# Educational Research in Developing 3-D Spatial Skills for Engineering Students

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## Abstract

The ability to visualize in three dimensions is a cognitive skill that has been shown to be important for success in engineering and other technological fields. For engineering, the ability to mentally rotate 3-D objects is especially important. Unfortunately, of all the cognitive skills, 3-D rotation abilities exhibit robust gender differences, favoring males. The assessment of 3-D spatial skills and associated gender differences has been a topic of educational research for nearly a century; however, a great deal of the previous work has been aimed at merely identifying differences. The author has been conducting applied research in the area of spatial skills development for more than a decade aimed at identifying practical methods for improving 3-D spatial skills, especially for women engineering students. This paper details the significant findings obtained over the past several years through this research and identifies strategies that appear to be effective in developing 3-D spatial skills and in contributing to student success.

**Keywords:** Engineering education; Spatial skills; Gender differences; Spatial training; Student success