

Using Introductory level Geoscience Instruction to Analyze the face of Geology through 3D Visualization

Gillian Goldhagen¹, Kinnari Atit² and Heather A. Ford¹

¹Dept. of Earth and Planetary Sciences, University of California, Riverside

²Graduate School of Education, University of California, Riverside

Abstract

Three-dimensional (3D) visualization skills are the ability to visualize and mentally manipulate 3D objects, a skill used often within geosciences. Despite the importance of 3D visualization skills to success in beginner-level geoscience (Kali & Orion, 1996; Piburn et al., 2002; Titus & Horsman, 2009), significant research gaps still exist in our understanding of the most effective methods for teaching spatial pedagogy. This study's objective was to research how various introductory geoscience pedagogy can foster the development of beginner-level students' 3D visualization skills. To carry this out, we focused on four research aims: (1) examine how students' demographics are related to pre-geoscience 3D visualization skills; (2) examine how the learning environment can influence the development of 3D visualization skills; (3) examine how learning method can influence the development of 3D visualization skills; (4) identify if students' 3D visualization skills will predict their performance on a domain-specific geoscience midterm. To test this, we randomly assigned students to an online or in-person classroom where they were taught geoscience concepts via 2D homework review, 3D static models, or 3D dynamic demonstrations. Students had to complete a 3D visualization test before and after five weeks of treatment. We found that males outperformed females' scores on the 3D visualization tests; however, the degree of improvement from pre to post-test did not statistically differ by gender. Overall, our research found null results for our hypotheses regarding the efficacy of different learning methods and environments, which paves the way for future research.

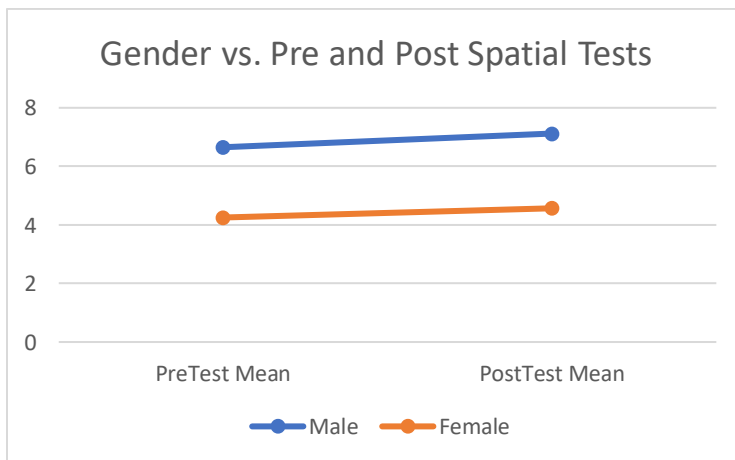


Figure 1: Students were administered a 3D visualization test before and after treatment. This Graph displays the mean scores on both tests for female and males. Females scored worse than males on both pre and posttests however both genders improved their spatial skills at the same rate.