Enhancing Spatial Visualization Skills Online
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In engineering, spatial visualization skills correlate with retention and academic success in the first academic year [1,2]. Spatial visualization can be developed through practice, offering an opportunity to better prepare incoming freshmen for their studies.

PRE-TESTING

Process
First-time students entering the College of Engineering were given the Purdue Spatial Visualization Test for Rotations online using Blackboard Vista. This is a multiple choice exam with thirty 1- and 2-axis rotation tasks. Testing was voluntary, and done prior to the start of the fall quarter.

Sample Task

![Sample Task Image]

PSVT:R Pre-Test Score Histogram

Result Highlights

Below Threshold: 16%
Male Students Below Threshold: 12%
Female Students Below Threshold: 24%

Actions
• Spatial visualization skill level of the fall 2012 incoming engineering class was assessed on a voluntary basis using the Purdue Spatial Visualization Test: Visualization of Rotations (PSVT:R).
• A 6-module, 10-week web-delivered course was offered (opt-in) to those students who scored below a threshold score. Course supported by workbook and web-based simulation software [3,4].
• Skill level was reassessed with the PSVT:R after the course.

Course Goals
• Improve our students ability to perform spatial visualization tasks
• Improve our student’s ability to learn and succeed in their first year science and mathematics courses
• Through improved learning, to get our students into the second year of their engineering program in good academic position

Course Outcomes
• Improved ability to interpret spatial visualization problems as indicated by an increased number of correct responses on the Purdue Spatial Visualization Test: Visualization of Rotations

Course Module Structure in Learn
• Multimedia Lecture
• Reading Assignment
• Simulation Exercise - browser-based
• Homework
• Test - Homework Entry
• Lecture Slides (PDF)

Course Development Tools Used
• Learn 9, Blackboard
• Keynote, Apple
• Numbers, Apple
• Camtasia 2, TechSmith
• MovieCaptioner, SynchriMedia
• GraphicConverter, Lemke Software

POST-TESTING

Process
Students were reassessed using the Purdue Spatial Visualization Test for Rotations following the 6-module development course. Credit was issued based on a minimum score of 70% on homework assignments and completion of the PSVT:R retest, regardless of score.

Registration History

936 Invited
621 Pre-Tested
87 Eligible
24 Pre-Completed
19 Registered
3 Dropped
5 Withdraw

Pre- (Blue), Post-Course (Black) Histogram

Result Highlights

Average Score Increase: 5.6
Male Students Gaining Threshold Score: 80% (N = 10)
Female Students Gaining Threshold Score: 80% (N = 5)

Summaries based on students who completed course and took both pre- and post-tests

References