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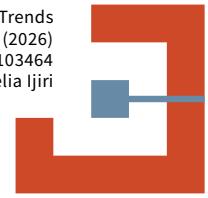

Castledown

"Another type of nervousness": Technological social presence anxiety in AI-mediated VR language learning

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This study investigates how Japanese university students experience AI-mediated speaking practice in immersive virtual reality (VR) environments, focusing on affective adaptation and digital literacy. Using a within-subjects design, 17 English as a Foreign Language (EFL) learners participated in both human-peer and AI-chatbot interactions within Ovation VR (Ovation, 2024), a pre-generative public-speaking simulator. Quantitative data from digital literacy and perception surveys were triangulated with qualitative reflections to explore self-efficacy, comfort, and anxiety patterns. Findings revealed a moderate positive relationship between digital literacy and AI comfort (r = .34) and identified "another type of nervousness" a form of technological social presence anxiety arising from limited emotional feedback in AI interactions. Students with higher digital literacy exhibited greater self-regulation and adaptability, whereas lower-literacy learners reported confusion and discomfort. These results extend socio-technical learning theory by illustrating how affective and regulatory processes are co-produced through human–AI interaction, providing insight for culturally responsive AI integration in language education.

Keywords: AI-mediated learning, digital literacy, EFL, virtual reality, language anxiety

As digital technologies increasingly mediate human communication, language educators face a critical juncture: understanding how learners navigate between human-centered and AI-mediated learning experiences. This transformation extends beyond technological adoption, challenging assumptions about social presence, authenticity, and the role of human interaction in second language acquisition.

Recent research has demonstrated VR's efficacy in reducing foreign language anxiety and increasing engagement and motivation in language learning contexts (Gruber & Kaplan-Rakowski, 2023; Thrasher, 2022; York et al., 2021). Simultaneously, AI chatbots have shown promise in providing non-judgmental practice opportunities

for language learners (Zou et al., 2023). The research contributes to understanding the socio-technical transformation occurring in language education and provides insights into the potential of AI-VR integration for personalized language learning experiences.

Methodology

This study employed a within-subjects experimental design with 17 first-year university students (aged 18–19; 70% male, 30% female) from two English language classes at a Japanese university. Participation in this study was voluntary. Of the 30 students initially recruited, 13 were excluded from analysis due to incomplete data. The study was conducted at the conclusion of a 15-week semester, ensuring participants had established familiarity with course expectations and peer interactions. Students had prior exposure to chatbots as group collaborators in text-based classroom activities (e.g., brainstorming, writing feedback) but no previous experience interacting with chatbots in immersive virtual reality environments or in one-to-one or one-to-three interview-style simulations. . The research was carried out at the end of the semester to maximize the validity of comparisons between human-peer interactions and AI-chatbot encounters. The course emphasized creative communication and intercultural competence rather than technical mastery.

Procedure

The study was conducted over three consecutive class periods within the regular course schedule. In the first class, students completed a "2024 Wrapped: Year in Review" worksheet containing 30 personal reflection prompts, such as "What was the most exciting event of your year?", "What new thing did you learn?", and "What was something you were proud of?". They were instructed to prepare to answer any of these topics in the following week's classmate interview activity.

In the second class, students worked in groups of three to interview one another using the written responses as prompts. This stage aimed to reinforce spontaneous questioning strategies, peer listening, and elaboration techniques.

In the third class, each student delivered a one-minute individual presentation in Ovation VR based on one of their selected topics, followed by a Q&A session with AI chatbots configured to ask topic-related follow-up questions. This final task represented the AI-mediated condition contrasting with the human-peer interview as the control condition.

VR platform and AI chatbot configuration

The Ovation VR platform used in this study was the pre–January 2025 version, used with a laptop computer not VR headsets. Ovation VR's platform featured a teacher's dashboard that showed the speaking analytics and transcripts. However, the teacher did not have access to directly write prompts for the chatbots. Instead, the setting on the dashboard could be set for different difficulty for the Chatbot Q and A sessions ranging from hostile to friendly. The chatbot questions were AI-generated

context-specific based on the student's personal topic such as "What was the most memorable thing you experienced in Vietnam? or "Who cooks the special food at New Year's in your family?", which were converted to synthetic speech and delivered through virtual avatars.

Instruments

The digital literacy questionnaire, adapted from the ISTE Standards following Mills and White (2010) and Healy and Kennedy (2024) focused on the subdomains of Information Fluency, Creative Communication, and Digital Literacy demonstrated acceptable internal consistency in a pilot test.

The post-intervention survey, adapted from Ijiri's pilot (Mori et al., 2023) retained key constructs of comfort, perceived usefulness, perceived pressure, and interaction preference and added two items on automated feedback and perceived human-likeness. Foreign Language Public Speaking Anxiety (FLPSA) was measured using an adapted version of the Foreign Language Classroom Anxiety Scale (Horwitz et al., 1986) modified for virtual reality contexts, but as the instrument was lengthy and completed fully by only one participant, it was omitted, and no statistical analysis was conducted.

Instead, indicators of foreign language anxiety were inferred qualitatively from participants' open-ended post-intervention responses and reflective comments. Students frequently described emotional reactions such as "a different kind of nervousness" or "feeling tense when the AI could not show expressions." These responses were coded thematically under *affective reactions to AI interaction* and triangulated with observations self-reported comfort levels.

Data analysis

Qualitative data from post-intervention surveys and reflections were manually coded using an inductive thematic approach by the first author and refined through axial grouping to identify consistent patterns in student perceptions, emotional responses, and preferences.

Results

This exploratory study sought to identify the key cognitive, affective, and digital literacy factors influencing learners' comfort and engagement in AI-chatbot–mediated interaction within an EFL context.

Descriptive and correlational findings

Although the study was primarily qualitative, quantitative data provided complementary insight into learners' baseline profiles and their responses to AI-mediated activities. Descriptive analysis of the digital literacy items (24 Likert-scale questions) revealed generally high self-perceived competencies, with item means ranging from M = 3.59 to 3.95 (SD ≈ 1.05–1.10) on a 5-point Likert scale. The composite

digital literacy score from the chatbot dataset averaged M = 3.70 (SD = 0.45), while the AI-related creativity and comfort measure averaged M = 3.55 (SD = 0.37).

A Pearson correlation analysis was conducted to explore the relationship between students' digital literacy and their comfort and creative engagement with AI chatbots. The correlation was r = .34, suggesting a moderate positive relationship: learners with higher digital literacy tended to report greater confidence and comfort in interacting with AI systems.

Qualitative and thematic findings

Learners with stronger baseline digital competencies frequently noted that the AI interaction "helped me speak longer" or "made me think more," whereas lower-literacy peers reported "confusion" or "pressure from technology."

Students who described themselves as confident in creating and evaluating digital content tended to view the chatbot as "a new partner" or "a tool that makes my talk smoother," whereas those with lower creative fluency expressed uncertainty about AI's usefulness.

Nine students preferred the human interaction, five favored the AI condition, and three remained neutral. High-literacy learners described their experience with terms such as "helpful," "interactive," and "interesting," reflecting empowerment and curiosity. In contrast, lower-literacy learners emphasized challenges, using phrases such as "hard to understand" or "no feedback," indicating uncertainty and lack of confidence.

The phrase "another type of nervousness" emerged as a salient affective theme. Students reported feeling anxious not because of social judgment, but due to the unpredictability and lack of emotional feedback from the AI audience as reported in the lower digital literacy group. Comments highlighted the absence of facial expressions, tone variation, and timing consistency, which made the experience cognitively demanding. This suggests a shift from social-evaluative anxiety to performance-adaptive anxiety tied to machine unpredictability.

No significant gender or proficiency-level differences were observed in the data, and no evidence of longitudinal change or learning transfer appeared beyond immediate post-session reflections.

Discussion

The recurrent theme of "another type of nervousness" can be framed as technological social presence anxiety; anxiety produced not by human judgment but by *reduced/non-human social cues* (flat prosody, absent facial feedback, irregular timing). Simultaneously, moments of confusion when the system asked multi-clause or unintuitive questions suggest AI-mediated cognitive dissonance: learners reconciling expectations of human dialog with machine-driven turns that lack the usual interpersonal signals. Together, these effects position affect not only as an individual trait but as co-produced by the socio-technical ecology.

Students with stronger digital literacy

Students with stronger digital literacy reported higher self-efficacy and described the chatbot as a scaffold ("helped me speak longer," "made me think more"); adjusting performance with an AI partner. Thus, the AI is not a neutral aid; it affects socio-technical accounts of learning.

Cultural mediation and "gaming-like adaptation"

The qualitative findings reflect cultural mediation, as some learners reframed the VR chatbot as a low-stakes, video game-like experience, that reduced face-threat and encouraged experimentation, while others experienced tension due to mismatched politeness cues and turn-taking norms.

Addressing the challenge of human-like interactivity in AI tutoring systems.

The Warm Body Effect (Siler & VanLehn, 2009) in AI-mediated learning contexts offers insight into importance of human presence versus learners' self-regulatory capacity in shaping language learning outcomes. While Martin (2025) suggests that learning gains primarily correlate with student reflection rather than tutor format. Investigating whether high-digital-literacy learners can achieve comparable outcomes with AI tutors, or whether certain affective or cultural factors necessitate human presence, would help clarify the boundary conditions for effective AI integration in language education and inform more nuanced, culturally responsive implementation strategies.

Limitations and future directions

This exploratory study is limited by its small sample size (n = 17) from a single Japanese university, the use of a pre–2025 scripted version of Ovation VR that restricted dialogic naturalness, reliance on self-reported reflections and incomplete FLPSA data, absence of longitudinal follow-up, and occasional mismatches between AI question complexity and learner proficiency. Future research should adopt larger, more diverse samples across institutions, integrate mixed-method longitudinal designs, and explore the affordances of post-2025 generative Ovation VR updates to allow for deeper investigation into the co-regulation of affect, cognition, and technology in AI-mediated EFL learning environments, moving closer to resolving human-like interactivity in educational AI.

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