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Adapting CAMIL for K–12 World Language Learning: A Qualitative Study of Immersive VR in Middle School Spanish

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Abstract

This exploratory study examines how immersive virtual reality (IVR) can support world language acquisition in middle school classrooms. Seventh- and eighth-grade Spanish students used head-mounted display (HMD) headsets with the ImmerseMe platform to practice conversational interactions in simulated, authentic settings. To interpret learners' experiences, the study applied the Cognitive Affective Model of Immersive Learning (CAMIL), which positions presence and agency as key affordances shaping affective and cognitive outcomes. CAMIL was adapted for adolescent learners by organizing six factors (interest, motivation, self-efficacy, embodiment, cognitive load, and self-regulation) into three developmentally appropriate domains. Data were collected through student surveys and teacher observations and analyzed thematically using the adapted model. Students reported high levels of social and physical presence, moderate motivation, and increased confidence in pronunciation. However, limited agency within the platform and intermittent technical barriers reduced engagement and, at times, contributed to cognitive overload. Overall, findings indicate that IVR can strengthen engagement and perceived learning in middle school language instruction when presence is paired with meaningful learner agency and when implementation reduces friction and supports autonomy. This study contributes an adapted CAMIL framework for younger learners and offers design and deployment implications for IVR in K–12 education.

Keywords: Immersive virtual reality (IVR); world language learning; middle school; CAMIL; presence.

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Adapting CAMIL for K–12 World Language Learning: A Qualitative Study of Immersive VR in Middle School Spanish

Emily Loughlin and Kevin Mentzer

1. INTRODUCTION

Virtual reality (VR) is emerging as a promising tool in education because it can simulate real-world experiences in ways that deepen attention, participation, and experiential understanding. Across disciplines, VR has been used to support learning outcomes ranging from technical skill development to exploratory engagement with complex environments, and its adoption in K–12 settings continues to grow.

Recent research has also extended VR's use into higher education business and communication courses, particularly through head-mounted display (HMD) platforms that support experiential learning. For example, a multi-site ISCAP study used Meta Quest headsets to simulate business scenarios and found that immersion increased student engagement, although implementation challenges (e.g., setup time and limited content control) constrained outcomes (Mentzer et al., 2025). Similarly, VR has been applied in public speaking instruction to strengthen learner confidence and promote self-awareness in delivery, suggesting broader potential for communication-based learning contexts (Patterson et al., 2025).

As VR hardware and software mature, educators are increasingly exploring immersive virtual reality (IVR), especially HMD-based IVR, as a viable instructional approach across content areas. World language education is a particularly strong fit for IVR because language learning depends on context, interaction, and multisensory cues. Traditional classroom instruction often struggles to provide authentic linguistic and cultural exposure. In contrast, IVR can place learners in simulated real-world settings where they can practice listening and speaking, engage in contextualized conversations, and explore cultural environments in safe, controlled spaces. This affordance may be especially valuable in middle school classrooms, where students are building foundational skills and typically have limited access to native-speaking environments or study abroad experiences.

Despite growing interest in IVR for learning, relatively little is known about how HMD-based IVR functions in middle school settings, particularly for novice language learners. Much of the existing literature focuses on adult learners or technical training contexts, leaving an important gap in understanding how adolescent learners experience immersion in language learning. In addition, commonly used immersive learning frameworks have rarely been adapted to reflect the cognitive, emotional, and behavioral characteristics of younger learners.

To address this gap, the present study examines HMD-based IVR in seventh- and eighth-grade Spanish classrooms using the Cognitive Affective Model of Immersive Learning (CAMIL). CAMIL, originally developed for adult learners, identifies presence and agency as key psychological affordances that shape affective and cognitive learning outcomes. This study adapts CAMIL to better reflect adolescent learning characteristics and applies the revised framework to qualitative data gathered from student surveys and classroom observations.

Beyond its pedagogical focus, this study also aligns with increasing expectations for business schools to demonstrate societal impact through community partnerships and educational outreach. AACSB's business accreditation standards emphasize mission-aligned engagement that improves stakeholder outcomes and supports broader societal goals (AACSB, 2023). By partnering with a middle school to explore immersive language instruction, this project illustrates one pathway for business faculty to contribute to educational impact while advancing research on emerging instructional technologies.

The sections that follow review the relevant literature and describe the adapted theoretical framework, then detail the classroom implementation and methodology. Results are organized according to the revised CAMIL constructs, and the paper concludes with implications for instructional design, platform development, and future research on immersive learning in secondary education.

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2. LITERATURE REVIEW AND THEORETICAL FRAMEWORK

Immersive virtual reality (IVR) has gained increasing attention as an instructional technology because it can place learners in simulated environments that support experiential, contextualized learning. Across educational settings, IVR has been associated with increased engagement, focused attention, and opportunities for active participation. At the same time, researchers caution that these benefits depend heavily on effective instructional design and may be constrained by usability issues, cognitive overload, cost, accessibility, and health concerns such as simulator sickness (Cabrera-Duffaut et al., 2024; Kaimara et al., 2022).

World language learning is a particularly relevant context for IVR because language acquisition depends on meaningful interaction, situational context, and cultural cues. Traditional classroom instruction often provides limited opportunities for authentic communicative practice, especially for novice learners. IVR can help address this limitation by situating students in simulated real-world settings where they can practice listening and speaking in context, engage with culturally situated prompts, and experiment with language in a low-risk environment. Prior research suggests that virtual environments can support intercultural communication, vocabulary development, and learner engagement in second-language instruction (DeWitt et al., 2022; Legault et al., 2019; Lin & Lan, 2015).

Although the literature points to the promise of IVR for language learning, much of this work has focused on adult or higher education populations. Less is known about how head-mounted display (HMD) IVR functions in middle school settings, where learners may differ developmentally in attention, self-regulation, and comfort with immersive technologies. In addition, immersive learning frameworks have rarely been adapted specifically for adolescent learners in K-12 environments. This gap is especially important because younger learners may experience the motivational and cognitive demands of immersive environments differently than adults.

This study is guided by the Cognitive Affective Model (see Figure 1) of Immersive Learning (CAMIL) developed by Makransky and Petersen (2021). CAMIL explains how immersive technologies influence learning through the interaction of technological affordances and learner-centered psychological processes. The model identifies two central affordances, presence and agency, that shape six related affective and cognitive factors: interest, motivation, self-efficacy, embodiment, cognitive load, and self-regulation. According to CAMIL, immersive learning environments are most likely to support learning when these affordances and learner conditions are aligned in ways that promote meaningful engagement rather than distraction or overload.

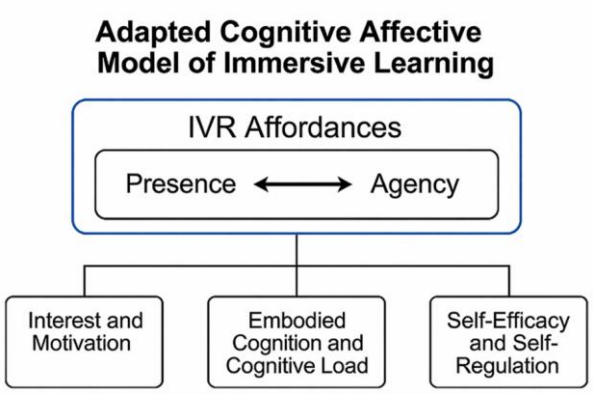


Figure 1: Adapted CAMIL Model

Presence refers to the subjective sense of "being there" in a virtual environment. Prior scholarship conceptualizes presence including physical presence, social presence, and self-presence (Ijsselsteijn & Riva, 2003; Lee, 2004; Lombard & Ditton, 1997). Physical presence reflects the feeling of being located within the virtual space. Social presence refers to the sense of interacting with others in that space, including avatars or AI-driven agents. Self-presence refers to the perception of oneself as an active participant in the environment. Together, these dimensions help explain why immersive environments can feel more immediate and personally involving than traditional digital interfaces.

Agency refers to the learner's perceived ability to act within and influence the virtual environment. When learners feel that they can control pacing, make meaningful choices, and affect the flow of an experience, they are more likely to report engagement, autonomy, and confidence (Moore & Fletcher, 2012). In immersive learning contexts, agency is especially important because presence alone does not guarantee productive learning. A virtual environment may feel vivid and absorbing, but if learners perceive little control over navigation, difficulty, or interaction, the benefits of immersion may be reduced.

In addition to presence and agency, CAMIL highlights six affective and cognitive factors that mediate learning in immersive environments.

Interest and motivation shape whether learners are drawn into the task and remain engaged over time. Embodiment reflects the extent to which cognition is experienced as situated within action and sensory experience. Cognitive load refers to the mental effort required to process information and navigate the environment, which can support or hinder learning depending on the quality of the instructional design. Self-efficacy and self-regulation relate to learners' confidence, persistence, and ability to manage attention and effort during the learning process. Together, these factors provide a useful framework for examining how immersive experiences influence both engagement and perceived learning.

Prior studies suggest that IVR can support these dimensions when learners are able to interact with realistic environments, receive timely feedback, and engage in focused, contextualized practice. For example, research has shown that immersive environments can increase engagement through multisensory and game-like experiences while also supporting vocabulary learning and intercultural communication (DeWitt et al., 2022; Legault et al., 2019). At the same time, the literature also shows that immersive experiences may become less effective when learners encounter technical friction, excessive sensory stimulation, or limited control over pacing and task difficulty (Çoban et al., 2024; Freina & Ott, 2015; Kaimara et al., 2022; Javadi et al., 2024). These concerns may be especially relevant for younger learners, who may require more scaffolding and clearer structures for self-regulation.

Health and usability concerns are also important in K-12 contexts. Studies have noted that children and adolescents may be particularly sensitive to issues such as dizziness, visual discomfort, disorientation, and cognitive fatigue when using immersive systems (Kaimara et al., 2022). In educational settings, these concerns are compounded by practical implementation challenges such as headset calibration, battery management, onboarding time, and the need for close monitoring during use. These factors suggest that the effectiveness of IVR depends not only on the quality of the virtual content but also on the usability and classroom fit of the technology itself.

Because CAMIL was developed primarily in adult learning contexts, this study adapts the model for middle school language learners. The adapted version retains the central importance of presence and agency while consolidating the six original learner factors into three developmentally appropriate domains: interest and motivation; embodied cognition and cognitive load; and self-efficacy and self-regulation. Figure 1 presents the adapted CAMIL model used in this study. This adaptation offers a more practical framework for examining adolescent learners' experiences while preserving CAMIL's core theoretical logic. Grouping the constructs in this way is intended to reflect the interrelated nature of affective and cognitive responses in middle school classrooms, where engagement, confidence, and self-management often operate together rather than as fully distinct processes.

This adaptation is also appropriate for world language learning because language acquisition is both cognitive and social. Learners must attend to vocabulary, pronunciation, context, and cultural meaning while also managing uncertainty and taking interpersonal risks. In immersive environments, these demands may be intensified by the sensory richness and novelty of the medium. As a result, a framework that accounts for both the affective and cognitive dimensions of learning is especially useful for understanding how students experience IVR in language instruction.

Taken together, the literature suggests that IVR has strong potential for world language learning because it can provide contextualized, interactive practice that is difficult to replicate in traditional classrooms. However, the effectiveness of IVR appears to depend on the balance between immersive affordances and instructional usability. Presence may increase engagement and authenticity, but meaningful learning is more likely when learners also experience agency, manageable cognitive demands, and sufficient support for confidence and self-regulation. To examine these dynamics in a middle school Spanish context, the present study applies an adapted CAMIL framework to explore how presence, agency, and related affective and cognitive factors shape engagement and perceived learning outcomes.

3. METHODOLOGY

This section describes the study design, participants, instructional context, and procedures for data collection and analysis. The implementation of immersive virtual reality (IVR) in a middle school Spanish classroom was examined using an exploratory qualitative approach guided by the adapted Cognitive Affective Model of Immersive Learning (CAMIL). Data were collected from student reflections and

classroom observations to examine learners' affective and cognitive responses to head-mounted display (HMD) VR.

This study was guided by the following research question: "How does immersive virtual reality (IVR), through the affordances of presence and agency as conceptualized in an adapted CAMIL framework, influence engagement and perceived learning outcomes among middle school Spanish learners?"

Research Design
This study used an exploratory qualitative design to investigate how IVR supports language learning among middle school students. Guided by CAMIL, the analysis focused on how presence and agency shaped engagement, motivation, and perceived learning outcomes. CAMIL was adapted for this context to better reflect adolescent learners by consolidating the original six cognitive and affective factors into three domains: interest and motivation; embodied cognition and cognitive load; and self-efficacy and self-regulation.

Participants and Setting
The study was conducted in spring 2025 at a public K–8 school in rural central Massachusetts. Participants included 30 seventh-grade students and 38 eighth-grade students enrolled in Spanish classes taught across multiple sections by the same teacher. Students were novice learners in their first or second year of Spanish. Participation in the IVR activities occurred during regular instruction and was not tied to additional assessment or grading. Students used school-issued Chromebooks in class and could choose to use the VR platform.



Figure 2: Classroom Setting

Technology and Platform
Students used Meta Quest 3 headsets (https://www.meta.com/quest/quest-3/) to access ImmerseMe (https://immerseme.co/), a commercial VR platform designed to support guided language conversations in immersive, culturally situated environments. The platform allowed students to select scenarios such as dining in a restaurant or exploring a marketplace and to practice scripted conversations with recorded characters (Aros et al., 2024; Briand, 2021; Karageorgakis, 2022). While ImmerseMe offered some flexibility in pacing and scenario selection, student interaction was largely limited to responding to scripted prompts.

Headsets were rotated among students. Twenty headsets were loaned to the school, each assigned a city name. Because the teacher taught five class sections, each device was typically shared by five students. Additional headsets were available when technical issues occurred. Devices were stored securely and sanitized regularly; however, battery drainage and controller alignment occasionally interfered with use. Students received instruction on device handling and platform navigation, and many were using HMD-based VR for the first time.

Instructional Design
The IVR activities were integrated into a broader unit on conversational Spanish. Over ten weeks, students completed approximately 10 to 20 IVR sessions, typically lasting 30 minutes or less. The teacher selected ImmerseMe lessons aligned with classroom objectives (for example, greetings, food and drink, and body parts), and students were encouraged to self-select difficulty levels or scenarios within those constraints.

Across lessons, students could choose among speaking, typing, translating, or listening activities based on comfort level. Although the platform was intended to provide opportunities for low-stress speaking practice, student responses varied due to individual differences in comfort, cognitive load, and prior exposure to immersive technologies.

Data Collection
Data were collected through two rounds of open-ended student questionnaires administered via Google Forms, once in May and once in June. The May questionnaire captured initial perceptions, while the June questionnaire served as a follow-up to assess changes over time. The teacher noted that many students declined to complete the follow-up due to end-of-year fatigue and reported that they would respond only if their opinions had changed. As a result, the May responses served as the primary dataset for analysis.

Additional qualitative data were collected through

researcher field notes and classroom observations, including informal conversations with students about their experiences. No formal recordings were used. The researcher documented observations related to headset use, off-task behavior, engagement, and technical issues. These notes provided context to supplement student reflections. The teacher also maintained observation notes during and after headset use and added end-of-day reflections on lesson implementation.

Data Analysis
Survey responses and observation notes were coded thematically using the adapted CAMIL framework. Responses were grouped into five constructs: presence; agency; interest and motivation; embodied cognition and cognitive load; and self-efficacy and self-regulation. Representative student quotes were selected to reflect both common themes and divergent perspectives and were anonymized by grade level and gender.

Ethical Considerations
The study received Institutional Review Board (IRB) approval through Nichols College. Parental consent and student assent were obtained in accordance with ethical research guidelines. Responses were anonymous, and no audio, video, or screen recordings were collected. Students could opt out of VR use or switch to the Chromebook version of the platform if they experienced discomfort.

4. RESULTS

Findings from student surveys and teacher observations are presented in alignment with the study's research question, examining how presence and agency, as framed within the adapted CAMIL model, influence engagement and perceived learning outcomes. Student feedback was analyzed thematically across five key constructs: presence, agency, interest and motivation, embodied cognition and cognitive load, and self-efficacy and self-regulation. Direct quotations from students are included to illustrate common perceptions, challenges, and variation in experience.

Overview of Data Collection
Students completed an open-ended qualitative questionnaire twice, once in May and again in June. The June dataset was less robust due to survey fatigue, end-of-year disengagement, and the instruction that students should complete the second survey only if their opinions had changed. Approximately 90% of students opted not to complete the June survey. Most responses remained stable. One notable exception involved a student who initially enjoyed the VR experience but later described it as "repetitive and annoying."

A recurring concern involved speech recognition. Several students reported that classroom background noise affected microphone performance. In many cases, the headset microphones captured student speech, but ImmerseMe did not consistently convert speech to accurate text. Students with speech impediments were especially frustrated by this issue, and many students reported at least one instance where the platform did not recognize what they said.

Presence
Student responses indicated varied experiences with presence. Most students described social presence through simulated interactions within the ImmerseMe platform. One male eighth grader noted the value of "speaking to a real person," which increased his confidence. Students also described physical presence in comments such as:

- "While I was using it, it was like I was actually there" – Female, Grade 8
- "When we were in the cities it made it feel so real" – Male, Grade 7

Self-presence was evident when students referenced their avatars or described their appearance in VR. While many reported feeling immersed, others suggested that limited interaction with the environment reduced their overall sense of presence.



Figure 3: Students Actively Engaged

Overall, these findings align with CAMIL's emphasis on presence as a key affordance of immersive virtual reality. Students described both physical and social presence, which likely contributed to engagement and perceived immersion.

Agency

Students described limited agency within the ImmerseMe platform. Several commented on the lack of control over the environment and the limited ability to tailor difficulty. One eighth grader noted:

- "I can never find a lesson that is in my perfect level in Spanish. It is either too hard or too easy."

Another student suggested that a more game-like structure could increase engagement and motivation:

- "If the VR was set up so it's like a quest game… it could motivate the learning experience." – Male, Grade 8

Although the platform offered some choice within lessons, students could not navigate freely or dynamically adjust settings, which constrained perceived agency. While many students reported feeling immersed and "actually there" within the VR environments, their experience of agency often constrained the potential benefits of presence. One student shared,

- "I like to use VR to learn Spanish because I can go at my own pace, but… it's a lot of time I'm stuck online and I would rather not spend my whole day behind screens,"

reflecting how limited control over content flow and platform design may temper the motivational benefits of high presence. Another remarked,

- "I like using them, the only downside is how long it takes to get in"

These comments underscore that presence alone is insufficient. Without meaningful agency, students may become disengaged or frustrated, even in richly immersive environments.

Consistent with CAMIL, limited agency constrained students' ability to navigate and control their experience, moderating the positive effects of presence. This reinforces the importance of balancing both affordances to sustain engagement and support learner autonomy.

Interest and Motivation (Combined)

Interest and motivation were strongly expressed by most students, especially those who had not previously used VR. For many, the novelty and personal relevance of the lessons contributed to engagement:

- "I found the topics that were more personal or aimed towards me the most helpful, because they were more interesting." – Female, Grade 8

Students appreciated working at their own pace and being in a different environment:

- "I like using VR to learn Spanish because I can go at my own pace." – Female, Grade 8
- "It makes class even more interesting… you can challenge yourself or just practice at the level you feel comfortable on." – Male, Grade 8

However, some voiced concerns about the tedium of repetition, technical barriers to entry, or overstimulation. One student noted:

- "It was very quick and I didn't get a lot of time to process the words." – Female, Grade 7

Despite frustrations, many learners expressed a desire to continue using the tool, provided the usability improves.

This combination of interest and motivation aligns with CAMIL's assertion that affective engagement increases when students experience high presence and a sense of personal relevance. However, diminished agency and technical challenges appeared to temper this engagement over time.

Embodied Cognition and Cognitive Load (Combined)

Students reported feeling fully immersed in the language-learning context, often drawing comparisons to real-life conversations or travel experiences:

- "It feels like I'm having a full Spanish conversation in the real world where I will actually use Spanish." – Male, Grade 8
- "It helps to capture my attention, since the only thing I can see is the lesson." – Male, Grade 8

That said, cognitive load emerged as a challenge for some. A handful of students described issues with simulator sickness, blurry visuals, or overstimulation:

- "I struggled with staying in the headset because it made me feel woozy." – Female, Grade 8
- "I don't like VR because it gives me motion sickness." – Male, Grade 8

These cognitive limitations, while not universal, suggest the importance of limiting headset time and offering alternative platforms when needed.

As outlined in CAMIL, immersive sensory input can enhance embodiment and deepen conceptual engagement. At the same time, cognitive overload, particularly from discomfort or system limitations, can reduce learners' ability to fully benefit from these experiences.

Self-Efficacy and Self-Regulation (Briefly Mentioned)
While these were less directly addressed in survey responses, some students reported feeling more confident after using ImmerseMe:

- "I feel like since I've started [VR lessons], my pronunciation of Spanish is getting much better." – Male, Grade 8

The teacher observed that most students followed through on their tasks and stayed engaged. However, because the researcher lacked visibility into what students were doing inside the headsets, verifying on-task behavior was difficult. Notably, while some students joked about using the devices for games, no off-task behavior was confirmed.

Although these factors were less overtly referenced, student persistence and self-monitoring reflect the role of self-regulation in immersive environments. This is consistent with CAMIL, which links strong regulation to lower cognitive load and improved learner confidence.

Taken together, these findings highlight the interdependence of presence and agency as conceptualized in the adapted CAMIL model. Their balance appears important for sustaining motivation and supporting cognitive regulation in immersive learning environments.

5. CONCLUSIONS AND FUTURE WORK

This study examined how immersive virtual reality (IVR), through the affordances of presence and agency as conceptualized in an adapted Cognitive Affective Model of Immersive Learning (CAMIL), can support world language instruction in middle school Spanish classrooms. The adapted model consolidated six CAMIL factors into three domains appropriate for K–12 learners: interest and motivation; embodied cognition and cognitive load; and self-efficacy and self-regulation.

Overall, most students responded positively to the immersive experience. Students reported strong social and physical presence, high engagement, and enjoyment, and many valued the ability to work at their own pace. Several students also reported increased confidence in pronunciation. At the same time, student feedback indicated that agency within the ImmerseMe platform was limited, and technical frustrations and overstimulation sometimes interfered with deeper learning and sustained motivation. Cognitive barriers, including simulator sickness, poor visual clarity, and constrained control over the learning path, reduced learning efficacy for some students.

These findings support the relevance of CAMIL in secondary education. When presence and agency are balanced, IVR can support language practice, cultural exposure, and learner autonomy. Outcomes appear to depend less on novelty and more on thoughtful instructional design, pacing, and usability.

This work also illustrates how research with middle school learners can advance both scholarly and institutional priorities. By leveraging immersive learning expertise to enhance world language instruction in K–12 classrooms, the project provides a model of community engagement that supports meaningful stakeholder outcomes.

Future Work
This exploratory study suggests several directions for future research. First, future studies should use tools that allow instructors to view student activity within the headset in real time to strengthen observation validity. Second, adding quantitative measures such as pre and post assessments of vocabulary retention or oral proficiency would help validate and extend the perceptual findings reported here. Comparative studies across traditional instruction, video-based activities, and immersive instruction could also clarify which outcomes are uniquely supported by IVR. Finally, platform features such as gamified elements, differentiated learning paths, and improved speech recognition may strengthen agency and sustain motivation over time.

Limitations
Several limitations should be considered. The study was conducted in a single school with one

teacher, which may limit generalizability and introduce instructional bias. Findings relied primarily on qualitative surveys and observations rather than formal proficiency measures. Technical constraints, limited platform functionality, limited teacher visibility into headset activity, and occasional discomfort may also have shaped engagement. In addition, follow-up data collection was reduced by end-of-year fatigue, limiting longitudinal comparison. Despite these limitations, the study contributes evidence supporting the adapted CAMIL framework and identifies practical considerations for IVR integration in K–12 language learning.

6. ACKNOWLEDGMENTS

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APPENDIX A

VR TPS Nichols Qualitative post-research questions

VR Specific Questions

1. Have you used VR headsets before this experience in Spanish class?
    a. If so, how would you describe your experience, and for what did you use the VR headset?
2. How do you feel about using technology like VR in your learning process overall?
3. Were there any parts of the VR experience that you found challenging or difficult? Can you explain?
4. How do you think the use of VR could be adjusted to better support your learning?
5. What kind of activities or elements in the VR experience did you find most engaging or helpful?
6. How do you think the use of VR might be useful for learning other subjects or skills?
7. In what ways do you think VR can be improved to better support your learning experience?
8. Do you believe that using VR in language learning will be helpful for other subjects or areas of study? Why?

Spanish Specific Questions

1. What was your initial reaction when you first used a Virtual Reality headset in your Spanish class?
    a. What did you like about it?
    b. What did you dislike?
2. How did using the VR headset help you engage with the Spanish language compared to traditional learning methods in class?
3. In what ways did the use of VR influence your involvement or interest in the Spanish language?
4. Can you describe a specific experience or activity in the VR environment that helped you understand Spanish?
5. How do you feel that VR technology influenced your motivation to practice or learn Spanish outside of class?
6. In your opinion, how effective is VR in helping you develop your Spanish skills?
7. Were there any challenges or difficulties you encountered while using the VR headset to learn Spanish?
    a. If so, how did you overcome them?
8. Do you think VR technology can help you feel more confident in speaking Spanish? Why or why not?
9. How do you think using VR to practice Spanish will impact your ability to understand and communicate in real-life situations?
10. What would you tell a friend about using VR to learn Spanish? Would you recommend it? Why or why not?
11. How do you think your perception of learning languages has changed after using VR technology in your Spanish class?