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SPATIAL SKILL BUILDING IN GEOSCIENCE USING VR: MEASURING STRIKE AND DIP

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Measuring strike and dip is a common but complicated spatial task introduced to students in undergraduate geology courses. Students must employ multiple spatial reasoning skills in addition to geology-specific content knowledge. These spatial skills include disembedding - to recognize a suitable bedding or foliation plane to measure, spatial perception - to understand the plane's relationship to horizontal and vertical, and aspects of spatial visualization, perspective taking, and mental rotation to determine how to position and read the compass tool. We tested a virtual reality (VR) training module to help teach the use of the compass tool to measure strike and dip. Students in a large introductory course in a public university were placed by lab section into either a "standard" classroom instruction or VR instruction for their initial training, then all completed a simplified mapping exercise in which they measured five planes set up around the classroom. Pre and post tests of spatial skills and scores on the measurement portion of the map assignment were collected and compared between the 2 types of training groups. Of 12 lab sections, half were assigned to VR and the other half to standard. The instructional assistants each taught at least one section of each type, and the instruction types were distributed evenly across the scheduled lab times.

The VR group showed 11% higher improvement scores on the Water Level Task (WLT) compared to the standard group ($p = 0.008$, $n=159$). Because students in some lab sections had identical responses to the strike and dip task, we used a subset of four lab sections in which students submitted unique responses ($n=41$). We found no significant differences on the strike and dip task except with application of the right hand rule (RHR). The classroom instruction group performed 26% higher on the strike task when the RHR was taken into account ($p = 0.006$), but this difference does not persist when scoring is agnostic to the RHR. The VR module contains only a text explanation of the RHR.

These results suggest that VR is at least as good as classroom instruction for building geology skills and, through targeted instruction, can significantly impact performance on a spatial test. Feedback on the VR activity will be used to further refine the module and develop best practice strategies for VR spatial training.

Session No. 144

T29. Expanding the Tent: Strategies for Increasing Participation through Spatial Thinking and Geoscience Education Research
Tuesday, 17 October 2023: 8:00 AM-12:00 PM

328 (David L Lawrence Convention Center)

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