Research Support for Inquiry-based Science Instruction using CPO Science Programs

*Foundations of Physics*

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Foundations of Physics provides hands-on, inquiry-based physics instruction for high school students using three components that are integrated at the chapter-level: the student text and investigations manual, the teacher’s guide, and high-quality, custom-designed equipment (provided as kits) to be used with the investigations.

Introduction
Foundations of Physics has been in use in classrooms for eight years. Dr. Tom Hsu, an MIT-educated scientist and educational innovator, and experienced teachers have used pilot programs and teacher feedback to write and develop this program. In strong support of our inquiry-based, innovative programs, we present the following information and research: testimonials from teachers; an informal research study based on using the program; a summary of notes from a departmental meeting at the University of California, Riverside; and academic and research reports on the effectiveness of inquiry-based instruction. Copies of referenced articles are available upon request.

Informal research study
A small pilot study indicates that use of a CPO Science program helps historically difficult-to-reach students succeed.

Synopsis: This 2008-report was submitted to CPO Science by two Virginia high school teachers who work with historically difficult-to-reach students. Their classes include minority students, students from economically-disadvantaged backgrounds, and students who participate in special education. The teachers found an increased percentage of their students passing a critical exam and increased student proficiency in 2008 as compared to 2007. Because the use of Physics A First Course, a CPO physics-first curriculum that includes the text and hands-on equipment, in the classroom was the only new factor between the two years, the teachers attribute their students’ success to the use of this program.

“The collected data supports a correlation between an increase in proficiency in science and writing and the number of years in a hands-on learning environment.”

Academic articles on inquiry-based instruction
Modes of inquiry-based instruction are best practices in science teaching
Inquiry-based science instruction is supported by a broad consensus of teachers, policy makers, and evidence. CPO Science presents the following sample of this consensus:


Summary of notes from a Department of Physics Meeting at the University of California-Riverside, November 2006

Meeting topic of discussion: The choice of physics text for the regular physics course in the district high schools

José Wudka (Professor, Department of Physics),
University of California, Riverside

Summary of main points:

1. After examining *Foundations of Physics* and another text, all faculty members attending the meeting strongly favored *Foundations*. The faculty members appreciated the concept-based approach of the text and felt this approach would make it “easier for students to grasp the essential ideas in each new physics topic and gain intuitive understanding of the way physical principles work, when they are applicable and to which systems.”

2. Based on experience in working with college freshmen, the faculty members have recognized that students can successfully solve problems and still lack understanding of the formulas they are using and concepts that are being applied. As a concept-based text, the faculty members noted that *Foundations* is “more in tune with the current understanding of the best approach to teaching physics,” which involves focusing on leading students in assimilating concepts and building intuitive understanding ahead of formulaic problem-solving.

3. The faculty members also noted that *Foundations* “does not neglect the mathematical aspect of the discipline; it merely takes a more balanced approach where intuitive arguments are presented on the same footing as the numerical exercises.”

Testimonials by teachers who use CPO Science Programs

Tad T. Sudnick (high school teacher),
Cambridge Rindge and Latin School, Cambridge, MA

*I cannot speak highly enough of the curriculum. Students can do physics experiments where meaningful quantitative data can be collected and analyzed to ensure a deep understanding of physical concepts and also ensure and encourage students’ development as young scientists.*

Kelly Cawyer (high school teacher),
Fort Worth, TX

*My students raised their test scores as a group five points over the average, and science was the highest of all scores. I truly attribute this to them learning how to be thinkers instead of memorizers. They were not the least bit afraid of the graphs and charts like in years past.*

Richard E. Vincenti (high school teacher),
Eastside High School, Patterson, NJ

*The CPO Science curriculum is extremely flexible and diversified. Lesson plans can be easily adjusted to fit the level of student ability in any given class.*

Richard Lewis (high school teacher),
Wilson Central High School, Lebanon, TN

*I have found that the CPO Science investigations, which usually precede each new concept, are excellent at placing those concepts in the hands of every student. Each investigation asks a key question that conveys the main focus of the learning and the lab. The students then use very accurate and durable equipment to justify their conclusions based on their observed data.*

The process which students take to arrive at a conclusion from most labs involves cooperation, data gathering, graphing, and analysis. My students have learned, by comparing data, the importance of accurate observations. Graphing their results has visually allowed them to easily analyze and thus derive the appropriate equations. This has definitely increased their confidence in the lab and in the classroom. Students who normally would feel intimidated with the math have far less difficulty after they have experienced the lab and have derived the formula for themselves.

David W. Helm (science department chair),
Tates Creek High School, Lexington, KY

*The CPO Science program has made my teaching of Physical Science both a learning experience and an enjoyable experience for me, the teacher, as well as for the students involved. We are seeing positive results with many of our harder-to-reach kids as the science process leaves the traditional textbook and becomes something that they can experience in a hands-on way.*

CPO Science provides all the essential components to immerse learners in inquiry-based science. The learning components (print, hands-on equipment, and media) are organized to make science exciting for students of every learning and achievement level.

For more information and samples visit our website:
www.cposcience.com