What do I need to do to ensure that the principles behind each experiment in the lab ties in with the lecture material?

How do I ensure that everyone in the lab follows the safety rules?

How do I maintain both order and student interest in the lab?

The lab teaching assistant is a critical staff partner in teaching a science course. Most labs meet weekly and last 3 to 4 hours, so the TA is the department representative who usually knows the students the best because the TA has the most direct, one-on-one contact with the students on a regular basis.

The TA sets the tone for the lab group and helps determine how much students glean from the lab. The level of satisfaction students derive from their lab experience can affect their performance in the lecture part of the course. A good lab TA helps students with the mechanics of running the experiment, makes a link between the lab and lecture material, and welcomes student questions.

A lab is usually noisy and a little chaotic, so patience and humor are useful assets. In addition, a good strategy for maintaining control in your lab, while encouraging students’ learning, includes the following elements:

• Be clear on lab policies, know the material, and conduct the experiment yourself.

• Safety first! Laboratory rules should be strictly enforced because they are designed entirely for the safety of the class.

• Understand each experiment and relate lab activities to lecture material.

Before the Course Begins
Meet with the professor and be clear on lab policies:

• Do you need a tour of the lab to find out where the supplies are located, how to get equipment, and which are the potential hazards (high voltage electricity, corrosive chemicals)?

• What are the course policies?

• What exactly does the professor expect as far as grading, attendance, and group work? Plan to communicate this information to the students.

• Will you be asked to prepare (or help prepare) laboratory guides and lab report forms?
Before Each Lab

- Know the material: study the theories and methodologies being covered in order to be prepared for students’ questions.
- Do the lab experiment yourself. This is the only way to familiarize yourself with the assignment (in some cases, the lab manuals are unclear, or may not provide detailed descriptions).
- Anticipate problems and practice explaining procedures or difficult theories.
- Give yourself time to set up. You might need to arrive early and make sure that the lab is properly set up for the day’s experiment.

Mechanics of Running the Experiment

- Safety first! Safety enforcement is the number one priority for a lab TA. It is imperative that your students understand the hazards of a lab situation and correspondingly obey the rules set forth by the instructor and the TA. Emergency procedures should be thoroughly reviewed.
- Constant watchfulness is usually required to strictly enforce safety rules.
- Everyone present in the lab must obey all safety rules: students, faculty, and teaching assistants.
- Safety equipment must be used when required (cf. constant watchfulness).
- Ensure that students know and respect your authority. This is the best way to secure the safety of all involved. It may be necessary to keep reminding yourself of this because, in the lab situation, you work closely with individual students and may easily come to see them as peers.
- Stress cleanliness. Cleanliness goes hand-in-hand with safety. A lab where sharp objects, chemicals, reagents, or waste are not properly stored or disposed is a dangerous place.

During the Lab

- Clearly communicate course policies to the students. Outline your grading methods, the course requirements, and how students should write and submit their results. Review safety policies and explain how to use and care for laboratory equipment.
- Keep introductory comments succinct, indicate how the lab relates to the previous lecture(s), and what the procedure entails.
- Start with explanations. Present any theory that needs to be discussed, explain the experiment, and take questions.
- Make the objectives of each experiment clear. These should not be a secret. Tell your students what they are expected to find. Review the procedures for the day’s experiment.
• If applicable, explain the relevance of the experiment to real life. This will make the lab more meaningful to students. Or ask students to think how their results apply to a larger scientific question.

• Wherever possible, point out interesting historical aspects of the experiment: e.g., “Galileo did this whole experiment using a cathedral lantern for a pendulum and his pulse for a watch!”

• Circulate throughout the room and see how students are doing. Ask conceptual and analytical questions to determine what students know and to clarify what confuses them. For example you might ask students not only what they are doing, but why a certain aspect of the procedure might be necessary, and why they would expect this outcome. If the students cannot answer a question relating to the experiment, try to work through the problem until they are asked to demonstrate proper techniques. Be willing to help with problems and questions before they develop into failures or catastrophes.

• Maintain a current open lab grade book during lab time so that students can check their progress.

• Although, in some cases, staff is responsible for the cleaning of labs after the class has met, there may be times when students are responsible for cleaning work areas. Consider assigning individual students to clean specific areas each week and rotate the responsibility throughout the semester.

• The amount of material covered during the laboratory period should not exceed the time available. Keep the students to a schedule. If you do not want to spend all day (and all night) in a lab you must encourage your students to proceed through the experiment in a timely fashion. Make sure they know approximately how much time each step should take. Emphasize that they should finish by a certain time; then call out the remaining time at regular intervals. If the experiment requires groups of students, have a student in each group collate data on the board for the entire class. In this way, the variability of data is appreciated and generalizations may be drawn.

• Have students help each other. Depending on student capabilities, it is sometimes a good idea to encourage them to address some of their more straightforward questions to each other rather than to you.

• Set a good example by practicing and insisting on lab safety, cleanliness and courtesy.

Sources


Self-Assessment

• Display a working knowledge of the material and lab techniques.
• Clearly explain how to use the lab equipment.
• Explain possible lab hazards, and insist on safe practices.
• Provide clear, appropriate instructions before or during the lab.
• Use the teaching techniques of demonstration, illustration, and strategic questioning effectively.
• Grade lab reports fairly and return them promptly.
• Remain attentive to the needs of all the students in the lab.
• Answer student questions, offer encouragement and useful advice during lab activities.

Assessing the Lab’s Contributions to Student Learning

• Students have sufficient access to equipment and supplies needed for experiments.
• The lab experience stimulates student learning and interest.
• The lab experiences of the course are designed so that students have the opportunity to do additional experimenting on their own.
• Lab activities are sufficiently challenging so as to encourage critical thinking.

Assessing Lab Experiments and Activities Related to the Lectures

• The lab experience adds to students’ understanding of the course.
• Lab activities investigate problems that come up in the lecture sessions of the course.
• The results of the lab activities are discussed in the lecture sessions.
• The lab manual contributes to understanding and completion of the experimental activity.

Assessing the Conditions of the Lab

• The lab equipment is adequate, reliable and safe.
• There is enough equipment for all the lab groups.
• The lab environment (i.e. arrangement, space, heat, light) is conducive to the activities planned for the lab period.

Questions students will ask during the first lab:

• If I can’t make it to lab one week, can I go to another TA’s lab to do the work?
• If I miss a lab, how can I make up the work?
• Will the professor grade the lab work, or will you?
• If I can’t finish the experiment during lab, can I keep working after class?