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High-Immersion Virtual Reality in Language Teacher Education

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Abstract • This paper examines high-immersion VR in (foreign) language learning, focusing on teacher education. It identifies three approaches: (1) VR in teaching simulations, (2) VR for language competence development, and (3) social VR for expanded learning spaces. It highlights potential alongside technological and practical challenges and proposes guiding questions for VR app selection, scenario design, and teacher support. From a postdigital perspective, VR is framed not as a neutral tool but as part of broader socio-material transformations that change language education and interaction.

Schlagworte/Keywords • high-immersion virtual reality (VR), (foreign) language learning, language competence development, social VR, pedagogical guidelines

Introduction

Teaching languages in the postdigital condition involves organizing learning across interconnected analogue and digital environments, where meaning is created through speech, text, image, gesture, sound, and space. Literacy is therefore unalterably multimodal and dialogic: Learners must negotiate viewpoints, interrogate claims, and create content responsibly across technologically mediated environments (Pegrum et al., 2022; Gießler & Summer, 2025). This shift places a specific responsibility on language teacher education. Against this backdrop, we examine the role of high-immersion virtual reality (VR) in language teaching and teacher education. By VR we refer to high-immersion systems, typically involving head-mounted displays that situate users inside computer-generated 360° environments capable of evoking presence and embodiment (Kaplan-Rakowski & Gruber, 2019).

Immersion is best conceived as a continuum: Non-, semi-, and fully immersive configurations afford distinct forms of learning (Huang et al., 2023). The Cognitive-Affective Model of Immersive Learning (CAMIL) elucidates how cognitive and affective factors interact to produce VR-based outcomes (Makransky & Petersen, 2021). While immersion can enhance engagement and presence, it may simultaneously increase cognitive and physiological strain. Within CAMIL, cognitive load is recognized as a central mediator of learning outcomes (Makransky & Petersen, 2021). Empirical evidence suggests that fully immersive settings often induce higher cognitive load than non-immersive ones, partly due to cybersickness – a form of motion sickness caused by sensory-vestibular conflict – which diverts attentional resources and impairs learning (Breves & Stein, 2023; Sepich et al., 2022).

The empirical picture of VR usage and effectiveness remains promising, but still fragmented and unevenly supported. Research in language education reports positive effects of VR on motivation, self-efficacy, and performance (e. g., Yu & Duan, 2024). In teacher education, studies focus on simulations, classroom scenarios, and task design, thereby revealing two main modes of VR integration: teacher education in VR (e. g., teachers acting within virtual classrooms) and teacher education with VR (e. g., preparing teachers to use VR as an instructional tool; for an outline of language learning *in* versus *with* VR, see Schnellbögl & Summer, under review). Findings, however, are dispersed across diverse platforms, learner groups, and research de-

jlb no. 1/2026 https://doi.org/10.35468/jlb-01-2026-01

signs, while reporting a number of technological challenges and practical hurdles. Moreover, practical implementation is affected by data protection, accessibility, onboarding, and classroom logistics.

Drawing on empirical and conceptual work, we first provide an overview of VR research and practice in language teacher education. A literature review of 46 empirical studies dealing with VR and teacher education in general (not language education) revealed that studies mostly target pre-service teachers, a range of (high-immersion and low-immersion) VR systems ranging from *Second Life* to self-developed VR systems, mostly investigating simulated instructional situations such as classroom situations with heightened level of disruption (Huang et al., 2023). A further recent systematic review and meta-analysis of 52 empirical studies found a positive moderate overall effect of VR on teacher education (Han et al., 2025). To date, there are no meta-analyses or literature reviews providing an overview of research conducted on VR in the field of language teacher education specifically; hence, this paper offers an initial overview of the field. We identify three areas of VR application in language teacher education: (1) VR for teaching simulations, (2) VR for developing language competences, and (3) social VR for expanding learning spaces. On this basis, we discuss the key potentials of VR in language teacher education and derive corresponding guiding questions for teacher educators. It is important to note that while our focus lies on teacher education, we adopt a differentiated view of professionalization that explicitly includes the learner perspective. Accordingly, our analysis of VR not only addresses teacher development, but also its implications for student learning and engagement.

Integrating VR in language teacher education

Approach 1: VR for teaching simulations

The use of VR for teaching simulations refers to the incorporation of VR simulations into teacher education programs to enable learning experiences and promote teacher professionalization. The concrete use of such simulations for teacher education in foreign languages, however, is still in its infancy.

Examples of VR simulations are *Virtual Speech* and *Ovation* (Kaplan-Rakowski & Schnellbögl, 2024). Although these VR apps are designed

to train soft skills in public speaking scenarios, they also offer a classroom scenario, allowing verbal interaction with virtual students. Commonly used VR tools for teaching simulations are *Breaking Bad Behaviors* (University of Würzburg), and the VR classroom *Teach-R* (formerly *VR-Klassenzimmer*) (University of Potsdam), where pre-service teachers practice classroom routines with virtual student avatars and develop teaching skills (Wiepke et al., 2019). One advantage of such settings is that, unlike in real classrooms, they can be tailored to the individual needs and learning objectives of pre-service teachers, while classroom disruptions can be entirely eliminated (or enhanced). This enables full concentration on selected aspects of instruction. However, negative effects have also been identified, such as a lack of interaction and feedback, the absence of teaching materials, technological issues, and psychological factors including stress and insecurity (Pitura et al., 2024). A further drawback of VR simulations like *Teach-R* or *Breaking Bad Behaviors* at present is the requirement of an additional human facilitator, usually the seminar instructor, who has to externally control avatar responses and to intervene in the simulation. Consequently, the virtual environment is not entirely autonomous. Observation by a coach may also trigger nervousness in pre-service teachers, potentially counteracting the benefits of the VR setting. This issue, however, is likely to be mitigated in the future through the integration of generative AI. Building on this idea, Pitura et al. (2024) demonstrated that English pre-service teachers can subjectively benefit from VR-AI-assisted simulations in terms of facilitating both their content knowledge and their ability to apply it. Yet, the absence of a control group limits the generalizability of the findings. In addition to AI-enhanced simulations, VR monitoring software makes it possible to collect vast amounts of data on teaching behavior and have it analyzed automatically, thereby fostering subsequent reflection (Van Der Want & Visscher, 2024).

Concerning the current state of research, Hong et al. (2025) observe that simulations in teacher education provide a safe environment for practice and reflection, offering the distinct advantage of allowing the repeated rehearsal of routines without exerting any negative impact on real students. At the same time, they note that VR simulations frequently exhibit shortcomings with respect to opportunities for spontaneous improvisation, dialogic fluidity, and authentic learner feedback, and moreover display limitations in terms of scalability (Hong et al., 2025).

jlb no. 1/2026 https://doi.org/10.35468/jlb-01-2026-01

Gerholz et al. (2022) conducted a systematic literature review covering the period from 2010 to 2022 and identified eight studies focusing on the use of simulations in (general) teacher education. Their analysis revealed two overarching objectives of such simulations: the enhancement of classroom management and the development of communicative competence. As concerns classroom management, the reviewed studies emphasized several key dimensions including instructional practice, the handling of classroom disruptions, the cultivation of classroom leadership skills, and the strengthening of teacher resilience (Van Der Want & Visscher, 2024). The findings of the systematic literature review suggest that (high-immersion and low-immersion) VR is perceived by pre-service teachers as both useful and meaningful for competence development, with participants reporting a subjective increase in their professional skills (Gerholz et al., 2022). Studies addressing communicative competence investigated the promotion of reflective and empathic capacities, fostering awareness of test anxiety, and the implementation of discrete trial training for children with autism. Across these studies, too, VR was ascribed considerable potential for the respective domains of application. Moreover, empirical evidence indicated an enhanced sense of presence as well as an increased awareness of test anxiety among participants (Gerholz et al., 2022).

Results of empirical studies in foreign language teacher education are lacking. However, some potentials can be identified and these include practicing foreign language correction routines and feedback strategies, managing the classroom and discourse in the target language, formulating task instructions, simulating intercultural encounters, e. g. critical incidents and nonverbal (culture-specific) communication, interacting with students experiencing speaking anxiety or reluctance, and teaching in linguistically diverse classrooms to foster multilingualism.

According to Budin (2024), providing early and continuous opportunities for practical teaching experience through virtual simulations – independent of short-term school placements – may enhance the attractiveness of teacher education programs and contribute to mitigating teacher shortages, particularly when prospective students gain virtual teaching experience before formally enrolling in teacher education. The fact that distance learning scenarios in teacher education can be more easily implemented through VR (Van Der Want & Visscher, 2024) may likewise lend further support to this argument.

Approach 2: VR for language competence development

The integration of VR for developing language competences involves using VR environments to promote language acquisition and skill development, while simultaneously developing digital, cultural, and global competencies. In language teacher education, this means that pre-service teachers learn how to select and use appropriate VR software as well as develop and evaluate VR-based language learning. Meta-analyses and systematic reviews report largely positive effects from the perspective of learners, with benefits clearest for contextualized vocabulary learning and when learners receive repeated exposures to VR tasks; overall effectiveness varies by task design and implementation fidelity (Dhimolea et al., 2022). A further meta-analysis suggests that (low-immersion and high-immersion) VR can reduce language anxiety and enhance motivation, performance, satisfaction, and self-efficacy compared with traditional methods (Yu & Duan, 2024). Drawing on this evidence, an examination of the possibilities of using VR for fostering language competence reveals two sub-approaches:

The first sub-approach, language practice in VR, uses purpose-built VR apps to rehearse language in (partly simulated) scenarios. For instance, in a study by Lee and Wu (2024), Korean pre-service English teachers designed micro-teaching units with *Immerse*. Despite no prior VR experience, participants navigated the environment intuitively and designed didactic scenarios to foster speaking, writing, and lexico-grammatical development, employing methods such as role-plays, interactive objects, and multimedia input.

The second sub-approach entails shifting from using environments to creating them. It involves learners and pre-service teachers creating multimodal VR content, thus fostering productive and receptive language skills and digital competence (Summer et al., 2025). Co-design and prototyping tasks in VR (and social VR, cf. Approach 3) can position learners and pre-service teachers as VR-designers: They construct scenes, artefacts, and narratives that others interpret (Wengler & Rempel, 2026). Research on collaborative design points to benefits such as heightened process awareness, more equitable participation, and stronger connections between linguistic expression and design intent (Dorta et al., 2019). Approaches such as story-envisioning systems or card-based scene construction have been found to support joint problem-solving and narrative coordination (Mirzaei et al., 2019; Yu

jlb no. 1/2026 https://doi.org/10.35468/jlb-01-2026-01

et al., 2025). Experiments with agent-supported role-play also suggest potential for low-pressure improvisation (Pan et al., 2024). Existing contributions include design recommendations for VR English-learning applications (e. g., 18 recommendations in Esteves et al., 2023), VR content created with authoring tools such as *AR2VR* combined with reading picturebooks (Summer & Flämig, 2025), a university seminar integrating VR content creation by undergraduate English teachers (Schnellbögl, 2026, this special issue), and Spanish teacher-education seminars where students produced task-based 360° videos inspired by literary works (Wengler & Rempel, 2026). Although promising, this line of work remains rather sparse, likely due to limited affordable authoring tools and the time required to design effective VR scenarios (Summer et al., in press). Overall, several practical and technological constraints remain key issues in the use of VR for language education – both from the perspective of learners and teacher education. App availability poses a challenge with VR apps such as *Mondly VR*, *VirtualSpeech*, *Immerse*, *ImmerseMe*, and *Google Expeditions* used to train language competences, despite their high cost and largely commercial focus (e. g., Elhambakhsh et al., 2024; Figueroa Flores et al., 2022; Kaplan-Rakowski et al., 2023; Wu & Chun, 2025; Huang et al., 2023). These studies point to substantial technological, financial, and pedagogical barriers that currently prevent VR from becoming routine in school-based language learning. Successful integration, as they emphasize, requires reliable hardware and high-quality headsets, compatible and goal-oriented software, stable internet connectivity, and on-site technical support.

Approach 3: Social VR for expanding learning spaces

When the concept of VR is developed further within a postdigital educational perspective, it unfolds as a medium of spatial and relational expansion. Learning thus takes place across transcultural and newly emergent spaces in which the boundary between analogue and digital practices dissolves, giving rise to hybrid ecologies where the classroom becomes porous and dynamically co-constituted (Köstler-Kilian, 2024).

This relational framing allows for more concrete instantiations of VR as social and networked practice. A prominent example is social VR, which refers to networked, avatar-based 3D environments accessed

through head-mounted displays. Unlike two-dimensional videoconferencing, social VR situates learners in co-present, embodied settings where spatial audio, gesture proxies, and shared artefacts sustain joint activity. Platforms such as *ViLeArn* (Eisenmann & Steinbock, 2024) allow learners to assume alternative identities and engage in target-language interactions designed to cultivate both cultural and communicative competence. Empirical studies show that engagement, willingness to communicate, and linguistic performance – both receptive and productive – improve when interaction occurs in shared, goal-oriented spaces rather than through abstract drills (Ciekanski et al., 2020; Jehma & Akaraphattanawong, 2023).

In literature education, VR enables a shift from *discussing* texts to *enacting* them. When learners co-construct scenes in a virtual world, they continuously negotiate stance, focus, and point of view – moment by moment – thus transforming interpretation into embodied dialogue. Research on the chronotope (a concept that described how time and space are connected and fused into a concrete whole within a narrative; Vallance & Towndrow, 2022) and immersive theatre (Dooley, 2024) demonstrates that stories can unfold through embodied dialogue and spatial positioning rather than through fixed sequence (Ballis et al, 2025). In this dramaturgical mode, VR becomes a stage for co-authored agency (Lawrence & Ahmed, 2023), where role, tension, and viewpoint – long central to drama pedagogy – can be rehearsed, paused, and rendered linguistically explicit. Studies with pre-service teachers (Nousiainen et al., 2023) indicate that such practices foster affective presence, empathy, and group cohesion, which in turn translate into more reflective teaching.

Extending this dialogical and performative potential, inter/trans/cultural learning adds a further dimension to this field. Because VR creates worlds with its own spatial conventions, artefacts, and interfaces, cultural difference is not encountered as distant and abstract, but as situated interaction. Learners negotiate stance, repair misunderstandings, and align meaning across languages in the immediacy of shared space (Jauregi-Ondarra et al., 2021; Ahlers et al., 2022). Design research further shows that curated artefacts and spatial prompts can encourage noticing, vocabulary development, and cultural reflection (Hein et al., 2022).

Taken together, these findings foreground not only new forms of learning, but also new demands on pedagogical design and profes-

jlb no. 1/2026 https://doi.org/10.35468/jlb-01-2026-01

sional judgement. For teacher education, in line with a task-based, action-oriented approach, these developments entail more than ever a shift from content transmission to the design of conditions for purposeful, reflective interaction.

At a deeper level, this shift is not merely didactic. It reveals a postdigital logic: Immersive practice does more than enhance communication; it reconfigures corporeality, presence, and relation. Bodies extend through technological infrastructures, perception becomes distributed, and meaning arises in negotiation with machinic partners (Schwarz & Mauersberger, 2023; Przybylka, 2022). Within such assemblages, teachers and students inhabit overlapping spatialities that demand attentiveness, empathy, and metacognitive awareness. The pedagogical challenge, then, lies not in producing ever more realistic simulations but in cultivating *literacy for hybridity* – the capacity to perceive how knowledge and agency emerge within fluid human-machine ecologies (Schlag & Yadav, 2023).

Guiding questions and future perspectives

The integration of VR in language teacher education provides a wide range of learning opportunities, which we described above as three complementary approaches: simulation-based training, competence-oriented language practice, and social VR for expanding learning spaces. Table 1 summarizes these approaches, highlighting several affordances with the aim of encouraging teacher educators to establish clear criteria for selecting appropriate VR apps, designing purposeful didactic scenarios, and supporting pre-service teachers in a meaningful integration of VR into their practice, which includes developing goal-oriented tasks. A task-based approach is promising from the perspective of teaching practice because it foregrounds language development and uses task features to "recruit technologies" and target their affordances, integrating the digital design coherently into tasks for language learning (González-Lloret & Ortega, 2014, p. 6). In a postdigital understanding of language education, such developments in task design would involve treating VR as one element within hybrid learning ecologies, carefully coordinating immersive experiences with a range of tasks to support language development.

jlb no. 1/2026 https://doi.org/10.35468/jlb-01-2026-01

Table 1 Guiding questions for integrating VR in language teacher education

Affordances	Guiding questions
Approach 1: VR for teaching simulations	
• facilitation of increased practical experience in teacher education from the very beginning, under controlled and protected conditions	• How can immersive VR environments provide early teaching practice opportunities without exposing pre-service teachers to real-world risks or performance pressure? • In what ways do controlled and protected VR environments support the gradual development of teaching confidence and professional identity?
• simulation of classroom routines, teacher discourse, and crisis management in the target language in VR	• How effectively can VR simulations replicate authentic classroom dynamics, routines, and unexpected disruptions for training purposes? • What indicators can be used to assess the effectiveness of VR scenarios in training adaptive decision-making and professional resilience under pressure?
• simulation of teacher-student-interactions (e. g. questioning, error correction, and teacher-parent-interactions) in the target language	• How can VR-based simulations be designed to authentically model communicative patterns between teachers and students, including feedback and corrective dialogue? • How can AI-driven avatars in VR simulations be programmed to respond authentically to teachers' linguistic and emotional cues during interaction? • What are the opportunities and limitations of VR for training culturally responsive communication strategies in diverse classroom and parent-teacher contexts?
• promotion of reflective and empathetic capacities, and emotional awareness	• How can immersive VR simulations cultivate emotional awareness and empathy through embodied perspective-taking while safeguarding pre-service teachers from overwhelm or distress? • In what ways can collaborative debriefing after VR teaching simulations deepen pre-service teachers' reflection on their own emotions and strengthen their capacity to empathize with learners' perspectives?

jlb no. 1/2026 https://doi.org/10.35468/jlb-01-2026-01

Approach 2: VR for language competence development	
• promotion of language competence development	• Which VR apps are suitable for fostering specific language competences (e. g., speaking, lexico-grammatical, and cultural competence)? • Which didactic scenarios are required for a successful implementation in practice?
• increase in motivation	• Which VR apps offer engaging opportunities for language practice and how can motivation be sustained?
• reduction of anxiety and promotion of interaction	• How can learners be supported in becoming less anxious about language learning? • How can learners be supported in practicing speaking in VR (through AI-based interaction) in a relaxed environment?
• supporting task-based projects involving literary texts and encouraging creativity, productive language skills, and digital competence	• How can VR be combined with teaching literature in project-based work? • How can authoring tools foster a creative engagement with language/literature? • Which design principles should guide the creation of VR environments?
Approach 3: Social VR for expanding learning spaces	
• experimenting with voices, roles, and interaction, which can foster pragmatic fluency and deepen perspective-taking	• How can social VR be designed as a rehearsal space for identity, where turn-taking, and role-play become teachable moments?
• inter/trans/cultural encounters across distance, object-rich environments anchor stance-taking and mutual understanding in shared, lived experience	• How can inter/trans/cultural encounters across times and spaces in social VR be structured so that communication and collaboration across difference become routine practice?
• bodies, technologies, and meanings intertwine, thus teaching shifts from transmitting content to curating conditions for reflective interaction	• How can VR-based teacher education foster literacy for hybridity, that is, the ability to perceive and engage with learning in fluid human-machine environments?

Meaningful language and literature learning today unfolds within hybrid, postdigital ecologies in which presence, relation, and knowledge are co-constructed by human and technological actors alike. As

jlb no. 1/2026 https://doi.org/10.35468/jlb-01-2026-01

such, immersive media not only mediate learning but also participate in shaping epistemic and pedagogical realities. Teacher education is thus the site where technological affordances are interpreted and taken up in pedagogical practice, and where literacy for hybridity is fostered, that is, the capacity to perceive, design, and ethically engage with learning across human-machine ecologies. The guiding questions proposed here aim to support this process while also indicating areas for further conceptual development and research. Co-design, orchestration, and reflective debriefing remain vital. However, their purpose extends beyond technical competence to the cultivation of attentiveness, empathy, and critical agency within these learning environments. In this sense, VR challenges language teacher education to rethink not only how to teach *in* or *with* technology (VR in this case), but what it means to teach, learn, and communicate in relational worlds.

In this light, the postdigital perspective dissolves the binary of potential versus limitation. VR is neither an instrument to be mastered nor a threat to be contained, but a relational field of negotiation in which educational meaning depends on how design, ownership, and reflection configure human-technological entanglements; even as practical hurdles and technological challenges continue to have an impact on the practical implementation of VR. In this view and provided these challenges can be overcome, immersive learning expands the classroom into a living, hybrid culture of encounter – one that renders the invisible tangible, the distant proximate, and the new thinkable.

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