

# The Impact of Using Computer Models on Academic Performance of Engineering Students

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## Abstract

Encouraging students to take on a Science, Technology, Engineering, and Math (STEM) major has recently been a top priority in the nation's policy-making debates. STEM-related majors often are deemed very difficult and demanding. Specifically, students tend to face difficulties to conceptualize engineering problems which can eventually impede otherwise successful individuals from pursuing a career in engineering. Conceptualizing a problem help students see the 'big picture' of a system and its components. Moreover, Finite Element-based computer programs such as the COMSOL Multiphysics® software, are able to demonstrate accurate spatial models and present various post-processing plots, so that users can visualize engineering phenomena. Finite Element technique has long been employed to solve complex problems in a vast variety of engineering fields to complement experimental results, corroborate scientific theories, and study diverse scenarios. Alternatively however, computer models can be developed to solve rather simpler problems for educational purposes. To that end, using the COMSOL Multiphysics® software, a 3D multi-section cantilever beam model was developed to display deformation due to various forces acting on the beam and provide the corresponding moment and shear plots. Participants, engineering college students, were asked to take a test comprising ten conceptual problems pertaining to solid mechanics once before they are acquainted with the model, and once again after the model with ample instruction was presented to them. Findings of this study can potentially show an improvement in conceptualizing and visualizing engineering problems and their equivalent real-world replicates.