Teaching Strategies to Facilitate/Foster Active Learning

Minute Assessment

My favorite large-class technique for getting students to think and tell me what they are thinking is the "minute assessment" or "minute paper." At some point in a lecture I pose a question or a pair of questions for the students. The students have one to a few minutes to write their responses. If I pose the question in the middle of the class period, we discuss the responses in class. Often, however, I use minute assessments as a way to end a lecture, then discuss the student's responses at the beginning of the next class. A moment of writing is a productive way to use those last couple of minutes when students are restless and losing focus. Whether I use a minute assessment in the middle of class or at the end, I always have the students turn them in at the end of the class. I read through the student's responses after class to get a sense for how the class is doing. In very large classes it is not strictly necessary to read all the responses— just enough to get a sense of the class. If I assigned the assessment at the end of lecture, I start the next lecture with a brief summary of what students had to say in their assessments. If the responses revealed considerable disagreement or confusion, I use that as the basis for a discussion or review of the difficult material. Regardless of the outcome, I think it is important to come back to the students with some summary of their assessments to make clear that you are really interested in their thoughts, so that they learn more from each other, and so that they will put effort into their next minute assessment. In theory, minute assessments could be graded or returned to the students with comments, but that would make their use impractical in really large classes. Instead, I simply give students a point or two of credit for turning them in. Recording who turned the assessments in also becomes one way to note attendance for at least some lectures. Minute assessments work best when they are conducted repeatedly during the semester so that students get used to them. In a typical semester, I usually assign 5–7 assessments. I do not tell the students when they will occur. The usefulness of minute assessments depends on choosing appropriate questions. In general, questions that are a little open-ended or that require some thought probably work best, as opposed to factual questions with one-word (or number) answers. You want the questions to cause the students to process some information and work to express themselves, albeit briefly.

The Concept Map

Concept maps are drawings that link concepts or facts together into logical networks with arrows. For example, for the terms "genes, environment, disease" one logical map would have both genes and environment linked to disease with arrows pointing to disease, because both genes and environment influence the occurrence of disease. To use a concept map assessment in class, I give the students a list of 5 to 10 terms and ask them to take a few minutes to connect those terms into a logical map. Usually I encourage them to work with the students next to them to generate conversation. I then ask the students to call out connections that I write on the board, and to explain why those connections are logical. Because students already have something on paper, they are fairly brave about volunteering their ideas. Students who disagree or have alterative connections in their concept maps can call those out, and we use the differences as a basis for discussion of how the terms and concepts are related to one another. After class, I study the students' assessments. If the majority of assessments show logical connections, I may simply post a consensus map on the class website or present one quickly as review in the next class. If I find common errors, then I revisit those connections in the next class.
See: Institute for Human and Machine Cognition for a free computer program for drawing and revising large concept maps.

(from: https://distance.fsu.edu/instructors/encouraging-active-learning-large-classes)

Think – Pair – Share

The instructor states an open-ended question. Individual students then spend a minute or two to **think** about and write a response. Students are directed to **pair** up with a partner to discuss their responses. The instructor reconvenes the class after a few minutes and calls on individual students to **share** the pair's responses. Think-Pair-Share encourages students to develop their own responses before discussing, and then allows students to compare responses before they are public,

which can greatly facilitate participation, especially for risk-averse students. Additionally, calling on individual students (instead of asking for volunteers) in the final step demonstrates that all students are individually accountable, even in large classes.

Muddiest point

This technique, developed by Thomas Angelo and Patricia Cross (1993), can both promote active learning and provide the instructor with midcourse feedback on where students are still having the greatest difficulty. Students complete a small form stating, ‘‘The point that is still the most unclear for me about this unit is . . . ,’’ which they then pass to the instructor. Students may also be divided into groups to help explain to one another the points about which one or more of their members still find confusing. As a variant, at the end of class or just before a break, the instructor can ask: “What are the two most important points from today’s session?” or “What would make the material clearer for you?”

PowerPoint Jeopardy

Use this PowerPoint template (complete with instructions, requires PowerPoint 2007+) that will allow you to turn a PowerPoint presentation into a game of Jeopardy, thanks to Rochelle Schwartz-Bloom.

Case studies and problem solving

Students can be provided with simple case studies or scenarios, and asked to think through and solve these, then relate their answers to the class. Example cases for the sciences can be found at the National Center for Case Study Teaching in Science.

(from: https://cit.duke.edu/get-ideas/teaching-strategies/active-learning/)

Inside/outside circles

Organize the students of the course into two concentric rings, each containing the same number of students. (In very large courses, it may be helpful to use several pairs of concentric rings so that each group contains no more than about twenty students.) Assign the students a problem or topic to discuss in pairs consisting of one student from the outer circle and one from the inner circle. After a set period of time (usually only one to five minutes), have one of the circles rotate so that each pair is now different. Repeat this exercise three or four times until each student receives a variety of perspectives on the topic, different ways of solving the problem, or opportunities to explain how a task is best accomplished.

Send a Problem

Divide the students of the class into groups of approximately six to ten. Have each group develop a problem or discussion question based on the material covered in the unit currently under study. They should also come up with their own solution to the problem or set of key points to be discussed on that issue. Each group then sends its problem to another group, receiving a problem in return. After each group has worked on each of the problems, the entire class is reconstituted and the various solutions compared in discussion.

Top Ten List

Working in groups, students are assigned the task of creating lists—in reverse priority order—of the top ten facts or observations about a particular unit. The goal is not merely to identify what students believe are the most significant observations to be made about the material but to weigh them in significance. Making the answers humorous is a desirable, though not a required, component of the assignment.

Game show

Almost every season introduces a new and television game show that becomes highly popular. Choose whichever game format is currently popular, adapt its format to your discipline, and use this structure for a unit review or to prepare for an examination. In larger courses, break the students into separate teams, have each team prepare questions in the appropriate format, and use the questions to help the students master the material or approaches covered in the course.

(from: Buller, The Essential Department Chair, Ch. 16)

Hypothesis-Testing

Process of science activities were exercises designed to help students generate testable hypotheses and explain observable phenomena, design experiments, and analyze authentic data from current scientific literature. For example, in one process of science activity ("helpers at the nest: pied kingfishers"), groups were charged with developing hypotheses to explain helping behavior in pied kingfishers. After large-group discussion of these ideas (facilitated by the Magic 8 Ball), groups analyzed authentic data on reproductive success in helpers and drew conclusions about the inclusive fitness benefits of altruism.

Manipulatives

Groups used manipulatives in a type of desktop laboratory to kinetically explore fundamental principles. For example, we used a bag of beans to demonstrate allelic frequency change, pipe cleaners and paper clips for visualizing nuclear division, and Velcro-backed labels for narrating the events of DNA replication.

(from: Walker, J. D., Cotner, S. H., Baepler, P. M., & Decker, M. D. (2008). A Delicate Balance: Integrating Active Learning into a Large Lecture Course. *CBE Life Sciences Education*, *7*(4), 361–367. http://doi.org/10.1187/cbe.08-02-0004)

Clarification Pauses

This is a simple technique aimed at fostering "*active listening*". Throughout a lecture, particularly after stating an important point or defining a key concept, stop, let it sink in, and then (after waiting a bit!) ask if anyone needs to have it clarified. Or, ask students to review their notes and ask questions on what they've written so far.

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 used at the beginning of the semester or the chapter for students to help students identify their misconceptions.

Large Group Discussion

Students discuss a topic in class based on a reading, video, or a problem. The instructor may prepare a list of questions to facilitate the discussion.

Cooperative Groups in Class (Informal Groups, Triad Groups, etc.)

Pose a question on which each cooperative group will work while you circulate around the room answering questions, asking further questions, keeping the groups on task, and so forth. After an appropriate time for group discussion, ask students to share their discussion points with the rest of the class. Generally, it is better to form heterogeneous groups (with regard to gender, ethnicity, and academic performance), particularly when the groups will be working together over time or on complex projects; however, some of these techniques work well with spontaneously formed groups.

Cooperative groups encourage discussion of problem solving techniques ("Should we try this?", etc.), and avoid the embarrassment of students who have not yet mastered all of the skills required.

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, corrects mistakes in problem-solving or grammar, and so forth. You can ask students to then comment on how they've made use of their peers' feedback when revising their work.

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. For example, "*What are possible safety (environmental, quality control) problems we might encounter with the process unit we just designed?"* could be a brainstorm topic in an engineering class.

Case Studies

Use real-life stories that describe what happened to a community, family, school, industry or individual to prompt students to integrate their classroom knowledge with their knowledge of real-world situations, actions, and consequences.

Hands-on Technology

Students use technology such as simulation programs to get a deeper understanding of course concepts. For instance, students could use simulation software to design a radio antenna with the ultimate goal of understanding electromagnetism.

Interactive Lecture

Instructor breaks up the lecture at least once per class to have all of the students participate in an activity that lets them work directly with the material. Students could observe and interpret features of images, interpret graphs, make calculation and estimates, etc.

Active Review Sessions (Games or Simulations)

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.

Role Playing

Here students are asked to "act out" a part. In doing so, they get a better idea of the concepts and theories being discussed. Role-playing exercises can range from the simple (e.g., "What would you do if a client rejects your engineering design concept based on the cost and usability of the product?") to the complex.

Jigsaw Discussion

In this technique, a general topic is divided into smaller, interrelated pieces (e.g., the 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 in the team knows something important about every piece of the puzzle.

Inquiry Learning

Students use an investigative process to discover scientific or engineering concepts for themselves. After the instructor identifies an idea or concept for mastery, a question is posed that asks students to make observations, pose hypotheses, and speculate on conclusions. Then students are enlisted to tie the activity back to the main idea/concept.

Forum Theater

Use theater to depict a situation and then have students enter into the sketch to act out possible solutions. If students were watching a sketch on dysfunctional teams, have students brainstorm possible suggestions for how to improve the team environment. Then, ask for volunteers to try to act out the updated scene.

Experiential Learning

Plan site visits that allow students to see and experience applications to the theory/concepts discussed in the class. (from: From: http://www.crlt.umich.edu/tstrategies/tsal)

Buzz Groups

McKeachie (2006) uses a buzz group technique to ensure student participation in large classes. In his lectures, when he comes to a concept that lends itself to discussion, he asks students to form groups of five to eight people to talk about the issue. He instructs them to make sure each member of the group contributes at least one idea to the discussion. After 10 minutes, he calls on some of the groups to report and asks other groups who came to the same conclusion to raise their hands. As they report, he records their main points on the blackboard and then incorporates the material into a future lecture.

Three-Step Interview

For this small group process, students first work in pairs. The first person in the dyad interviews or questions the second person. The second person then interviews or questions the first person. For the next step, two dyads work together. One person from the first dyad explains their conclusion or summary to the second dyad, and one of the individuals from the second dyad explains their summary or results to the first dyad.

The Lecture Check (Mazur, 1997)

This strategy works very well in large classes, but is equally effective in smaller class enrollments. The first step is to deliver a lecture for 15 to 20 minutes, and then project a question for the class to see. Often this is a multiple choice item that is similar to the type of question that will be used on an exam. Students are asked to raise their hands as the instructor asks how many think ‘a’ is the correct response; how many chose ‘b,’; and so on. If most of the students have the correct response, the instructor simply continues with the course material. If, however, more than approximately 20% chose the incorrect response, the instructor has students turn to their neighbor and convince them of the correct choice. Finally, the instructor goes through the items again to see how many choose each alternative. If an unacceptable number

still have incorrect responses, it may be wise to go back over the material. Students also can be called on to defend the selection they have made.

Whole-Class Debates (Frederick, 2002)

Taking advantage of the dividing aisle in large lecture halls, the instructor assigns sides of a debate to the two halves of the class (or, by prearrangement, students sit on the side of the room representing the point of view they wish to support). The instructor asks each side for five statements supporting their side of the issue. This process may be repeated, with rebuttals, until the instructor feels that the class has fully explored the issue. To end the debate and achieve closure, the instructor asks for two or three volunteers to make summary arguments for each side.

Role-Playing and Debates (Fredrick, 2002)

A simple definition of role-playing is a loose simulation in which students assume the roles of individuals or groups in a real-life situation. Contemporary issues in the social sciences are often appropriate for these kinds of simulations (for example, the placement of a toxic-waste dump, the forced integration of an ethnic neighborhood, or the opening of a nuclear power plant). In order to plan such an exercise, the instructor must clearly identify the situation, define the roles of the interest groups involved, and specify the task for each group. These proposals will inevitably conflict ideologically, tactically, economically, regionally, or in some other fundamental way. The class usually begins with a mini-lecture to establish the context and setting, after which students work on their proposals in their assigned groups. When they have finished, the instructor can hear the proposals and immediately incorporate them into a lecture on how closely they reflect positions people have taken in these conflicts (and the implications for society).

Close Reading

A time-honored technique that improves reading comprehension and provides a measure of engagement in the subject matter is the Close Reading Method (Bass & Linkon, 2009). In class, the instructor models how to read and interpret a passage while the students follow in their books. After this demonstration, individual students may be called upon to read aloud and interpret similar selections. In a literature course, after reading particularly ambiguous passages of a novel or poem, students might be asked to discuss them in groups of two or three to decide what the selection means, paraphrasing it in their own words. The instructor can ask a few of the groups to give their interpretations before providing his or her own analysis. This technique works well for other kinds of analysis and interpretation: for example, teaching students in an economics course how to read a supply and demand curve, or, in an anthropology course, how to read an artifact. Finally, the technique can be used early in the semester in an introductory course to demonstrate how to read and highlight the textbook or the course readings.

Classroom Assessment Techniques

Some instructors use short, in-class writing assignments as a means to keep students mentally engaged in the course material and also as feedback to assess the extent to which students understanding the material (Angelo & Cross, 1993). Writing also helps them learn to express their thoughts more clearly and focuses their attention on important elements of the course. Short writing assignments (a paragraph or two) can be given as pre- and post-lecture activities. Requiring students to write their thoughts or questions about the day's topic before the lecture begins will concentrate their attention on the topic and prepare them for active listening. At the end of the presentation, writing out their impressions of the lecture, and any questions they have about the topic, will help them place the material in context. It also provides valuable feedback to the instructor as a collection of possible test questions. Students can be asked to write short summaries of material at any point during a lecture. In summarizing, they select the most pertinent elements from the material and restate them in their own words. This process of synthesis and personalization leads to better, more permanent learning.

(from: http://cfe.unc.edu/files/2014/08/FYC2.pdf)

Affective Response

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.

Daily Journal

The daily journal 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.

Reading Quiz

Clearly, this is one way to coerce students to read assigned material! Active learning depends upon students coming to class prepared. The reading quiz can also be used as an effective measure of student comprehension of the readings (so that you may gauge their level of sophistication as readers). Further, by asking the same sorts of questions on several reading quizzes, you will give students guidance as to what to look for when reading assigned text. If you ask questions like "What color were Esmerelda's eyes?" (as my high school literature teacher liked to do), you are telling the student that it is the details that count, whereas questions like "What reason did Esmerelda give, for murdering Sebastian?" highlight issues of justification. If your goal is to instruct (and not merely to coerce), carefully choose questions which will both identify who has read the material (for your sake) and identify what is important in the reading (for their sake).

Response to a demonstration or other teacher centered activity

The 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.

The "Socratic Method"

Taking its namesake from the most famous gadfly in history, this technique in its original format 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.

Wait Time

Rather than choosing the student who will answer the question presented, this variation has the instructor WAITING before calling on someone to answer it. The wait time will generally be short (15 seconds or so) - but it may seem interminable in the classroom. It is important to insist that no one raise his hand (or shout out the answer) before you give the OK, in order to discourage the typical scenario in which the five students in the front row all immediately volunteer to answer the question, and everyone else sighs in relief. Waiting forces every student to think about the question, rather than passively relying on those students who are fastest out of the gate to answer every question. When the wait time is up, the instructor asks for volunteers or randomly picks a student to answer the question. Once students are in the habit of waiting after questions are asked, more will get involved in the process.

Student Summary of Another Student's Answer

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 other's 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.

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 which 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).

Quiz/Test Questions

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.

Finger Signals

This method provides instructors with a means of testing student comprehension without the waiting period or the grading time required for written quizzes. Students are asked questions and instructed to signal their answers by holding up the appropriate number of fingers immediately in front of their torsos (this makes it impossible for students to "copy", thus committing them to answer each question on their own). For example, the instructor might say "one finger for 'yes', two for 'no'", and then ask questions such as "Do all organic compounds contain carbon [hydrogen, etc.]?" Or, the

instructor might have multiple choice questions prepared for the overhead projector and have the answers numbered (1) through (5), asking students to answer with finger signals. In very large classes the students can use a set of large cardboard signs with numbers written on them. This method allows instructors to assess student knowledge literally at a glance.

Flash Cards

A variation of the Finger Signals approach, this method tests students' comprehension through their response to flash cards held by the instructor. This is particularly useful in disciplines which utilize models or other visual stimuli, such as chemistry, physics or biology. For example, the instructor might flash the diagram of a chemical compound and ask "Does this compound react with H_2O?" This can be combined with finger signals.

Quotations

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.

The Pre-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.

Puzzles/Paradoxes

One of the most useful means of ferreting out students' intuitions on a given topic is to present them with a paradox or a puzzle involving the concept(s) at issue, and to have them struggle towards a solution. By forcing the students to "work it out" without some authority's solution, you increase the likelihood that they will be able to critically assess theories when they are presented later. For example, students in a course on theories of truth might be asked to assess the infamous "Liar Paradox" (with instances such as 'This sentence is false'), and to suggest ways in which such paradoxes can be avoided. Introductory logic students might be presented with complex logic puzzles as a way of motivating truth tables, and so forth. In scientific fields you can present experimental data which seems to contradict parts of the theory just presented or use examples which seem to have features which support two opposing theories.

Discussion

Students are asked to pair off and to respond to a question either in turn or as a pair. This can easily be combined with other techniques such as those under "Questions and Answers" or "Critical Thinking Motivators" above. For example, after students have responded to statements, such as "Whatever a society holds to be morally right is in fact morally right" with 'true' or 'false', they can be asked to compare answers to a limited number of questions and to discuss the

statements on which they differed. In science classes students can be asked to explain some experimental data that supports a theory just discussed by the lecturer. Generally, this works best when students are given explicit directions, such as "Tell each other why you chose the answer you did".

Note Comparison/Sharing

One reason that some students perform poorly in classes is that they often do not have good note-taking skills. That is, while they might listen attentively, students do not always know what to write down, or they may have gaps in their notes which will leave them bewildered when they go back to the notes to study or to write a paper. One way to avoid some of these pitfalls and to have students model good note-taking is to have them occasionally compare notes. The instructor might stop lecturing immediately after covering a crucial concept and have students read each other's notes, filling in the gaps in their own note-taking. This is especially useful in introductory courses or in courses designed for non-majors or special admissions students. Once students see the value of supplementing their own note-taking with others', they are likely to continue the practice outside of class time.

Active 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.

Work at the Blackboard

In many problem solving courses (e.g., logic or critical thinking), instructors tend to review homework or teach problem solving techniques by solving the problems themselves. Because students learn more by doing, rather than watching, this is probably not the optimal scenario. Rather than illustrating problem solving, have students work out the problems themselves, by asking them to go to the blackboard in small groups to solve problems. If there is insufficient blackboard space, students can still work out problems as a group, using paper and pencil or computers if appropriate software is available.

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 which 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.

Jigsaw Group Projects

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 African 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 research, the group then reforms to complete a comprehensive report. In a chemistry course each student group could research a different form of power generation (nuclear, fossil fuel, hydroelectric, etc.). Then the groups are reformed so that each group has an expert in one form of power generation.

They then tackle the difficult problem of how much emphasis should be placed on each method.

Role Playing

Here students are asked to "act out" a part. In doing so, they get a better idea of the concepts and theories being discussed. Role-playing exercises can range from the simple (e.g., "What would you do if a Nazi came to your door, and you were hiding a Jewish family in the attic?") to the complex. 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.

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.

Games

Many will scoff at the idea that one would literally play games in a university setting, but occasionally there is no better instructional tool. In particular, there are some concepts or theories which are more easily illustrated than discussed and in these cases, a well-conceived game may convey the idea more readily. For example, when students are introduced to the concepts of "laws of nature" and "the scientific method", it is hard to convey through lectures the nature of scientific work and the fallibility of inductive hypotheses. Instead, students play a couple rounds of the Induction Game, in which playing cards are turned up and either added to a running series or discarded according to the dealer's pre-conceived "law of nature". Students are asked to "discover" the natural law, by formulating and testing hypotheses as the game proceeds.

(from: http://web.calstatela.edu/dept/chem/chem2/Active/)

Initiation

Engage your students from the start—weave course content into icebreakers, warm-ups, etc. When students walk in, given them an index card on which to write a question about the day's content. You can collect them, redistribute them to students to answer in small groups, or use them for the following lesson. Get their brains ready to receive the information using schema activators/hooks (start with a story, a problem, an opening question, an interesting fact all related to the day's content).

Encourage Class Participation

Engender class participation from the very beginning. Frequent participators (those who do so voluntarily) tend to be established early on and then others sit back. To avoid this, don't make a habit of calling on the first hand raised.

Ways to increase number of participators: Create pre-discussion (pair shares, and then open to whole group); obtain commitment to participate (how many have thoughts on this? ask for show of hands). You have opened it up to all who have thoughts and can call on them. Specify # of participants wanted: "I'd like to have 4 or 5 students give me their opinion on this." New participant rule (I'd like a new participant this time). Student calls on the next speaker.

Enlist student participation during the lesson: Write questions on cards as they watch a video. Tell students they will need to critique a presentation when it's finished. Stop and ask questions. Have a class debate or mock trial.

During-Class Activities to Engage Learners

- Engage students before diving into discussion (survey/poll, vote with your feet).
- Distribute a compelling document (photo, article, chart, artifact; provide a contrasting opinion on a topic
- Hold pre-discussions (pairs)
- Ask open-ended questions
- Use a few questions rather than a lot
- Identify goals for discussion
- Have students anonymously write their response to a discussion question on a card and then collect them to share during discussion.
- Encourage students to ask questions: learning stems from curiosity about something (make students seekers rather than consumers of knowledge)
- Create experiences that simulate or match reality, and build in reflection on the experience
- PowerPoint: Don't just use slides for content. Use for questions to consider, problems to solve, etc.

Closure

- Don't do the summary for the students. Have them do it.

(from: Silberman, M. (2006). Teaching Actively: Eight Steps and 32 Strategies to Spark Learning in Any Classroom. Boston: Pearson)