Active Learning Strategies to review.

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| # | Description  | Stud Ease | Instr Prep | Instr Assmt |
| 1 | [Think Pair Share](http://serc.carleton.edu/sp/library/interactive/tpshare.html): students ponder the answer to a question and then share their thoughts with a neighbor. Examples are included at the first site, here is another [example](http://serc.carleton.edu/sp/library/interactive/examples/morrisonpuzzle.html)  that uses TPS |  |  |  |
| 2 | [Role Playing](http://serc.carleton.edu/sp/library/interactive/roleplay.html): Students takes the role of a person who will affect or be affected by an Earth science issue, such as a potential natural hazard, new use of land (mining, parking lot) or a polluted lake. Students study the impacts of the issue and presents the assigned perspectives. This link includes example activities. |  |  |  |
| 3 | [Discussion](http://serc.carleton.edu/sp/library/socratic/index.html): promoting a successful discussion depends on correctly framing questions. Discover tips for framing discussion questions to promote higher order thinking. Additional information on [Socratic Questioning](http://serc.carleton.edu/introgeo/socratic/fourth.html) may also be useful. |  |  |  |
| 4 | [Peer Review](http://serc.carleton.edu/sp/library/peerreview/index.html): students review and comment on materials written by their classmates. |  |  |  |
| 5 | [Problem solving using real data](http://serc.carleton.edu/sp/library/teachingwdata/index.html): students use a variety of data to explore scientific questions. |  |  |  |
| 6 | [Teaching with Models](http://serc.carleton.edu/introgeo/models/index.html) has students use conceptual mathematical and statistical models or physical demonstrations and visualization to interact with course content. |  |  |  |
| 7 | [Game Based Learning](http://serc.carleton.edu/sp/library/games/index.html): uses competitive exercises, either pitting the students against each other or through computer simulations. |  |  |  |
| 8 | [Structured Academic Controversy](http://serc.carleton.edu/sp/library/sac/index.html) is a type of cooperative learning strategy in which small teams of students learn about a controversial issue from multiple perspectives  |  |  |  |
| 9 | [ConcepTests](http://serc.carleton.edu/NAGTWorkshops/teaching_methods/conceptests/index.html) are conceptual multiple-choice questions that focus on one key concept of an instructor's learning goals for a lesson. When coupled with student interaction through peer instruction, ConcepTests represent a rapid method of formative assessment of student understanding. |  |  |  |
| 10 | [What is it?](http://serc.carleton.edu/NAGTWorkshops/structure/SGT2012/activities/62805.html) Is an activity that can be used daily to have students interpret geologic images (this example uses geologic structures) using photos presented during class. Photos are shown either after topics or towards the end of class and one student (or a group if they work in small groups) are called upon to interpret the photo. Students may come to the screen to point out features if they choose.  |  |  |  |
| 11 | [Jigsaw](http://serc.carleton.edu/introgeo/jigsaws/index.html) activities starts with the class divided into several teams, with each team responsible separate but related assignments. When all team members are prepared, the class is re-divided into mixed groups, with one member from each team in each group. Each person in the group teaches the rest of the group what he/she knows, and the group then tackles an assignment together. |  |  |  |
| 12 | [Gallery Walks](http://serc.carleton.edu/introgeo/gallerywalk/index.html) has the class in teams that rotate around the classroom to stations where questions or prompts are posted on paper (or white boards, large memo sheets, etc.) that are located in different parts of the classroom. As a group, students compose answers to prompts, including reflection or synthesis of answers given by other groups. Each chart or "station" has its own question that relates to an important class concept. The technique closes with an oral presentation or "report out" in which each group synthesizes comments to a particular question. |  |  |  |
| 13 | [Investigative Case Study](http://serc.carleton.edu/introgeo/icbl/index.html) Students structure their own learning using the "story" of the case as a problem space. Although the case defines the general area of geoscience under investigation, students generate questions based both on their interests and prior knowledge that relates to the topic of study. A [variety of investigative case study examples](http://serc.carleton.edu/sp/library/cases/examples.html) are available on the SERC site. |  |  |  |
| 14 | A [Concept Sketch](http://serc.carleton.edu/NAGTWorkshops/careerdev/AcademicCareerTeach2013/march.html) is a useful assessment tool but can also be used to engage students in active/group learning. Sketches are annotated with descriptions, processes, important features and inter-relationships. This link guides you in the development of concept sketches and provides examples.  |  |  |  |
| 17 | [Concept Maps](http://serc.carleton.edu/NAGTWorkshops/assess/conceptmaps.html) are graphical representations of concepts and relationships among concepts. Additional resources are available through [Carnegie Mellon](http://www.cmu.edu/teaching/assessment/howto/assesslearning/conceptmaps.html) and from [Novak and Canas](http://cmap.ihmc.us/docs/theory-of-concept-maps) who provide a thorough description including theoretical justification, evidence of learning and some examples are available (a [shorter summary](https://msu.edu/~luckie/ctools/) is also available from Michigan State Univ.).  |  |  |  |
| 18 | [Lecture Tutorials](http://serc.carleton.edu/sp/library/lecture_tutorials/index.html) are worksheets students use throughout class with questions of increasing conceptual difficulty and guide students through lecture content. Examples of lecture tutorial worksheets are included at this site along with a guide for making your own lecture tutorial.  |  |  |  |
| 19 | Metacognition- [Minute Paper](http://serc.carleton.edu/introgeo/interactive/oneminwrite.html), Muddiest Point, etc. are similar short writing techniques that students complete in class to summarize what they have just learned (or what is confusing to them). These metacognitive activities are important to students recognizing what they have learned (or not learned) and provide instructors with feedback that can be used in subsequent class periods to clarify misconceptions as needed. Suggestions for collecting, organizing and responding to materials like Minute Papers in large lecture courses is [here](http://serc.carleton.edu/introgeo/interactive/feedback.html).  |  |  |  |