

# **Understanding and Overcoming Difficulties with Building Mathematical Models in Engineering: Using Visualization to Aid in Optimization Courses.**

Preliminary Research Report

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In an optimization course, many students find modeling – the process of translating a verbal description of a decision making problem into a valid mathematical optimization model – difficult to learn. To identify the types of mistakes and difficulties experienced by engineering students, we examined various textbooks to create a taxonomy of the types of problems encountered in these courses, and analyzed student performance on modeling questions given on past exams and quizzes to create a taxonomy of the types of mistakes typically made. In our analysis, we observed students often made errors that indicate that they did not have a sound conceptual understanding of the word problem models and the variables and symbols involved. Based on this research, we have designed a preliminary web-based visualization tool using node-link diagrams that aims to help students to gain a better conceptual understanding of modeling problems and formulate valid optimization models.

Keywords: Mathematical Modeling, Engineering, Technology, Visualization

