

Physics and Human Affairs and the accompanying lab (PHYS 1023/1L)

Reason for Reforming Course

Physics and Human Affairs (PHA) is the physics class designed for non-science majors. Currently, it is taken by 50% of the elementary education majors, and is required for the middle level majors planning on a specialty in math and science. It has not had previous NSF support, and has limited resources. Starting in the spring of 2005 an alternative class was offered for elementary education majors, Physics for Elementary Teachers, primary developer Fred Goldberg, San Diego State University. Subsequently, negotiations are underway across colleges to provide the long-term support to make PET a requirement for all elementary majors. It takes significantly more instructional resources to provide this course, and while it is undoubtedly worth it, the funding must be found. The College of Education and Health Professions, which has already voted to make the course a requirement, is helping in this effort. It would require at least four sections to make it a requirement, which is a full time instructor position. This being the case, while less effort in the future will be expended on PHA in the hopes of using PET, some work will continue on the course. Further, since the course is a large general education class, it is tied to courses throughout the state for transfer purposes. Since only two institutions in the state are currently offering PET, it is still a standard for the rest of the institutions, and easy to adapt to almost any set of resources.

Background

The class meets three times a week for 50 minutes in a large group setting (in two sections) and once a week for 110 minutes in a lab setting (15-18 sections).

The large group setting (a “raked” lecture hall with approximately 200 students). Peer instruction techniques are used, varying with the instructor. Infrared personal response devices have been used, as well small-group work within the lecture setting.

The lab setting (20-22 students) allows students to do inquiry-based labs, carrying out guided explorations. They are encouraged by class policy and the questions raised in the course materials to argue amongst themselves and with their instructors (either a graduate assistant, or advanced undergraduate learning assistant) about course topics.

An honors section of the course (with the difference being primarily in the labs) is allowing us to experiment with more extensive out-of-class assignments, and enhancing the lab experience. Some of these elements can then be funneled back into the larger main course.

The class is made up of students from across the disciplines, primarily excluding science majors, except those who have chosen to teach. The course has long been recommended for teachers because of its emphasis on societal topics and things greatly of interest to students and teachers, such as identifying pseudoscience, and being able to understand graphs and statistics.

The textbook for the course is Hobson's Physics: Concepts and Connections¹, with an activity guide developed at UA.

The course is taught by a team made up of one faculty member, 3.5-4.5 teaching assistants and 0-1 learning assistants each semester.

Scholarly Basis of Reform

The class uses Peer Instruction² in the lecture and activities and laboratory exercises based on familiar phenomena or utilizing everyday items to illustrate new phenomena. An accompanying version of the lab manual available to teachers has versions of activities that can be done very inexpensively in their own classrooms. Much of the early work was adapting UPI and UPII (see references in those PhysTEC classes) activities to a level of mathematics appropriate for non-science majors, since we hold the copyright to those materials and can distribute them freely. Further work to modify the labs to more parallel the strategies in PET is being undertaken.

Pedagogical Reforms Implemented

Labs are guided inquiry. Additional project-based assignments are being piloted in the honors sections. For the lecture component, students are divided up into groups of 4 people. Most of the work done in class is done within these groups. Class work ranges from things collected in class (quizzes or other assignments) to simply participating in class discussions. Each group will also be called on to make at least one presentation to the rest of the class.

Students are expected to have read the reading assignment before coming to class so that class time can be used to answer questions, work examples, and do in-class projects. This class also offers a regrade option on the tests to encourage the students to correct their own work, for approximately one-third of the points missed.

For documentation of addition of efforts to create an environment with much more extensive group work to both small and large lecture formats, and evaluations, click [here](#).].

¹A. Hobson, Physics: Concepts and Connections, 4th Ed. Prentice Hall, 2006.

²C. Crouch and Eric Mazur, Peer Instruction: Ten years of experience and results, Department of Physics, Harvard University, Cambridge, Massachusetts, American Association of Physics Teachers, 2001.