

Collaborative Learning in your Classroom, Ann Bykerk-Kauffman

I started incorporating collaborative learning into my classes as I came to understand more about the learning process. An impressive number of studies have shown that students learn more with collaborative learning than they do with the traditional all-lecture format. Collaborative learning encourages students to think harder during class, putting their brains into a more active state and thereby enhancing learning. There is a wealth of literature available on cooperative and collaborative learning—see for example <http://serc.carleton.edu/introgeo/cooperative/index.html>. This workshop will not try to duplicate this literature but will instead focus on my first-hand experience incorporating collaborative learning into my classes for the past 15 years.

Keys to Success

Over the years, I have tried a wide variety of specific collaborative learning techniques and have settled on a small number that work for me and my students. I have successfully used collaborative learning in classes ranging from 7 to 150 students. But along the way, I have had my share of failures; collaborative learning activities can take students out of their comfort zones. They are often tempted to stray from the topic and discuss safer topics such as the latest gossip. To avoid this problem and make the incorporation of collaborative learning into your teaching more successful, I suggest the following strategies:

- (1) Make it clear to the students why collaborative learning is such a powerful a way to learn (and not just a way for the professor to “do less work”—a common misconception among students even though, in reality, it’s more work to create a successful collaborative learning activity than it is to write a lecture). Briefly explain how learning takes place in the brain (new connections are made between neurons) and that these new connections require active thinking and reasoning, not just listening and absorbing.
- (2) Start collaborative learning activities early in the semester and do them often enough that they become routine, just part of how things are done in your class, rather than some alien procedure done as an experiment on captive guinea pigs.
- (3) Carefully structure the activities so that they are specific and focused, with simple clear instructions. Students—like the rest of us—hate to be confused and uncertain as to what they’re supposed to do.
- (4) Make the material engaging and relevant to students’ lives. Draw them in by bringing in global and local issues, tapping into current events, presenting a mystery to be solved, using high-technology “clickers,” or by any other method you can think of. And if all of that isn’t enough, build in some accountability—participation points for getting actively involved, for example.

Specific Strategies for Different Types of Classes

Collaborative Learning in Lab

Lab classes are an ideal environment for collaborative learning. Lab tables make it easy for students to face each other and students naturally work together in lab anyway; one need only add a bit of structure to their natural tendency to collaborate. For example, rather than leaving it up to students to break the ice and begin talking to each other (potentially leaving shy persons out), I assign each student to a group. In addition, instead of letting individual students work at their own pace, I instruct the groups to stay with each question until all group members understand the answer and feel comfortable moving on. Collaborative learning in lab is especially powerful when combined with guided-discovery problems, which can be quite difficult to work out alone.

I have found it very effective to close each lab session with group presentations. Each group is assigned a different piece of the lab to present; they prepare their presentations on overhead transparencies and come to the front of the class as a group. In order to ensure individual accountability, I assign a particular person per group to act as spokesperson, using random neutral characteristics such as the person who was born earliest in the year or the one who traveled the furthest during a recent semester break.

Collaborative Learning in Small Lecture Classes

Small lecture classes, like lab classes, lend themselves well to collaborative learning. The desks can usually be re-arranged to face each other and students can get to know each other—at least in passing—relatively quickly, increasing their level of comfort and making it easier for them to speak up in class. Short guided-discovery problems and group exams or quizzes work well.

In my structural geology class, I use a modified version of the classic “jigsaw” cooperative learning activity. All students complete a 4-question homework assignment, each on a separate sheet of paper. Students turn in their homework in separate piles, one for each question. Students are then randomly assigned to become “experts” on one of the questions. Students assigned to the same question meet as a group, study the answers submitted by the class, thoroughly discuss the question, and formulate a group answer. They present this answer to the class, illustrating it on overhead transparencies (when enough students bring computers to class, I’ll try having them use PowerPoint).

Larger projects are a great application of collaborative learning; they do involve accountability issues (see below) but are well worth the hassle. In my Earth Science course, students complete a semester-long research project on the moon, culminating in the development and facilitation of a guided-discovery lesson on their findings. Because students’ busy schedules make out-of-class meetings logistically difficult, I set aside class time for students to meet in their groups. I can also be there to provide guidance as needed.

Collaborative Learning in Large Lecture Classes

Ironically, collaborative learning can make the biggest positive impact in large classes yet fixed forward-facing seats and crowd control issues can make implementation very difficult. Most collaborative learning techniques just can’t be done successfully (in my experience) in large-enrollment classes. Which can? I have had the most success with

student collaboration answering conceptual multiple-choice questions. The limited scope of the activity helps students focus and makes the task crystal clear. The gratification that comes from getting the right answer helps motivate the students. The stakes for such an activity can be set high or low, depending on your goals for the activity.

For this kind of activity to be a successful learning tool, the questions must truly address concepts, not just facts. The distracter answers must seem reasonable (at first glance, anyway) and, ideally, should include common misconceptions. I have structured student collaboration on multiple choice questions in a wide variety of ways.

Exam Review: Just before an exam, I hand out printed practice tests and let the students spend the class period arguing out the answers. Near the end of class, I write the correct answers on the board—to a mixture of cheers and groans—and give students time to ask why particular answers are right or wrong.

Post-Exam Feedback: Group tests are just as powerful after an exam—it's a way for students to learn from the exam without being bored to death listening to me talk about something that's over and done with anyway. Students repeat the exam in groups; winning back partial credit on any questions missed on the individual exam. Because this group exam counts, students debate vigorously and very productively; they really care about the answers and learn a lot from the experience—they also love getting a second chance.

ConcepTests: This method was originally developed by Eric Mazur, a physics professor at Harvard University (Mazur, 1997). It has the added attraction of being high-technology and therefore inherently appealing. Several times during a lecture, the instructor displays a multiple choice question on the screen. Students use electronic personal response pads (clickers) to answer the question. A histogram of student responses is displayed and then the fun begins; students try to convince each other of their answers. Then they “vote” again. This process can be repeated as often as necessary (with hints provided by the instructor as needed) until most students choose the right answer. This method breaks up lecture, helping students to remain attentive. It is also an automatic way to take roll.

The personal response pad systems were once a rather expensive investment for departments; they are now free of charge when a significant number of students buy the personal response pads. David Steer and David McConnell at the University of Akron are creating and reviewing ConcepTest questions for introductory geoscience courses. They have posted information and over 300 sample questions at <http://serc.carleton.edu/introgeo/interactive/conctest.html>.

Online ConcepTests: I have developed a way to give ConcepTests on-line using WebCT. As an added bonus, WebCT makes it possible to set the correct answer to two or more of the options, giving partial credit for choosing some but not all of the correct options. Students have access to each WebCT quiz for a week. They can attempt each quiz twice; the higher score counts. In the discussion function of WebCT, I set up a separate topic for each question; students can then discuss their answers to the questions between their two attempts at the quiz. To encourage this discussion, I award full credit to every student who enters a discussion item for each question and receives a score of 60% or higher on the quiz.

The Issue of Individual Accountability

Collaborative learning inevitably bumps up against the issue of individual accountability. Ideally (and usually), each member of the group makes valuable contributions and the group is more capable and productive than the sum of its parts. But occasionally one person may dominate the group, causing others to avoid confrontation and just follow along, inhibiting their own potentially valuable creativity and initiative. Or one “smart” student may feel obliged to do almost all the work while others freeload.

These kinds of problems can elevate student anxiety. So it is best to anticipate potential problems and minimize them as much as possible. For example, I rarely grade collaborative learning activities; any credit earned is usually based on attendance. Later exam scores show what each individual student learned from the experience. On group tests, students record their answers individually; they can (and sometimes do) dissent from the group answer. On the rare occasions when I actually do grade collaborative learning projects, I always require each student to complete a confidential form, asking exactly how each individual group member contributed to the project and evaluating the quality of each of their contributions. Students can then chalk up a bad group dynamic as a learning experience without the added anxiety of receiving a poor grade due to the actions of others or of not receiving credit where credit is due.

One More Thing

As a new professor, you will be in an ideal position to incorporate collaborative learning into your teaching. You are not yet set in your ways. For a professor who already has a class “down pat,” the development of collaborative learning activities is a daunting prospect. But if you’re starting from scratch anyway, it is just as easy to develop a class using collaborative learning as it is to develop a traditional lecture-only class. And, besides, collaborative learning is more fun.

References

Mazur, E., 1997, *Peer Instruction: a User's Manual*: Prentice Hall, 253 pages.