Beautiful Idea:

In Galileo’s Footprint Learning Physics by Doing Physics

Co-Developers:

Yoel Rodriguez and Jaime Lujan

Project Description:

The engineering and science students find Physics a very difficult subject (1). It really is; no doubt about it! A way to lessen this problem could be to teach Physics by making it more enjoyable by having more practical and daily-life problem-solving situations as well as keeping interactive teaching techniques where students teach each other. Eric Mazur, a renowned physicist, has called these methods Peer Instruction (PI) and Just-in-Time teaching (2). PI methodology is found to decrease student attrition in introductory physics courses at both four-year and two-year institutions (3). Toward this end, we could make our Physics Lab an exciting place, where the students would feel they could go to discover and understand-by-doing, to analyze results and to put into practice knowledge that they have already learned. The students will have the possibility to develop physics projects during the semester. They will choose among different topics allowing them to find their own passions. By doing, the students will go back to the textbook and ascertain the meaning of the content from a motivation perspective. This strategy will empower and make the students more responsible in the learning process. Questions such as what do you want to do-learn? and how would you do it? will be used to improve both the teaching of physics and comprehension. Our approach should be able to instill students with scientific curiosity and give them opportunities to develop needed hands-on lab as well as abstract-analysis skills. You can forget facts, but you cannot forget understandings: They will stay forever (2).

GOALS

In order to foster the students’ learning process our goals will be the following:

1. Develop daily-life physics hands-on projects. In addition to the regular laboratory experiments the students perform during the physics course, they will have the opportunity to put into practice their physics knowledge and to understand new concepts by doing lecture-topics related physics projects, which will likely facilitate their learning process.

2. Implement Peer Instruction method and reinforce the use of mathematics. During the lecture period students will discover and understand concepts through active discussions about specific topics previously assigned. The students will also employ Vector Analysis, Least-Square and other Statistics as well as Graphic Analyses in developing their projects (4). The students will be encouraged to apply computational programs to do these analyses.

3. Involve our College Lab Technician (CLT) in the student-learning process. The students will benefit from having some additional support other than the lab instructor to help them to develop their own projects. The CLT participation in the learning process will be potentiated at a great advantage.

OUTCOMES

Students will learn and understand new physics concepts by doing physics. They will be immersed in analysis, discovery, problem-solving, and communication skills. They will be able to visualize physics problems, and
develop their hands-on and likely their abstract-analysis skills. The gap between lecture and practice could be fulfilled. By making the course experience more relevant to real life, the students will become more focused on their learning and more likely to reach a higher level of accomplishment. Students will gain certain skills to pass the CUNY Proficiency Exam (CPE) and be more successful in senior college. Finally, by bringing our CLTs to the learning process itself, they will likely be more motivated and creative in their science college tasks. The CLT will go from being a passive to an active component in the Physics Lab design. This project will also potentiate the Instructor – CLT communication, which will directly benefit the performance of the student as well as the modernization and improvement of lab experiments. In short, the college will optimize the use of its resources.

REFERENCES


TIMELINE

This project is designed to achieve the stated specific aims in 1 year. A group of about 25 students will be selected from Hostos Community College to carry out this research. Some aspects of the study that are interrelated will be conducted simultaneously or in parallel. A tentative timetable for achieving the main objectives of the study is given as follows:

Fall 2010:

1. Select physics hands-on projects.

2. Select problems to help students translate math knowledge into physics problems.

Spring 2011:

1. Develop the Peer Instruction methodology and hands-on projects as well as reinforce the use of math.

2. Showcase: The students will present their projects at the end of the semester and make videos explaining their objectives and results.