Massachusetts Institute of Technology

Brain & Cognitive Science
New TA Orientation

Teaching & Learning Laboratory

Wednesday, 31 August 2011
2-4PM

TA-ing Labs

I. Preparation

A. Before the Semester Begins

Make sure that you have the following information before the semester begins.

Administrative Details

___ The goals of the lab

___ What is expected of you

___ When and where the lab meets

___ How you obtain a class list and grade book

___ The course syllabus

___ The textbook for the subject

___ The drop/add policy

___ The class size limit

___ A copy of the lab book and experiments, if applicable

___ Where to get supplies for each experiment

___ Where to get other supplies (disks, pens, paper, grade books)

___ Where to get photocopies done and who pays for them

___ Where to get the keys for the room and outside doors

___ What help to expect (typing, copying, collating materials, etc.)

___ The lab schedule.

Facilities

___ Location of lab where you will be teaching

___ Location of the necessary equipment

___ Identity and likely locations of the lab technician

___ Responsibilities of the lab technician

___ The location of the first-aid kit

___ The location of the eye wash and safety shower

Expectations and Class Policies

___ Clarify your role in the lab, for example:

- How much interaction between you and the students does your supervisor want? Should you ask probing questions while the students are collecting data?
- When should you answer students' questions and when should you encourage them to think through the answers themselves?

___ Determine the lab ground rules

- Safety
- Attendance
- Lab make-up policy
- What is expected in lab reports
- How grades are determined
- Late reports
- Plagiarism policies

Responsibilities

Find out who is responsible for:

___ insuring that equipment is operating correctly

___ repairing and/or replacing damaged equipment

___ ordering lab supplies

___ paying for repairs or replacements

Safety

___ Know the location and availability of all safety equipment in the lab.

___ If any safety equipment is missing or in disrepair, make sure there is a replacement.

___ Attend the appropriate departmental, and/or Institute-wide safety trainings and seminars

___ Determine hazards contained in your lab (electrical, mechanical, chemical and other equipment, materials, radioactivity). Know how to safely handle and dispose of hazardous material.

___ Think about your response to a crisis.

___ Determine department policy for handling injuries.

___ Understand the department/Institute policy on goggles, lab coats, food and drinks.

___ Determine the Institute's regulations and the role that safety offices might play.

B. Before the First Lab

Put in careful thought and planning for the first lab class. This is the time to set the tone for the rest of the term. Become acquainted with the students and for the students to get acquainted with you and each other. For example, you may want to ask the students about their majors, math backgrounds, computer expertise, and similar courses taken previously, including high school. You can ask students to put this information on an index card.

If you plan to have the students work in groups it is important to form the groups and have some way for them to get acquainted with each other. The first day's experiment may be simple but require group members to work together so they begin to get to know each other as collaborators and resources in a learning context.

Help the students understand the relationship of the laboratory section to the overall course and point out that most of the experiments are intended to illustrate basic ideas that underlie the fundamental concepts of science. Briefly review the types of experiments the students will be performing. Emphasize that because it will generally be necessary for you to present essential information and instructions at the beginning of each session they should be sure to arrive for class on time. Show them the laboratory facilities and give them a few minutes to become familiar with their surroundings.

Much of the lab philosophy, protocol and policies should be written on a handout in addition to being discussed in class.

Other things that should be communicated on that first day include:

Safety

- Explain the importance of laboratory safety.
- Make sure students know the safety rules, e.g. when to use goggles.
- Make sure the students know what to do in the event of an emergency.

Lab expectations

- Explain in detail the general ground rules for the proper handling and storage of supplies and equipment.
- Emphasize that because the laboratory must be used by subsequent classes, work areas must be cleared and all equipment cleaned and stored before the end of each session.
- Identify the name and source of the manuals and supplies the students will be expected to purchase.
- Explain the general type of preparation required for each session.

Student concerns

Encourage students who may require special considerations regarding testing, assignments, and/or course access to arrange to meet with you (or the subject instructor) as soon as possible. Some students may not be accustomed to advocating for themselves, and may benefit from you remarks.

Grading

- Review the overall grading policy that will be used in the course and/or lab
- Discuss your expectations regarding independent and collaborative work.
- Give guidelines on what is expected for lab reports. Consider distributing an example of a good lab report and discuss with them why you consider it to be good.

Policies

- Make clear any ground rules such as: --Attendance policies --Late report policies --Lab make up policy --Cheating and plagiarism policies --Breakage and replacement policies.
- It is especially important to distribute a handout that specifies policies and guidelines. This is important for several reasons: it gives you and students a written record, students joining the class after the first day don't miss this important information, and, if disputes arise later, you will have documentation. Bring copies to subsequent classes for those who don't attend on the first day. In courses with multiple sections where the instructor provides a course-wide lab handout, it is still important to have your own handout for the section(s) you will teach. Your students will appreciate knowing your personal outlook and expectations for lab, and you can give more details about your sections, e.g. expected quiz dates, due dates for assignments, embellishments on discretionary points, etc.

- Discuss the assignment for the next laboratory session.

Experienced TAs are a good resource for finding out what specifically needs to be emphasized or explicitly explained on the first day.

C. Before Each Lab

There is much to coordinate in a laboratory class. Not only must you know the material, you must also supervise and guide students through the lab. Preparation for labs will probably require a large part of your teaching effort. Efficient preparation is a necessity, so take advantage of all available resources. Asking for advice from TAs who are familiar with the lab can save time, effort, and even occasional embarrassment.

Read the assigned lab in the lab manual.
Know what the students are supposed to learn and why. Look up any terms or concepts which are unfamiliar to you or your students. It can be most embarrassing to stare blankly into space when students ask you about some concept which was presented in the lab manual. Re-familiarize yourself with the subject you will be teaching. This involves reading the course text or reference books and bringing them to the lab for student use. Be sure that you feel comfortable and knowledgeable about the material before lab. Also, keep abreast of the corresponding lecture syllabus. If it is possible for students to take the lab without being concurrently enrolled in the lecture, find out which students are doing so.

Some labs may benefit from supplemental materials, especially those that consist solely of demonstrations. If the lab manual does not have this, it may be helpful for students for you to prepare a handout to guide their observation. Comparative questions can be useful here.

Use the subject syllabus to determine if a lab comes before the relevant lecture, you must take this into account as students will not yet have had the theory.

Do the experiment and analysis about one week before the students will do it. The benefits of preparing the experiment in advance cannot be underestimated. Running through the protocol allows you to plan for problems. As you do the experiment, pay attention to the clarity and completeness of the lab manual. You may need to warn students about possible pitfalls or supplement the manual with instructions or handouts.

Consider the logistics of student use of equipment and supplies.
What and how much will you need for your students? Will you need to schedule class to avoid long waiting lines for a crucial piece of equipment?

Run through the data analysis with your trial data. Keep a record to refer to during lab, and include units and necessary equations since many students have difficulty with these. Finally, know whether you can obtain the expected result. If you can't, or if you can't expect the students to do so, now is the time to plan alternate strategies.

Many large courses have weekly preparatory sessions with TAs and the course supervisor and/or the lecturer attending. "Prep" sessions have many advantages over individual preparation. When doing the lab as a group, you can preview the experiment and the lab manual in more of an actual classroom atmosphere. As a group you can decide what to emphasize across sections and discuss how to solve difficult situations from a variety of perspectives. This is also a wonderful opportunity to learn from TAs who are experienced with the lab.

Think about time management.
When preparing the lab, keep in mind how long to allow for particular tasks. What should students be doing after a half hour, an hour, three hours? Try to anticipate any problems your students will have with budgeting their time on various sections of the experiment. Figure out how you can pace your students so they all finish on time. Sometimes you can subdivide lengthy labs, with different groups carrying out different sections. In some cases, you may need to do certain parts of the experiments or give a group demonstration.

Know your equipment and materials.
Be in control of all materials needed for the lab. Check that all the relevant equipment is available and in the appropriate location (consult the equipment lists as needed). Know how to use the equipment safely and efficiently, and where to find more should you need it. Be familiar with how to turn equipment on and off, what constitutes breakage or failure, where to find a replacement or how to get around it. Fiddle with the knobs before the students do. In what units are measurements given?

Safety.
Review the safety concerns presented by the lab and plan what you need to do to reinforce these concerns for students. Try to stay aware of any health-related problems students might have that require special consideration (allergies to latex gloves or chemicals, students who need rest breaks because of health, etc.).

Plan your introduction and closure.
This is a good time to think about goals of the class, and/or lab. Think about how to integrate the lab and lecture. What concepts must be introduced or reviewed to make the material understandable? What is the take-home message for the lab and how will the students understand and retain it? Where appropriate, a short, well done demonstration can often be informative here.

These are important periods during the class, and your presentations should be short and to the point. Remember that students are there to do hands-on work, not to listen to another lecture.

Take a few minutes at the end of lab to review the goals, and discuss results and difficulties. A group analysis and comparison of results helps students learn about the realities of the scientific process.

Facilitate student preparation and write-up.
In order to help students come to lab prepared and informed, you may wish to consider implementing some of the methods and strategies described below.

- assign advance readings, with guiding questions to focus their study,
- pose questions to students randomly during the lab introduction,
- require pre-lab write-ups in the lab notebooks of an introduction or purpose of the lab,
- give short quizzes of two to three questions at the beginning of lab (students can grade these), and
- briefly discuss the key lab procedures and outline them on the board (or via a handout).

If you plan to implement any of these strategies, you may want to talk to the course instructor to inform him/her of your intentions (and motivations), and to make sure that students receive consistent information from everyone involved with the lab.

II. Running the Lab
With your preparations finished, everything is in place and ready to go for the students. Here are some suggestions for structuring the lab period.

Go into the lab early and write a brief outline on the board.
This helps keep students focused, helps pace the work, and is especially important for classes that might have multiple ongoing experiments. Include pertinent announcements to avoid spending too much time on these during the lab session. You may wish to put this information on a handout for the students.

Begin the lab on time.
Waiting for everyone to show up only encourages latecomers. Consistent promptness on your part can provoke everyone to arrive on schedule.
Briefly summarize the results of the previous week's lab (if this is relevant/useful).

Give a brief introduction to this week's lab.
Here you can give any announcements, answer questions about lecture, and introduce the lab. Be concise. You might consider saving the latter part of the introduction for later, as results come in.

Demonstrate any tricky techniques or apparatus and point out the location of special materials.
Gather the class close for this, and make certain everyone can see and hear. Encourage questions, but ask your own to monitor understanding. This will help you avoid explaining the same thing repeated. Have students form lab groups now.

Interact with students.
Take an active role with your students. Learn and use their names. Try to interact with everyone during the period. Move throughout the room. Check notebooks and make suggestions, eavesdrop on discussions or read over students' shoulders. This way you are readily available when questions come up and you can steer students in the right direction if they've gone off course.
Never pretend to know the answer to a question.
Instead, if you don't know the answer be willing to look it up in a reference text, or ask another TA or the professor.

Let students take responsibility for learning.
Try to de-emphasize the "teacher as expert" model. One purpose of a laboratory section is to teach students how to learn through experimentation, in other words, how to do science themselves. It can be hard to know where to draw the line between effective hands-off teaching and letting the class drift aimlessly. Have a procedure for encouraging students to be their own resources and follow it. For example, you might require students to pose their question to three other students before they ask you.

Pace student progress.
Many labs are too short and students will not finish unless you keep the class on track. Tell them what parts of the lab absolutely must be completed during the period. You can also periodically announce what they should be working on at a given time. Try to keep the class at roughly the same point, but recognize that students work at different rates. Assist groups that are behind schedule. For those who finish early, encourage review of the material or discussion of additional questions, and expect some socializing.

Provide a sense of closure for the lab experience and allot time for clean-up
With students working at various paces, some people will finish before others, and it can be difficult to gather everyone's thoughts at the end of a chaotic period. However, a good conclusion reinforces learning. It is a time for reflection and processing observations. Some labs are designed so that students are allowed to leave once they have completed the lab – make sure that you, the instructor, and the other TAs are on the same page with respect to when students may leave the lab.

Before leaving, check that all equipment and utilities such as gas, air and water outlets have been turned off.

Adapted from: Guidebook for Teaching Labs for University of Michigan Graduate Student Instructors, Beverly Black, Martha Gach, and Nancy Kotzia.