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Undergraduate Students' Perspectives of Virtual Reality Applications in an Intercultural Communication Course: An Exploratory Study

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Abstract: This study explores undergraduate students' evaluations of three Virtual Reality (VR) applications—Wander, Bodyswaps, and VirtualSpeech—integrated into an entry-level intercultural communication course at a university in the Midwestern United States. The experiment aimed to enhance students' cultural awareness, empathy, and public speaking skills aligned with the course's learning outcomes through immersive learning experiences. Both quantitative and qualitative data were collected from 48 participants via survey, which gathered participants' background information and their perceptions of effectiveness, engagement and overall feedback after experimenting with the VR applications. Findings indicate that while participants generally perceived these three VR apps as effective learning tools, their impact varied by application type and skill areas. Wander increased awareness of cultural diversity but was limited in terms of interactive communication skill development. Bodyswaps was effective for fostering perspective-taking skill, and VirtualSpeech supported the development of public speaking skill, though some *participants* raised concerns about the quality of AI-generated feedback such as reliability and personalization in both applications. Despite a few reports of minor physical discomfort using VR headsets, students overall found the three VR applications engaging and recommended their continued use in communication classes. Finally, participants highlighted the need for improved scenario design, enhanced AI feedback, and stronger connections between conceptual understanding and actionable intercultural communication skills to maximize learning outcomes in VR environments.

Keywords: virtual reality; intercultural communication; cultural awareness; perspective-taking; public speaking; student engagement; AI-driven feedback; immersive learning; VR effectiveness

1. Introduction

The integration of VR into education and training has gained significant momentum in recent years (Evangelou et al., 2025), driven by the "lower cost and increased access" of VR technologies (Kaser et al., 2019, p. 17). VR can be utilized to enhance conceptual understanding, to facilitate skill development through realistic simulations or to foster cognitive development. VR is also capable of creating immersive environments that support linguistic and cultural competency. Research also highlights its role in fostering essential 21st-century skills such as critical thinking, creativity, collaboration, and communication (Adelana et al., 2023).

Although the adoption of VR in classrooms is still developing (Radianti et al., 2020), previous studies pointed out that there is a lack of studies on teachers and students' perspectives on integrated virtually situated learning

(Schott et al., 2024) and most VR studies are experimental rather than fully developed educational interventions (Asad et al., 2021). Furthermore, numerous studies have explored the effectiveness of VR in various academic fields, such as STEM and science education, mathematics instruction, computer science courses, engineering education, healthcare education, etc. (Fink et al., 2023; Adelana et al., 2023), where it provides interactive and engaging learning experiences. Despite its broad application across multiple disciplines, the potential of VR in communication education remains largely unexplored. In addition, few studies have examined how VR tools—such as Meta Quest headsets and AI-driven applications—can transform communication instruction. The purpose of this study is to explore how VR can enhance students' cultural awareness (via Wander App), perspective-taking abilities (via Bodyswap App), and presentation skills (via VirtualSpeech App) in AI-integrated VR environments.

2. Theoretical Foundations

Virtual Reality has emerged as a transformative tool in education, offering immersive and interactive learning experiences that align with several major learning theories, which has also been cited frequently in VR-related studies as reviewed by Radianti et al. (2020). Constructivism emphasizes that learners actively build knowledge through experiences making VR an ideal tool for immersive, hands-on learning. Sociocultural theory (Vygotsky, 1978) highlights the role of social interaction and guided learning, which VR facilitates through collaborative virtual spaces. Social learning theory (Bandura & Walters, 1977) also highlights the role of observation, modeling, and feedback in skill acquisition—elements that AI-driven VR environments enhance by providing real-time responses and adaptive communication scenarios. Additionally, participatory learning theory (Lave & Wenger, 1991) positions learning as a socially situated process, emphasizing the importance of active engagement in authentic communication settings. These theoretical perspectives converge to support the notion that targeted skills are best developed through contextualized practice.

When applied to communication education, these theories explain how VR can enhance teaching and learning in ways that traditional methods cannot. Traditional classroom settings for communication courses often rely on reading, discussion, reflection, classroom presentation and paper writing, but they provide limited opportunities for students to practice communication in diverse settings or receive individualized, personalized feedback on their communication skills. AI-powered VR has the potential to address these limitations by offering immersive, interactive scenarios where students interact with AI roleplay simulators and receive real-time feedback. As Donally (2022) notes, "individualized exploration with AR/VR can inspire passion and interest in topics that students might otherwise find boring, especially when taught using traditional methods" (p. 16). Take Bodyswaps as an example, it can provide precise, real-time feedback on aspects such as hand gestures, eye contact (measured as a percentile), speaking pace (words per minute), volume, and intonation. Furthermore, it can evaluate and score students on critical interpersonal skills such as showing respect, perspective-taking, withholding judgment, and naming and validating emotions—feedback that would be difficult for educators to provide with the same level of precision and detail in a limited time frame. By integrating AI-driven VR apps into the learning environment, this study seeks to "bypass the restrictions and limitations" (Donally, 2022, p. 16) of traditional teaching methods and provide students with a more engaging and practical way to develop intercultural communication skills.

3. Literature Review

3.1. Virtual Trips to Increase Cultural Awareness

VR has increasingly been used to create immersive field trip experiences, allowing students to explore distant, inaccessible, or historical locations from their classrooms. Research has highlighted the educational benefits of VR-based field trips, particularly in enhancing engagement, simplifying complex concepts through visualization, and providing access to lost or restricted environments. For example, Boffi et al. (2023) examined the impact of VR immersion on human learning processes and found that VR facilitates a deeper understanding of historical sites by offering an interactive and immersive experience. In a similar vein, Silva et al. (2023) reviewed the role of participatory activities in augmented reality cultural heritage experiences, emphasizing their ability to increase engagement and emotional and sensory connections with historical content. These studies suggest that VR can significantly enhance learning by making abstract or distant concepts more tangible and personally relevant. Wander is a VR application that enables users to explore global locations from a convenient indoor space. Utilizing Google Street View data, Wander allows for immersive travel experiences, enabling users to virtually visit landmarks, cities, and remote areas worldwide. Features include voice search, historical imagery, and collaborative exploration with friends, which can enhance the interactive experience.

As shown in Figure 1, Wander provides an immersive 3D visual environment that allows participants to virtually "visit" locations around the world. Although it does not include interactive agents, it supports cultural

perspective taking by enabling users to explore diverse real-world settings in a first-person view. Prior studies have demonstrated Wander's potential in communication-related fields. For instance, Hester and Lu (2023) investigated its use in university communication classes to enhance intercultural competence. Participants who explored various cultures and locations through Wander reported increased motivation to learn about foreign countries and cultures. Additionally, Gruenewald (2023) detailed the design and implementation of a virtual field trip course in American Studies using Wander, highlighting its effectiveness in providing experiential learning opportunities that would be challenging to replicate in traditional classroom settings.

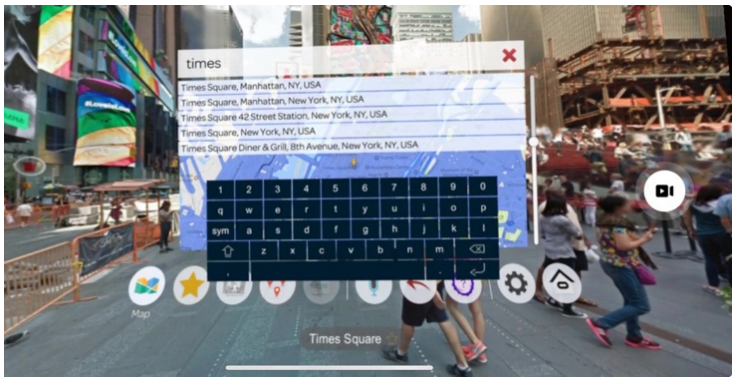

Figure 1. Example scene from the Wander VR Application.

3.2. Virtual Scenarios to Develop Perspective Taking Skills

VR has been widely used to foster empathy through perspective-taking activities across different fields. In the healthcare field, for example, VR simulations immerse disability workers and pre-service health professionals in first-person patient experiences (Wilding et al., 2023), enhancing their ability to adopt another's perspective and respond with empathy (Bearman et al., 2015). In immersive storytelling, VR enables users to embody another person's perspective through multimodal experiences, strengthening emotional and cognitive empathy (Young et al., 2022; Shin, 2018). For children, VR-based empathy games engage young users in narrative-driven interactions, supporting the development of perspective-taking skills (Muravevskaia & Gardner-McCune, 2023). These studies demonstrate VR's effectiveness in cultivating empathy by allowing users to step into another's world.

Bodyswaps places participants in a structured scenario where they interact with embodied AI characters during a communication task (see Figure 2). After completing the interaction, the system enables users to "swap bodies" with the AI avatar, allowing them to re-experience the conversation from the other person's point of view. The platform then generates targeted feedback based on the user's verbal (Figure 3) and non-verbal performance (Figure 4).

Figure 2. Empathy training module in Bodyswaps.

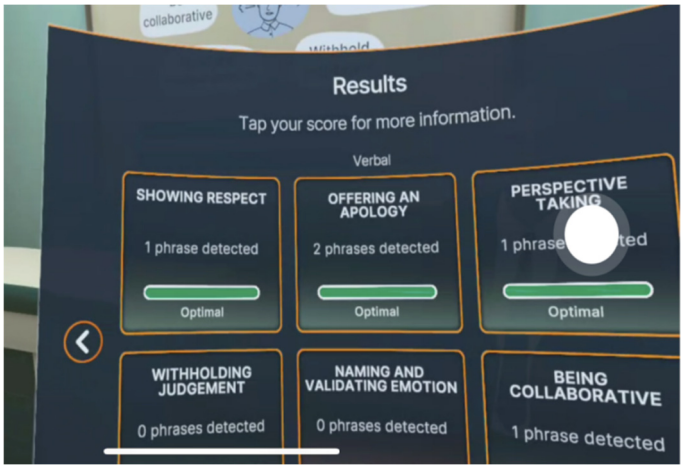

Figure 3. AI feedback (verbal) from the Bodyswaps.

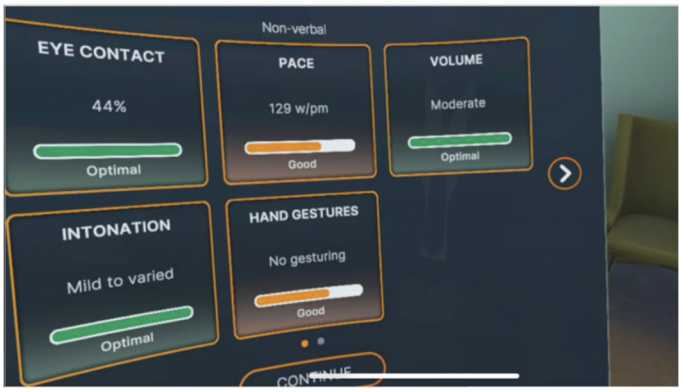

Figure 4. AI feedback (non-verbal) from the Bodyswaps.

Bodyswaps first gained recognition in 2019 when an early version of its soft-skills training simulator was shortlisted for the VR Education and Training of the Year category at the VR Awards (Bodyswaps, 2019). The full Bodyswaps platform was later officially released in 2021. Recent studies have explored its effectiveness in various training contexts. Boel (2024) examined how higher education students perceive Bodyswaps for communication skills training, finding that factors like performance expectancy and social influence affect their willingness to adopt the technology. Shilling et al. (2025) investigated its use in medical education, showing that Bodyswaps helps students develop strategies for handling difficult conversations, particularly with angry patients. Frigenti (2025) explored its role in equity, diversity, and inclusion (EDI) training, highlighting its potential to foster empathy and awareness of workplace biases. These studies collectively demonstrate how Bodyswaps leverages VR's capacity for perspective-taking to enhance communication skills across different professional and educational settings.

3.3. Virtual Environment to Practice Public Speaking Skills

Recent research has highlighted the effectiveness of VR in enhancing presentation skills by providing immersive, interactive, and anxiety-reducing training environments. Tangsripairoj et al. (2024) developed Speech Lab VR, a system designed to help university students refine their presentation skills through self-practice and AI-generated feedback, addressing common challenges such as nervousness, poor eye contact, and time management. Similarly, Valls-Ratés et al. (2022) demonstrated that unguided VR training improved high school students' voice clarity and reduced public speaking anxiety, making VR a promising tool for early oral communication education. Chen (2024) further explored the impact of VR on English as a foreign language (EFL) learners, finding that VR-facilitated instruction significantly lowered public speaking anxiety compared to traditional methods, with AI-generated feedback enhancing learning outcomes. Collectively, these studies illustrate how VR's immersive nature supports the development of communication skills by providing a safe space for practice, immediate feedback, and anxiety reduction, reinforcing its potential for public speaking and presentation training.

VirtualSpeech functions similarly to Bodyswaps by offering a range of realistic scenarios, such as job interviews or presentations (Figure 5). After users complete the task, the application provides automated AI-driven

feedback on elements such as content, filler words, speaking pace, eye contact, listenability, and body language (Figure 6). This feedback loop helps users reflect on and improve their communication skills within contextually rich environments. Several pioneering studies have shown its effectiveness in developing public speaking and interview skills by increasing self-efficacy, reducing anxiety, and promoting skill transfer to real-world scenarios. For example, studies (e.g., Allen et al., 2025; Shafiee Rad, 2024) integrating VirtualSpeech into public speaking courses and language learning programs have found that structured VR practice improves preparedness, engagement, and speaking proficiency, with some learners also experiencing reduced communication apprehension. In vocational training, VirtualSpeech combined with behavioral skills training has helped students with disabilities develop and generalize interview skills (DuBois, 2023). These findings highlight VR's potential as a powerful tool for communication training, offering structured, engaging, and transferable practice for a range of learners.

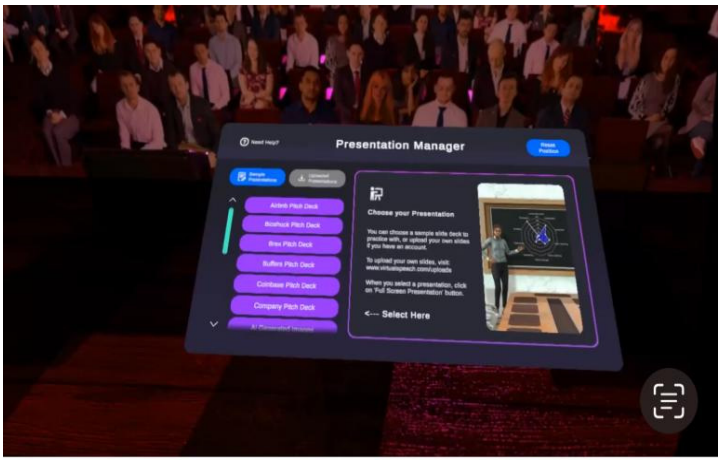

Figure 5. Presentation skill training in VirtualSpeech.

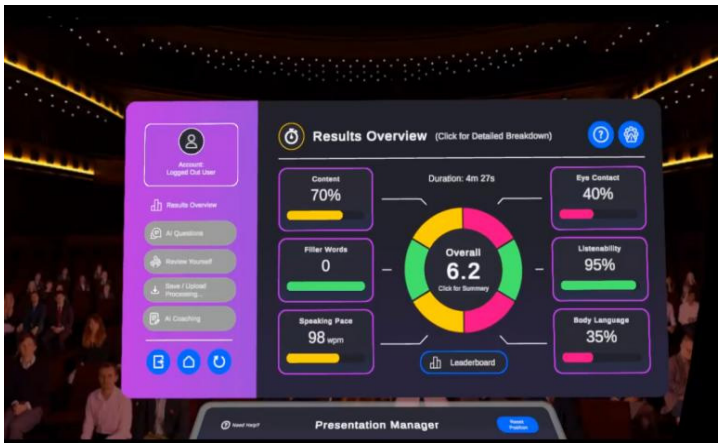

Figure 6. Example AI feedback in VirtualSpeech.

4. Summary of Research Gap and Research Questions

Advancements in technology, such as generative AI and speech recognition, have elevated VR to new levels, enabling interactive experiences through simulated avatars. However, research on AI-driven VR for communication skills development remains limited, primarily focusing on healthcare and language acquisition, with participants often restricted to medical students or EFL learners—groups that may not fully represent the broader higher education population. Additionally, findings on VR's effectiveness in skill development are mixed; while some studies report positive outcomes (Lacle-Melendez et al., 2024), others highlight a lack of rigorous empirical evidence supporting its impact (Villalba et al., 2021). Although pioneering studies have explored the three VR applications central to this study, further research is needed across diverse participant groups and contexts to examine how VR can reshape communication instruction. In particular, there is a need to explore how VR headsets can enhance students' cultural awareness, perspective-taking abilities, and presentation skills.

In this study, Wander was chosen because one of the course objectives is for students to understand cultural differences across regions and countries. By placing students in a variety of virtual environments, Wander allows

them to observe cultural variations firsthand, supporting experiential learning even though it cannot capture all aspects of culture. Bodyswaps was selected due to one of its modules focusing on empathy skills, which are essential for effective intercultural communication. Bodyswaps enables students to experience their own performance from another person's perspective, fostering self-reflection and perspective-taking in realistic social scenarios. VirtualSpeech was included because oral communication is a key skill for all students in the course. This application allows students to practice presentations or interviews in immersive scenarios and provides AI-driven feedback to improve their communication skills.

The following research questions guide this study:

(1) To what extent are VR apps such as Wander perceived by students as effective tools for cultural exploration?
(2) To what extent are VR apps such as Bodyswaps perceived by students as effective tools for perspective-taking?
(3) To what extent are VR apps such as VirtualSpeech perceived by students as effective tools for improving public speaking skills?
(4) Overall, how do students perceive the integration of VR into intercultural communication learning, including its perceived affordances and limitations?

5. Methodology

5.1. Participants' Background

The participants (N = 48) completed several background questions to provide the researchers background information. Answers to the questions indicate that the study primarily involved freshmen and sophomores. This is reasonable as the study was conducted in a 100-level university introductory general education course (three sections in 2025) for intercultural communication competence, with the majority of enrollees being first- or second-year students from a variety of different majors (integrative studies, business, health care, liberal arts, psychology, etc.). The demographics included 44% identifying as male, 44% as female, and 12% as non-binary or third gender or prefer not to tell.

Although a few participants had prior experience with Meta Quest headsets, this was limited to casual gaming; none had previously used VR for intercultural learning. When asked to self-assess their intercultural communication confidence, 49% rated themselves as average and another 33% as somewhat above average. Over half (56%) reported regular cross-cultural interactions. Despite this, many noted common challenges in intercultural communication, including fear of causing offense, language barriers, limited cultural knowledge, and differences in humor.

5.2. Procedure

The study followed a structured sequence. Participants who consented to participate had the option to stay in class for VR sessions after regular teaching and use the VR headsets two to three times (30 min each time) and engage with one or two applications each time. Students rotated their participation in VR sessions across the semester. By spreading participation over multiple weeks, all students had sufficient opportunity to access the equipment and engage with each of the three applications.

Before the experiment started, participants first completed Section 1 of the survey (participants' background), which gathered demographic information, prior VR familiarity, and baseline intercultural communication competence. Then participants got to know the basic function of VR devices by completing some basic tasks (e.g., how to set up the guardian boundary, navigate the home menu, use the controllers to select, grab, and interact with objects, how to teleport or move in VR environments, etc.). This preparation process was about 15–20 min.

Then they began engaging with the VR applications (Wander, Bodyswaps, or VirtualSpeech) using Meta Quest 3 headsets. Each application session lasted about 15–20 min. They completed one application per session and continued with the remaining applications during their second or third stay. For each application, participants completed the following tasks:

- Wander (around 15 min): Each student selected 1–3 locations to explore in the 3D environments, aiming to observe cultural differences across regions and countries, such as visible variations in architectural styles, urban organization and density, street markets and public spaces, cultural or religious landmarks, local signs and other environmental cues that reflect regional cultural norms.
- Bodyswaps (around 20 min): Participants completed one learning module within the app on empathy skills training, practicing person-centered communication and perspective taking with a virtual patient and then re-experiencing the conversation from the patient's perspective to reflect on their communication behavior. This app also provided AI-driven feedback on their performance.

- VirtualSpeech (around 15 min): Students practiced a presentation or interview in a virtual scenario, choosing from virtual environments such as a meeting room or an auditorium, etc. After completing the task, they received AI-driven feedback on aspects of their performance, such as speech clarity, pacing, confidence, eye contact, etc.

After completing the VR sessions, participants filled out the remainder of their survey, evaluating the effectiveness of the VR applications in fostering cultural awareness, empathy and presentation skills and providing feedback on their experiences.

5.3. Study Design

The survey was designed by the researcher to assess participants' backgrounds, experiences, and perceptions of VR technology in intercultural learning. Survey question development was informed by literature review and expert consultation. Two professors in the field of education reviewed the instrument for content validity and clarity prior to deployment. It comprised four sections:

- Section 1: Six questions covering demographic details (year in school, gender), prior VR familiarity (multiple-choice and open-ended responses), and baseline intercultural communication competence (multiple-choice and open-ended responses).
- Section 2: Fifteen Likert scale questions evaluating the effectiveness of the three VR applications, five questions each (Wander, Bodyswaps, VirtualSpeech) in terms of user engagement, cultural awareness, and communication skill improvement.
- Section 3: Six Likert scale questions focused on self-evaluation, assessing how VR influenced participants' intercultural competence, understanding of cultural differences, confidence in communication, and preparedness for cross-cultural interactions.
- Section 4: A combination of Likert scale and open-ended questions (six in total), gathering feedback on comfort with VR technology, preferences for specific VR modules, extent of physical discomfort, and suggestions for improving future VR-based learning experiences.

5.4. Survey Reliability Test

Internal consistency for Section 2 (three apps separately) and Section 3 (six items on overall evaluation) was assessed using Cronbach's alpha, with thresholds following Kline's (2000) criteria ($\alpha \geq 0.7$ acceptable, ≥ 0.8 good). The Wander ($\alpha = 0.82$) and VirtualSpeech ($\alpha = 0.89$) modules demonstrated good-to-excellent reliability, while Bodyswaps reached acceptability ($\alpha = 0.75$). Section 3's self-evaluation scale was also reliable ($\alpha = 0.79$). Sections 1 and 4, containing open-ended responses, were analyzed thematically.

5.5. Data Analysis

Quantitative data from the Likert scale questions (Sections 2–4) were analyzed using descriptive statistics to examine trends in participants' responses. For each Likert-scale question, the frequency of responses for each scale point (1 to 5) was calculated, and the mean and standard deviation were computed to assess the central tendency and variability of responses. Open-ended qualitative responses from Sections 1 (background and VR familiarity), Section 4 (feedback on VR modules, comfort, and suggestions for improvement), and other areas were analyzed using thematic analysis. Responses were coded into categories based on common themes or keywords that emerged across participants. The themes identified were related to participants' prior VR experiences, specific features they found helpful in each VR module (i.e., Wander, Bodyswaps, VirtualSpeech), discomfort during VR use, and suggestions for improving VR technology and learning outcomes.

6. Results

Q1: To what extent are VR apps such as Wander perceived by students as effective tools for cultural exploration?

Results for Wander App (Table 1) indicate that participants generally found the Wander App visually appealing and valuable for cultural exploration. A majority (77%) agreed that the VR images of global destinations were attractive, with a mean score of 4.0 (SD = 1.1), demonstrating positive reception despite some variation in responses. Interest in using VR for cultural exploration was particularly strong, with a mean score of 4.7 (SD = 0.5); notably, 67% strongly agreed, and 33% agreed, reflecting unanimous enthusiasm. Participants also found the VR visuals informative, as the statement "The VR images provided practical insights for learning about different cultures" received a mean rating of 4.0 (SD = 0.6). Similarly, increased cultural awareness was reported, with a mean score of 4.0 (SD = 0.7), though 22% remained neutral, suggesting room for enhancing immersion.

Importantly, all respondents (100%) felt that the VR journey stimulated their curiosity about global cultural practices, as reflected in the strong mean score of 4.3 (SD = 0.5). Overall, the Wander App effectively sparked curiosity (M = 4.3) and provided practical insights (M = 4.0), reinforcing its potential as a tool for cultural learning.

Table 1. Effectiveness of Wander App (cultural exploration).

Questions (Likert Scale: 1= Strongly Disagree → 5 = Strongly Agree)	M	SD
1. The VR images of global destinations were very attractive.	4.0	1.1
2. I am interested in using VR to explore world cultures and landmarks.	4.7	0.5
3. The VR images provided practical insights for learning about different cultures.	4.0	0.6
4. The VR experiences increased my awareness of cultural diversity.	4.0	0.7
5. The VR journey stimulated my curiosity about global cultural practices.	4.3	0.5

Q2: To what extent are VR apps such as Bodyswaps perceived by students as effective tools for perspective-taking?

As for the effectiveness of Bodyswaps (Table 2 below), results indicate that participants found the Bodyswaps VR experience immersive and engaging (M = 4.3, SD = 0.6), with all respondents reacting positively. The app effectively raised awareness of how cultural identity shapes perspectives (M = 4.0, SD = 0.5), with 88% agreeing. Responses were more divided on understanding others' viewpoints (M = 3.5, SD = 0.5), with half agreeing and half remaining neutral. Role-switching enhanced awareness of cultural and interpersonal differences (M = 4.0, SD = 0.8), though a quarter remained neutral. Increased empathy toward diverse backgrounds was reported (M = 3.8, SD = 0.8), with some participants highlighting the value of experiencing communication challenges from different perspectives.

Table 2. Effectiveness of Bodyswaps App (empathy & perspective-taking).

Questions (Likert Scale: 1 = Strongly Disagree → 5 = Strongly Agree)	M	SD
1. The VR Bodyswaps experience was immersive and engaging.	4.3	0.6
2. I became more aware of how cultural identity shapes perspectives.	4.0	0.5
3. Bodyswaps helped me see situations from the viewpoint of someone from a different culture/position.	3.5	0.5
4. VR role-switching enhanced my awareness of interpersonal/cultural differences.	4.0	0.8
5. The Bodyswaps simulation improved my empathy toward diverse cultural backgrounds.	3.8	0.8

Q3: To what extent are VR apps such as VirtualSpeech perceived by students as effective tools for improving public speaking skills?

Regarding VirtualSpeech, the survey results (Table 3) indicate mixed perceptions of the VirtualSpeech app's realism, with a mean rating of 4.0 (SD = 1.1). While 38% strongly agreed that the VR environment was realistic and supportive, the variation in responses suggests differing levels of immersion. Despite this, interest in using VR for public speaking practice was high (M = 4.3, SD = 0.9), with 88% expressing a willingness to incorporate it into their skill development. Practicing speeches in VR contributed to increased confidence in addressing diverse audiences (M = 4.3, SD = 0.9), and 88% found the feedback effective in refining their communication skills (M = 4.3, SD = 0.9). However, the standard deviation suggests some variation in how participants perceived the AI-generated feedback. Notably, all respondents (100%) agreed that the app improved their ability to adapt to multicultural audiences, reflected in the highest mean score of 4.4 (SD = 0.7), emphasizing its value in cross-cultural communication training.

Table 3. Effectiveness of VirtualSpeech App (public speaking).

Questions (Likert Scale: 1 = Strongly Disagree → 5 = Strongly Agree)	M	SD
1. The VR environment for speech practice was realistic and supportive.	4.0	1.1
2. I am interested in using VR to improve my public speaking skills.	4.3	0.9
3. Practicing speeches in VR increased my confidence with diverse audiences.	4.3	0.9
4. The VR simulation provided effective feedback to refine my communication skills.	4.3	0.9
5. VR speech practice helped me adapt to multicultural audiences.	4.4	0.7

Q4. How do students perceive the integration of VR into intercultural communication learning, including its perceived effectiveness, affordance and limitations?

Students' self-evaluation on their VR training outcome (as shown in Table 4) indicate that participants perceived the VR training as moderately effective in improving intercultural communication skills (M = 3.2, SD = 0.4), with 78% rating it as moderately effective and 22% as very effective. Understanding of cultural differences showed slightly higher ratings (M = 3.4, SD = 0.9), though responses varied, suggesting room for deeper learning. Comfort in communicating across cultures increased modestly (M = 4.0, SD = 0.8), with most participants somewhat agreeing, though none strongly agreed, indicating that additional real-world practice may be necessary. The highest-rated outcome was VR's ability to provide valuable cultural insights (M = 4.3, SD = 0.9), with 88% recognizing its potential for broadening perspectives. However, preparedness for addressing cultural conflicts was less pronounced (M = 3.7, SD = 1.0), with 56% remaining neutral, suggesting a need for more scenario-based training. Reflection on cultural biases emerged as a key takeaway, with a mean rating of 4.2 (SD = 0.8) and 89% acknowledging increased self-awareness. Overall, participants valued VR for fostering cultural understanding and self-reflection but identified areas for improvement in conflict resolution and real-world application.

Table 4. Participants' perceived effectiveness of VR training.

Questions (1–5 Scale)	M	SD
1. On a scale from 1 to 5, how effective were the VR modules in improving your intercultural communication skills?	3.2	0.4
2. How much did the VR modules help you understand cultural differences?	3.4	0.9
3. I am more comfortable communicating with people from diverse cultural backgrounds after using VR for intercultural communication training.	4.0	0.8
4. I believe that VR can provide valuable insight into different cultures that improves communication skills.	4.3	0.9
5. After the VR training, I feel more equipped to address cultural misunderstandings or conflicts in communication.	3.7	1
6. I feel that the VR training encouraged me to reflect on my cultural biases and assumptions.	4.2	0.8

The final part of the survey solicits students' overall reflection on the VR experience in this class. It includes both multiple choice questions and open-ended questions. The quantitative responses from multiple choice questions are presented in Table 5 below:

Table 5. Participant feedback and reflections.

Questions (1–5 Scale)	M	SD
1. How comfortable did you feel using VR headsets for learning?	4.3	1.1
2. On a scale of 1 to 5, how much physical discomfort did you experience while using VR? (1 = no discomfort, 5 = extreme discomfort; e.g., dizziness, eye strain, nausea)	1.2	0.4
3. Would you recommend using VR for learning intercultural communication in future courses?	4.5	0.5
4. Overall, to what extent do you believe the feedback provided by the VR apps is accurate?	4.0	1.0

The quantitative analysis above shows that participants overwhelmingly supported VR's integration into intercultural communication training. 100% recommended VR for future courses (recommend or highly recommend), with near-perfect scores for comfort using the technology (M = 4.3/5, SD = 1.1). Physical discomfort was rare (M = 1.2/5, SD = 0.4), though feedback believability was moderate (M = 4.0/5, SD = 1.0), with equal thirds of respondents rating it "neutral", "somewhat believable", or "extremely believable". These results confirm strong acceptance of VR as a learning tool, albeit with reservations about AI-driven feedback accuracy.

The final section of the survey also included two open-ended questions. Participants were asked to briefly explain the reasons behind their responses to the multiple-choice items (e.g., any discomfort experienced, their level of trust in the AI feedback, and their recommendation rating). They were also invited to provide suggestions for improving the VR experience or making it more effective for communication-skills learning. For the qualitative replies from open-ended questions, the analysis shows that participants overall see numerous advantages of VR integrations in communication classes. Participants highlighted several key strengths of the VR training applications. Many praised the AI generated feedback—provided specifically by the Bodyswaps and

VirtualSpeech applications—noting its ability to track subtle communication cues. One participant stated, *"The feedback said I could have used my hands more, which was very accurate because I didn't use them the whole time. It also tracked my eye contact."* Another participant said, *"VR showed me how much tone matters in cross-cultural talks."* Others appreciated the conversational practice opportunities by commenting that *"I was impressed that it was able to hold a conversation and give feedback at the end"*. They also hold a positive attitude towards the system's overall educational value by stating that *"It worked well and gave good examples"* and provide comments like *"Very realistic and fun responses. They know a lot".* The immersive nature of VR—particularly in Wander, which does not provide feedback but allows free cultural exploration—was also affirmed. Comments such as *"Grand Canyon was beautiful—very immersive"* suggested that participants recognized VR's unique capacity to simulate authentic intercultural interactions.

Despite these advantages, participants identified existing issues as well. For example, the AI feedback system in Bodyswaps and VirtualSpeech drew mixed reactions, with some criticizing its accuracy (*"I felt like all the advice and guidance it gave wasn't completely accurate"*) and lack of nuance (*"The AI needs to be a bit more fine-tuned to respond more thoroughly. Right now, it feels like predetermined responses"*). Specific examples of problematic feedback included *"Some of the feedback made perfect sense, but other parts didn't. It caught stutters and filler words like 'um' and 'uh,' but also critiqued some strange things like making eye contact."* Technical challenges also emerged, with requests for better onboarding (*"Need a knowledge test on how to use the VR first so I didn't have trouble accessing the game"*) and more practice opportunities (*"More practice of learning the games would be helpful"*). These comments collectively highlight the tension between VR's promising capabilities and its current technical and pedagogical limitations.

7. Discussion

7.1. The Effectiveness of the Three VR Apps for Communication

As shown in the results, the Wander app was perceived as highly effective for sparking cultural curiosity and immersion, with participants praising its immersive environments. However, critiques of passive engagement (*"Some destinations felt empty"*) revealed limitations in fostering deeper cultural understanding. These findings align with Makransky and Lilleholt's (2018) research finding that immersion can predict "presence and positive emotions" (p. 1141), yet also reflect Parong and Mayer's (2021) warnings about immersive environment and cognitive distraction—where immersive visuals alone may fail to scaffold meaningful learning. In addition, the lack of interactive or reflective elements in Wander underscores a gap between sensory immersion and substantive cultural competence development. To bridge this, future iterations could integrate guided activities (e.g., quizzes, local narrator dialogues, scavenger hunt) in class to transform passive viewing into active learning.

The study's positive findings on Bodyswaps app—particularly the strong immersion ratings (M=4.3) and cultural awareness outcomes (M = 4.0)—align with existing VR research on perspective-taking. These results correspond to Frigenti's (2025) work demonstrating VR's capacity to foster empathy and workplace bias awareness through embodied experiences. The effectiveness in enhancing cultural perspective awareness also supports Herrera et al.'s (2018) conclusion that VR facilitates perspective-taking more effectively than traditional methods, particularly for measurable behavioral outcomes. Several factors may explain these successful dimensions of Bodyswaps' implementation. Boel's (2024) identification of performance expectancy and social influence as key adoption drivers helps explain participant engagement levels, while the Proteus Effect (Yee & Bailenson, 2007) provides a theoretical foundation for how avatar embodiment shapes behavioral outcomes, particularly in the successful role-switching components (M = 4.0). However, our study's more moderate results in deep empathy development (M = 3.8) and consistent perspective adoption (M = 3.5) present an interesting difference with Shilling et al.'s (2025) findings, which reported stronger outcomes for handling difficult conversations. This divergence may reflect key differences in participant cohorts (general users versus medical students) suggesting that while Bodyswaps shows strong foundational efficacy, its application may benefit from context-specific adaptations to achieve consistent depth of perspective-taking across domains.

The strong quantitative findings from VirtualSpeech (all ratings ≥ 4.0) align with and extend previous VR training research, demonstrating consistent effectiveness across multiple presentation skill domains. The high scores for confidence-building (M = 4.3) and multicultural adaptation (M = 4.4) particularly support Tangsripairoj et al.'s (2024) findings that VR's self-practice and feedback capabilities effectively address core presentation challenges, while the reduced anxiety implied by these results echoes Chen's (2024) EFL study showing VR's superior anxiety-reduction compared to traditional methods. The slightly lower but still positive realism ratings (M = 4.0) with greater variability (SD = 1.1) reflect important individual differences in user expectations or sensitivity to VR immersion that weren't discussed much in previous studies. Notably, VirtualSpeech's

exceptional performance in multicultural scenarios (M = 4.4) advances beyond DuBois' (2023) interview training research by demonstrating VR's effectiveness for more complex intercultural communication contexts. These results collectively validate the app's ability to provide the anxiety-reducing, skill-building benefits.

7.2. The Limitation of the Experimented VR Apps for Communication

While Wander App (cultural exploration) and VirtualSpeech (public speaking) received consistently high ratings (all ≥4.0), their strengths lie in awareness-building (e.g., cultural diversity knowledge in Wander) and technical skill development (e.g., speech delivery in VirtualSpeech), rather than the nuanced intercultural communication skills evaluated in Table 4 (e.g., resolving misunderstandings, adapting dialogue to cultural contexts). In contrast, Bodyswaps App—which directly targets empathy and perspective-taking—shows closer alignment with Table 4's objectives but also reveals critical gaps. For example, its lowest-rated items—seeing others' viewpoints (M = 3.5) and empathy improvement (M = 3.8)—mirror Table 4's weaker outcomes in intercultural skill application (M = 3.2–3.7). Such data triangulation suggests a limitation in current VR tools. While they excel at providing immersive exposure and building learner confidence, they still fall short in fostering actionable communication skills in complex, dynamic cultural scenarios. To further investigate the reasons behind these limitations, critical comments in the qualitative feedback were selected and analyzed, which revealed three major factors causing the limitations, as discussed below.

Limited Scenario Realism: First is the issue of constrained scenario design and authenticity. As one participant noted, "The audience reactions (in VirtualSpeech) felt robotic" while another stated, "The AI avatars' facial expressions (in Bodyswaps) were unreal." One participant gave an overall comment that "some scenes (in the VR app) are not very realistic" and another one said, "[I] feel like in-person is a bit better" compared to VR training. These remarks suggest that while VR provides immersive environments, the scenarios may lack the complexity and authenticity of real-world intercultural interactions.

Deficiencies in AI Feedback Quality: The most frequent and consistent criticism focused on AI feedback, which was provided in two of the applications: Bodyswaps and VirtualSpeech.

Several students expressed concerns about the evaluation accuracy by AI, noting that some feedback maybe did not match their actual performance. Comments such as "The AI wasn't fully capable of evaluating me" and "All the advice and guidance it gave wasn't completely accurate" illustrate doubts about the reliability of the assessments. Others indicated that they trusted the feedback only partially and said, "I (chose) *somewhat believe* the feedback because it's AI, so there could be some mistakes".

A second theme involved the lack of personalization in the AI responses. Some participants described the feedback as generic or insufficiently tailored to their individual communication style. Statements such as "Non-personalized feedback", "I would want more descriptive and personalized feedback", and "The AI needs to be more fine-tuned… feels like predetermined responses" illustrate a desire for feedback that reflects the nuances of each learner's interaction.

Finally, several students noted issues with the relevance and appropriateness of specific feedback points. For example, one participant shared that "some feedback made perfect sense, but other parts didn't… critiqued some strange things," while another pointed out that "AI responses felt repetitive". These concerns suggest that while the AI systems offer valuable automated insights, their current limitations may reduce their instructional effectiveness. This may help explain the relatively lower quantitative scores for skill application shown in Table 4.

Disconnection Between Understanding and Action: A crucial gap emerged between awareness and practical application, as shown by one participant's comment about needing "more opportunities to see how to get yourself out of a wrong situation when placed into it—like saying something culturally offensive and what you do to make it better." This highlights a type of skill training that is difficult to address in a traditional communication class, where students rarely have realistic opportunities to practice navigating such high-stakes moments. While VR apps such as Bodyswaps could offer a promising pathway, the apps in this study are still limited in providing nuanced, responsive guidance for such scenarios. Additionally, the limited interaction time with the VR apps meant that participants could not complete all related training modules, which further contributed to the difficulty in translating understanding into real-world action. For example, Bodyswaps offers around forty modules related to communication and cultural intelligence, yet participants in this study were only able to complete one module due to limited time and devices.

8. Conclusions

This study examines the effectiveness, learning outcomes and participants' feedback on experimental use of three VR applications for intercultural communication class in higher education. Overall, the analysis demonstrates

that VR applications hold strong potential for enriching foundational intercultural learning, though their effectiveness varies across training objectives. Instructors may consider integrating Wander for immersive cultural exploration, especially if paired with task-based learning activities that makes the exploration more intentional and engaging. Bodyswaps was found to be effective for perspective-taking and empathy skill development and may yield even stronger outcomes if students are given access to more learning modules in the app and extended interaction time. VirtualSpeech emerged as a valuable tool for public speaking skills, particularly in building confidence and adaptability.

This study also yields several critical insights about integrating VR in intercultural communication courses. First, VR's potential lies in its ability to enhance exposure, engagement, and foundational skill development in ways traditional instruction alone cannot. Students valued the immersive environments, the opportunity to practice communication behaviors in low-risk settings, and the inclusion of AI-driven feedback. Meanwhile, the current AI feedback embedded in VR apps (VirtualSpeech and Bodyswaps) still faces credibility challenges due to perceived inaccuracy and lack of personalization to a certain level by participants. Third, the study has identified a gap between cultural awareness and competent actions—an instructional challenge that VR has the potential to address, yet the experimented apps still fall short in fostering such behavioral competence. These findings highlight the need for future VR apps development in prioritizing dynamic scenarios and culturally adaptive AI coaching to bridge this gap, moving beyond technical immersion to true intercultural skill development.

Inevitably, this study has several limitations including generalizability constraints from the modest sample size, reliance on self-reported data, short interaction time with VR apps, and the focus on only three VR applications. Future research should address these through expanded participant pools, and incorporate objective performance-based assessments, and longer-term VR interventions to measure sustained learning gains. Yet the significance remains clear for educators. This study provides crucial evidence that VR works best as a supplemental—rather than standalone—approach for building intercultural communication competencies. The study thus makes timely contributions to both research and practice in technology-enhanced intercultural learning.

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Institutional Review Board Statement

The study was conducted following the ethical guidelines of the office of research compliance and integrity (ORCI)/Institutional Review Board (IRB) in Grand Valley State University. The study received approval from the office (Protocol Number: 25-165-H).

Informed Consent Statement

All participants provided informed consent before participating.

Data Availability Statement

The data collected were kept secure to ensure confidentiality and anonymity, and the study was designed to minimize any potential risks or discomfort for the participants.

Conflicts of Interest

The authors declare no conflict of interest.

Use of AI and AI-Assisted Technologies

During the preparation of this work, the authors utilized Grammarly for grammatical correction and proofreading purposes. All content was carefully reviewed, edited, and verified by the author to ensure academic integrity and preservation of the work's original meaning. The author takes full responsibility for all content, interpretations, and conclusions presented in this publication. No generative AI was used for content creation, analysis, or ideation.

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