17-7 - USING VR TO TRAIN SPATIAL PERCEPTION: A PILOT STUDY WITH THE WATER LEVEL TASK

Sunday, 9 October 2022

9:35 AM - 9:50 AM

Colorado Convention Center - 502

Abstract

Spatial reasoning skills have been linked to success in STEM and are considered an important part of geoscience problem solving. Most agree that these are a group of skills rather than a single ability, though there is no agreement on the full list of constituent skills. Few studies have attempted to isolate specific spatial skills for deliberate training. We conducted an experiment to isolate and train the skill of recognizing horizontal (a crucial component in measuring the orientation of planes) using a dedicated Virtual Reality (VR) module. We recruited 21 undergraduate students from natural science and social science majors for the study, which consisted of a pretest, 15-minute training, and posttest. The pre- and posttests consisted of a short multiple choice vocabulary quiz, 5 hand-drawn and 5 multiple choice Water Level Task (WLT) questions, and the Vandenberg and Kuse Mental Rotation Task (MRT). Participants were sorted based on pre-test Water Level Task scores, only those with scores <80% were placed in an intervention group and randomly assigned to training, either in VR (experimental) or on paper (standard), of about 15 minutes. The high-scoring participants received no training (comparison). All three groups of participants completed a posttest after the training (if any). After removing three participants who did not return for the posttest session, we had 18 participants in total: 6 in VR, 7 in the comparison group, and 5 in the standard group.

Repeated measures ANOVA of the pre to post hand-drawn WLT scores shows at least one group is different ($p=.002$) and Tukey's Post-Hoc analysis indicates that the VR group improved significantly more that the high-scoring comparison group (Mean Difference = -1.857, $p = .001$) and the standard group (Mean Difference = -1.200, $p = .049$).

While any significant result is encouraging, a major limitation of this study is the small sample size and unequal variances on both the pretest (Levene's HOV test, $F = 7.50$, $p = .006$) and posttest ($F = 13.53$, $p < .001$), despite random assignment. More trials are needed to demonstrate reproducibility. While more tests are needed, this preliminary study shows the potential benefit of VR in training spatial reasoning skills.

Geological Society of America Abstracts with Programs. Vol 54, No. 5, 2022
doi: 10.1130/abs/2022AM-382318

Author

J

Katharine Johanesen
Juniata College

Authors

P
Territa L. Poole
Juniata College

S
Hanneliese Scheel
Juniata College

S
Brianna M. Shortell
Juniata College

Ask a question or comment on this session (not intended for technical support questions).

Have a question or comment? Enter it here.

View Related