

Getting Started with a Laboratory Class

Portions of this section adapted from Gale and Andrews (1989)
as described in Black, Gach, and Kotzian (1996)

Goals of the Course

Every laboratory class has goals that may be particular to that course and it is important to find out those goals before classes begin. For example, in the introductory physics laboratory students learn “how to apply the concepts learned in lectures to physical systems” while in the introductory chemistry laboratory students engage in “developing principles from data.” A general goal that pertains to most labs is to “make a connection between the theoretical elements of a discipline and the practical aspects of the technical performance.” Most laboratory instruction addresses these three common objectives:

- The practice and mastery of specific technical skills (such as using the microscope, setting up an apparatus for measuring mass changes in a chemical reaction, determining voltage changes across a circuit, or generating code to run a device.)
- The mastery of the skills of the scientific process (such as observation, classification, inference, hypothesizing, and designing methods of investigation.)
- Experiencing abstract concepts in a concrete manner (such as measuring and understanding free energy or angular momentum.)

On another level, the lab experience is valuable for its ability to give students a more intimate knowledge of the discipline and a more intense involvement in the process of scientific inquiry. A basic framework for bringing scientific inquiry into the laboratory involves having students asking

GSI Tip: Lab time is best spent having students do the experiments. Generally, laboratory objectives involve the students in active learning through participation in laboratory experiences and not in passive learning by listening to someone talking about scientific concepts.

questions and then using data to answer these questions. Laboratory classes encourage cooperation and teamwork among students, thus reinforcing the social aspect of learning that is implicit in the practice of scientific inquiry. Together all of these elements – experiencing abstract ideas in a concrete manner, practicing scientific inquiry, and participating in cooperative teamwork – are goals that help promote a positive and exciting learning environment.

The Role of the GSI

The graduate student instructor (GSI) has a very important role in helping students feel good about their lab experience.

As a GSI you may have many responsibilities: discussion leader, laboratory instructor, safety monitor, grader, exam proctor, and other roles. You also have an especially important role in helping to make the undergraduate students’ education a quality experience. In fact, in most lab settings, the GSI has the biggest influence on the success or failure of the lab experience for the student.

Because you work with students in small groups and on a one to one basis in your office hours, you have the opportunity to provide the personal touch, individual feedback, and encouragement that students need in order to succeed in a science laboratory class. You have the opportunity to get to know the students as individuals, to know their strengths and weaknesses, to understand how they think, and to challenge them to improve. In their early years, many undergraduate students need encouragement and understanding and you have the opportunity to provide them with the personal help that can motivate them to do their best work.

Another important aspect of your work will be to help students develop higher level thinking skills and problem-solving skills through active involvement, guidance and feedback. Your role will be to ask the kinds of questions that will help students think through the problems and learn how to go about solving them. In order to do this, you must create the climate needed for students to feel safe enough to ask and answer questions and to participate in discussions. Often students don’t participate because they are afraid they will be wrong and look stupid in front of the GSI and their peers. It is important to help students realize that everyone learns from mistakes, and that it is working through the mistakes as a group that often leads to a much deeper level of understanding and thought for everyone.

Finally, you will be working as part of a team with other GSIs and the faculty member in charge of the course to help make the course better. It helps everyone if GSIs collaborate with each other, sharing and discussing successes and any problems that might arise. Several ways of communicating with others teaching the course include weekly meetings, e mail, and lab-section wikis. It is also important that you provide a communication channel between the students and the supervisor and/or faculty instructor in charge of the course. Instructors are not always in a position to know what students are finding difficult or how the lectures could be more helpful to students.

Reference

Black, B., Gach, M., & Kotzian, N. (1996). *Guidebook for teaching labs for University of Michigan Graduate Student Instructors*. Ann Arbor, MI: Center for Research on Learning and Teaching, University of Michigan.