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The Virtual Stage: Virtual Reality Integration in Effective Speaking Courses

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Abstract

This research examines the implementation of virtual reality into an effective speaking course at a small business college in New England. The researchers detail how they piloted the use of MetaQuest 2 headsets to students for round-the-clock availability of public speaking software in an Effective Speaking course. Students were administered a pre-and post-survey to gauge their feelings about public speaking before and after the virtual reality intervention. The results indicate statistically significant improvements in speech confidence and anxiety level reduction. In addition, student and instructor attitudes toward VR exposure in the classroom are overwhelmingly positive.

Keywords: virtual reality, metaverse, public speaking, education, experiential learning

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The Virtual Stage: Virtual Reality Integration in Effective Speaking Courses

Adam Patterson, Cathy Temple, Nikki Anderson, Chris Rogalski and Kevin Mentzer

1. INTRODUCTION

Virtual Reality (VR) is a technology that resides in the Reality-Virtuality Continuum (Milgram et al., 1995). On one end is the real environment (Reality); this is the non-digital world we live in. On the other end, there is a fully digital environment (VR) in which the entire domain is digitally constructed. Along the continuum, there is also Augmented Reality (AR), where virtual objects are overlaid in a real-world environment, and augmented virtuality (AV), where real objects are projected into a virtual world.

The COVID-19 pandemic highlighted the need for non-real environment solutions with an emphasis on remote work and remote learning capabilities. The World Economic Forum (2022) went as far as stating that VR will reshape the future of education, highlighting that while online educational tools were critical to overcoming the challenges posed by the pandemic, they were limited in that they lacked experiential learning. This is where innovative technologies such as AR and VR come into play. Academic institutions must understand how VR may fit into the curriculum.

VR uses computer modeling and simulations to allow individuals to be fully immersed in an artificial 3D environment (Abich et al., 2021). There are three types of VR systems: non-immersive, semi-immersive, and total immersive (Moro et al., 2016). Non-immersive consists of environments visualized in conventional technology, such as monitors and screens. Semi-immersive comprises a combination of real and virtual environments for simultaneous interaction. Total immersive includes three-dimensional simulated environments using head-mounted displays. The latter two levels are considered the metaverse (Hwang & Chien, 2022). The objective of VR is to make the user feel like they are inside the computer-generated system (Saeed et al., 2017).

Although VR technology has been available since the 1960s, recent developments in hardware and quality have allowed mass adoption in the gaming and entertainment industries (Wohlgenannt et al., 2020). Given these advancements, it has been stated that the metaverse is the future of the internet (Bhattacharya et al., 2023; Cui et al., 2022; Ramesh et al., 2022; Ritterbusch & Teichmann, 2023).

The high levels of immersion offered in VR systems can potentially enhance conceptual understanding in academic applications (Holly et al., 2021). Student activities with increased engagement are found to help overall learning (Carini et al., 2006; Patterson et al., 2023). However, a comprehensive literature review of VR applications in academia found that the technology is not widely used despite enhancing student learning outcomes (Alfarsi, 2021).

More specifically, VR has excellent potential for impact regarding increased engagement in public speaking courses. According to Zhou et al. (2021), approximately 77% of people fear public speaking. VR provides a unique solution to this issue, as individuals can experience a learning point of view during intimidating situations while staying sheltered (Halarnkar et al., 2012). A meta-analysis of VR on public speaking indicates an overall statistically significant effect of anxiety reduction (Lim et al., 2023).

Although the benefits of metaverse adoption in academia and public speaking are plentiful, VR usage has consequences. For example, research shows that cyber-sickness is prevalent among VR application users (Martirosov et al., 2022). Cost and user experience are also problematic in hindering widespread adoption (Kavanagh et al., 2017).

According to a systematic review of 61 papers examining VR in education, user perception and impact have not been explored in detail (Noah & Das, 2021). This study fills a research need to understand student and instructor perspectives while recognizing the impact of VR in academic settings.

This paper details the deployment, application, and student/instructor experience of VR headsets during a pilot in an effective speaking course at a small business college in New England. Each student is required to take an effective speaking course to graduate. Throughout the course,

students are required to perform weekly presentations, group presentations, engage in workshops, and participate in an elevator pitch competition.

This exploratory study was guided by the following questions:

- RQ1: What are students' attitudes toward implementing VR technology in the pilot course?
- RQ2: How might increased immersion resulting from VR influence student learning outcomes in public speaking?
- RQ3: How does VR influence engagement within an effective speaking course?
- RQ4: In what ways might negative side effects, such as cyber-sickness and headaches, impact the adoption of VR in academic settings?

This study contributes directly to previously limited knowledge surrounding VR's impacts on introductory-level communication courses. The researchers present both statistical results of exposure to the technology and detail student attitudes toward usage. Establishing information about VR technology provides insight to instructors about potential adoption in courses.

2. LITERATURE REVIEW

According to Hwang and Chien (2022), research on metaverse applications in academia is sparse despite the tremendous learning potential that recent technological advances have brought. Much literature denoting educational applications of the metaverse focuses on learning second languages (Alwafi et al., 2022; Gruber & Kaplan-Rakowski, 2020; Muthmainnah et al., 2023; Netta et al., 2020; Wang et al., 2023; Yuan et al., 2023).

Investigations in non-academic settings revolving around the impact of VR on public speaking are well established. Research by Reeves et al. (2021), utilizing a randomized control trial, found that VR exposure reduced public speaking anxiety and fear of negative evaluation. According to Anderson et al. (2013), a randomized control trial reported VR interventions exhibited significant improvement in all measures of public speaking for individuals diagnosed with social anxiety disorder.

Anderson et al. (2013) and Lim et al. (2023) provide robust evidence supporting the effectiveness of VR exposure therapy in reducing anxiety levels, noting significant improvements in users' confidence and performance. Similarly, Frisby et al. (2020) and Kryston et al. (2021) focus on integrating VR into public speaking courses, demonstrating how it can enhance students' self-efficacy and engagement.

In contradiction to these results, implementing VR headsets embedded with public speaking training software in a college-level introductory public speaking course found that the technology did not reduce public speaking anxiety (Kryston et al., 2021). It is essential to investigate the results of VR in higher education as much research indicates a fear of public speaking among students (Grieve et al., 2021).

Additionally, students may be unique adopters of the technology. According to Frydenberg et al. (2024), VR exposure at a business school showcased varying attitudes among students, as some showed interest while others struggled to connect their prior gaming experience with VR to business applications. Further supporting this argument is a study that deployed VR headsets in an introductory communication course, indicating that the technology both hindered and enhanced students' abilities to practice communication skills (Frisby et al., 2020).

Abich et al. (2021) highlight the overall effectiveness of VR in training environments, emphasizing the ability to create immersive and interactive scenarios that promote skill acquisition. Similarly, Alfarsi (2021) explores VR's applications in education, noting its potential to enhance engagement and learning outcomes across various domains. These studies collectively underscore VR's transformative potential in education and beyond, yet they also highlight gaps in evaluating long-term retention and the scalability of VR-based interventions.

This study contributes directly to previously limited knowledge surrounding VR's impacts on introductory-level communication courses. The researchers present both statistical results of exposure to the technology and detail student attitudes toward usage. Establishing information about VR technology provides insight to instructors about potential adoption in courses.

Innovative technology does not necessarily improve students' public speaking skills, as Clark and Jones (2001) found no significant differences in students' public speaking abilities between face-to-face courses and online offerings. In addition, a common belief is that current college students are tech-savvy, but this cannot be assumed (Mentzer et al., 2024). The findings in this research may also provide insights into the

technological adoption, of VR, by current students.

3. METHODOLOGY

Meta's Meta Quest 2 devices were set up in the Meta for Business application, a mobile device management (MDM) tool for controlling features and deploying software within headsets. The researchers purposely decided to put no device restrictions on the accounts. Thus, some students may have chosen to use their headsets for entertainment.

The first half of the semester was spent configuring the headsets, training the deployment team, and working with IT so they were prepared to support the rollout. For the last six weeks of the semester, students enrolled in the pilot course *COMM-257 Effective Speaking* received Meta Quest 2 headsets to take home. Before receiving the headsets, students were asked to consent to participate in research and complete a Qualtrics survey (note that students could opt out of the survey and still participate in the pilot program). The questions asked are detailed in Appendix A.

Each headset was equipped with the VirtualSpeech application in addition to all the default applications that came with the headset. VirtualSpeech is VR professional development training software that offers learning paths such as compelling storytelling, sales pitch and closing, salary negotiations, job interview preparation, business networking, and elevator pitches. Learning paths are a curated collection of courses providing students with a straight route to professional development and career goals.

On the day the headsets were distributed, students were given a hands-on lesson on setting up their accounts and logging into VirtualSpeech. Students were encouraged to complete the public speaking mastery learning path for skill enhancement. All tasks in VirtualSpeech were voluntary and not included in the calculation of final grades.

Analytics included for administrators of VirtualSpeech software include total VR time, number of sessions per student, and completed learning paths or courses. The data also details the number of speeches each student finished and their overall score.

The application also provides an automated analysis of each speech. Students are graded based on eye contact score, words per minute, voice volume, filler words, and listenability. In addition to students receiving instant feedback on areas to improve through their scoring, instructors have the option to easily embed performance analytics as part of course evaluation.

A significant benefit of each student having their headset for six weeks is the continuous availability of a virtual avatar audience for practicing speeches. The tool allows students to gain instant assessment at any time of the day or night.

Upon returning the headsets to class during the last week of the semester, students were asked to complete a post-survey. This post-survey included Likert scale inquiries to match the pre-survey and open-ended responses to understand their attitudes and feelings toward VR.

Research questions are addressed from the pre-and post-survey results of students exposed to VR within the effective speaking course (n=15). It is to be noted that many students downloaded applications with virtual meeting spaces, as evidenced by (a) the library of apps and (b) interactions with Meta users they met and engaged with online. Although unexplored, these other applications may have provided another outlet for students to practice their public speaking. These platforms could have allowed students to simulate real-world scenarios, engage with diverse audiences, and gain confidence in their communication skills.

Students were asked six questions, all with a 7-point Likert response scale, to help researchers quantify the impact of VR on their public speaking skills and course experience. Questions included their feelings of anxiety, comfort level, and confidence before giving a speech. Satisfaction with past speeches and student perspectives on the importance of public speaking were also included. The last question gauged student enjoyment in the effective communication course.

Mean responses from the pre-and post-survey are statistically analyzed to understand potential significant outcomes better. Although the responses appear normally distributed to a certain degree (see Figure 1 in Appendix), and only the anxiety variable results in rejecting the Shapiro-Wilk normality test, a Wilcoxon signed-rank test is performed in place of the traditional paired t-test.

The sample size used in this analysis is too small to approximate a normal distribution, which is an

assumption of the commonly used t-test. Since violating this assumption can lead to unreliable results, the Wilcoxon signed rank test was chosen instead (Taheri & Hesamian, 2013). The Wilcoxon test is a non-parametric alternative to the t-test that offers a more stable result with low observations (< 30) or non-normal distributions (I.C.A & Ebuh, 2012).

At the end of the post-survey, open-ended questions were asked to evaluate attitudes toward the pilot program qualitatively. Given the small sample size, the answers were visually analyzed to provide insights into student perceptions of the pilot program.

4. RESULTS

Student Feedback

The sample's average age was 18 years old, with every student a freshman class rank. Sixty-seven percent of respondents were female. Eighty percent of students were enrolled to pursue a Bachelor of Arts degree compared to the 20 percent enrolled to obtain a Bachelor of Science in Business Administration.

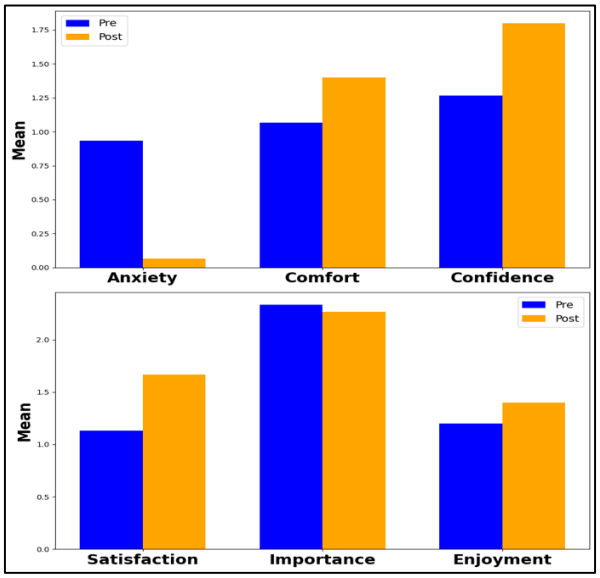


Figure 1: Pre- and Post-Survey Mean Values

The mean responses, showcased in Figure 1, indicate a sharp drop in feelings of anxiety before public speaking. Comfort, confidence, and satisfaction increased noticeably, reflecting a positive shift in students' self-perception and readiness to engage in public speaking tasks. Course enjoyment also showed a marginal improvement, suggesting that students found the learning experience more rewarding as they progressed. Interestingly, the perceived importance of public speaking experienced a slight decline from pre- to post-public speaking, possibly indicating a reevaluation of priorities or a sense of reduced pressure after gaining VR experience.

Table 1 exhibits the Wilcoxon results, providing a statistical validation of these changes. These findings highlight the program's effectiveness in addressing anxiety and enhancing key emotional factors associated with public speaking, even if some dimensions showed more subtle shifts.

Question	Pre-mean	Post-mean	Wilcoxon P-value
Anxiety	0.93	0.07	0.025852*
Comfort	1.07	1.40	0.327489
Confidence	1.27	1.80	0.033471*
Satisfaction	1.13	1.67	0.103483
Importance	2.33	2.27	0.705457
Enjoyment	1.20	1.40	0.453695

Table 1: Wilcoxon Test Results

In answering RQ2, the findings indicate that students experienced a statistically significant increase in public speaking confidence and a statistically significant decrease in anxiety before giving a speech. The Wilcoxon signed-rank test reported no significant difference in student enjoyment of the course. The desired course learning outcomes of increased confidence and decreased speech anxiety may be, at least partially, attributed to the VR intervention. According to Akbari and Sadhibzada (2020), increased student confidence reduces student anxiety and positively benefits their learning process. Research indicates that student anxiety plays a crucial role in learning outcomes, and alleviating learner anxiety significantly enhances learning outcomes (Cao & Yu, 2023).

Impacting both student anxiety and confidence provides VR with potentially powerful outcomes. Communication departments are seeking best practices for reducing public speaking anxiety, as this topic is a standard goal of introductory courses (Hunter et al., 2014). Additionally, increased public speaking confidence is often a significant advantage for undergraduates completing a basic communication course (Finn et al., 2009).

To answer RQ1, the quotes below were obtained as part of the open-ended responses. Visual analysis indicates an overwhelmingly positive experience.

- "I found it to be helpful to get my words straight for my speech."
- "It helped me have a mock audience and be able to say my speech out loud before I had to present."
- "Virtual speech helped me improve my public speaking confidence."
- "Felt like it helped me feel more comfortable in front of real people."
- "It was fun and helped me a lot."
- "It helped me be better as I was able to feel like I was presenting in front of people."
- "I didn't use it. I didn't find any huge use in practicing with a headset on."
- "Improved my public speaking."
- "It helped in many ways and gave me many different outlooks on different speeches."
- "It has helped me."
- "Great impact on my public speech."

Next, students were asked to describe their experience using the VR headset. The following are quotes obtained directly from the post-survey:

- "It was fairly enjoyable."
- "It was relatively easy to use."
- "It was a fun, good experience."
- "I really enjoyed using the virtual reality headsets."
- "I loved it!"
- "It was super useful and fun."
- "It was fun and easy to use."
- "It was a cool experience."
- "It was fun for the games besides the virtual speech but again I lost interest after one day."
- "It was a lot of fun."
- "It helped me to practice for the real speech in class."
- "Sometimes got loose beside that totally fine."
- "It was a good, fun experience."

In addition to the quotes, most of the feedback reported to the pilot's professor during class meetings was about the fun factor instead of the effectiveness of the learning modules. This is not surprising, as this was the program's first rollout, and it serves as a basis for moving forward regarding student directives and course expectations.

With respect to RQ3, research indicates that students who are more satisfied with their academic experience show a higher degree of engagement and achieve better grades (Roebken, 2007). Course satisfaction and course enjoyment scores both increased from the pre- to the post. Although not statistically significant, these results may provide insights into student engagement throughout the course and their perception of VR applications in the classroom.

Regarding RQ4, the survey asked respondents if they experienced headaches or dizziness while using the VR headset and, if so, how they dealt with it. Seven students reported getting headaches while using the VR system. One student reported that the headaches would occur after an hour and a half of continuous usage. Five students said they removed the headset and stopped using VR whenever the headaches occurred. No students reported that negative side effects were a reason to abstain from the headsets. It is important, however, to recognize that students cannot perform academic activities for extended times without getting cyber-sickness from the headsets that they were given.

According to the software's analytics, the average time spent on VirtualSpeech throughout the pilot was 4.5 hours per student, while time spent on entertainment and other applications was not tracked. In addition to using the headset for practice with public speaking, students were asked how else they used VR. 12 students responded that they utilized the technology for YouTube, Netflix, or gaming.
The last survey question asked students if they had suggestions for improving this experience for future offerings. Most responses included "None" or "No," while one student asked for the requirement of more VirtualSpeech lessons and another opined that more outside applications, other than VirtualSpeech, should be incorporated.

Instructor Feedback
The course professor was from the Communications department and had little to no experience with VR but was enthusiastic about its use. According to the professor, it was easy to incorporate the headsets into the course for several reasons. First, VR is playful, and young students find it easier to learn through engaging gamification methods. Second, the technology is unique and compelling for all ages. Third, using VR technology in the context of learning gives students many choices and is empowering as their use and availability of choices negates top-down learning styles present in traditional classroom pedagogical settings.

According to the instructor, there are a few areas for improvement. Items to improve for future

semesters include more directives regarding class expectations for their use and closely monitoring the data generated to increase the usage of VR headsets for coursework over entertainment purposes in real-time. VR headsets may still be used for entertainment purposes with increased course directives.

Per the instructor, VR headsets can be effective in helping students feel more comfortable talking in front of people since individuals can create a virtual classroom of avatars to replicate how that might feel in person. As a result, students can create and act through scenarios that explore personal feelings that are may be hard to reproduce in their day-to-day lives. Surprisingly, this VR classroom can also help create a more vital consciousness in students who spend much time mindlessly scrolling their phones.

Student feedback in previous semesters with traditional learning indicates that when a student speaker looks out at a group of peers primarily on their phones, they feel their presentations diminish. It is "hard to concentrate" on the content they have created and practiced. In this scenario, everybody loses as the student speaker's scores go down, the presentation may not be as vibrant as it originally was, and they feel far less confident as they perceive that nobody is listening to them. The avatars that exist now are listening, non-phone-holding, and engaged in the speech.

The observation was made that some students associated the VR headsets with a game-type feeling. Gamification bridges the gap between traditional education and students' digital familiarity (Lampropoulos & Kinshuk, 2024). The combination of gamification and VR helped to create an engaging and interactive learning environment that enhanced student motivation and retention.

Some students felt as though they were part of an interactive story, alleviating the anxiety public speaking can often bring (Grieve et al., 2021). Moreover, gamification within VR encouraged self-reflection. This self-reflective aspect cultivates a growth mindset, empowering students to take ownership of their progress.

To improve the teaching and integration of VR headsets more seamlessly into an effective speaking course, it is beneficial to focus on enhancing familiarity with VR tools and the strategic incorporation of these resources into the curriculum. This could involve participating in professional development workshops or training sessions to deepen understanding of VR technology and its applications in communication skills training.

By collaborating with IT and colleagues more experienced in VR integration, instructors could be better equipped to troubleshoot potential challenges and develop best practices. Additionally, gathering more student feedback on their VR experiences would help refine the approach, defining that the technology is not just a novel tool but a meaningful enhancement to the student learning experience.

5. DISCUSSION AND CONCLUSION

Our results corroborate previous research indicating that VR applications have the potential to reduce public speaking anxiety and promote increased communicative confidence (Reeves et al., 2021). The Wilcoxon test's statistical evidence, accounting for the small sample size, provides empirical evidence supporting VR training strengthening student learning outcomes through reduced anxiety and increased confidence.

Additionally, student attitudes toward using technology in the course are overwhelmingly positive. One student lost interest after one day, but 11 other students felt VR exposure was fun and valuable. The students' perspective on the VirtualSpeech public speaking training software was a significant driver of positive insights for deploying VR headsets in future public speaking course offerings.

According to the instructor: "Using technology that fits into a contemporary tech consumption landscape is the best way to reach young students who see school and particularly public speaking as something quite undesirable overall. The potential for this fun toy to be a real and functional tool is high."

As today's students are immersed in a world of rising technology and gaming, students can capitalize on this familiarity by creating an immersive learning experience (Li et al., 2023). The connection to digital and gaming experiences fostered enthusiasm and relatability for student participants, making the learning process less intimidating and more engaging.

One limitation of this study is the small sample size. Twenty-one students received headsets, and only 15 completed both the pre-and post-survey. Positive response bias may be shown throughout

the results, as students having a better experience with the headset may be more likely to fill out the survey.

A further limitation of this study is the need for a control group. Causal inference of the intervention of VR exposure cannot be stated during this investigation. Students' anxiety reduction and increased confidence levels may be partially, or wholly, attributed to spending six additional weeks in an effective communication course, although it is to be noted that the pre-survey was deployed halfway through the semester. Evaluation of student attitudes toward using the technology signifies that the statistical results found in this paper can, at least partially, be attributed to the intervention of VR headsets.

Gaps also remain in understanding VR's accessibility across diverse populations, its integration with traditional pedagogies, and its potential for adverse effects, such as cyber-sickness. Future research should address these gaps by exploring cost-effective solutions, the pedagogical alignment of VR tools, and strategies for mitigating adverse effects while maximizing inclusivity.

6. FUTURE DIRECTION

The college is taking proactive steps to integrate VR technology into all freshman-level effective speaking courses, aiming to enhance student engagement and public speaking proficiency. The plan focuses on providing increased training for instructors to ensure they are equipped to leverage VR tools effectively, creating a more immersive and interactive learning environment for all students.

Pedagogical response to technological advancements, such as Meta Quest 2's, can and should be a positive integration into higher education. Such integration prepares learners to participate in a digital society and innovate within it, driving VR progress while addressing challenges through informed and technology-enabled solutions.

As VR technology continues to evolve, its potential in education is anticipated to significantly expand across a wide range of disciplines, including communication, STEM (science, technology, engineering, and mathematics), arts, and humanities. This growth will allow for the development of more immersive and interactive learning environments where students can engage with content in new ways. By offering personalized, experiential learning opportunities, VR can tailor educational experiences to individual needs, helping students grasp complex concepts and develop skills more effectively.

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8. REFERENCES

Abich, J., Parker, J., Murphy, J. S., & Eudy, M. (2021). A review of the evidence for training effectiveness with virtual reality technology. *Virtual Reality*, *25*(4), 919–933. https://doi.org/10.1007/s10055-020-00498-8

Akbari, O., & Sahibzada, J. (2020). Students' Self-Confidence and Its Impacts on Their Learning Process. *American International Journal of Social Science Research*, *5*(1), 1–15. https://doi.org/10.46281/aijssr.v5i1.462

Alfarsi, G. (2021). A Review of Virtual Reality Applications in an Educational Domai. *International Journal of Interactive Mobile Technologies (iJIM)*, *15*.

Alwafi, G. A., Almalki, S., Alrougi, M., Meccawy, M., & Meccawy, Z. (2022). A Social Virtual Reality Mobile Application for Learning and Practicing English. *International Journal of Interactive Mobile Technologies (iJIM)*, *16*(09), 55–75. https://doi.org/10.3991/ijim.v16i09.28289

Anderson, P. L., Price, M., Edwards, S. M., Obasaju, M. A., Schmertz, S. K., Zimand, E., & Calamaras, M. R. (2013). Virtual reality exposure therapy for social anxiety disorder: A randomized controlled trial. *Journal of Consulting and Clinical Psychology*, *81*(5), 751–760. https://doi.org/10.1037/a0033559

Bhattacharya, P., Saraswat, D., Savaliya, D., Sanghavi, S., Verma, A., Sakariya, V., Tanwar, S., Sharma, R., Raboaca, M. S., & Manea, D. L. (2023). Towards Future Internet: The Metaverse Perspective for Diverse Industrial Applications. *Mathematics*, *11*(4), Article 4. https://doi.org/10.3390/math11040941

Cao, W., & Yu, Z. (2023). Exploring learning outcomes, communication, anxiety, and motivation in learning communities: A systematic review. *Humanities and Social Sciences Communications*, *10*(1), 1–13.

https://doi.org/10.1057/s41599-023-02325-2

Carini, R. M., Kuh, G. D., & Klein, S. P. (2006). Student Engagement and Student Learning: Testing the Linkages*. *Research in Higher Education*, *47*(1), 1–32. https://doi.org/10.1007/s11162-005-8150-9

Clark, R. A., & Jones, D. (2001). A comparison of traditional and online formats in a public speaking course. *Communication Education*, *50*(2), 109–124. https://doi.org/10.1080/03634520109379238

Cui, H., Xu, Z., & Yao, C. (2022). *Will the Metaverse Be the Future of the Internet?* 2165–2170. https://doi.org/10.2991/assehr.k.220504.392

Finn, A. N., Sawyer, C. R., & Schrodt, P. (2009). Examining the Effect of Exposure Therapy on Public Speaking State Anxiety. *Communication Education*, *58*(1), 92–109. https://doi.org/10.1080/03634520802450549

Frisby, B., Kaufmann, R., Vallade, J., Frey, T., & Martin, J. (2020). Using Virtual Reality for Speech Rehearsals: An Innovative Instructor Approach to Enhance Student Public Speaking Efficacy. *Basic Communication Course Annual*, *32*(1). https://ecommons.udayton.edu/bcca/vol32/iss1/6

Frydenberg, M., Yates, D. J., & Noonan, A. (2024, November 1). *Teaching the Metaverse: Applying TPACK to a Multidisciplinary First Year Seminar Course Design.* | *Information Systems Education Journal* | *EBSCOhost*. https://doi.org/10.62273/RXFI8909

Grieve, R., Woodley, J., Hunt, S. E., & McKay, A. (2021). Student fears of oral presentations and public speaking in higher education: A qualitative survey. *Journal of Further and Higher Education*, *45*(9), 1281–1293. https://doi.org/10.1080/0309877X.2021.1948509

Gruber, A., & Kaplan-Rakowski, R. (2020). User Experience of Public Speaking Practice in Virtual Reality. In *Cognitive and Affective Perspectives on Immersive Technology in Education* (pp. 235–249). IGI Global. https://doi.org/10.4018/978-1-7998-3250-8.ch012

Halarnkar, P., Shah, S., Shah, H., Shah, H., & Shah, A. (2012). A Review on Virtual Reality. *Internation Journal of Computer Science Issues*, *9*(6), 325–330.

Holly, M., Pirker, J., Resch, S., Brettschuh, S., & Gütl, C. (2021). Designing VR Experiences – Expectations for Teaching and Learning in VR. *Educational Technology & Society*, *24*(2), 107–119.

Hunter, K. M., Westwick, J. N., & Haleta, L. L. (2014). Assessing Success: The Impacts of a Fundamentals of Speech Course on Decreasing Public Speaking Anxiety. *Communication Education*, *63*(2), 124–135. https://doi.org/10.1080/03634523.2013.875213

Hwang, G.-J., & Chien, S.-Y. (2022). Definition, roles, and potential research issues of the metaverse in education: An artificial intelligence perspective. *Computers and Education: Artificial Intelligence*, *3*, 100082. https://doi.org/10.1016/j.caeai.2022.100082

I.C.A, O., & Ebuh, G. (2012). Modified Wilcoxon Signed-Rank Test. *Open Journal of Statistics*, *02*, 172–176. https://doi.org/10.4236/ojs.2012.22019

Kavanagh, S., Luxton-Reilly, A., Wuensche, B., & Plimmer, B. (2017). A systematic review of Virtual Reality in education. *Themes in Science and Technology Education*, *10*(2), 85–119.

Kryston, K., Goble, H., & Eden, A. (2021). Incorporating Virtual Reality training in an introductory public speaking course. *Journal of Communication Pedagogy*, *4*, 133–151. https://doi.org/10.3316/INFORMIT.105960039981701

Lampropoulos, G. & Kinshuk. (2024). Virtual reality and gamification in education: A systematic review. *Educational Technology Research and Development*, *72*(3), 1691–1785. https://doi.org/10.1007/s11423-024-10351-3

Li, M., Ma, S., & Shi, Y. (2023). Examining the effectiveness of gamification as a tool promoting teaching and learning in educational settings: A meta-analysis. *Frontiers in Psychology*, *14*, 1253549. https://doi.org/10.3389/fpsyg.2023.1253549

Lim, M. H., Aryadoust, V., & Esposito, G. (2023). A meta-analysis of the effect of virtual reality on reducing public speaking anxiety. *Current Psychology*, *42*(15), 12912–12928.

https://doi.org/10.1007/s12144-021-02684-6

Martirosov, S., Bureš, M., & Zítka, T. (2022). Cyber sickness in low-immersive, semi-immersive, and fully immersive virtual reality. *Virtual Reality*, *26*(1), 15–32. https://doi.org/10.1007/s10055-021-00507-4

Mentzer, K., Frydenberg, M., & Patterson, A. (2024). Are Tech Savvy Students Tech Literate? Digital and Data Literacy Skills of First-Year College Students. *Information Systems Education Journal*, *22*(3), 4–24. https://doi.org/10.62273/MFSD3135

Milgram, P., Takemura, H., Utsumi, A., & Kishino, F. (1995). *Augmented reality: A class of displays on the reality-virtuality continuum* (H. Das, Ed.; pp. 282–292). https://doi.org/10.1117/12.197321

Moro, S. B., Carrieri, M., Avola, D., Brigadoi, S., Lancia, S., Petracca, A., Spezialetti, M., Ferrari, M., Placidi, G., & Quaresima, V. (2016). A novel semi-immersive virtual reality visuo-motor task activates ventrolateral prefrontal cortex: A functional near-infrared spectroscopy study. *Journal of Neural Engineering*, *13*(3), 036002. https://doi.org/10.1088/1741-2560/13/3/036002

Muthmainnah, M., Khang, A., Yakin, A. A., Oteir, I., & Alotaibi, A. N. (2023). An Innovative Teaching Model: The Potential of Metaverse for English Learning. In *Handbook of Research on AI-Based Technologies and Applications in the Era of the Metaverse* (pp. 105–126). IGI Global. https://doi.org/10.4018/978-1-6684-8851-5.ch005

Netta, A., Trisnawati, I. K., & Helmanda, C. M. (2020). Indonesian EFL students' strategies in dealing with speaking anxiety in public speaking course. *ACCENTIA: Journal of English Language and Education*, *1*(1), 1–9. https://doi.org/10.37598/accentia.v1i1.807

Noah, N., & Das, S. (2021). Exploring evolution of augmented and virtual reality education space in 2020 through systematic literature review. *Computer Animation and Virtual Worlds*, *32*(3–4), e2020. https://doi.org/10.1002/cav.2020

Patterson, A., Mocarsky, M., Cho, J., Harmon, O., & Calvert, C. (2023). Teaching Data Literacy and Sports Economic Fundamentals Using Fantasy Sports. *Business Education Innovation Journal*, *15*(1).

Ramesh, U. V., Harini, A., Divya Gowri, Ch. S., Vyshnavi Durga, K., Druvitha, P., & Siva Kumar, K. (2022). Metaverse: Future of the Internet. *International Journal of Research Publication and Reviews*, *3*(2), 93–97.

Reeves, R., Elliott, A., Curran, D., Dyer, K., & Hanna, D. (2021). 360° Video virtual reality exposure therapy for public speaking anxiety: A randomized controlled trial. *Journal of Anxiety Disorders*, *83*, 102451. https://doi.org/10.1016/j.janxdis.2021.102451

Ritterbusch, G. D., & Teichmann, M. R. (2023). Defining the Metaverse: A Systematic Literature Review. *IEEE Access*, *11*, 12368–12377. IEEE Access. https://doi.org/10.1109/ACCESS.2023.3241809

Roebken, H. (2007). The Influence of Goal Orientation on Student Satisfaction, Academic Engagement and Achievement. *Electronic Journal of Research in Educational Psychology*, *5*(13).

Saeed, A., Foaud, L., & Fattouh, L. (2017). Environments and System Types of Virtual Reality Technology in STEM: A Survey. *International Journal of Advanced Computer Science and Applications*, *8*(6). https://doi.org/10.14569/IJACSA.2017.080610

Taheri, S. M., & Hesamian, G. (2013). A generalization of the Wilcoxon signed-rank test and its applications. *Statistical Papers*, *54*(2), 457–470. https://doi.org/10.1007/s00362-012-0443-4

Wang, Q., Tang, L., & Wang, Y. (2023). Potential Applications of the Metaverse in Higher English Education. *Open Journal of Social Sciences*, *11*(1), Article 1. https://doi.org/10.4236/jss.2023.111031

Wohlgenannt, I., Simons, A., & Stieglitz, S. (2020). Virtual Reality. *Business & Information Systems Engineering*, *62*(5), 455–461. https://doi.org/10.1007/s12599-020-00658-9

World Economic Forum. (2022). *The future of education is in experiential learning and VR*. https://www.weforum.org/agenda/2022/05/the-future-of-education-is-in-experiential-learning-and-vr

Yuan, J., Liu, Y., Han, X., Li, A., & Zhao, L. (2023). Educational metaverse: An exploration and practice of VR wisdom teaching model in Chinese Open University English course. *Interactive Technology and Smart Education*, *20*(3), 403–421. https://doi.org/10.1108/ITSE-10-2022-0140

Zhou, H., Fujimoto, Y., Kanbara, M., & Kato, H. (2021). Virtual Reality as a Reflection Technique for Public Speaking Training. *Applied Sciences*, *11*(9), Article 9. https://doi.org/10.3390/app11093988

APPENDIX

Label in Paper	Question Asked	Response Items
Anxiety	I feel anxious before giving a public speech or speaking in a public setting	Strongly disagree, disagree, somewhat disagree, neither agree nor disagree, somewhat agree, agree, strongly agree
Comfort	I feel comfortable speaking in front of a group of classmates	same as above
Confidence	I am confident in my ability to deliver a presentation clearly with good vocal projection	same as above
Satisfaction	I have been satisfied with my past performance when delivering a public speech	same as above
Importance	I feel effective communication is important for my future job	same as above
Enjoyment	I enjoy the effective communication course	same as above

Likert scale values were coded as follows:

Strongly disagree = -3, Disagree = -2, Somewhat disagree = -1, Neither agree not disagree = 0 Somewhat agree = 1, Agree = 2, Strongly agree = 3

Table 1: Quantitative Survey Questions

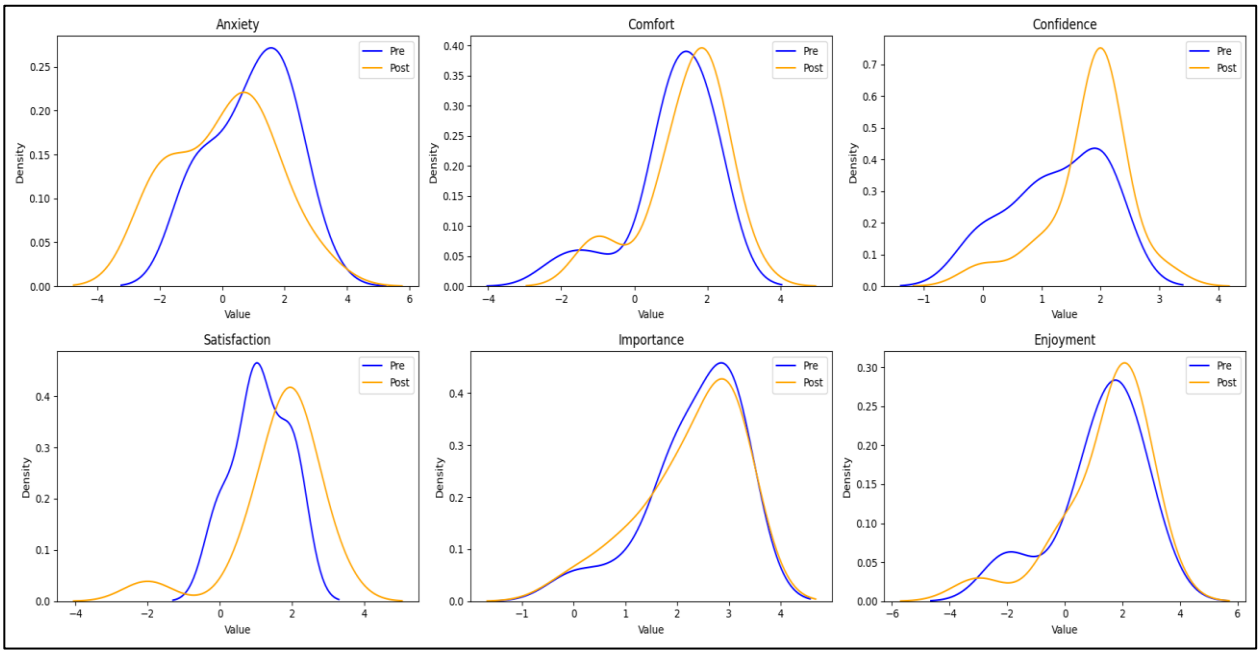


Figure 1: Distribution of Quantitative Questions