

Exploring student understanding of equations through the conservation of energy

Abstract – Tim Major

Physics students often think of “solving problems” as simply choosing formulas and plugging in known values without understanding the conceptual basis of the formulas or giving thought to the meaning of the results. Even students who are able to use this technique to get correct answers often demonstrate a lack of understanding of the concepts involved when interviewed.¹ Some studies have already been done on student understanding of mathematics in a physical context,² involving both students’ ability to understand and manipulate formulas, as well as how they relate their math knowledge to physics problems.³ In this project, I plan to take advantage of one situation where there is no universal formula, but rather a law that allows the creation of an equation based on a physical concept: the Law of Conservation of Energy. When applying this law to solve problems, students cannot simply “plug and chug”, but must construct an equation based on the specific situation described. Using test questions and interviews, I will study the process by which students construct equations from physical concepts such as work and energy. I hope to identify students’ assumptions and misleading ideas about the role of equations in physics, as well as the areas with which students show no difficulty under typical instruction.

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