

Session AB: PER: Mathematical Reasoning and Problem Solving**Location:** Mount Vernon Square A**Sponsor:** AAPT/PER**Time:** 8:30–10:30 a.m.**Date:** Monday, July 30**President:** Daniel Smith**AB01: 8:30-8:40 a.m. Some Mathematical Aspects of Physics Students' Problem-Solving Difficulties***

Contributed – David E. Meltzer, Arizona State University, College of Integrative Sciences and Arts, Mesa, AZ 85212; david.meltzer@asu.edu

Dakota H. King, Arizona State University

Over the past three years, we have examined mathematical difficulties encountered by students in introductory physics courses and have documented a variety of issues with trigonometry, vector representation, and algebraic problem-solving. Here we wish to place our findings in the context of previous work by other investigators. In particular, Torigoe and Gladding [Am. J. Phys. 79, 133 (2011)] revealed significant and striking differences in correct-response rates on problems in introductory physics courses, depending on whether the problems were posed in numerical or “symbolic” form (i.e., with symbols replacing numerical values for mass, velocity, time, etc.). Other work in mathematics education examined specific difficulties associated with algebraic manipulations and symbolic representation [for example, Payne and Squibb (1990) and Booth et al. (2014)]. We will provide an overview of our own findings, and outline a broader framework in which findings from all of these related investigations may be reconciled with each other.

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AB02: 8:40-8:50 a.m. Exploring Physics Students' Difficulties in Solving Symbolic Algebra Problems*

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David E. Meltzer, Arizona State University

As part of an investigation into students' mathematical difficulties in introductory university physics courses, we have administered written diagnostics which include multiple, high-school-level algebra problems in both their symbolic and numeric form. (“Symbolic” and “numeric” refer to the nature of the constant coefficients.) We find that symbolic algebra problems are significantly more difficult than numeric problems of the same form, for students in both algebra- and calculus-based courses. We are analyzing students' written work in detail, as well as carrying out one-on-one problem-solving interviews, in order to identify students' specific struggles in solving symbolic equations. In this talk we will report on our methods and most recent findings.

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