Overview of **C**ollaborative **L**earning **T**echnique**s**: **Problem Solving CoLTs**

Source: Collaborative Learning Techniques by Barkley, Major and Cross (Jossey-Bass, 2014)
With additional adaptations from George Washington University Teaching & Learning Center

13 Think-aloud Pair Problem Solving

Students solve problems aloud to try out their reasoning on a listening peer. This technique is useful for emphasizing the problem solving process rather than the product and helping students identify process errors. Pairs of students are presented with a series of problem. For each problem, one student thinks aloud about how to solve the problem while the other student listens and offers suggestions or requests clarifications. The students alternate roles. Although the problems would be designed to have a single answer, open ended problems may also be used. If all of the pairs use the same questions, the pairs can report-out their solutions with the class. The students should record the steps taken to solve the problem. Since students may not be comfortable with sharing their reasoning, some level of trust among the students prior to the activity is desirable. Students may also need help in learning how to present their steps in problem solving. Some assessment of the results (the recorded steps) is necessary since the reasoning or the answer may be incorrect.

Group size

Pairs

Time on task

30 to 45 minutes

Preparation

Develop an appropriate set of problems that can be solved in a limited amount of time.. Ideally the problems should engage the students in identifying the type of the problem, the knowledge and skill required to solve the problem, and the criteria for selecting or evaluating a solution.

Procedure

1. Students form pairs.
2. The instructor provides the basic instructions concerning what the students are to do, states the time limit, and indicates how the results will be collected.
3. One student reads the problem aloud and talks through the process of solving the problem.
4. The listener should offer encouragement through requests for clarification and suggestions while recording the steps.
5. The students change roles and address the next problem.
6. The activity ends when either all of the problems are solved or a time limit is reached

14 Send-problem

Students try to solve a problem as a group, and then pass the problem and solution to another group who does the same; the final group evaluates the solutions. This technique is useful for helping students practice, as a group, the thinking skills required for effective problem solving and for evaluating, comparing, and discriminating between multiple solutions. Each group attempts to solve the problem without looking at the solutions offered by previous groups. The activity has two components: solving problems and evaluating solutions. Several

variations are possible. For example, the students might generate a list of problems they would like to see solved in class or problems from old exams might be used in reviewing for an upcoming exam. The technique is best used for problems where there is more than one solution or where some solutions are better than others. Timing can be an issue since different groups may work at different rates. Presenting an example and a format for reporting a solution is useful.

Group size

2 to 4

Time on task

30 to 45 minutes

Preparation

Determine how many problems will be needed so that the groups work simultaneously and complete both the problem solving and solution evaluation activities. Establish time limits and the order in which groups should exchange their results. Provide very clear instructions about what the students should do. A file folder should be used to hold the solutions that the teams provide.

Procedure

1. The instructor describes the activity, gives instructions and answers procedural questions.
2. The students form groups.
3. Problems are distributed to the groups.
4. The groups discuss the problem, generate possible solutions, indicate the best solution and add their report to the response folder.
5. Notify the groups that time has expired and that the folder should be passed to the next group.
6. The new groups repeat the process.
7. Repeat as needed until one exchange remains and the folder is passed to the final group.
8. The final group analyzes and evaluates the proposed solutions and places a report in the folder.
9. After the appropriate time has elapsed the final groups may report out their results.

15 Case Study

Student teams review a written study of a realistic scenario and develop a solution to the dilemma or problem presented in the case. The technique is useful for presenting abstract principles and theories in ways that students find relevant. Typically the "case" includes a history of how a situation developed and presents a dilemma or problem that a key character is facing. Writing a good case can be difficult. For example, while adding detail to a case can make it feel more realistic, it may also obscure the point of the case. In many disciplines case banks are available. Rather than a written case videos may be available.

Group size

3 to 6

Time on task

Varies

Preparation

Writing a good case is a complex task. Both real and hypothetical cases require a good deal of effort. However, there are many case data banks that can be used. The cases will need to be distributed to the students and there should be a series of question to guide the students.

Procedure

1. Distribute the cases, questions and other instructions.
2. Form student groups.

3. Allow time for the students to ask question about the process of the activity.
4. Students work in groups to study the case for some period of time. This might be one class or an extended period including out of class effort.
5. The groups identify factual issues, apply analytical techniques, present the issues, draw conclusions, and make recommendations.
6. The groups prepare a written or oral report on their work.
7. The groups present or discuss their work on the case with the rest of the class.

16 Structured problem solving

Student groups follow a structured format to solve problems. The technique is useful for dividing the problem-solving processes into manageable steps so that students learn to identify, analyze, and solve problems in an organized manner. The activity also promotes meta-cognitive disciplinary skills. There is a time limit for the activity. The group must agree to a solution and be able to explain the solution and the strategy used to solve the problem. This technique can be used to develop problem solving skills and trust before more complex techniques are used. The groups can build a response that indicates the parts of the solving process. For example, the groups might report out about what is known, what needs to be known, and how the missing information or knowledge be found.

Group size

4 to 6

Time on task

1 to 2 hours

Preparation

Creating a problem that is sufficiently complex to require student effort and is readily broken into parts is challenging. The instructor should solve the problem using the specified procedure. It will be useful to build additional hand-out materials focused on the problem and the problem solving steps.

Procedure

1. Distribute the problems and indicate the procedure for the activity.
2. Form student groups.
3. Allow students to ask questions about the process of the activity.
4. Allow the groups to solve the problem using the specified step-wise problem solving technique.
5. The team records the results of each step.
6. The groups report out their solution and how they developed it.

17 Analytic teams

Team members assume roles and specific tasks when critically reading an assignment, listening to a lecture, or watching a video. This technique is useful for helping students understand the different activities that constitute a critical analysis. The roles might include a summarizer, proponent and critic. The roles allow the students to assume the positions of the parts of a critical analysis. They focus on one part of the analysis. The task needs to be sufficiently complex that each of the students will be able to participate in a significant way. It is useful for the students to do the reading beforehand and have them express what skills they believe their role requires.

Group size

4 or 5

Time on task

15 to 45 minutes

Preparation

Select the topic and determine the roles that the students will take. The roles might include: proponent, critic, example giver, summarizer, and questioner. Each role should have a significant task. Determine how the teams should report-out their work.

Procedure

1. Present the topic and the rules for the activity including a time limit.
2. Allow students to ask questions about the procedure.
3. Form teams and assign the specific roles.
4. Assign the reading or, as appropriate, present a lecture or view a video.
5. In class the individuals in the team will present the findings from their role.
6. The group will work together to prepare an oral or written report of their analyses.
7. The groups will report-out their findings.

18 Group investigation

Groups of students plan, conduct, and report on in-depth research projects. This is useful for teaching students about research procedures and how to gain in-depth knowledge. Having a time limit and having a set of steps to follow discourages plagiarism that might happen with a more traditional term paper. Using peer and instructor review of the project can provide practical experience in giving and receiving constructive criticism. The assignment should provide some direction about manageable steps. Some steps to consider are the construction and presentation of an initial prospectus, identifying and collecting resources, building an outline, planning and delivering a presentation, and revising a final report given the presentation. The prospectus can include specifications of the research question, goals, resources, methods, and work plan. Students should have time in the class period for brief team discussion. This indicates to the students that the activity is an essential part of the course.

Group size

2 to 5

Time on task

Several hours

Preparation

Preparation will be similar to that for a term paper. Make decisions about the topics, the sources, and the manner of reporting out by presentation and written report. Also determine the way in which the groups will report their progress during the activity. Having deadlines for steps as well as interim reports is useful. Determine the amount of time the students can use in class for their group work.

Procedure

1. Allow students to propose topics that are within the parameters of the course.
2. Allow students to identify their interest in the topics.
3. As far as possible, form groups based on student interests.
4. Give teams class time prepare a prospectus for their investigation.
5. Review the prospectus
6. Students begin work on the reviewed prospectus.
7. Groups report-out their efforts.