

Section III: Instructing an Undergraduate Physics Lab

Instructional Method

Undergraduate physics labs are based on an active learning technique called “cooperative learning.” Cooperative learning is a technique that involves group interaction among the students and interaction with the instructor. The instructor, the TA, acts as the discussion facilitator. The following elements are associated with this method of active learning.

- Students are involved in more than passive learning, such as a typical lecture section.
- Students are engaged in activities such as reading, discussing, writing, etc.
- There is less emphasis placed on information transference and greater emphasis placed on developing a student’s skills.
- Students receive immediate feedback from their TA.
- Students are involved in higher cognitive levels. (Analysis, synthesis, evaluation, etc.)

Besides just learning the material represented in the course, these elements will help the students develop good communication skills and good interpersonal skills.

Students do not learn much by just sitting in class listening to an instructor, memorizing assignments, and spitting out answers. They must talk about what they are hearing, write about it, and relate it to past experience. They must make learning part of themselves. (Chickering and Gamson, 1987).

This method of active learning works very well for the way the labs are designed. Most of the labs are designed so that the students are performing an experiment that will help them take a physical concept introduced in class and prove its validity. For example, showing that momentum is conserved but that energy is not always conserved during a collision.

When participating in a lab activity, students work in groups of three or four. The size of the group depends on the activity and the size of the lab-room. The number of lab set-ups is usually consistent during the semester; however, the lab curator may change the number of set-ups depending on the lab and the equipment involved.

There are at least three roles played by the members of the group, the leader, the timekeeper, and the recorder. The leader is usually the most outgoing student, one who likes to take charge, and most likely the one who is willing to ask the TA questions. The timekeeper’s duty is to keep the group on task. The recorder’s duty is to record all of the necessary information needed for the analysis of the experiment; however, all the students in the group are encouraged to perform this duty.

The TA is the lab and discussion facilitator. The TA monitors the progress of each group and gives help when and where it is needed. The following is a list of the duties performed by the TA as the role of the facilitator.

- Assign students to groups.
- Explain the concepts covered in the lab and the goal of the lab so that the students are clear about the assignment.
- Explain the criteria for success - The criteria could be anything from the acceptable percentage of error to how the results are to be presented in the written lab report.
- Structure positive interdependence - This means that the TA has the responsibility of making sure that each member of the group achieves a prescribed level of mastery of the concepts covered and that all members participate in the lab activity.
- Evaluate students' achievements and evaluate how well the group functioned. (You may need to change the groups depending on how well the students worked together.)
- Interact with each group even if the group seems to be functioning well and is on task.

The facilitator has a responsibility to the students to be prepared for the lab and to be knowledgeable of the material. If you are not prepared to instruct the lab then you will not be able to perform properly in the role of the facilitator.

Uniformity of Lab Instruction

This is a major concern of the students each semester. The students will complain about their lab instructor if they find out that another lab instructor does not grade the lab reports as hard. This has caused many problems in the past. The following is a set of suggestions that will help TAs instructing labs for the same course to be consistent as a group when teaching and grading. See appendix D; guidelines provided by the lab curator.

- Practice the labs as a group. This will give the TAs a chance to discuss what material to present prior to the students performing the lab.
- Decide on how many students will be assigned to each lab group. This may vary depending on the number of students in each lab.
- When you meet to practice the lab, decide on the point distribution for the lab reports and develop a grading format together.
- Grade together. This might be hard to do because of class schedules, but grading together will help you to grade consistently.
- Try grading lab reports written by students from other lab section(s).

Following these suggestions will make the TA's teaching assignment go more smoothly and create consistency among the lab sections.