

ABSTRACT

THESIS: Efficacy Beliefs of Indiana Project Lead the Way Teachers as to Teaching Optimization in Pre-Engineering Education

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National standards and multiple research studies have concluded that *optimization*, a core concept of engineering design, needs to play a prominent role in technology and pre-engineering curriculum. Optimization is characterized as the “act, process, or methodology used to make a design or system as effective or functional as possible within the given criteria and constraints” of an engineering design challenge (ITEA, 2000). In Indiana secondary schools, pre-engineering is widely delivered in Project Lead the Way’s (PLTW) Pathway to Engineering (PTE) program. As a relatively new curricular focus, secondary teachers may have had little opportunity to develop the prerequisite knowledge, skills, resources, and teaching efficacy—belief in one’s ability to teach—that they need to effectively teach students about the role of optimization in engineering design and strategies used for optimizing design solutions.

Using survey design, this study a) characterized how Indiana teachers understood and represented optimization in their PLTW programs, and b) characterized the perceptions and efficacy judgments of teachers relative to teaching optimization. Overall, in the State of Indiana, participating teachers believed themselves to be “effective” in being able to achieve instructional goals and student performance objectives in relation to teaching optimization. A majority of

teachers communicated desire for professional development in relation to teaching optimization with needs for professional development to be most beneficial, to be provided in the form of examples of optimizing design solutions, students optimizing a design solution and mathematical methods of optimizing design solutions. The results provided teachers, teacher educators, curriculum developers, and school administrators with insights into the professional development needs of PLTW teachers relative to integrating optimization into instruction.