Teaching a Discussion Section

Sample Active Learning Techniques:

☐ **Clarification Pauses:** This simple technique fosters —active listening. Throughout a lecture, pause to allow students time to think about the information. After waiting, ask if anyone needs to have anything clarified.

☐ **Writing Activities such as the —Minute Paper:** Ask the students to take out a blank sheet of paper. Then, state the topic or question that you want students to address. For example, “Today we discussed conduction as a method of heat transfer, please list as many examples of conduction that you can think of in everyday life. You have one minute – go!”

☐ **Self-Assessment:** Students receive a quiz (typically ungraded) or a checklist of ideas to determine their understanding of the subject. Concept inventories or similar tools may be useful at the beginning of the semester or at the beginning of a new unit to help students identify misconceptions.

☐ **Large-Group Discussion:** Students discuss a topic in class based on a concept or problem. The instructor may prepare a step by step problem where students can offer assumptions that need to be made, the next steps to take and the reasons why to use a particular method.

☐ **Think-Pair Share:** Have students work individually on a problem or reflect on a question. Students then compare their responses with a partner and synthesize a joint solution to share with the entire class.

☐ **Muddiest Point:** Ask students to jot down a quick response to one question: “What was the muddiest point in _____?” the focus could be a lecture, a theory or a homework assignment.

☐ **Cooperative Groups (Informal Groups, Triads, etc.):** Pose a question for each cooperative group while you circulate around the room answering questions, asking further questions, and keeping the groups on task. After allowing time for discussion, ask students to share their discussion points with the rest of the class.

☐ **Peer Review:** Students are asked to complete an individual homework assignment or short paper. On the day the assignment is due, students submit one copy to the instructor to be graded and one copy to their partner. Each student then takes their partner's work and, depending on the nature of the assignment, gives critical feedback.

☐ **Group Evaluations:** Similar to peer review, students may evaluate group presentations or documents to assess the quality of the content and delivery of information.

☐ **Brainstorming:** Introduce a topic or problem and then ask for student input. Give students a minute to write down their ideas and then record them on the board. An example might be —Imagine that you want to design an operating system that takes advantage of what we know about motor programs and skill learning. What factors must you consider?"
Case Studies: Use real-life examples to prompt students to integrate their classroom knowledge with their knowledge of real-world situations. For example, you might present examples of real world problems balancing environmental impact, regulations, and cost in a plant design course.

Hands-On Technology: Students can use simulation programs to get a deeper understanding of course concepts. For example, students might use COMSOL on a homework problem to solve a fluid mechanics problem to see the software in action.

Interactive lecture: Instructor breaks up the lecture at least once per class for an activity that lets all students work directly with the material. Students might interpret graphs, make calculations, or predict experimental outcomes.

Active Review Sessions (Games or Simulations): The instructor poses questions and the students work on them in groups or individually. Students are asked to show their responses to the class and discuss any differences.

Role Playing: Here students are asked to ‘act out’ a part or position to get a better idea of the concepts or theories being discussed. For example, students could have to act out a concept and learn to break it down into simple terms as a term project.

Jigsaw Discussion: In this technique, a general topic is divided into smaller, interrelated pieces (e.g., a puzzle is divided into pieces). Each member of a team is assigned to read and become an expert on a different topic. After each person has become an expert on their piece of the puzzle, they teach the other team members about that puzzle piece. Finally, after each person has finished teaching, the puzzle has been reassembled, and everyone on the team knows the important information about every piece of the puzzle.

Inquiry Learning: Students use an investigative process to discover concepts for themselves. After the instructor identifies an idea or concept, a question is posed that asks students to make observations, pose hypotheses, and speculate on conclusions. Then students share their thoughts and tie the activity back to the main idea.

Forum Theater: Use theater to depict a situation and then have students enter into the sketch and act out possible solutions. Students watching a sketch on dysfunctional groups might brainstorm possible suggestions for how to improve the group dynamic. Ask for volunteers to act out the updated scenario. This could be used to introduce tough ethical situations balancing safety, time to complete a task, and profit to students.

Experiential Learning: Plan site visits that allow students to see and experience applications of theories and concepts discussed in the class.

*Adapted from a handout by Chris O’Neal and Tershia Pinder-Grover, Center for Research on Learning and Teaching, University of Michigan.
Teaching a Discussion Section

Active Learning Reflection Questions

Why would you like to use the 2 techniques you chose?

Now, think about a subject or example problem you might be covering at the beginning of the semester. Describe this subject or example here.

Think of specific ways you might implement the one of the techniques listed above as part of an actual lesson.
This is a spectrum of some active learning activities arranged by complexity and classroom time commitment.

Prepared by Chris O’Neal and Tershia Pinder-Grover, CRLT
Strategies for Establishing and Maintaining Classroom Authority

Make a strong first impression.
Arrive early, post important information on the board (class name, agenda, etc.), and begin (and end) on time. Show students that you are enthusiastic about the course content and teaching. Some instructors dress more formally on the first day(s) of class.

Establish your credibility.
Share your qualifications with your students by discussing your research interests and teaching experience (in and out of the classroom). Focus on what you know rather than the gaps. Instead of announcing, —It is my first time teaching and I’m not really an expert on this topic! say —As a PhD student in this department, I have always been interested in this topic and I look forward to working more closely with it along with you. You do know more than your students.

Clarify your expectations.
Tell students what will be expected in terms of attendance, grading, participation, assignments and late work policies. Assertive policies can always be softened during the term, but it is difficult to toughen policies as the term progresses. Announce important administrative information such as office hours, drop/add policies, and where to buy books/course packs. Allow time for student questions.

Identify the value and importance of the subject.
Explain why your course is important. Describe why the subject matter is interesting to you and what you hope the students will gain from the course.

Establish participation ground rules.
As a class, set ground rules for classroom interaction and discussion. By asking students for their input, you them a sense of ownership that may help them to take the ground rules more seriously. Refer to p. 48 in the GSI guidebook for some examples.

Establish and explain an email policy.
Decide how you want email to be used in your course and develop a clear set of rules for that usage. Email can be a great way to communicate with students, but without guidelines it has the potential to become a problem. Students may expect quick, detailed responses from you – even at midnight the day before a paper is due. Establishing policies prevents these instances and ensures that expectations are clear.

1 Adapted from Nicole Stanton, —First Days of Teaching, CRTL, University of Michigan, 2004.
Teaching a Discussion Section

Resource Packet

Engineering GSI/IA Teaching Orientations
Academic Integrity at the University of Michigan:

1. Consider your syllabus statements on plagiarism.

2. Take some time to talk to your professor or fellow GSIs about past experiences, departmental/school policies, or the preferred course of action.

3. Consider the discipline-specific definitions of Academic Integrity and that students may not be familiar with or fully understand how it is practiced in your discipline or field.

4. Know where to locate resources on Academic Integrity: see links below.

5. Instructors need to *teach* students about Academic Integrity (how it is defined, how to develop ethical research practices) in addition to having clear about the consequences for plagiarism in our courses. Don’t assume that students all share the accepted definitions of plagiarism or cheating. Many of the lines are blurry and discussing preventive strategies with students is important. See handout on discussing ethical scenarios for more information.

Additional Web Resources: Academic Integrity in the Classroom:

Academic Integrity in the Classroom: A Selected List of Resources for the University of Michigan
http://www.lib.umich.edu/acadintegrity
- This website provides information for instructors on teaching about academic integrity, identifying plagiarized works, finding resources for students, and linking to UM policies and procedures for dealing with violations of academic integrity.

Honor Codes at the University of Michigan http://www.crlt.umich.edu/publinks/honor.html
- This website provides links to the Honor Codes and Academic Integrity policies of the various UM schools and colleges.

Consultations and Customized Programs
- CRLT instructional consultants can help instructors to preserve their pedagogical goals while minimizing the likelihood of cheating and plagiarism. To request a consultation, email crltengin@umich.edu or http://www.engin.umich.edu/teaching/crltengin/gsi_serv/etcwebrequest.html
Before the First Day: Things to think about

Below you will find a list of some issues you will want to talk about with your professor or other GSIs so that you’ll share consistent standards and ensure that you have the resources to teach effectively. Many of these issues will also help you in developing a course syllabus (see sample syllabus for more ideas).

**ADD/DROP:** What is the procedure for adding/dropping students? How soon can you drop students to accept students off the wait-list? Is priority given to concentrators? Seniors? Does your department have a waitlist or add/drop procedure?

**MEETINGS:** How often does the Professor want to get together with all the GSIs?

**GRADING:** What will the process be like? Will the professor sit down with the GSIs to talk about what constitutes a good answer? Will the professor allow GSIs to provide input of the test/paper assignment before it is given out? Will you, as the GSI, have the final authority if a student tries to go over your head by meeting directly with the professor? Will your professor tell you that she or he has been approached by a student? What is your grading rubric? How will you communicate grading standards to your students?

**GOALS:** What are the goals for discussion sections? Labs? Are you supplementing, facilitating, reviewing, teaching, moderating, or all of the above? Similarly, will you be covering material that the professor left out during lecture? Should you be explaining things…only when students ask? What is your responsibility as the GSI and the responsibility of the students for learning the material?

**READINGS:** How do you obtain free copies of the course pack and the textbooks? When should students complete the readings? (By the time the section meets? What if the section meeting time comes between the two lectures, i.e., lectures are delivered on a Tuesday and Thursday but the section meets on Wednesday?) Will you, as the GSI, need to make allowances and hold the students responsible for the past week’s readings? (In the previous example, will students be responsible for readings from last Thursday? How will that affect the syllabus?). Is there a coursepack?

**LATE WORK:** Is it penalized? How much? What about extensions (how far in advance do they need to ask for them? On what grounds do you give them)?

**REWRITES:** If a student receives any grade lower than a —C— will she or he get an automatic chance to rewrite it? (Do you make this policy explicit at the first meeting with the section or do you handle it, i.e. will you average the grades or throw out the earlier paper?)
**EXTRA CREDIT:** What is the professor’s policy?

**FEEDBACK** (in each direction): How would the professor like GSIs to communicate students’ feedback on the lectures? Does the professor want to observe the GSI?

**GEO:** Some visiting professors who teach with GSIs don’t know the GEO contract requirements about hours and section size. Please contact the GEO office (995-0221) umgeo@umich.edu if you have any questions.

**CLASSROOM:** Does it have enough seats and can you arrange them to suit the teaching method you’ll be using more often? If not, what can you do to improvise? Is the necessary equipment present (for instance, overhead projector (with spare bulbs), chalk?) If the room is unsuitable, whom should you contact to change the room? Consider contacting Projection Services (763-6037) if equipment breaks in your classroom.

**DEPARTMENTAL RESOURCES:** What other GSIs or professors have taught this course before and can give you information about student expectations, their level of knowledge and potential pitfalls of the course? Which administrative assistant in the department can help you? Where can you get office supplies (grade book, overhead transparencies, chalk, etc?) Where is your office space? Where is the photocopier, copy code, etc? Do you need to make copies for the first day? If so, do it early so you don’t have to wait in line!

**ROSTER:** Check out your roster online to get a sense of how full the class is, how many students are on the waitlist, etc.

**PRACTICE:** A great deal of anxiety can be relieved by trying out your lesson in advance. Ask a friend to listen or simply talk in an empty room to work out the quirks.
Sample Feedback Form
Or you can contact the Center for Research on Learning and Teaching in Engineering for a free and confidential Midterm Student Feedback (MSF) session at:
http://www.engin.umich.edu/teaching/crltengin/gsi_serv/etcwebrequest.html
or
crltengin@umich.edu

I find it particularly useful when:

To improve the class, I (the student) can:

My learning would be strengthened if:

I am still confused about/would like more clarification on:

Please check as many or as few of the following as appropriate:
___ I’d like more small group work.
___ I’d like more review of class concepts.
___ I’d like more in-class problem solving.

It would be useful in the second half of the term if we:

Other comments (on assignments you particularly like/disliked, office hours, the class as a whole):
1- Pass back homework
   a. Mean 4.5 St. dev. 0.5
   b. conductance =1/resistance
2- Go over defining coordinate system/ direction of rate/flux
3- Give hint for Homework 2—Problem 4
   a. Draw out the figure together
4- Derive resistance in spherical coordinates
5- Go through example problems 1 (example problems were posted online the night before, and students were instructed to bring the handout to class)

Problem 1:

You have designed a “bathysphere”, a spherical deep sea submersible for studying wildlife underwater. It is a spherical cavity with walls that consist of 2 in. steel, 3 in. insulation, and another 2 in. of steel. You insert a 7 in thick window for covering about 10% of the sphere surface area. The inside diameter of the sphere is 5 feet the thermal conductivity of the steel is 10 btu/hr-ft-°F. The thermal conductivity of the insulation is 0.2 Btu/hr-ft-°F. The thermal conductivity of the window is 0.3 Btu/hr-ft-°F. The heat transfer coefficient is 50 Btu/hr-ft²-°F.

a) Draw a schematic of the bathysphere
b) Determine an equation for calculating the rate at which one will have to supply heat to the sphere to maintain the inner wall temperature at 60°F when the water temperature is 40°F.
c) Determine the controlling resistance(s).
d) Considering the controlling resistance(s), approximate the rate you will need to supply heat when the inner wall temperature is 60°F and the water temperature is 40°F.
e) What is the temperature at the inner surface of the insulation when inner wall temperature is 60°F and the water temperature is 40°F.
f) What fraction of heat loss occurs through the window?
Problem 2:

A pipe has an inner radius of \( r_1 \), an outer radius of \( r_2 \), thermal conductivity, \( k \), and length, \( L \). Assume convection is occurring inside and outside of the pipe, with \( h_i \) and \( h_o \), respectively. Write an equation for determining the overall heat transfer coefficient at the inner cylinder wall in terms of: \( r_1, r_2, k, L, h_i \) and \( h_o \).

Additional Example of how to incorporate active learning into an engineering problem during discussion

ChE 342, Fall 2011
Discussion Session #10
Tuesday, November 22, 2011

2. A very thick slab has a uniform concentration of solute A of \( c_0 = 1.0 \times 10^{-2} \text{ kmol/m}^3 \). Suddenly, the front face of the slab is exposed to a flowing fluid having a concentration of 0.1 \text{ kmol/m}^3. The concentration at the surface of the slab is 6 \times 10^{-2} \text{ kmol/m}^3. The diffusivity of A in the solid is \( 4 \times 10^{-9} \text{ m}^2/\text{s} \).

a) Calculate the concentration 1 cm into the solid after:
   - 1 hr
   - 6 hr
   - 12 hr
   - 24 hrs
   - 48 hrs
   - 1 week

b) Sketch a plot of \( C_A(t) \) and describe the trend that you see.