

The following handout was prepared by Bryna Clover, Chemistry department, UMD

## Teaching Strategies

Don't be afraid to ask other GTAs about their teaching techniques, especially the older GTA's...we've all been in the same boat!

### Strategies for the Lab

Preparation (It's all about preparation...)

- Read over the lab manual and know what to expect from the weekly lab meeting.
- Review background material and concepts. It's good to give yourself a head's up if students ask thoughtful questions - which we hope they will!
- Review instrument techniques
  - If there is a new instrument that you have not previously used, make sure YOU know how to use it *before* the lab.
  - This can be done by dropping into a lab that takes place earlier in the week.
- Be aware of any safety issues or other difficulties that may arise.

Pre-lab lecture

- Don't explain the entire lab procedure step-by-step. The students should have read this before coming to lab.
- Keep it short. You can always follow up with students in their groups.
- Discuss the goals of the lab. Better yet, have a student tell you the goal.
- Review background concepts.
- Show instruments and techniques.
- Discuss any safety issues.
- Mention any helpful points that will aid in time management. "It would be a good idea to split into pairs and multitask here..."
- Leave time for questions and encourage discussion. This helps hash out any student misconceptions before the lab begins.
- Lead student questions into discussion with fellow students: "Can anyone answer Bobby's question?"

During Lab

Supervise experiments (and experimenters)

- Whatever you do, don't sit at the front of the classroom watching...be involved!
- Be aware of signs students are confused (rustling papers, perturbed faces...)
- Use mini-lectures and discussions whenever possible. If you notice that a group (or two) is having problems, you can get into further discussions at the lab bench/hood. (Some might call this "micro-teaching," that is, you're teaching to small groups instead of the class as a whole.)
- Encourage group work. These labs are designed to get students to work together. If you notice one person in a group is flying ahead, or another has many blank questions, guide these groups by asking a specific person a question. This requires that the group discuss the answer together before they can move on in the procedure.

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### Inquiry driven labs

- Labs are designed so that students come upon answers and concepts on their own.
- You are there to guide students to those answers.
- Often you can give hints, or ask questions in a way that starts at a simple concept and builds until the group reaches the right conclusion.
- Students do not learn if you tell them the answers flat out. Although they'll certainly beg you to do so!
- It is important to show students that they can solve a problem on their own.
- Students will not always have TAs to guide them in their research, and they need to get used to the idea that there may not be a "right" or "known" answer.

### Student Assessment

- Each lab has some small portion of the student's grade attached to their performance during the lab.
- Although the exact criteria may differ between courses, it is important to assess students for:
  - Preparation
  - Participation in lab procedures
  - Participation in group discussions
  - Recording answers to guided questions and writing in their lab notebooks appropriately
  - Observance of safety rules

The following resources were used and offer more ideas about conducting laboratory sessions:

The Graduate School and Center for Instructional Development and Research, University of Washington "A handbook for teaching assistants."  
<http://depts.washington.edu/cidrweb/TAHandbook/ConductingLabs.html> Accessed 12.02.2009

Center for Teaching, Vanderbilt University. "Teaching Laboratory Classes."  
[http://www.vanderbilt.edu/cft/resources/teaching\\_resources/activities/labs.htm](http://www.vanderbilt.edu/cft/resources/teaching_resources/activities/labs.htm) Accessed 12.03.2009

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## Strategies for Discussion Sections

Preparation (Yep, still all about the preparation...)

- Attend lecture (and actually follow along! - show a good example to the students and you'll know what to talk about in discussion)
- Note points of possible confusion during the lecture, you'll want to cover these again.

Make a lesson plan

- A common mistake among first-time discussion TAs is expecting students to have a bunch of questions for you. Often times students don't know what they don't understand and haven't touched their homework assignments.
- Prepare practice problems and review notes from the lecture.
- Go over any difficult homework problems the students might have that week.
- Sometimes a recitation style is appropriate where the main points from the lecture are noted and reviewed.
- Other weeks the discussion section is better suited for covering problem solving techniques and addressing practice problems.

Presenting Material

- Students learn through different styles.
- The more ways you can present material, the better chance one of these methods will "stick" with a student.
- Think about using different classroom techniques such as group work to go over practice problems. You might even think about letting the students "be the TA" and present material or a problem to the class.
- Try to find "real life" examples to connect with difficult ideas and concepts. This helps students have a concrete and tangible example of often-confusing concepts.
- Connect current and past material, this shows the students how ideas and concepts connect over the semester. (This also keeps them from forgetting original materials they'll need for the final!)

Encouraging Discussion (It's called "discussion" for a reason)

- It is important to encourage students and engage them in conversation about the class material.
- Hopefully, this is not a conversation between you and two or three different students, but rather a conversation among students.
- It may be helpful to redirect questions from one student to the whole class: "That's a good question, does anyone have any ideas on how to solve this?"
- Give students time (usually 10 seconds) to respond to questions. This may feel like forever to you, but will show the students that you want them to participate and you'll wait until they do. Eventually, they should get the hint and answer just to get rid of the "awkward" silence. But also, it gives them time to think...always a good thing!

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- If you have a particularly quiet bunch (and hey, sometimes it happens) you may want to ask them to email any questions they have prior to the discussion section. This will help you to focus the conversation and answer their problems.
- You may want to ask students to write a quick sentence at the end of class saying what was still a bit “muddy” or confusing at the end of the section. This way you know what you should retouch on next time, and aids in helping you see what teaching methods are working.

#### Above and Beyond

- Students may ask you to hold a review session for exams (especially finals). This is completely optional and up to you.
- Some TAs have found that putting together a “review” sheet of problems may be beneficial for discussions prior to exams. Just remind the students that these are YOUR problems, and in no way reflect what may or may not be on the exam created by the instructor.

Some points adapted from:

Center for the Enhancement of Teaching and Learning, Georgia Institute of Technology. “Teaching in Recitations.”  
<http://www.cetl.gatech.edu/students/tas/taweb/handout/recitation.pdf> Accessed 12.03.2009

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## Universal Tips and Ideas

Be passionate and enthusiastic about your subject matter! - It's catching and you may find your students being excited about it too!

Student participation in discussion and pre-lab lectures are very important for getting students to learn the material being presented, but how do you deal with their responses?

- Be positive in your feedback! When possible throw in "Great!," or if an answer is wrong, find something that was good and acknowledge that too.
- Acknowledge all responses. This helps students see that their participation is encouraged. This can be as simple as nodding your head, or saying "I see what you're getting at..."
- Handle "wrong" answers :
  - Give credit the answer by pointing out situations when it might be true. "Hmm, that might be true, if..."
  - Get other students involved in resolving and finding the correct answer. Don't just blurt out the correct answer; instead use this as a learning opportunity for the class. Be sure that if one student doesn't completely understand a concept, there are probably more! Restate the question and help the class build on the incorrect statement until the correct answer is reached.
  - Remember to never say "NO" or "That's wrong!" This just discourages participation, and may make a student embarrassed.
  - Eventually get around to reviewing the correct answer. If there is a lot of confusion within the class, it may be a good idea to summarize the answer.

Adapted from:  
Santa Barbara Teaching Assistant Development Program; University of California.  
[http://oic.id.ucsb.edu/sites/default/files/Acknowledging\\_responses.pdf](http://oic.id.ucsb.edu/sites/default/files/Acknowledging_responses.pdf) Accessed 12.03.2009