I. Discussion

Class discussion

Discussion in class is one of the most common and effective strategies for promoting active learning. If the objectives of a course are to promote long-term retention of information, to motivate students toward further learning, to allow students to apply information in new settings, or to develop students’ thinking skills, then discussion is preferable to lecture (McKeachie et al. 1986). Research has suggested, however, that to achieve these goals faculty must be knowledgeable of alternative techniques and strategies for questioning and discussion (Hyman 1980) and must create a supportive intellectual and emotional environment that encourages students to take risks (Lowman 1984).

Teaching by Discussion (Penn State) http://www.schreyerinstitute.psu.edu/Tools/Discuss/
Tactics for Effective Questioning (Stanford University) http://ctl.stanford.edu/Tomprof/postings/121.html
FAQs: Discussions (Indiana University) http://www.iub.edu/~teaching/allabout/faq/leading.shtml
The Dreaded Discussion: Ten Ways to Start (Carroll College) http://www.carroll.edu/~msmillie/Honorscholars/TenWaysDisc.html

II. Group Work/Collaboration/Cooperation
There are many different types of group activities that can be used to facilitate active learning.

**Buzz groups**

A buzz group is a small discussion group formed for a specific task such as generating ideas, solving problems, or reaching a common viewpoint on a topic within a specific period of time. The use of buzz groups was first associated with J. D. Phillips and is sometimes known as the Phillips 66 technique. Large groups may be divided into buzz groups after an initial presentation in order to cover different aspects of a topic or maximize participation. Each group appoints a spokesperson to report the results of the discussion to the larger group. Buzz groups are a form of brainstorming.

**Steps to Implementing:**
1. Reach important concept in lecture
2. Ask students in groups of 5-8 to discuss
3. Each student contributes at least 1 idea - 10 minutes
4. Call on 1-2 groups to share ideas
5. Groups that reached similar conclusion raise hands
6. Capture main points on blackboard or overhead
7. Incorporate questions/issue into lecture

**Ke ts’ao**

Ke ts’ao, which literally means “ferment” in China, is a group discussion technique used to arrive at consensus in teaching, training, or mediation sessions. It is similar to Buzz groups in that every member of a group is required to say something but the emphasis is placed on members of a group reaching consensus on an idea, policy, procedure, etc.

**Steps to Implementing:**
1. Reach important or controversial point or concept in a lecture
2. Ask small groups of students to discuss and reach consensus
3. Small groups report conclusions to whole class
4. Repeat if consensus is not reached
5. If consensus is reached, ask groups to report their conclusion and discuss as a class
6. After all groups report, instructor provides additional information
7. Small groups return to deliberate
8. Repeat process until consensus on problem, idea or issue is reached.

**Case Study analysis**

Traditionally associated with business school, law school and social science classes, case studies can be used effectively in any discipline in which students need to explore how issues and principles learned in class interact in real world situations. As a result, case studies methodologies have expanded to other disciplines including the physical sciences, mathematics, literature and history and are considered an example of Problem Based Learning.

Cases can range from a simple question such as “What would you do in this situation?” to a more elaborate simulation or role-playing scenario in which students must resolve a complex questions based on real-world data and documents. How simple or elaborate a case is depends on what you want your students to be able to do in the course.

Most case assignments require students to answer an open-ended question or develop a solution to an open-ended problem with multiple potential solutions. Requirements can range from a one-paragraph answer to a fully developed group action plan, proposal or decision.

**Examples:**


Case studies are powerful because they:
- Expose students to the ambiguity of real world situations and data
- Allow students to explore multiple perspectives
- Require students to engage in critical thinking, analysis and inquiry
- Help students synthesize course content

**References:** [http://tlt.its.psu.edu/suggestions/cases/](http://tlt.its.psu.edu/suggestions/cases/)

**Jigsaw technique**

In jigsaw projects, each member of a group is asked to complete some discrete part of an assignment; when every member has completed his assigned task, the pieces can be joined together to form a finished project. For example, students in a course in South American geography might
be grouped and each assigned a country; individual students in the group could then be assigned to research the economy, political structure, ethnic makeup, terrain and climate, or folklore of the assigned country. When each student has completed his or her research, the group then reforms to complete a comprehensive report.

**Visual lists**

Here students are asked to make a list-on paper or on the blackboard; by working in groups, students typically can generate more comprehensive lists than they might if working alone. This method is particularly effective when students are asked to compare views or to list pros and cons of a position. One technique that works well with such comparisons is to have students draw a "T" and to label the left- and right-hand sides of the cross bar with the opposing positions (or 'Pro' and 'Con'). They then list everything they can think of which supports these positions on the relevant side of the vertical line. Once they have generated as thorough a list as they can, ask them to analyze the lists with questions appropriate to the exercise. For example, when discussing Utilitarianism (a theory which claims that an action is morally right whenever it results in more benefits than harms) students can use the "T" method to list all of the (potential) benefits and harms of an action, and then discuss which side is more heavily "weighted". Often having the list before them helps to determine the ultimate utility of the action, and the requirement to fill in the "T" generally results in a more thorough accounting of the consequences of the action in question. In science classes this works well with such topics as massive vaccination programs, nuclear power, eliminating chlorofluorocarbons, reducing carbon dioxide emissions, and so forth.

**Panel discussions**

Panel discussions are especially useful when students are asked to give class presentations or reports as a way of including the entire class in the presentation. Student groups are assigned a topic to research and asked to prepare presentations (note that this may readily be combined with the jigsaw method outlined above). Each panelist is then expected to make a very short presentation, before the floor is opened to questions from "the audience". The key to success is to choose topics carefully and to give students sufficient direction to ensure that they are well-prepared for their presentations. You might also want to prepare the "audience", by assigning them various roles. For example, if students are presenting the results of their research into several forms of energy, you might have some of the other students role-play as concerned environmentalists, transportation officials, commuters, and so forth.

**Pair Work**

Grouping students in pairs allows many of the advantages of group work students have the opportunity to state their own views, to hear from others, to hone their argumentative skills, and so forth without the administrative "costs" of group work (time spent assigning people to groups, class time used just for "getting in groups", and so on). Further, pairs make it virtually impossible for students to avoid participating thus making each person accountable.

**Think/Pair/Share**

Think-pair-share is a relatively low-risk, short collaborative learning structure. In think-pair-share, the instructor poses a challenging or open-ended question and gives students one minute to think about the question. Students then pair with a collaborative group member or neighbor sitting nearby to discuss their ideas about the question for several minutes. (The instructor may wish to always have students pair with a non-collaborative group member to expose them to more learning styles.) The think-pair-share structure gives all students the opportunity to discuss their ideas. This is important because students start to construct their knowledge in these discussions and also to find out what they do and do not know. This active process is not normally available to them during traditional lectures. Once students have discussed their ideas in pairs, the instructor can call upon pairs to share what their responses and have the class discuss or vote.

**Peer-Assessment/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. These may be assigned that day, or students may be assigned partners to work with throughout the term. Each student then takes their partner's work and depending on the nature of the assignment gives critical feedback, standardizes or assesses the arguments, corrects mistakes in problem-solving or grammar, and so forth. This is a particularly effective way to improve student writing.

**III. Writing Activities**

**The "One Minute Paper"**

The one minute paper is a highly effective technique for checking student progress, both in understanding the material and in reacting to course material. Ask students to take out a blank sheet of paper, pose a question (either specific or open-ended), and give them one (or perhaps two - but not many more) minute(s) to respond. Some sample questions include: "How does John Hospers define "free will"?", "What is "scientific realism"?", "What is the activation energy for a chemical reaction?", "What is the difference between replication and transcription?", and so on. Another good use of the minute paper is to ask questions like "What was the main point of today's class material?" This tells you whether or not the students are viewing the material in the way you envisioned.
Muddiest (or Clearest) Point

This is a variation on the one-minute paper, though you may wish to give students a slightly longer time period to answer the question. Here you ask (at the end of a class period, or at a natural break in the presentation), “What was the “muddiest point” in today's lecture?” or, perhaps, you might be more specific, asking, for example: “What (if anything) do you find unclear about the concept of ‘personal identity’ (‘inertia’, ‘natural selection’, etc.)?”

Affective Response

Again, this is similar to the above exercises, but here you are asking students to report their reactions to some facet of the course material - i.e., to provide an emotional or valuative response to the material. Obviously, this approach is limited to those subject areas in which such questions are appropriate (one should not, for instance, inquire into students' affective responses to vertebrate taxonomy). However, it can be quite a useful starting point for courses such as applied ethics, particularly as a precursor to theoretical analysis. For example, you might ask students what they think of Dr. Jack Kevorkian’s activities, before presenting what various moral theorists would make of them. By having several views “on the table” before theory is presented, you can help students to see the material in context and to explore their own beliefs. It is also a good way to begin a discussion of evolutionary theory or any other scientific area where the general public often has views contrary to current scientific thinking, such as paper vs. plastic packaging or nuclear power generation.

Explication of text - individual or group based

Ask students to discuss difficult passage in text after reading - group based explication of text
Ask groups to give their interpretation before presenting teacher's analysis
Also works for teaching students how to read charts and graphs, supply, demand curves, etc.

Use decision-making exercises that let them see tensions, pressures, tactics of real situations. Have them write about them in a journal to reflect and make sense of their learning

Quick response - Response to instructor-centered activity

Students are asked to write a paragraph that begins with: I was surprised that ... I learned that ... I wonder about ... This allows the students to reflect on what they actually got out of the teachers' presentation. It also helps students realize that the activity was designed for more than just entertainment.

Can be given pre or post lecture
Write thoughts about today's lecture
Write short summaries of the material during a lecture
Select most pertinent points and summarize in their own words
Synthesis and personalization - deeper learning

Writing samples can be collected, graded, kept in journals, used by students to review

Journaling

Journaling combines some of the advantages of the other techniques, but allows for more in-depth discussion of or reaction to course material. You may set aside class time for students to complete their journal entries, or assign this as homework. The only disadvantage to this approach is that the feedback will not be as “instant” as with the one-minute paper (and other assignments which you collect the day of the relevant lecture). But with this approach (particularly if entries are assigned for homework), you may ask more complex questions, such as, “Do you think that determinism is correct, or that humans have free will? Explain your answer.”, or “Do you think that Dr. Kevorkian's actions are morally right? What would John Stuart Mill say?” and so on. Or you might have students find and discuss reports of scientific studies in popular media on topics relevant to course material, such as global warming, the ozone layer, and so forth.

IV. Feedback/Presentation Activities

Questioning techniques

These techniques are designed to give the instructor some indication of student understanding of the material presented during the lecture itself. Questioning and feedback activities generally provide formative assessment rather than summative assessment of student understanding and should be designed in ways that help students evaluate their own thought processes by probing the thinking behind their statements and questions. Asking students different types of questions: knowledge questions, comprehension questions, analysis questions, synthesis questions, evaluation questions, is often a good complement to lectures and provides insight into how well they've understood the subject matter.

For each feedback method, an instructor might stop at appropriate points to test out student comprehension of the material; in this way, she can adjust the lecture mid-course, slowing down to spend more time on concepts students are having difficulty with or moving more quickly over concepts students have easily grasped.
Socratic method

In its original format, this technique involved instructors “testing” student knowledge (of reading assignments, lectures, or perhaps applications of course material to a wider context) by asking questions during the course of a lecture. Typically, the instructor chooses a particular student, presents her with a question, and expects an answer forthwith; if the “chosen” student cannot answer the question presented, the instructor chooses another (and another) until the desired answer is received. This method has come under criticism, based on claims that it singles out students (potentially embarrassing them), and/or that it favors only a small segment of the class (i.e., that small percentage of the class who can answer any question thrown at them). In addition, once a student has answered a question they may not pay much attention as it will be a long time before the teacher returns to them for a second question. In spite of these criticisms, we feel that the Socratic method is an important and useful one; the following techniques suggest variations, which enhance this method, avoiding some of these pitfalls.

Summary of another student's response

In order to promote active listening, after one student has volunteered an answer to your question, ask another student to summarize the first student's response. Many students hear little of what their classmates have to say, waiting instead for the instructor to either correct or repeat the answer. Having students summarize or repeat each others' contributions to the course both fosters active participation by all students and promotes the idea that learning is a shared enterprise. Given the possibility of being asked to repeat a classmates' comments, most students will listen more attentively to each other.

Quotations Exercise

This is a particularly useful method of testing student understanding when they are learning to read texts and identify an author's viewpoint and arguments. After students have read a representative advocate of each of several opposing theories or schools of thought, and the relevant concepts have been defined and discussed in class, put on the overhead projector a quotation by an author whom they have not read in the assigned materials, and ask them to figure out what position that person advocates. In addition to testing comprehension of the material presented in lecture, this exercise develops critical thinking and analysis skills. This would be very useful, for example, in discussing the various aspects of evolutionary theory.

Pre/post theoretic intuitions quiz

Students often dutifully record everything the instructor says during a lecture and then ask at the end of the day or the course "what use is any of this?", or "what good will philosophy organic chemistry, etc. do for us?". To avoid such questions, and to get students interested in a topic before lectures begin, an instructor can give a quiz aimed at getting students to both identify and to assess their own views. An example of this is a long "True or False" questionnaire designed to start students thinking about moral theory (to be administered on the first or second day of an introductory ethics course), which includes statements such as "There are really no correct answers to moral questions" and "Whatever a society holds to be morally right is in fact morally right". After students have responded to the questions individually, have them compare answers in pairs or small groups and discuss the ones on which they disagree. This technique may also be used to assess student knowledge of the subject matter in a pre-/post-lecture comparison. The well-known "Force Concept Inventory" developed by Hestenes to measure understanding of force and motion is another good example of this.

Concept Questions

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Visual maps - Concept mapping/Content mapping

A concept map is a way of illustrating the connections that exist between terms or concepts covered in course material; students construct concept maps by connecting individual terms by lines, which indicate the relationship between each set of connected terms. Most of the terms in a concept map have multiple connections. Developing a concept map requires the students to identify and organize information and to establish meaningful relationships between the pieces of information.

V. Whole class activities

Problem based learning - group or whole class

http://pbl.cqu.edu.au/content/studs.htm

Problem-Based Learning—Guided Design

Variation of problem based learning. A student team attacks a problem by dividing it into a series of prescribed steps (e.g. identify the problem, state the goal, list constraints, etc.) to be resolved in order; after each step, instructor provides written "expert" analysis elaborating on the various alternatives the students had available during the previous step.
Active Lecturing

Lectures can be made active if they involve students in doing something other than passively receiving content. Below are some examples of ways in which lecture formats can be transformed to engage students in active learning.

Guided Questions Lecture

Provide students with a set of questions and instructions to look for answers within the lecture.

During a pause in the lecture, ask students to jot down questions and submit via a chat tool or discussion board. Begin next class with these questions.

During a pause in the lecture, ask students to summarize a point that you've just made in their own words and relate it to something covered in the previous day's material or ask them to speculate quickly in writing on how what you've just covered relates to a given key concept.

Feedback lecture

The feedback lecture consists of two mini-lectures separated by a small-group study session built around a study guide, and (2) the guided lecture, in which students listen to a 20- to 30-minute presentation without taking notes, followed by their writing for five minutes what they remember and spending the remainder of the class period in small groups clarifying and elaborating the material.

The Fish Bowl

Students are given index cards, and asked to write down one question concerning the course material. They should be directed to ask a question of clarification regarding some aspect of the material that they do not fully understand; or, perhaps you may allow questions concerning the application of course material to practical contexts. At the end of the class period (or, at the beginning of the next class meeting if the question is assigned for homework), students deposit their questions in a fish bowl. The instructor then draws several questions out of the bowl and answers them for the class or asks the class to answer them. This technique can be combined with others (e.g., #8-9 above, and #2).

Whole class debate

Debates provide an efficient structure for class presentations when the subject matter easily divides into opposing views or ‘Pro’/’Con’ considerations. Students are assigned to debate teams, given a position to defend, and then asked to present arguments in support of their position on the presentation day. The opposing team should be given an opportunity to rebut the argument(s) and, time permitting, the original presenters asked to respond to the rebuttal. This format is particularly useful in developing argumentation skills (in addition to teaching content).

Alternative

Faculty assigns sides of room to two halves of class
Faculty asks each side for 5 ideas supporting their side of the issue
Process can be repeated with rebuttals until issues explored fully
To close debate, teacher asks 2-3 volunteers to make summary arguments for each side
Time - approximately 20 minutes

Role playing

Role playing activities involve students assuming roles of individuals or groups and acting out the part. In doing so, they get a better idea of the concepts and theories being discussed. Role-playing exercises can range from the simple to the complex.

Contemporary issues in social sciences or sciences lend themselves to this type of activity. Complex role-playing might take the form of a play (depending on time and resources); for example, students studying ancient philosophy might be asked to recreate the trial of Socrates. Using various sources (e.g., Plato's dialogues, Stone's The Trial of Socrates, and Aristophanes' The Clouds), student teams can prepare the prosecution and defense of Socrates on the charges of corruption of youth and treason; each team may present witnesses (limited to characters which appear in the Dialogues, for instance) to construct their case, and prepare questions for cross-examination.

Begin class with mini-lecture to establish context
Students work on proposals in their assigned role play group
Preparation
Identify situation
Define roles of interest groups
Specify task of each group
Proposals designed to conflict - ideologically, theoretically, tactically, etc.
Groups work on their positions and present
Faculty incorporates into lecture on how closely they've represented issues, whether others have done same in history, etc.
Identify key things students have learned and recap or ask students to do this

VI. Content Creation

Student-led review sessions

In the traditional class review session the students ask questions and the instructor answers them. Students spend their time copying down answers rather than thinking about the material. In an active review session the instructor poses questions and the students work on them in groups. Then students are asked to show their solutions to the whole group and discuss any differences among solutions proposed.

Student generated quiz/exam questions and answers

Here students are asked to become actively involved in creating quizzes and tests by constructing some (or all) of the questions for the exams. This exercise may be assigned for homework and itself evaluated (perhaps for extra credit points). In asking students to think up exam questions, we encourage them to think more deeply about the course material and to explore major themes, comparison of views presented, applications, and other higher-order thinking skills. Once suggested questions are collected, the instructor may use them as the basis of review sessions, and/or to model the most effective questions. Further, you may ask students to discuss the merits of a sample of questions submitted; in discussing questions, they will significantly increase their engagement of the material to supply answers. Students might be asked to discuss several aspects of two different questions on the same material including degree of difficulty, effectiveness in assessing their learning, proper scope of questions, and so forth.

Audio/Video production - out of class or in-class?

Cite Wexsler's class at Kansas state and use of Web 2.0 content creation

Several additional strategies promoting active learning have been similarly shown to influence favorably students' attitudes and achievement. Visual-based instruction, for example, can provide a helpful focal point for other interactive techniques. In-class writing across the disciplines is another productive way to involve students in doing things and thinking about the things they are doing. Two popular instructional strategies based on problem-solving models include the case study method of instruction and Guided Design. Other active learning pedagogies worthy of instructors' use include cooperative learning, debates, drama, role playing and simulation, and peer teaching. In short, the published literature on alternatives to traditional classroom presentations provides a rich menu of different approaches faculty can readily add to their repertoire of instructional skills.

Any given instructional strategy can be supported by a number of contrasting technologies (old and new)

Content produced by Hannah Reeves for the 2010 UIT Summer Institute