VR Glasses for Developing Academic Presentation Skills at an EMI University

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Reference Data:

Tikhomirova E., & Sharapkova, A. A. (2024). *VR glasses for developing academic presentation skills at an EMI university*. In B. Lacy, P. Lege, & P. Ferguson (Eds.), Growth Mindset in Language Education. JALT. https://doi.org/10.37546/JALTPCP2023-23

VR glasses can be employed as invaluable tools of instruction when adopted to foster students' academic presentation skills within an EMI institution. However, integrating VR glasses into the established curriculum requires great scrutiny, carefully weighing its benefits and drawbacks. In our study, 29 MS/PhD students from the science and engineering tracks gave two consecutive presentations to a virtual audience. We used a presentation simulator developed by Modum Lab, capable of providing instant, automatic feedback on vital metrics contributing to effective oration. When a performance delivers positive eye contact and maintains fluency, the audience shows signs of approval—primarily expressed through applause. Conversely, insufficient eye contact, in tandem with audible pauses or an excessive use of filler words, results in the audience showing signs of irritation or distraction. Important correlations between oral fluency and audience management improving with each successive trial are discussed throughout this paper, accompanied by an analysis of immersive VR experiences from instructor and student perspectives. Through our analysis, suggestions for improving and fine-tuning VR to enhance one's educational experience emerge.

英語媒介型講義(EMI)を採用する大学における学術プレゼンスキル向上のためのVRグラスEMI教育機関において学生の学術プレゼンスキルを向上させるためにVRグラスを使用することは、学生と指導者双方にとって貴重な経験となり得る。しかしながら、既存のカリキュラムにVRグラスを組み込む場合には、その利点と欠点を慎重に検討する必要がある。本研究では、理工系コースの修士・博士課程の学生29名が、仮想聴衆の前で2回続けてプレゼンテーションを行った。Modum　Lab社が開発したプレゼンテーション・シミュレーターを使用したが、このシミュレーターは、話し手のアイコンタクトやフィラーワード（つなぎ言葉）の使用、その他自動的に収集される重要なメトリクスについて、即座にフィードバックを提供するものである。アイコンタクトが良好で流暢なパフォーマンスの場合、仮想聴衆は拍手などの承認の反応を示す。アイコンタクトが不十分で、間やフィラーワードが多い魅力的でないプレゼンスタイルの場合、聴衆は雑音を発するなど、スピーチから気を逸らしてしまう。本論文では、スピーチの流暢さと連続的試行において向上する聴衆コントロールスキルとの間の興味深い相関関係が強調されている。指導者と学生それぞれの視点からこの没入型VR体験を分析するとともに、より良い教育体験のためのVRシミュレーターの改善と微調整の方法を提案する。

Since its early prototypes were devised in the 1960s, Virtual Reality (VR) technology has evolved prodigiously: first as a tool of the gaming industry, prior to its implementation in educational practice. With advances in technology, VR has become commercially accessible and viable (from $70,000 in 1980 to around $700 in 2023), providing greater opportunities to educators worldwide. As VR is a computer-generated simulation of an interactive, three-dimensional environment, it can offer versatile realistic scenarios that educators may use in their classrooms. Furthermore, VR engages several cognitive and sensory capacities, thus augmenting and—potentially—enhancing education: consistent with the broader trend towards gamifying the acquisition of knowledge on the human brain (Lampropoulos and Kinshuk, 2024).

This study sought to investigate benefits and challenges of VR integration into an Academic Presentations course, designed for an EMI technical institute. Furthermore, this course focuses upon the fundamentals of technical academic presentations: structure, formats, and specific content inclusive. Our cohort comprised 29 MS/PhD students from science and engineering educational tracks who gave two consecutive presentations using VR glasses. The employment of this VR simulator to train presentation skills was analysed, with a particular focus placed on feedback generated by the VR app. Additionally, freeform essays penned by the students provided an insight into the experience through their haptic perspective. Ultimately, feedback originating from the system itself and the students arouse valuable insights into potential improvements in VR training, therein courting an improved educational experience.

Literature Review

In 1992, East Carolina University established a virtual reality technology and education laboratory, advancing the institution past their contemporaries Moreover, they began to formally integrate virtual reality technology into their faculties, investigating the impact of the format on cognition and education (Juan & Hong Wei, 2021). By the early 2000s, VR labs had been established in major universities, serving as a synecdochic substitute for complex research labs (Van Dam et al., 2002). Since then, VR has proven useful in many educational fields: environmental engineering (Grivokostopoulou et al., 2020), mechanical and electrical engineering (Kaminska et al., 2017), and medicine (Izard et al., 2018). Students could immerse themselves in restricted and/or unsafe locations previously inaccessible due to safety concerns; their dimensions were altered to an inimitable scale Studies of the optimal VR laboratory design for engineering and natural sciences primarily scrutinize its cost evaluation, benefits, and integration into the already existing courses (Marks & Thomas, 2021).

In the first systematic review of the use of VR in education, held between 1999 and 2009, the researchers outlined VR features that may enhance education: namely, first-order experiences, natural semantics, learner autonomy, and the presence effect. Moreover, a trend towards intuitive interactivity emerged, questioning the retention rate of knowledge gained in VR spaces against real-world environments; the necessity of a collaboration between these media became apparent (Mikropoulos & Natsis, 2011). Furthermore, integration of VR into education has also been found to increase the students' intrinsic motivation, collaboration, and gamification (Kavanagh et al., 2017). Additionally, a noted benefit of VR in the classroom is its positive impact on student motivation and attention (Soto et al., 2022). Practicing in a safe, intrinsically inconsequential virtual environment empowers learners to repeat the actions in an authentic setting, thus increasing their confidence and motivation (Cheung et al., 2013). Repeated attempts in a VR setting help foster automatism, codifying a habit of performing the required actions correctly—thus exercising habit-related learning effects (Taunk et al., 2021). Furthermore, tasks executed in a virtual milieu can raise student's competencies, particularly in tandem with traditional teaching methods; interactive, digital learning environments can imitate real-life processes, thus facilitating channels of feedback (Richards & Taylor, 2015).

With respect to language learning, VR glasses can foster the development of knowledge-creation skills (Yu, 2021). For instance, recent systematic reviews outline VR's propensity to aid twenty-first century learners to cultivate essential competencies and language faculties in kind: teamwork, autonomy, and cultural awareness inclusive (Parmarxi, 2023). Moreover, researchers have also attempted to use VR to facilitate teaching presentation skills in a second or foreign language, due to the device's noted verisimilitude (Alsaffar, 2021). In addition, modern VR broadly permit the simultaneous collection of essential data on eye movements, voice recordings, and behavioral parameters, harnessed for further analysis in order to improve student performance.

Research Rationale

Nonetheless, VR technology is far from being a 'universal cure' or 'fit-for-all solution'. Research indicates integration issues, setup challenges and physical concerns—notably cybersickness—among the most common quandaries inhibiting its effectiveness (Pegu, 2014; Urueta, 2023). Therefore, were VR to be implemented into an existing course, or developed for an entirely new rendition, a thorough evaluation of VR's ultimate qualities must be undertaken; the benefits, moreover, must be greater than simply gamifying one's learning experience.

It is believed producing presentations is simultaneously the most desired and complex skills of an academic and professional persuasion. (Banowski, 2010). Furthermore, it is known to invariably arouse anxiety within a social setting (Smith & Sodano, 2011). In their formative papers, Woodrow (2006) and King (2002) demonstrated the broadly detrimental impact of communication anxiety on students' educational experience.

Conversely, further research posits presentations held via VR glasses may allow students to practice public speaking in private, lessening their anxiety through training in a low-stakes environment (Alsafar, 2021). Presently, VR-based programs help participants to develop stage confidence, deal with glossophobia, and refine their aptitude. (Khurpade et al., 2020). Additionally, VR could democratise bespoke tutoring, generating automated, yet personalised feedback.

Case Study Context

The study drew upon 29 MSc and PhD students enrolled in an Academic Presentations course featuring an integrated VR experience. Crucially, the course was offered within university wherein English is recognised both as the medium of instruction and the lingua franca. Participants provided informed consent prior to collating feedback; their answers were anonymized prior to processing. Furthermore, the project was also approved by the university's board of review.

As a preliminary measure, several methodological steps were addressed; details of the VR system were provided thereinafter. Throughout the course, the students gave two presentations via the software. This program collected and saved feedback on each speaker's presentation autonomously. Additionally, the application preserved audio recordings of each presentation. Subsequently, instructors provided constructive, detailed feedback on the quality of the audio, before assessing comments produced by the program. Then, students were given time to prepare for the second presentation, reflecting upon the feedback formulated by the program, along with the observations of their instructor. In turn, students altered their second attempt according to their initial feedback. Lastly, students wrote essays on their experiences using the VR program; these simulations primed them for a live presentation to their peers. An application was provided by Modum Lab (https://modumlab.com/), a company specialising in the development of simulations covering various businesses and industries. Notably, the institution programmed a Public Speaking Simulator the authors found useful for their course. Initially, the simulator was designed for Russian speakers to be used in business courses; Modum Lab adapted and 'localized' the interface for English language users. This required adapting the software's automatic analysis of the language in a similar manner to a Deep Learning Neural Network, which notes frequencies of an audio file to assess the basic prosodic parameters.

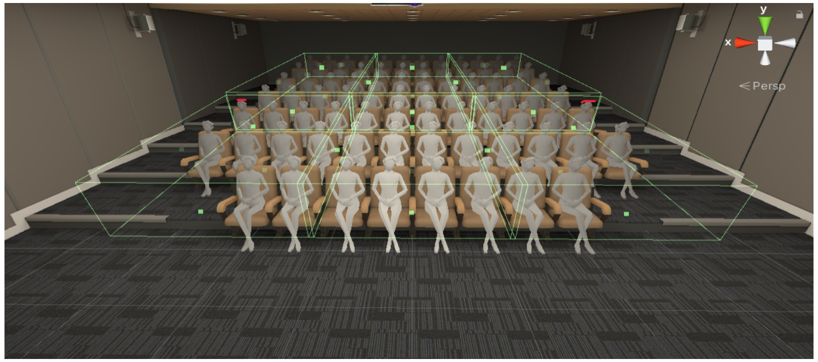
When the speakers wore the VR glasses, they found themselves in front of a virtual audience. The virtual public is designed to immediately react to the manner of presentation. If the speech is 'boring', deemed through a slow tempo, low volume, or poor eye contact, the audience starts making noises and showing discontent. However, if the presentation is successful, demonstrating better fluency and eye contact, the audience nods, exhibits further signs of approval, and applauds at the end. Through these behaviours the virtual audience replicates the manner of an authentic audience; the images—though recognisably virtual to the speaker—succeed in altering one's instinctual emotional response.

Methodology

In the VR simulation, the audience is divided into sectors; the speaker is expected to keep eye contact with each sector during the presentation, rather than settling on one avatar alone. Such behavior is common to those suffering from stage fright, yet it may be considered intimidating by the audience (Khurpade et al., 2020). Thus, the skill of maintaining eye contact with the entire lecture hall must be trained to ensure its implementation, alleviating anxiety associated with its execution. Notably, VR glasses prescribed for the experiment do not track one's eye movement: typically, these gadgets trace various types of saccades. The system identifies a sector as covered when the center of the glasses is directed towards its center, as indicated by a green spot in Figure 1 below; each sector features several avatars. For the system to judge a sector as appropriately covered by eye contact, the center of the VR glasses must be directed towards the middle of each sector. To temper the influence of this factor, we informed the participants on the system's logic prior to the first attempt. However, this factor was negligible: the virtual lecture hall was large, implicitly encouraging the speaker to adjust their posture in order to respect each sector.

Figure 1

The technical design of sectors behind the app



To take part in these exercises, students created an account on the platform; PDF files of the presentations were prepared beforehand. Throughout the class, students presented in VR glasses; the system returned the feedback autonomously to each student. Furthermore, the instructor could access all feedback generated through the system. In turn, this feedback was referred to for further analyses, practice, and improvement, as indicated in Figure 2.

Grading rubrics included several parameters concerning eye contact: instances where the presenter referred to their rear presentation screen, or to prompts located on the right on an additional screen—similar to a TED Talk milieu. In addition, the system measured moments the speaker deferred to the floor and/or walls, kept tallies of the employment filler words, rude words, along with an assessment of general attention distribution for eye contact. In particular, the latter demonstrates the necessity of universally-spread eye contact, rather than settling upon a particular sector of the lecture hall. Furthermore, as VR presentations were integrated into a course on teaching academic presentation skills, the participants had equal fluency in expressing education via instinctual trial and error and theoretical, interactive discourse.

As students were granted two opportunities, their following attempts were influenced by feedback generated through the system. Between presentations, the students discussed this feedback with their instructor to clarify questions and quandaries. Then, each participant studied the refined feedback to improve upon their first attempt. Audio tracks were recorded autonomously, sent by the system to the participant and their instructor. Students studied their audio recording, focusing on the subjective elements of their presentation, regarded as invalid by automated measures; this encouraged heightened scrutiny on their behalf. Ultimately, students presented three times: two attempts were made through VR, , with a final rendition given live to the class. Students reported the visualization of their errors through the system feedback eased the implementation of improvements in their delivery.

Figure 2

Metrics used in the system, detailing feedback provided to a participant

Eye contact	95% of the time, you maintained eye contact with the audience.
Loss of eye contact	Up to six seconds—not bad! Try to reduce maximum contact loss to 5 seconds.
No eye contact	No eye contact.
A glance at the presentation	0 times—was not distracted by the presentation.
Plague words	12—excellent! You hardly used any plague words: So (7), you know (3), like (1), well (1).
Rude words	0—excellent! You did not use rude words.
Attention distribution	Bad: you paid little attention to the rear left, rear right, and front left areas of the room.
Attention to the irrelevant	You looked at your feet too often.

Note. The following data was drawn from the original document, revised to enable greater clarity in assessing key criterion:

Subsequently, the data produced by the system was coded further to ensure anonymity, processed into one Excel file, and analyzed through several statistical methods—namely Spearman's rank correlation coefficient and the Wilcoxon signed rank test.

Following both presentations, students were requested to provide unstructured feedback on their experience in the form of an essay. These documents reflected on the positives and negatives of the format, noting the most helpful rendition of automatic feedback, before providing their judgement of its effectiveness. Then, feedback from the students' essays were anonymized, leading to a semantic and conceptual analysis of the exercise, thus illuminating key themes and ideas that emerged through their responses.

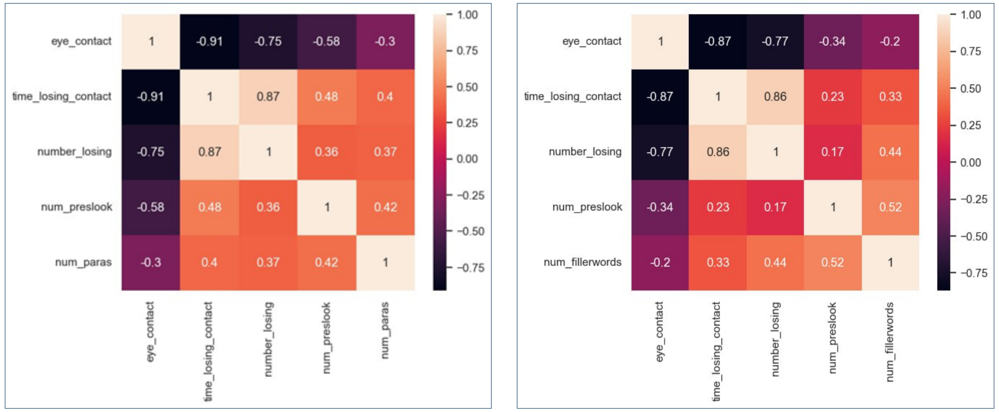
Results and Discussion

Analysis of the Program Feedback

Initially, the program's provided feedback was uploaded, allowing its given parameters to be analysed. Broadly across each attempt, students maintained eye contact at a mean score of 85% of the time, albeit with an average of 8.7 seconds of lost eye contact recorded. Furthermore, students deferred to an average of 11 filler words per presentation; . their speeches settled on an approximate length of 5.7 minutes. However, further analysis revealed interesting links (Spearman correlations) between these parameters throughout the first and second attempts.

Figure 3

Heatmap representations of attempts one and two, respectively.



There is an evident correlation between the duration of eye contact loss with the number of times that contact with the audience was lost: 0, 86 and 0,87 in the first and second attempts respectively. Consequently, an intuitive pattern emerges: as one's anxiety rises, greater instances of distraction occur—both in number and duration. This is consistent with recorded data on the impact of anxiety on attention distribution and problems with inhibiting irrelevant information during task performance (King & Finn, 2017). As this correlation remained consistent through the second trial, students may require further practice to modify develop a habit of public speaking, ensuring they may effectively communicate resisting variable influences or distractions.

Curiously, students throughout their initial presentation appeared to look at other objects in the virtual room upon losing contact with their virtual audience; their second attempt, however, yielded an evident shift in their optical focus. For instance, students eminently referred to their own presentation resulting in their disconnect with the audience:: 0,17 and 0,36 in the first and second attempts, respectively. Therefore, looking at the presentation instead of producing unmotivated glances around the room could be a productive strategy for remedying public speaking anxiety for inexperienced presenters. However, this correlation could disappear with subsequent presentations, as participants may memorize their content, requiring less support from auxiliary means such as the text or the slides.

Furthermore, a weaker correlation between the number of filler words and cases of lost attention with the audience (0,44 – 0,37), in tandem with the number of filler words accompanied by instances of reference to the presentation screen (0,52- 0,42), were noted throughout the second performance. These findings align positively with reports on VR's validity in resolving anxiety and glossophobia in L1 (Khurpade et al., 2020). Nevertheless, this lower correlation coefficient may be related to fewer filler words used in the second attempt.

Table 1

Spearman correlations and statistical significance with p-values in two attempts.

	eye_contact	time_losing_contact	number_losing	num_preslook	num_fillerwords
eye_contact	-	***	***	**	
time_losing_contact	-0.911	-	***	**	*
number_losing	-0.749	0.867	-		
num_preslook	-0.575	0.477	0.357	-	*
num_fillerwords	-0.304	0.395	0.366	0.422	-

	eye_contact	time_losing_contact	number_losing	num_preslook	num_fillerwords
eye_contact	-	***	***		
time_losing_contact	-0.868	-	***		
number_losing	-0.766	0.865	-		*
num_preslook	-0.339	0.23	0.165	-	**
num_fillerwords	-0.198	0.332	0.445	0.52	-

Note. The upper table represents the first attempt, with the lower one represents the second. P value stars correspond to the following p values: 0.001: '***', 0.01: '**', 0.05: '*'

In the Wilcoxon test, adopted to compare two dependent samples, the nonparametric criterion was employed through the second stage of analysis. These results demonstrated students' continued reference to their presentations; a notable deviation in data between the performances was not recorded. Furthermore, students employed a near tantamount number of filler words across both presentations. However, the parameter of greatest alternation was eye contact: it increased, while the duration of contact loss decreased. This effect could be attributed to the students' familiarization with the VR reality technology, in accordance with their reduced anxiety in anticipation of the second presentation.

Table 2

Statistical values comparing the first and the second attempt and outlining the intensity of change in terms of analyzed parameters (Wilcoxon test)

Feature	W-val	P-value
Eye contact	8.5	0.017
Time losing eye contact	5.0	0.013
Number losing eye contact	0.0	0.013
Looking at presentation	4.5	0.202
Filler words	37.5	0.575

Overall, the eye contact percentage increased for the second attempt, retained for an average of 96%; the first attempt yielded a mere 81%. Furthermore, cumulative lost contact time numbered 2.6 seconds—a significant decrease from the initial 5 seconds. However, the number of cases wherein the contact was lost rem ained virtually identical, with no material change—as indicated in table two. Ultimately, these metrics show the intensity of change, thus questioning the significance of these deviations. The parameters with the greatest degree of change were the number of filler words and eye contact; the least deviation occurred in instances of lost eye contact. From this, it is evident that students were capable of regaining composure in response to momentary lapses, continuing to engage with their virtual audience effectively.

Figure 4

Comparison of the key parameters during the first and the second attempt

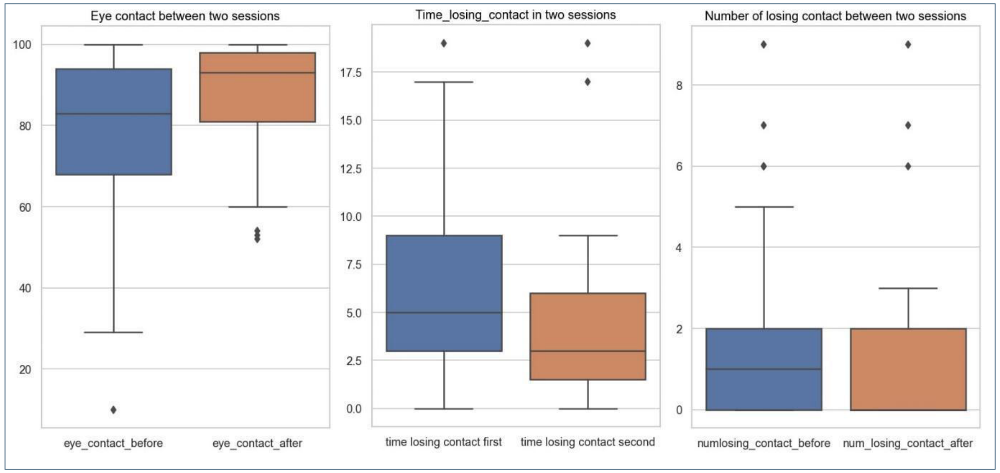
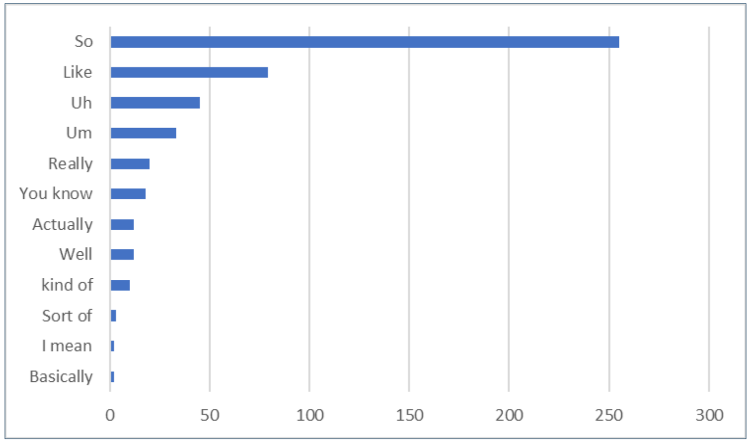


Figure 5

Filler words most used by students across forty-seven presentations



The analysis of filler words showed a tendency among Russian speakers to overuse particular filler words—namely ‘so’ and ‘like’ (Figure 5).

Conversely, English speakers may employ a broader suite of filler phrases: i.e., very, really, just, I mean, I guess, etc. Upon receiving feedback from the system, the students demonstrated both interest and surprise in assessing filler words used in their presentations. Therefore, this form of feedback can assist students in improving their awareness of their poor presentation habits and may serve as motivation to perfect their speech.

Audio File Analysis

As previously addressed, the audio tracks were automatically and autonomously recorded and sent by the system to each participant as well as instructor. Consequently, students could listen to their first attempt and improve the wording before the second attempt (Table 3). Then, the instructor analyzed these audio files further, providing individual detailed constructive feedback on the essential structural and linguistic issues to each participant. One of the major lessons students learned was the necessity of loud, clear speech as this would ensure a higher quality of recording.

Table 3

Transcripts of each presentation

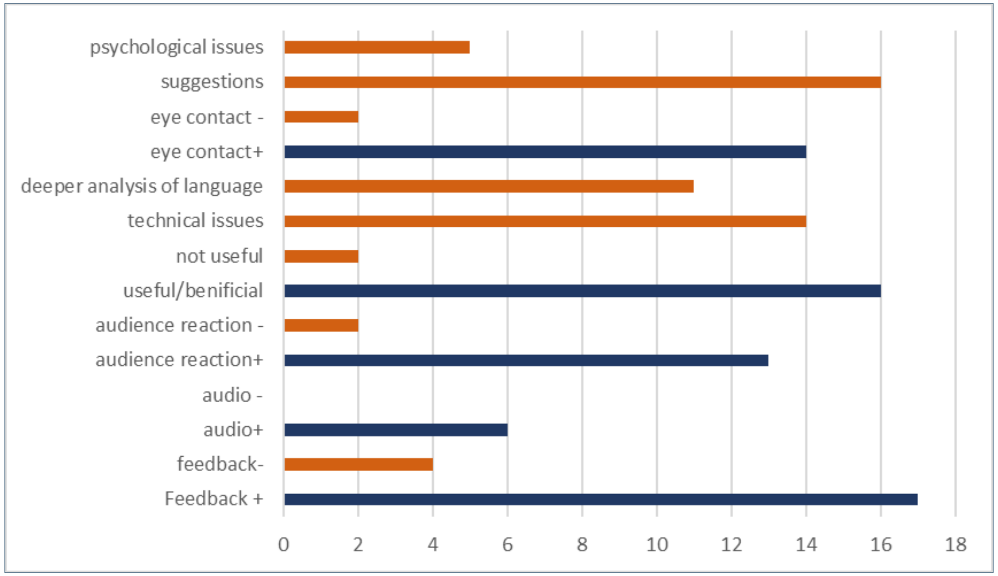
First attempt	Second attempt
Good morning, dear colleagues. Today, the topic of my research is a genetic background of schizophrenia. My contact you can find on the slide. First of all, what is schizophrenia? Schizophrenia is first a multifactional and I mean it's affected by lots of way. It's genetic and environmental and second, it's a polygenetic disease. It's affected by lots of genes, by many genes. We can't understand fully what schizophrenia is, but we have several hypotheses. The first, it's dopamine hypothesis...	Good morning, dear colleagues! The topic of my research is the genetic background of schizophrenia. All information about me and my contact you can find in the slide. First of all, what is schizophrenia? First, schizophrenia is multifactual. I mean it's affected by genes and environment. The second is multifactual disease. It's affected by many genes. And we can't fully understand it but we have several hypotheses.

Analysis of the Students' Feedback

Following the first round of presentations, the students wrote an unstructured essay reflecting on their experience, detailing the positives and negatives of their VR experience. Then, their responses (N = 22) were analyzed conceptually; fundamental, recurring issues were noted.

Figure 6

Analysis of Student Feedback Essays



Observations Drawn from Figure 6

- Most students appreciated the opportunity to present using the VR program, rating the experience as both positive and useful for developing presentation skills..
- Although VR technology was presumed to offer a safe and psychologically comfortable environment (Alsaffar, 2021), one student seemed to have such a severe case of stage fright that for them this VR experience was more stressful and intimidating than the real audience.

    - However, their peers stressed that practicing with the virtual audience made them feel comfortable and confident because they didn't worry about being judged.
- Students recognised the importance of eye contact whilst admitting the difficulty of distributing eye contact evenly throughout the lecture hall due to the system's technical limitations.
    - Were more advanced gear accessible—capable of tracking both head and eye movements—a greater breadth of data could be acquired on the students' behaviour during their presentations; nevertheless, feedback on eye contact was gathered acutely in spite of technical limitations.
- Students were generally positive on the audience's reactions, appreciating the change in avatars' mood according to the presenter's heightened fluency and improved eye contact.
- Students ostensibly understood the need for confident and fluent speech.
- Automated feedback satisfied the majority of students.
- Nevertheless, participants identified areas for improvement:
- There were some technical issues pertaining to the affixation and manipulation of the virtual headset, particularly in entering the virtual presentation space.
    - Technical assistance was required; the institute's IT department obliged. Integrating VR into a course at a higher institution requires a deal of preparation and constant support from an IT team—it cannot be provided solely by the instructor.
- The students recognised potential for increasing the breadth and depth of regarded metrics—particularly those concerning richer language analysis.
    - Instructors later analyzed the students' audio recordings, providing constructive feedback on relevant structural and language features to further improve their presentations.

Challenges and Limitations

A primary limitation of this study concerned the small sample size: a modest twenty-nine students participated, showing that more research is needed to confirm the findings with confidence. Secondarily, several issues highlighted by the study need to be resolved to better adapt the technology for educational use.

Some students noted that although the VR audience appeared realistic, the avatars could be enhanced further; the implementation of individualized models, complete with more human features, could ease the immersive experience. For instance, the audience could adapt to each successive iteration of one's presentation. Another issue to consider is that students with recognised vision impairments could not discern images correctly, resulting in their automatic feedback scores being lower than expected. As a consequence, students noted this issue could discourage afflicted participants—though a specialized set of VR glasses could be implemented to address this concern.

Curiously, both instructors and students agreed upon the need for richer language analysis from the program. . The integration of AI assistance, however, could resolve this criticism: models can transcribe speech to text, receiving appropriate adjustments regarding the style, pronunciation, and grammar of a presentation.

Conclusion

This course provided a rich opportunity for students to refine their oratory skills across both live and virtual environments. Through the novel VR equipment and software, participants received various forms of guided and individual training and assessment. To this end, , the students came to refine their skills, broaden their knowledge of presentation etiquette, and heighten their confidence in providing effective presentations in English.

Furthermore, participants were provided with baselines and feedback regarding their performance. Therefore, students became knowledgeable in the general form of an academic presentation and its content. Additionally, analysis of their audio helped students to refine their language skills, with particular focus on structure, intelligibility, pronunciation, and rhetoric. Lastly, analyzing the system's automated feedback provided useful insights into the language and behavior patterns of both students and instructors, highlighting important tendencies.

Ultimately, the authors believe that soft skills obtained in the course will become part of the students' portfolios, thus enabling them to chart all possibilities throughout their studies and future careers. Additionally, the project is versatile, scalable, and adaptable for any group of students, irrespective of expertise. Virtual practice space, in addition to at-home and in-class activities, may have an overall positive effect on students' performance.

Bio Data

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Acknowledgements

This work is supported by the institutional Innovations in Education Grant, 2023.

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