Project Summary for IAL Website

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Project Title:	"Do you know how you present?": Effectiveness of VR-augmented feedback for effective oral presentation
Project Number:	GA20-08
Year of Approval:	2021
Funding Source:	WDARF
Objectives and intended outcomes of the project:	1. To develop the presenters' presentation skills for engaging the adult audience in a virtual training environment. 2. To investigate the effectiveness of the virtual reality-based environment in improving presenters' oral presentation skills.
Project Team	
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Summary of Project (up to 300 words)

In any training situation, the instructors' competence in speaking to the audience will be crucial to the effectiveness of a training course. However, many instructors have limited competencies to deliver an effective oral presentation to the audience, the problems may be due to eye contact, gesture and verbal fluency. One way to develop the speakers' presentation skills is to provide them feedback based on their previously training videos, but such feedback given by the human expert is often limited by their limited angles of observation. Consequently, details of the speakers' facial expressions, changes in speaking speed and eye contact cannot be synchronously captured and analyzed fully by the human observer. Virtual Reality (VR) may potentially help to address the limited feedback provided by the human observer on the speakers' speaking competence problem by generating immediate and data-based feedback for the presenters' speaking. Such VR generated feedback allows the speakers to become more aware of their challenges in speaking and work towards improving their speaking. Moreover, VR can simulate an interactive and real classroom environment setting by allowing the speakers to experience and immerse themselves fully in the environment without any real human interference.

Studies on the use of VR for enhancing training effectiveness are rare, and the effect also remains questionable. This study will design the VR-augmented feedback environment to investigate the effectiveness of VR-augmented feedback in training. With this consideration, the objectives of this project are the following:

1. To develop the presenters' presentation skills for engaging the adult audience in a virtual training environment.
2. To investigate the effectiveness of the virtual reality-based environment in improving presenters' oral presentation skills.

This research will invite 128 participants to participate, randomly assign them in the VR augmented feedback environment and human experts' feedback. For participants' continuous improvements, every participant has three times to give presentations. Experts will also use the developed rubrics to assess

presenters' performance. The effectiveness of the VR training environment will be explored through comparison.

The research is expected to be directly applicable to continuing education practice. The virtual training environment, rubrics and research design have the possibilities to be replicated or adapted to different contexts of continuing education and training in Singapore and Asian countries.

Summary of Project Findings, Deliverables and Impacts (up to 500 words)

RQ1: To what extent do participants' profiles correlate with their perceptions of the learning environment?

Pearson correlation analysis revealed several significant relationships between participant profiles and perceptions of the learning environment. Learning outcomes were positively correlated with frequency of conducting training (1 = not at all, 5 = all the time) ($r = .18$, $p < .05$) and prior enrolment in online courses before COVID-19 (1 = no, 2 = yes) ($r = .23$, $p < .05$). These findings suggest that participants with more training experience and prior online learning exposure perceived both VR- and desktop-enabled environments as more supportive of their learning.

Learning motivation was also positively correlated with age ($r = .24$, $p < .01$), frequency of conducting training ($r = .18$, $p < .05$), and prior enrolment in online courses before COVID-19 ($r = .18$, $p < .05$). Overall, older participants and those with greater experience in training or online learning reported higher motivation.

RQ2: Are there significant differences between the VR and non-VR groups in terms of expectation and self-evaluation of oral presentations?

Independent samples t-tests indicated that the VR group reported a better learning experience than the non-VR group (Mean_VR = 3.06, Mean_NVR = 2.71, $t = 2.51$, $df = 125$, $p < .05$). The VR group also achieved higher self-evaluation scores for oral presentations (Mean_VR = 15.17, Mean_NVR = 13.78, $t = 2.28$, $df = 125$, $p < .05$).

A significant difference was found in eye contact (Mean_VR = 4.23, Mean_NVR = 3.56, $t = 3.31$, $df = 125$, $p < .01$). However, no significant differences were observed in posture and gestures, fluency and clarity, or speaking pace.

RQ3: To what extent did the VR and non-VR groups develop their oral presentation skills from Stage 4 to Stage 5?

The VR group showed significant improvements in posture and gestures (Stage 4 mean = 5.59; Stage 5 mean = 6.13, $t = -3.34$, $p < .01$), eye contact (Stage 4 mean = 5.95; Stage 5 mean = 9.13, $t = -13.37$, $p < .001$), and fluency and clarity (Stage 4 mean = 3.17; Stage 5 mean = 9.53, $t = -26.82$, $p < .001$), but not in speaking pace.

The non-VR group improved in posture and gestures (Stage 4 mean = 5.59; Stage 5 mean = 6.30, $t = -6.67$, $p < .001$) and eye contact (Stage 4 mean = 5.65; Stage 5 mean = 6.32, $t = -4.91$, $p < .001$), with no significant gains in fluency and clarity or speaking pace. Overall, the VR group demonstrated greater improvement, particularly in fluency, clarity, and eye contact.

RQ4: Are there significant differences between VR and non-VR groups' perceptions of the learning environment?

Participants completed a 32-item survey measuring Learning Motivation (LM), Learning Outcomes (LO), User Satisfaction (US), Learning Support (LS), Technology Acceptance (TA), and Ease of Use (EU).

Independent samples t-tests showed that the VR group scored significantly higher in learning outcomes (Mean_VR = 16.53, Mean_NVR = 15.63, $t = 2.61$, $p < .05$), user satisfaction (Mean_VR = 34.13, Mean_NVR = 32.19, $t = 2.34$, $p < .05$), learning support (Mean_VR = 21.16, Mean_NVR = 20.11, $t = 2.33$, $p < .05$), and technology acceptance (Mean_VR = 20.56, Mean_NVR = 19.49, $t = 2.44$, $p < .05$). No significant differences were found in learning motivation or ease of use.

Contributions and Impact

The project produced two conference publications (ASCILITE 2022; eLearning Forum Asia 2023) and supported curriculum innovation through the integration of immersive learning environments and VR-augmented assessment in modules such as MID923, MID942, and MLS3406. It also contributed to professional development and outreach, including a teacher development session at Woodlands Ring Secondary School (2022) and departmental exchanges. Two URECA undergraduate students were supported, leading to conference participation and research outputs. More broadly, VR-supported learning has been integrated into teacher education, leadership programmes, graduate electives, and community outreach, underscoring the growing role of immersive technologies in feedback-rich learning environments.