

ISLE (Investigative Science Learning Environment-Learning physics while practicing the processes of science) & TIPERs (Tasks Inspired by Physics Education Research) Workshop

April 14-16, 2005 at Monroe Community College in Rochester, NY

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The participants in the workshop will learn how to modify introductory physics courses to help students acquire a good conceptual foundation in physics, apply this knowledge effectively in addressing problems of the real world, and develop the science-process abilities that scientists use in their real world work. We provide tested curriculum materials and a learning framework to do the job. The curriculum resources include: (a) an *Activity Guide* with 50 or more activities per textbook chapter for use with any textbook in large and small group meetings (lectures and recitations) and for homework; (b) a CD with over 150 videotaped experiments and associated questions that can also be used in lectures, recitations, labs and for homework; and (c) a set of laboratory activities for use with relatively inexpensive equipment (not provided). The types of activities in these curriculum materials include: observation activities that students use to help build concepts, experiments to test the concepts devised by students, qualitative questions to evaluate and build understanding, multiple representation activities that enhance the ability to use the math language of physics with understanding, real world problems (regular and experimental), and activities that help students learn to evaluate their own thinking and work. Any or all of the materials can be integrated into a traditional format algebra-based or calculus-based physics course. However, during the workshop we will use the materials in a course format that has an explicit emphasis on using the processes of science and various cognitive strategies to help students achieve the goals described earlier. This course format is called Investigative Science Learning Environment (ISLE). The curriculum materials that we provide can be used with curriculum materials developed and/or provided during other TYC/HS project workshops.

Participants will also become familiar with various TIPERs (Tasks Inspired by Physics Education Research) and develop several of their own. These pencil and paper tasks will include ranking tasks, working backwards problems (also known as Jeopardy problems), predict and explain tasks, concept oriented demonstration tasks, qualitative reasoning tasks, predict and explain tasks, and many more.

Participants will have an opportunity to work on new materials for their students in a collaborative group of other Two Year College (TYC) and High School (HS) educators. One of the primary goals of this workshop is to show how these ideas can be implemented at TYCs and HSs. Several methods of integrating the ideas presented at this workshop into the curricula will be discussed including results from various settings. Participants will also receive copies of the new (2004) Ranking Task Exercises in Physics: Student Edition from Prentice Hall.

Discussion and information on the needs of the technological workforce and its connection with the activities of this workshop will be presented. There will also be an opportunity to share and discuss issues relating to teaching physics more effectively, particularly for students enrolled in technician/technology education programs. There will be extensive discussions on how to use various strategies, tools, and tactics to overcome problems and barriers to learning at TYCs and HSs. Important issues such as standards, assessment, diversity, and technology utilization will be addressed at various points during the workshop.

The workshop leaders have many years of experience in developing and refining curriculum for introductory physics students. In addition, and more importantly, the workshop leaders have had extensive experience with the implementation and adaptation of curriculum in a variety of institutions and for many types of introductory physics students. The workshop leaders have also had extensive experience training faculty in using and developing their own curricula for their technology-oriented students. Alan Van Heuvelen was the recipient of the 1999 Robert A. Millikan Medal from the American Association of Physics Teachers. The local host will be Paul D’Alessandris who has worked with Alan Van Heuvelen on an earlier project and has developed materials using a Spiral approach.