Support for Active Learning


Additional support:

- One study shows that the amount of information students are able to retain deteriorates after ten minutes (Thomas, 1972)

- In his CET&L training on evaluation, Wayne Hall suggests “lecturing in short doses (10 to 15 minutes) can be strategically effective.”

- This has been around for a while—“One must learn by doing the thing, for though you think you know it—you have no certainty until you try.” (Sophocles, 5th c. B.C.)
The following are tools we’ve personally used in the classroom or training situations that have worked really well for engaging participants.

1. **Think, Pair and Share**: In this method, you have participants work with another person (or in groups of three) to answer a question, solve a problem or discuss an issue. You give them time to think about the issue individually (I usually make them write their ideas on a notecard), then pair up with others to share their ideas. After everyone has had enough time to discuss, I ask someone from each group to share—or report out. I make sure all ideas are recorded on the notecards and I collect them at the end.

2. **Quick writes** – One Minute Paper, Daily Journals, Muddiest Point, Affective Response – There are many ways to get students to reflect on what they are learning. When students passively listen to lecture, they don’t always know what they don’t know. These quick writing exercises give students a chance to reflect, think about what they know and what they don’t understand, and they let the instructor know where there are disconnects. The Muddiest Point can be used at the beginning or end of the class giving the instructor a chance to clarify or develop the next “lecture.” One minute papers, and daily journals allow students to consolidate their thoughts (What was the main point of today’s lecture?) while affective responses require that students reflect on how they feel (Should we market products that are unhealthy?; I was surprised to learn…..and, I wonder about…..).

3. **Role Plays**: Using this technique, you would give the participants a scenario (either scripted ahead of time by you or created by the participants themselves). A good role play begins with a realistic scenario. Next, give each participant a specific role and as much background information as possible. Ask them to get into character and use the information given to guide their behavior in the role play. I have used these in two ways. In the first, you have all the groups do the same role play at the same time and then debrief about effective behaviors, ineffective behaviors, outcomes and why they were similar/different, etc. Or, you can give a different role play to each group and have them act them out in front of the rest of the group, debriefing what everyone saw after each skit. The second usually works better in groups that have already developed some level of trust.
4. **Gallery Walk**: This is a technique where you post various prompts around the room on flip chart paper and individuals, armed with a magic marker, can circulate around the room and respond at each station. This method has the advantage of giving participants the chance to read what others have written and respond to it, therefore gathering large amounts of information while stimulating conversation among participants. I typically conclude by summarizing each station and facilitating a dialogue about the most intriguing points with the participants.

5. **Debates** – This can be an exciting activity for students when discussing potentially controversial topics (e.g. genetic research). For this activity, students are asked to list the pros and cons of a topic. Then they share their list with their group. Eventually, the group is assigned to develop the pros or cons side of the argument in preparation for the debate.

6. **Impact Drawing** (Concept Maps; Visual Representations; Metaphors; Flow Charts) Students are asked to visually represent or organize their thoughts on paper. This can be in the form of concept maps (show relationships), flow charts (for processes), metaphors for thinking about complex ideas, or drawings. For example, students can be asked to draw a picture that represents who they are as an introductory activity for teaching *Personality*. In Interpersonal Relations, students can develop a metaphor for relationship progression as in “relationships are like theme parks.” Depending on the size of class, these can be shared on a document camera overhead or students can describe what they drew. Having questions ready that highlight the concepts you are covering in class will showcase the relevance of the activity.

Others:
# A Classification of Instructional Strategies by Levels of Instructor Risk

<table>
<thead>
<tr>
<th>Lower Risk Activities</th>
<th>Moderate Risk Activities</th>
<th>Higher Risk Activities</th>
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<tbody>
<tr>
<td>Pause Procedure</td>
<td>Ad Hoc Team discussion</td>
<td>Group Discussion (no structure)</td>
</tr>
<tr>
<td>Quick Writes</td>
<td>Structured debates</td>
<td>Guided lecture</td>
</tr>
<tr>
<td>Voting (Thumbs UP/DOWN)</td>
<td>Case Studies</td>
<td>Individual/group presentations</td>
</tr>
<tr>
<td>Surveys/Questionnaires</td>
<td>Fishbowl</td>
<td>Pairs/groups develop applications related to lecture content</td>
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<tr>
<td>Formative (ungraded) quizzes</td>
<td>Pairs/groups write test questions related to lecture material</td>
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</tr>
<tr>
<td>Think-Pair-Share</td>
<td>Students analyze a problem, poem, photography, etc.</td>
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<tr>
<td>Brainstorming</td>
<td>Students work a problem then evaluate each others’ work</td>
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<tr>
<td>Pairs/groups develop an outline of the lecture</td>
<td>Role plays illustrating a concept from lecture</td>
<td></td>
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<tr>
<td>Structured group discussions</td>
<td>Responsive lecture.</td>
<td></td>
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<tr>
<td>(specific questions provided)</td>
<td>Team Learning</td>
<td></td>
</tr>
<tr>
<td>Muddiest Point</td>
<td>Problem-based learning</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Learning communities</td>
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</tbody>
</table>

Adapted from Bonwell, Charles. Active Learning: Creating Excitement in the Classroom [www.active-learning-site.com](http://www.active-learning-site.com)

# Active Learning Strategies for Enhancing the Lecture

<table>
<thead>
<tr>
<th></th>
<th>First 10 minutes (or prior)</th>
<th>Middle 30 – 45 minutes</th>
<th>Last 10 minutes</th>
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</thead>
<tbody>
<tr>
<td><strong>Quick write</strong></td>
<td>Have students summarize the main ideas from the previous class session and speculate or pose questions about the upcoming class session.</td>
<td><strong>Debate</strong> – After introduction and presentation of a topic, divide class into groups that generate a list of pros and cons on the topic. Then assign the groups to the pro or con side of the debate and give them a chance to develop the position. Finally, debate in front of the class.</td>
<td><strong>List major points</strong> - Ask students to write down the major points covered in the class or the purpose of that specific class. Then, discuss what they have written with a partner for about two minutes. Then, ask them to write a revised version of the points which they submit. (This can be a way of keeping attendance records, too!)</td>
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<tr>
<td><strong>Admission Ticket</strong></td>
<td>- Ask student to identify one question from the assigned reading that they would like to have answered in class. Students then share their question with three peers and pick one question from the</td>
<td>Use “thumbs up, thumbs down or thumbs sideways.” Make a statement about the content and tell students to vote. Discussion on why the choices were made follows.</td>
<td><strong>Cooperative note-taking pairs</strong> – In pairs, students share their summarized notes and give feedback to each other about corrections or clarifications. Ideal after a short lecture segment.</td>
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group to pose to the instructor. Each group asks the instructor a question.

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<tr>
<th>Group quiz</th>
<th>Round table exercise</th>
<th>Problem solving</th>
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<tbody>
<tr>
<td>Put students into groups of three and have them develop a set of “consensus answers” to a series of eight to ten questions about the topic for the day. After providing correct answers followed by a discussion, reward the group with the most correct answers.</td>
<td>Write a response to a question, then pass it to the person on your left until all in the group have had the opportunity to respond. Responses can also be passed between groups.</td>
<td>Introduce a problem related to class material. Ask groups to solve the problem, proposing three alternative strategies towards its resolution.</td>
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<tr>
<th>Brainstorm</th>
<th>Stop and have students engage in a short write (“What do you think and/or feel about what has been said?”)</th>
<th>Test Creation</th>
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<tbody>
<tr>
<td>Students could work in small groups to brainstorm and possibly organize past experiences that may relate to the class objective for the day.</td>
<td>Have students form groups and write one or two good multiple choice questions and present these questions (via overhead) to the class. Discuss the questions.</td>
<td>Have students keep a journal, taking a few minutes to write down their feelings and thoughts regarding various topics.</td>
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<tr>
<th>Reading Quiz</th>
<th>Cognitive Map</th>
<th>Peer Evaluation</th>
<th>Muddiest Point</th>
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<tbody>
<tr>
<td>over assigned material – teaches students what to focus on in their readings.</td>
<td>Have students work in small groups to complete a cognitive map (a diagram showing relationships between elements) of concepts addressed in class. Large group discussion follows.</td>
<td>Have students evaluate each other’s work (something small) making sure there are grading instructions.</td>
<td>“What was the ‘muddiest point’ in today’s lecture?”</td>
</tr>
</tbody>
</table>

Adapted from Bonwell, Charles. Active Learning: Creating Excitement in the Classroom [link to website]
Exercises for Individual Students

1. **The "One Minute Paper"** - This 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.

2. **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.)?".

3. **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 evaluative 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.

4. **Daily Journal** - This combines the advantages of the above three techniques, and 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.

5. **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).

6. **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.

**Questions and Answers**

7. **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 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.

8. **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).

9. **Quiz/Test Questions** - 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.

**Immediate Feedback**

These techniques are designed to give the instructor some indication of student understanding of the material presented during the lecture itself.

10. **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.
11. **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 H₂O?”. This can be combined with finger signals.

12. **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.

**Critical Thinking Motivators**

Sometimes it is helpful to get students involved in discussion of or thinking about course material either before any theory is presented in lecture or after several conflicting theories have been presented.

13. **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. The well-known "Force Concept Inventory" developed by Hestenes to measure understanding of force and motion is another good example of this.

14. **Formative (ungraded) Quizzes**: This technique involves writing quiz questions on the board, an overhead projector, or a handout and giving students an appropriate time to respond. You may wish to collect anonymous responses, or if the question entails multiple choice, students can raise their hands in agreement as you announce each response. A quiz at the beginning of class allows you to determine how familiar students are with important terms, facts or concepts prior to the lecture, while a quiz that follows a lecture segment can reveal how well students understood the material.

15. **Pro and Con Grid**: The Pro and Con Grid lists advantages and disadvantages of any issue and helps students develop analytical and evaluative skills. It also forces students to go beyond their initial reactions, search for at least two sides to the issue, and weigh the value of competing claims. Let students know how many pros and cons you expect and whether they should use point form or full sentences.

16. **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.

17. **Brainstorm** - In this activity, students generate ideas which you record on the blackboard or overhead. When beginning a new topic, you might begin by saying “Tell me everything you know about…” You may decide to put the students’ comments into categories, or you might ask students to suggest categories and comment on the accuracy and relative importance of the array of facts, impressions, and interpretations. The main rules of brainstorming are to acknowledge every offering by writing it down and save any critiquing until after the idea generation time is over.

18. **Think/Share/Pair** - 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.

19. **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".

20. **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 eachother'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.

21. **Evaluation of Another Student's Work** - 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.

**Cooperative Learning Exercises**

For more complex projects, where many heads are better than one or two, you may want to have students work in groups of three or more.

22. **Cooperative Groups in Class** - Pose a question to be worked on in each cooperative group and then circulate around the room answering questions, asking further questions, keeping the groups on task, and so forth. After an appropriate time for group discussion, students are asked to share their discussion points with the rest of the class. (The ensuing discussion can be guided according to the "Questions and Answers" techniques outlined above.)
23. **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.

24. **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.

25. **Concept 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.

26. **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. 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 would work well with such topics as massive vaccination programs, nuclear power, eliminating chlorofluorocarbons, reducing carbon dioxide emissions, and so forth.

27. **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.

28. **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. 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.

29. **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.

30. **Debates** - Formal 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).

31. **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.

**References:**

The majority of this list with examples and explanation came from the University of Waterloo, Centre for
Teaching Excellence
http://cte.uwaterloo.ca/teaching_resources/tips/active_learning_activities.html

Additional material was provided from work by Paulson and Faust, Active Learning for the College
Classroom
http://www.calstatela.edu/dept/chem/chem2/Active/

and

Clearinghouse on Higher Education.
Activity name:

Chapter:

Concept:

Page number references:

Learning Outcomes:

Materials needed:

Handouts needed:

Time to complete:

Procedure—step by step:

Description of what usually happens:

How it could go wrong and how to save it:

Follow up questions for class: