spaces for practising the language without the drawbacks of real life situations would constitute the grounds to develop such an intervention with the aim to meet identified needs and improve the quality of university FL education. Other challenges, such as providing Finnish students with authentic communication situations, even multilingual ones, could also be simultaneously tackled, if deemed feasible. Teaching resources incorporating iVR in pedagogically relevant ways could be developed in collaboration with practitioners and be implemented in their classrooms. Their impact could then be evaluated in terms of learning outcomes, foreign language anxiety (FLA) and willingness to communicate (WTC). Iteration phases would follow each evaluation phase, with the ultimate goal of developing resources to integrate iVR in FL courses curricula in a way that promotes meaningful learning.

iVR has shown potential for language learning. However, teachers' should personally explore the possibilities of this innovative technological tool, because of their active role in implementing it in educational contexts. In fact, understanding of the impact of this technology cannot happen in a vacuum, it needs to be observed in the context of meaningful implementation. To be able to establish whether iVR can enhance learning, it needs to be implemented in accordance with approaches and methods that are suitable for specific target learners, and in line with established learning objectives. Therefore, to further progress in testing the potential of this technology, teachers should evaluate it critically, in light of a pedagogically-meaningful implementation. In order to be able to do so, they would need to adequately familiarise themselves with iVR, possibly through training, since lack of training has been shown to impact

teachers' perceptions of new technological tools (Lederer et al., 2000). Based on this study's findings, it is suggested to provide VR training to learners too, in order to ensure equity and support for all students, regardless of their previous experiences with immersive technologies. Additionally, the importance of pre-training for students has been highlighted by previous studies as a way to maximise learning and reduce distraction (Johecová et al., 2022; Meyer et al., 2019).

Based on the fact that VR was recognised as a potentially useful tool in language teaching and to support their expressed willingness to use it in their teaching, arrangements should be made to meet their needs. A list of recommendations was crafted based on this study's findings on the types of support needed by university FL teachers to implement iVR:

- (1) Increase teachers' awareness on iVR devices and licences available at the university by providing information about such resources and how to access them.
- (2) Provide teachers with general training on how to use iVR devices, and workshops / demo sessions targeting the use of specific apps and the development of strategies to integrate them in specific contexts, with specific learners and in order to achieve specific learning objectives.
- (3) Allocate time for professional development.
- (4) Provide IT support.
- (5) Make iVR equipment available for teachers to borrow and familiarise themselves with at home.
- (6) Set up a VR lab to provide students with access to iVR devices and applications outside the classroom.

Since this technology is still unfamiliar to most, implementation would need to be a gradual process, taking into account initial challenges, and start with familiarisation and the planning of basic tasks (creating an avatar, moving around in the iVE, etc.) before introducing more advanced ones.

In conclusion, this study sheds light on teacher perspectives on iVR technology and provides insights that can contribute to the process of critically and pedagogically evaluating the possibilities of this technology for university

FL learning environments. By expressing their concerns, expectations and needs in relation to iVR implementation in the context of language teaching and learning, this study also aimed at having university FL teachers' voices heard, so that in the future this new technology can be implemented in ways that are meaningful to students and don't fail at taking into account teachers' needs.

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APPENDICES

Appendix 1 - Pre-workshop questionnaire


PRE-WORKSHOP QUESTIONNAIRE
Participant details
1. What language(s) do you currently teach?
Previous experience with VR
2. What comes to mind when you think about Virtual Reality (VR)?
3. If you have had any experience with VR, either in your classes or free time, which applications / tools did you use? <i>VR can mean a range of experiences, including immersive head-mounted display (HMD) virtual reality, desktop/browser-based virtual worlds, avatar-based environments and games (such as Second Life, Gather.town, Minecraft, etc.)</i>
4. How would you describe your experience?
Reported use and attitudes towards technology for teaching
5. How often do you use technology in your teaching? <i>Technology refers to a variety of tools you can integrate in your teaching practice, including but not limited to synchronous and asynchronous learning tools, social media platforms, virtual and augmented reality tools, game-based learning platforms, online-based collaborative whiteboards, video conferencing platforms, presentation-building tools, etc.</i>
1-Never, 2-Rarely, 3-Sometimes, 4-Often, 5-Always
6. What kind of tools / apps do you use, and what purpose do they fulfil? <i>(ex. Flinga for active participation / collaborative learning, Kahoot! for grammar revision, Google forms for assessment, etc.)</i>
7. How would you describe your experience?
8. If you never use any technology tools in your teaching, can you explain why?*
Present attitudes towards VR
9. Based on what you already know about VR, would you like to use it for teaching languages?
1-Very unlikely, 2-Unlikely, 3-Neutral, 4-Likely, 5-Very likely
9. What are your expectations / concerns about using VR in your teaching?***
Current challenges teacher and student challenges
10. What challenges are you currently facing in your work as a language teacher, if any?
11. What are your students currently / mostly struggling with, if at all?

Appendix 2 - Post-testing questionnaire

	<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neither</i>	<i>Agree</i>	<i>Strongly agree</i>
1. I was involved in the virtual environment experience.	1	2	3	4	5
2. My interactions with the virtual environment seemed natural.	1	2	3	4	5
3. I became so involved in the virtual environment that I was not aware of things happening around me.	1	2	3	4	5
4. I thought there was too much inconsistency in the virtual environment.	1	2	3	4	5
5. I enjoyed being in the virtual environment.	1	2	3	4	5
6. I felt nervous in the virtual environment.	1	2	3	4	5
7. I felt confident using the controllers to move around the virtual environment.	1	2	3	4	5
8. I suffered from fatigue or dizziness during my interaction with the virtual environment.	1	2	3	4	5
9. I found that the virtual environment was confusing.	1	2	3	4	5
10. I found that the virtual environment was motivating.	1	2	3	4	5
11. What are the positive and negative aspects of this app, in your opinion?					
PROS _____					
CONS _____					

Appendix 3 - Workshop slides


524-C
VIRTUAL REALITY - VIRTUAL REALITY - VIRTUAL REALITY - VIRTUAL REALITY - VIRTUAL REALITY
NEXT
BACK
RESEARCH PROJECT - RESEARCH PROJECT - RESEARCH PROJECT - RESEARCH PROJECT
NEXT
BACK
OUR ICEBREAKER! - OUR ICEBREAKER! - OUR ICEBREAKER! - OUR ICEBREAKER! - OUR ICEBREAKER!
NEXT



VIRTUAL REALITY WORKSHOP

VR for Language Education

Francesca De Sanctis, University of Jyväskylä
5.06 & 7.06.2023



THIS RESEARCH PROJECT

Examining teacher perspectives of immersive virtual reality (VR) for university foreign language education



How are you feeling today?


- ★ Which owl represents you today?
- ★ Why that owl? Tell the person next to you.

BACK
TIMETABLE - TIMETABLE - TIMETABLE - TIMETABLE - TIMETABLE - TIMETABLE
NEXT
BACK
APPLICATIONS - APPLICATIONS - APPLICATIONS - APPLICATIONS - APPLICATIONS - APPLICATIONS
NEXT
BACK
VIRTUAL REALITY - VIRTUAL REALITY - VIRTUAL REALITY - VIRTUAL REALITY - VIRTUAL REALITY
NEXT


OUR TIMETABLE TODAY

01	INTRODUCTION - 20 min - Introductions - Timetable - VR applications for language education	03	BREAK - 15 min Coffee or tea?
02	VR TESTING - 1.20 h You will test 3 apps and fill in an evaluation form after testing each app	04	GROUP DISCUSSION - 80 min - Reflections on VR for LE - Collaborative task - Post-discussion questionnaire


THE APPLICATIONS YOU WILL TRY TODAY...



IMMERSEME
French, Mandarin Chinese, German, Japanese, Spanish, Greek, Indonesian, Italian, English, Brazilian Portuguese, Russian and Modern Standard Arabic



WONDA VR
Can be used for teaching languages

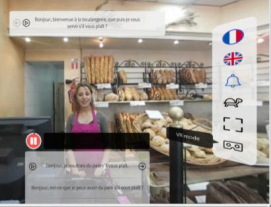


VIRTUALSPEECH
Soft skills in English

NOUN TOWN
Japanese, Korean, Chinese, Spanish, French, German and Italian

IMMERSEME (2015) immerseme.co/


- Simulations of everyday conversations in culturally authentic locations (360° photographic images)
- More than 250 lessons on various topics, with conversation scripts and real life scenarios
- 3 levels (beginner, intermediate, advanced)
- Up to 5 learning modes (pronunciation, typing, spelling, translation + immersion)
- Feedback on pronunciation
- Delay mode
- Teacher dashboard (monitor progress, assign personalised tasks)
- Accessible on mobile, tablet, desktop, and VR headsets



BACK
VIRTUAL REALITY - VIRTUAL REALITY - VIRTUAL REALITY - VIRTUAL REALITY - VIRTUAL REALITY
NEXT
BACK
VIRTUAL REALITY - VIRTUAL REALITY - VIRTUAL REALITY - VIRTUAL REALITY - VIRTUAL REALITY
NEXT
BACK
VIRTUAL REALITY - VIRTUAL REALITY - VIRTUAL REALITY - VIRTUAL REALITY - VIRTUAL REALITY
NEXT


WONDA VR (2016) www.wondavr.com/

- VR learning and collaboration platform
- You can edit, share and access immersive learning experiences based on 2D, 3D and 360° media
- Accessible on mobile, tablet, desktop, VR headset
- Institutional hub, private spaces, private or public 3D / 360° experiences
- Upload your own 360° pictures / videos to explore a real world setting of your choice, or use templates
- Customise by adding pictures, videos, icons, hotspots content cards, quizzes and score cards to monitor progress
- Online meetings and workshops in VR (share screen, draw free-hand, add videos, pictures, slides, quizzes)
- Creation of gamified experiences (quiz, save visitor progression)
- Avatar personalisation & multiplayer sessions




VIRTUALSPEECH (2016) virtualspeech.com/

- Self-paced online courses including exercises
- Soft skills in English (business / education)
- Focus on oral presentation skills, communication, public speaking
- Courses, exercises and videos (13 courses and 25 exercises accessible on VR headsets)
- Simulations of scenarios such as lectures, classes, job interviews, presentations, etc.
- Upload your slides and interact with chatbots
- Host private meetings or join workshops
- Feedback on performance (speech analysis – volume, speed, filler words, eye contact)
- Recording function and dashboard to check own progress



NOUN TOWN (2022) noun.town/

- Language learning immersive VR game
- Accessible on desktop and VR headsets
- Gamified approach – you are on a grayscale island gradually gaining colour as you complete tasks
- Focus on vocabulary and conversation (simple phrases and sentences)
- Fully interactive environment (you can pick up virtual objects)
- Interaction with chatbots
- Feedback on pronunciation
- Singleplayer, but linked to Discord community



BACK BREAK - BREAK - BREAK - BREAK - BREAK - BREAK - BREAK - BREAK - BREAK - BREAK NEXT

Let's test these apps!

OCULUS QUEST 2



Left Right

1. Thumbsticks
2. Menu button
3. Oculus button
4. Battery covers
5. Grip buttons
6. Triggers

Time for a break!



Today's applications... Your VR-testing experience...

- Their strengths and weaknesses?
- Any suggestions to improve them so they are better for language learning?
- Authenticity check (language, setting, etc.)
- Any comments?
- What are the benefits of VR for language teaching in your opinion?
- What are its challenges?

BACK LET'S BRAINSTORM! - LET'S BRAINSTORM! - LET'S BRAINSTORM! - LET'S BRAINSTORM! - LET'S BRAINSTORM! NEXT

VR IN THE FOREIGN LANGUAGE CLASSROOM?

- 1) What aspects of language teaching / learning could be best supported by the use of VR in your opinion?
- 2) What kind of skills / competences do you think VR might help your students develop?
- 3) Could VR help with any of the current challenges foreign language teachers and students are facing? How?

VR FOR LANGUAGE EDUCATION - VR FOR LANGUAGE EDUCATION - VR FOR LANGUAGE EDUCATION

How would you integrate the apps you have tried in your classes?

LEARNER PROFILE

- Increase motivation / engagement?
- Build confidence? Practice in a safe environment?
- Differentiation?
- Authentic contexts?

LEARNING OBJECTIVES

- How? Which apps? Which tasks? When? Where? ...
- Content knowledge? Language skills? Learning skills? Affective learning gains? ...

LEARNER NEEDS

- Monolingual / multilingual classroom? Proficiency level? ...


INTEGRATION

Anything else you would like to add? :)

BACK BREAK - BREAK - BREAK - BREAK - BREAK - BREAK - BREAK - BREAK - BREAK - BREAK NEXT

BACK POST-DISCUSSION QUESTIONNAIRE - POST-DISCUSSION QUESTIONNAIRE - POST-DISCUSSION QUESTIONNAIRE - POST-DISCUSSION QUESTIONNAIRE - POST-DISCUSSION QUESTIONNAIRE NEXT

POST-DISCUSSION QUESTIONNAIRE




- 1) If given the opportunity, would you use one or more of the apps you have tried today in your classes? Please explain why.
- 2) What kind of support would you need to be able to integrate VR effectively in your teaching?


BACK THANKS - THANKS - THANKS - THANKS - THANKS - THANKS - THANKS - THANKS - THANKS - THANKS THE END

THANKS!

If you are not too sick of answering questions at this point, please give feedback on this workshop →



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Appendix 4 - Post-discussion questionnaire**POST-DISCUSSION QUESTIONNAIRE****Attitudes towards VR implementation**

1. If given the opportunity, would you use one or more of the apps you have tried today in your classes?
2. Please explain why.

Support needed for VR implementation

3. What kind of support would you need to be able to integrate VR effectively in your teaching?