

ENGAGE Strategy Research Brief

Spatial Visualization Skills

“At Michigan Tech, the retention rate is 80 percent for women who go through training to improve their spatial skills versus 50 percent for those with weak spatial skills who do not receive additional training. These women were more confident as they progressed through the engineering program because as they persisted, they had a better understanding of the concepts that were being presented. Engineering professors tend to communicate by drawing pictures. If you don’t understand the pictures, you’re not going to understand what the professor is talking about. What we found is that helping these students improve their spatial skills, improved their success rate in engineering. It didn’t necessarily improve all their grades, but it improved their willingness to stick it out and become engineers.”

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Visual spatial skills are critical for success in undergraduate engineering programs. Spatial skills visualization plays a particularly important role in engineering graphics courses. Students who struggle in engineering graphics are often vulnerable to transferring out of engineering and into another major. In one study, 80% of students who did poorly in their first engineering graphics course, did not persist in engineering but transferred to another major (7). In fact, faculty maintain that engineering graphics should be considered a gateway course because it has such a large impact on student retention (1). This is particularly true for women and underrepresented minority students as well as students of low socioeconomic status (1). Gender and ethnic bias in this area may be attributed to lack of childhood exposure to 3-D video games, construction toys, certain sports, shop drafting and sketching and mechanics classes (1,2,5,7).

Poor performance on spatial visualization tasks can directly affect perceptions of self-efficacy, particularly in women and minority groups (2,3,7,10). Students who have the opportunity to improve their spatial visualization skills demonstrate greater self-efficacy and are more likely to persist in engineering (2,3). Research in this area has demonstrated that training is an effective way to improve spatial visualization skills and gender differences are eliminated as a result of intervention using both technology and manual strategies (2,3,4,6,7,9,7). In addition, improved

retention rates for female engineering students were demonstrated for those who enrolled in a spatial skills training course (3,7,8).

ENGAGE will work with teams from 30 engineering schools to implement spatial visualization skills training for first year students who have weak skills, as a strategy to improve retention among undergraduate engineering students. Links to spatial visualization skills curricula will be available on the ENGAGE website.

References

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