

Adaptation of Research-Based Curricular Materials for Middle-School Use

David E. Meltzer
University of Washington

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A New Teaching Experience

- *My background:* 15 years experience teaching college physics, with brief periods (1 day-3 weeks) teaching elementary, middle, and high school physics
- Last year I was the 8th-grade physical science teacher at a small school for gifted children; I taught 2 hr/day, five days per week
 - two classes of 15 students each, 13-14 years old

Student Characteristics

- Most of the students had entered the school in kindergarten; this was their ninth year together with the same classmates;
- The students had very high levels of verbal and language skills (> 90th percentile) and demonstrated subtle and insightful thinking, but spanned a broad range of (above-average) mathematical reasoning abilities;
- Even with this highly select group, conceptual and reasoning difficulties emerged which are very similar to those of college students

My Support System/Lifeline

- Highly supportive middle-school head
- The 6th/7th-grade award-winning science teacher, who had completed 3-year Univ. of Washington Summer Institute for In-Service Teachers [using *Physics by Inquiry*]
- Very experienced former middle/high-school physics teacher, now in U.W. Physics Education Group
- Experienced and supportive 8th-grade math teacher
- Other logistical, equipment, and intellectual help from U.W. PEG

Four Central Themes

- Classroom management issues
- Adaptation and implementation of curricular materials
- Adjustments and modifications in instructional activities
- Requirements for engaging students

Classroom Management Issues

- In college courses, decision to attend class or do class work is ultimately the student's responsibility: NOT true in middle school
- If the students are not attempting to participate in class or engage with the activities, they will learn nothing
- Learning classroom management skills is done on the job or with previous equivalent experience; it is a highly nontrivial task

Adaptation and Implementation of Curricular Materials

- Even verbally advanced young teenagers are challenged by wording, formatting, and sentence/paragraph structure of college-level materials
- Even after years of experience doing “hands-on” inquiry-based science activities, students required very substantial guidance to complete standard tasks [*e.g., data collection, recording observations, writing explanations*]
- Very large range of math/reasoning speeds and capabilities creates special challenges
- Time requirements for activities were far greater than anticipated

Adjustments and Modifications in Instructional Activities

- Groups of three (or more) seemed to invite excessive socializing and off-task behavior
- Periods of self-directed work had to be shortened (to 15-30 minutes) to maximize on-task behavior
- Frequent whole-class discussion (or joint board work) seemed to improve students' focus

Requirements for Engaging Students

- If students did not become engaged or “hooked,” they (mostly) wouldn’t work
- The more the work resembled “play,” the more they were engaged
- Themes or goals may be helpful (build a motor, a flashlight, a Rube Goldberg device, etc.)

Take-Home Lessons

- Direct participation of experienced middle-school teachers is ***essential*** in creating and planning appropriate activities and materials
- Effective engagement of students is utterly indispensable
- Ambitious instructional goals must be tempered by reality