Using Cooperative Learning to Foster Deep Learning

Dr. Barbara J. Millis
Director of the Teaching and Learning Center
The University of Texas, San Antonio

Goals

Participants will:
• Become familiar with some key research related to teaching and learning;
• Understand how cooperative learning—when carefully structured and monitored—supports the research on teaching and learning;
• Reflect on the nature of their own approaches to teaching and learning;
• Experience three learning-centered classroom techniques and two rapid-report-out methods;
• Enjoy interacting with like-minded colleagues.

Agenda

• An Overview/Introduction to Cooperative Learning
• Three-Step Interview: Exploring Cooperative Learning
• Roundtable: Barriers to Cooperative Learning
• Standup and Share: A Rapid Report-Out Method
• A Look at the First Key Learning Principle
• Focused Listing: An example with “Graphic Organizer,” plus other CAT’s

Agenda, Continued

• A Look at a Second Key Learning Principle
• A Memory Test
• Deep Learning with Two Sequenced Examples:
  - Combining a Graphic Organizer with a Jigsaw
  - Combining a Graphic Organizer (Double-Entry Journal) with Pair work
• Numbered Heads Together/Structured Problem Solving: Solutions to barriers
• Three Stay One Stray: A Rapid Report Method
• A Look at a Third Learning Principle
• “Metacognition” example
• Conclusion

Warning!

Do not do unto your students what I am about to do to you. Begin slowly with cooperative/active learning.

My Discipline-Specific Applications

<table>
<thead>
<tr>
<th>Structure/Activity/Assignment</th>
<th>Ways I Could Use It</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
What is Cooperative Learning?
Enhancing Learning—and more!—Through Cooperative Learning
Understanding Cooperative Learning
http://www.nea.org/he/advo03/advo1203/front.html

Cooperative Learning is:
- a structured form of
- small group problem solving that
- incorporates the use of
  heterogeneous teams,
- maintains individual accountability,
- promotes positive interdependence,
- instills group processing, and
- sharpens social skills

The Quiet Signal
- The teacher signals for quiet, often with a raised hand.
- Students complete their sentences.
- Students raise their hands and alert classmates to the signal.

The Three Step Interview
- A interviews B for the specified number of minutes, listening attentively and asking probing questions.
- At a signal, they reverse roles with B interviewing A for the same number of minutes with the same question(s).
- At another signal, each pair turns to another pair, forming a group of four (quad). Each member of the quad introduces his or her partner, highlighting the most interesting points.

Interview Questions
- Name and courses taught or other responsibilities?
- How familiar are you with cooperative learning? To what extent do you use it in your classes? In what ways?
  Extra time
  What are your greatest strengths as a teacher? What could you improve?
Always remember to plan for a “Sponge” or Extension Activity

First Things First
Always explain the structure to the students before you give them the task.

Monitoring
When you assign group work where issues are discussed, you can easily gain in-depth insights into your students’ learning and attitudes. Often comments you have overheard as you move from group to group can be integrated into a mini-lecture taking into account what you have learned about your students’ learning.

Three-Step Interview:
Various Discipline Applications
- Should Nora in The Doll House have left her husband?
- What are the most important qualities of an effective leader?
- Was the United States justified in dropping the atomic bomb on Nagasaki?
- Should wolves be reintroduced into Yellowstone National Park?
- Should the United States adopt a flat tax system?
- What are some of the ethical or societal issues related to human gene theory? What is your opinion about any of these issues?
- How has the current business environment affected managerial accounting?

Three-Step Interview
Your Class Applications:

<table>
<thead>
<tr>
<th>Activity/Assignment</th>
<th>Ways I Could Use It</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Roundtable
- The teacher poses an open-ended question.
- Each group has one piece of paper and one pen.
- The first student writes one response, saying it out loud.
- He or she passes the paper to the left where a second student writes a response, etc.
- The “brainstorm” continues until time elapses.
- Students may say “pass”.
What are Some Barriers to Cooperative Group Work?

- Your misgivings?
- Student concerns?
- Departmental barriers?
- Institutional?

I should get a refund of part of my tuition -- I had to teach myself.

Roundtable: Various Discipline Applications

- Have students brainstorm topics for a comparison/contrast composition.
- Have students predict the possible repercussions of a UN invasion of North Korea.
- Have students summarize the causes of the Civil War.
- Have students identify the characteristics of an ideal teacher/student.
- Have students list the components of the human respiratory system: as they pass the paper again, they add their functions.
- Have students brainstorm items that might be found in a manufacturing overhead.

Roundtable Applications:

<table>
<thead>
<tr>
<th>Structure/Activity/Assignment</th>
<th>Ways I could Use It</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Stand Up and Share

- The teacher calls out the number/suit/color of the person who will serve as each team’s spokesperson.
- That person rises and in rapid roundrobin fashion, each team shares its ideas.
- Several rotations may occur.
- The teacher changes the spokesperson by calling another “identity.”
- When a team’s ideas have been fully shared, the spokesperson sits down.

Linking Cooperative Learning to the Research on How People Learn
Three findings . . . have a solid research base to support them and strong implications for how we teach.

Three Key Learning Principles

• Prior Knowledge: Students construct new knowledge based on what they already know (or don’t know);
• Deep Foundational Knowledge: Students need a deep knowledge base and conceptual frameworks;
• Metacognition: Students must identify learning goals and monitor their progress toward them.

Learning Principle #1

The contemporary view of learning is that people construct new knowledge and understandings based on what they already know and believe.

Teaching/Learning Implications from Key Finding #1

It is critically important to learn where your students are and what they already know or don’t know, including their misconceptions.

Run, Forrest, Run!
Classroom Assessment Techniques (CATs) can help teachers learn what students know or don’t know or misunderstand.

- Learner-Centered
- Teacher-Directed
- Mutually Beneficial
- Formative
- Context-Specific
- Ongoing
- Rooted in Good Teaching Practice


Focused Listing

**Purpose:** This tool helps determine what learners recall about a specific topic, including the concepts they associate with the central point. Working in pairs can help students build their knowledge base and clarify their understanding. This technique can be used before, during, or after a lesson.

**Steps:** Ask students to write the key word at the top of a page and within a set time limit (usually 2-3 minutes) to jot down related terms important to understanding that topic.

Assessment of Focused Listing:

Compare students' lists with a master one you have generated, looking at both the quantity and quality of their responses. Categorize responses into "related" or "unrelated" or "appropriate" or "inappropriate" stacks. Consider compiling a master list and having students then sort them by categories.

Focused Listing Applications in Various Disciplines

Jot down relevant associations with the following:
- Antenna
- Symbolism
- Astronaut
- Myth
- Reinforcement
- Corporation
- Random Distribution
- Electrical Circuits
- Momentum
- Bonding

Graphic Organizer

A diagram to organize information in a visual format that suggests relationships. “Helping students to organize their knowledge is as important as the knowledge itself, since knowledge organization is likely to affect students’ intellectual performance.”

—Bransford, Brown, & Cocking, Eds. How People Learn: Brain, Mind, Experience, and School

http://curry.edschool.virginia.edu/go/edis771/notes/graphicorganizers/graphic/
Other Low-Preparation CATs: Directed Paraphrasing

- Students put into their own words key concepts or parts of a lesson for a specific audience or purpose (e.g., Explain the concept of “corporation” to high school students; Explain an “irrevocable trust” to a group of retirees);
- The responses can be sorted as “confused,” “minimal,” “adequate,” or “excellent.”

Application Cards

- Students give one or more real-world applications for an important principle, generalization, theory, or procedure.
  - Examples:
    - (Business) Stephen Covey recommends “Win-win performance agreements”: give two specific applications, one related to current news and one related to your own life.
    - (Government) Give a concrete example of the concept “due process.”
- The responses can be sorted as “unacceptable,” “marginal,” “adequate,” or “excellent.”

John Hertel’s “Key Principles and Restating”

Focused Listing
Directed Paraphrasing
Application Card “Key Principle and Re-Thinking”
Your Class Applications:

Learning Principle #2

To develop competence in an area of inquiry, students must:
(a) have a deep foundation of factual knowledge;
(b) understand facts and ideas in the context of a conceptual framework;
(c) organize knowledge in ways that facilitate retrieval and application.

Memory Test
Lessons Learned …

• Taken separately, there was simply too much information to remember all at once.
• However, if we can impose some organizing framework on the information, then it becomes much easier to remember … even over a long period of time.


“Making categorical chunking a regular part of classroom instruction can raise student learning, thinking, and retention significantly”


Key Elements that Foster a Deep Approach to Learning

• Motivational Context: Students’ motivation is intrinsic, and they experience a need to know something.
• Active Learning: Students are actively involved, rather than passive.
• Interaction with Others: There are opportunities for exploratory talk.
• A Well-Structured Knowledge Base: Content is taught in integrated wholes and related to other knowledge, rather than presented in small separate pieces.

—Oxford Center for Staff Development

Motivational Context

We learn best what we feel we need to know. Intrinsic motivation remains inextricably bound to some level of choice and control.
**Active Learning:**

Deep learning and “doing” travel together. Doing in itself isn’t enough.

When we involve students in activities that lead them to discuss, question, clarify, and write about course content, we not only foster better retention of subject matter but help expand students’ thinking abilities as well.


---

**Interaction with Others:**

“The teacher is not the only source of instruction or inspiration.”

--Noel Entwistle

The best answer to the question, “What is the most effective method of teaching?” is that it depends on the goal, the student, the content, and the teacher. But the next best answer is . . .

---

**“Students teaching other students.”**

—McKeachie, Pintrich, Lin, & Smith: *Teaching and Learning in the College Classroom: A Review of the Research Literature.*

A Well-Structured Knowledge Base

This doesn’t just mean presenting new material in an organized way. . . . Deep approaches, learning for understanding, are integrative processes. The more fully new concepts can be connected with students’ prior experience and existing knowledge, the more likely it is they will be impatient with inert facts and eager to achieve their own syntheses.
Preclass Assignments  
(Homework)

Use homework assignments to get students involved with the material and to foster repetition that will strengthen useful synapses.

Two Sequenced Activities to Promote Deep Learning

1. Homework using a graphic organizer processed through an in-class jigsaw.
2. Homework using a graphic organizer (a double entry journal) processed in class through pair work.

Four Characters

- Charlotte
- Wilbur
- Fern
- Templeton

Bloom’s Taxonomy of Educational Objectives

- Evaluation
- Synthesis
- Analysis
- Application
- Comprehension
- Knowledge

Chemistry Jigsaw: Absorption Spectroscopy

Activity used by Sandra Laursen of Western Michigan University

- Each home team member changes one variable in the experiment
  - The effect of concentration
  - The path length of a cell
  - A varied cpd
- Expert teams
  - Formulate a hypothesis about the effect of their variable and design an experiment to test the effect of their variable on a measurable (absorbency).
  - The team conducts the experiment and discusses how to share the results with their home team.
- Home teams prepare a compilation of the results.
Three-Part Jigsaw: Organic Molecules that are Polymers of Carbon

• Carbohydrates
• Lipids
• Proteins

An Accounting Jigsaw: Four methods of depreciation

• Straight-line
• Units-of-production
• Sum-of-the-year’s-digits
• Double declining balance

Other Jigsaw Applications

Psychology: Underpinnings of Childhood Moral Development

• Cognitive
• Social
• Emotional
• Biological

Botany: Major Plant Groups

• Nonvascular land plants
• Seedless vascular plants
• Vascular plants with “naked seeds” (gymnosperms)
• Vascular plants with flowers and protected seeds (angiosperms)

Double Entry Journal (condensed)

<table>
<thead>
<tr>
<th>Critical Points</th>
<th>Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Learning styles” has been over-emphasized in the research literature.</td>
<td></td>
</tr>
<tr>
<td>“Learning styles” have been over-emphasized in the research literature.</td>
<td></td>
</tr>
<tr>
<td>“Learning styles” have been over-emphasized in the research literature.</td>
<td></td>
</tr>
<tr>
<td>“Learning styles” have been over-emphasized in the research literature.</td>
<td></td>
</tr>
</tbody>
</table>

Researchers examined a key question, “What does it take to be good at learning?”

A good question!

Researchers examined a key question, “What does it take to be good at learning?”

A good question!

Researchers examined a key question, “What does it take to be good at learning?”

A good question!

Researchers examined a key question, “What does it take to be good at learning?”

A good question!

Researchers examined a key question, “What does it take to be good at learning?”

A good question!

Researchers examined a key question, “What does it take to be good at learning?”

A good question!

Researchers examined a key question, “What does it take to be good at learning?”

A good question!

Researchers examined a key question, “What does it take to be good at learning?”

A good question!

Researchers examined a key question, “What does it take to be good at learning?”

A good question!

Researchers examined a key question, “What does it take to be good at learning?”

A good question!

Researchers examined a key question, “What does it take to be good at learning?”

A good question!

Researchers examined a key question, “What does it take to be good at learning?”

A good question!

Researchers examined a key question, “What does it take to be good at learning?”

A good question!

Researchers examined a key question, “What does it take to be good at learning?”

A good question!

Researchers examined a key question, “What does it take to be good at learning?”

A good question!

Researchers examined a key question, “What does it take to be good at learning?”

A good question!

Researchers examined a key question, “What does it take to be good at learning?”

A good question!

Researchers examined a key question, “What does it take to be good at learning?”

A good question!

Researchers examined a key question, “What does it take to be good at learning?”

A good question!

Researchers examined a key question, “What does it take to be good at learning?”

A good question!

Researchers examined a key question, “What does it take to be good at learning?”

A good question!

Researchers examined a key question, “What does it take to be good at learning?”

A good question!

Researchers examined a key question, “What does it take to be good at learning?”

A good question!

Researchers examined a key question, “What does it take to be good at learning?”

A good question!

Researchers examined a key question, “What does it take to be good at learning?”

A good question!

Researchers examined a key question, “What does it take to be good at learning?”

A good question!

Researchers examined a key question, “What does it take to be good at learning?”

A good question!

Researchers examined a key question, “What does it take to be good at learning?”

A good question!

Researchers examined a key question, “What does it take to be good at learning?”

A good question!

Researchers examined a key question, “What does it take to be good at learning?”

A good question!

Researchers examined a key question, “What does it take to be good at learning?”

A good question!

Researchers examined a key question, “What does it take to be good at learning?”

A good question!

Researchers examined a key question, “What does it take to be good at learning?”

A good question!

Researchers examined a key question, “What does it take to be good at learning?”

A good question!

Researchers examined a key question, “What does it take to be good at learning?”

A good question!

Researchers examined a key question, “What does it take to be good at learning?”

A good question!

Researchers examined a key question, “What does it take to be good at learning?”

A good question!

Researchers examined a key question, “What does it take to be good at learning?”

A good question!

Researchers examined a key question, “What does it take to be good at learning?”

A good question!

Researchers examined a key question, “What does it take to be good at learning?”

A good question!

Researchers examined a key question, “What does it take to be good at learning?”

A good question!

Researchers examined a key question, “What does it take to be good at learning?”

A good question!

Researchers examined a key question, “What does it take to be good at learning?”

A good question!

Researchers examined a key question, “What does it take to be good at learning?”

A good question!

Researchers examined a key question, “What does it take to be good at learning?”

A good question!

Researchers examined a key question, “What does it take to be good at learning?”

A good question!

Researchers examined a key question, “What does it take to be good at learning?”

A good question!

Researchers examined a key question, “What does it take to be good at learning?”

A good question!

Researchers examined a key question, “What does it take to be good at learning?”

A good question!

Researchers examined a key question, “What does it take to be good at learning?”

A good question!

Researchers examined a key question, “What does it take to be good at learning?”

A good question!
“Learning is defined as stabilizing, through repeated use, certain appropriate and desirable synapses in the brain.” p. 5.

Jigsaw
Double Entry Journal
Your Class Applications

<table>
<thead>
<tr>
<th>Structured/Activity Assignment</th>
<th>Ways I Could Use It</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Numbered Heads Together/Structured Problem-Solving

- Each student has an assigned identity within a team/group: a number, playing card suit, color, etc.
- The students complete a task together.
- The group prepares to respond, making certain that each group member can serve as the spokesperson.
- Responses occur by number, suit, or color.

Structured Problem Solving

Review the list your team generated about the barriers to cooperative learning, selecting a problem you want to solve. Working together, come up with as many solutions as possible. (Sponge: Solve a second problem if time permits.) Review them, making certain that each team member can serve as the spokesperson.

A Rapid Report-Out Method

Three
Stay, One Stray
Numbered Heads Together/Structured Problem-Solving
Your Class Applications:

<table>
<thead>
<tr>
<th>Activity/Assignment</th>
<th>Ways I could Use It</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Learning Principle #3

A “metacognitive” approach to instruction can help students learn to take control of their own learning by defining learning goals and monitoring their progress in achieving them.

Teaching/Learning Implications from Key Finding #3

“The teaching of metacognitive skills [“thinking about thinking”] should be integrated into the curriculum in a variety of ways.”


Punctuated Lectures: Possible Questions

• How fully and consistently were you concentrating on the lecture during these few minutes? Did you get distracted at any point? If so, how did you bring your attention back into focus?
• What were you doing to record the information you were receiving? How successful were you?
• What were you doing to make connections between this “new” information and what you already know?
• What did you expect to come next in the lecture and why?

Three Key Learning Principles (Review)

• **Prior Knowledge**: Learn what students know and don’t know and discover their misconceptions;
• **Deep Foundational Knowledge**: Provide the conceptual framework and organize knowledge in ways that facilitate retrieval and application;
• **Metacognition** (“Thinking about Thinking”): Help students identify learning goals and monitor their progress toward them.

The Good News for Teachers and Students:

“There is no universal best teaching practice. If, instead, the point of departure is a core set of learning principles, then the selection of teaching strategies . . . can be purposeful.”

The End!

Happy Teaching!

Here is a memory test …

Apple  
Banana  
Bird  
Cat  
Chair  
Couch  
Desk  
Dog  
Fish  
Hamster  
Lamp  
Orange  
Peach  
Plum  
Table

To Be Successful …

<table>
<thead>
<tr>
<th>Pets</th>
<th>Fruit</th>
<th>Furniture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bird</td>
<td>Apple</td>
<td>Chair</td>
</tr>
<tr>
<td>Cat</td>
<td>Banana</td>
<td>Couch</td>
</tr>
<tr>
<td>Dog</td>
<td>Orange</td>
<td>Desk</td>
</tr>
<tr>
<td>Fish</td>
<td>Peach</td>
<td>Lamp</td>
</tr>
<tr>
<td>Hamster</td>
<td>Plum</td>
<td>Table</td>
</tr>
</tbody>
</table>