My Discipline-Specific Applications

Structure/Activity/Assignment	Ways I Could Use It

Source: http://www.ntlf.com/html/lib/bib/assess.htm
National Teaching and Learning Forum

What is classroom assessment?

Classroom assessment is both a teaching approach and a set of techniques. The approach is that the more you know about what and how students are learning, the better you can plan learning activities to structure your teaching. The techniques are mostly simple, non-graded, anonymous, in-class activities that give both you and your students useful feedback on the teaching-learning process.

How is classroom assessment different?

Classroom assessment differs from tests and other forms of student assessment in that it is aimed at course improvement, rather than at assigning grades. The primary goal is to better understand your students' learning and so to improve your teaching.

How do I use Classroom Assessment Techniques?

- Decide what you want to learn from a classroom assessment.
- Choose a Classroom Assessment Technique (CAT) that provides this feedback, is consistent with your teaching style, and can be easily implemented in your class.
- Explain the purpose of the activity to students, then conduct it.
- After class, review the results and decide what changes, if any, to make.
- Let your students know what you learned from the CAT and how you will use this information.

Why should I use CATs?

For faculty, more frequent use of CATs can:

- Provide short-term feedback about the day-to-day learning and teaching process at a time when it is still possible to make mid-course corrections.
- Provide useful information about student learning with a much lower investment of time compared to tests, papers, and other traditional means of learning assessment.
- Help to foster good rapport with students and increase the efficacy of teaching and learning.
- Encourage the view that teaching is a formative process that evolves over time with feedback.

For students, more frequent use of CATs can:

- Help them become better monitors of their own learning.
- Help break down feelings of anonymity, especially in larger courses.

- Point out the need to alter study skills.
- Provide concrete evidence that the instructor cares about learning.

Selected CATs for getting feedback on student learning and response to teaching[1]

Name:	***Description:***	***What to do with the data:***	***Time required:***
Minute paper[2]	During the last few minutes of the class period, ask students to answer on a half-sheet of paper: "What is the most important point you learned today?"; and, "What point remains least clear to you?". The purpose is to elicit data about students' comprehension of a particular class session.	Review responses and note any useful comments. During the next class periods emphasize the issues illuminated by your students' comments.	Prep: Low In class: Low Analysis: Low
Chain Notes	Students pass around an envelope on which the teacher has written one question about the class. When the envelope reaches a student he/she spends a moment to respond to the question and then places the response in the envelope.	Go through the student responses and determine the best criteria for categorizing the data with the goal of detecting response patterns. Discussing the patterns of responses with students can lead to better teaching and learning.	Prep: Low In class: Low Analysis: Low
Memory matrix	Students fill in cells of a two-dimensional diagram for which instructor has provided labels. For example, in a music course, labels might consist of periods (Baroque, Classical) by countries (Germany, France, Britain); students enter composers in cells to demonstrate their ability to remember and classify key concepts.	Tally the numbers of correct and incorrect responses in each cell. Analyze differences both between and among the cells. Look for patterns among the incorrect responses and decide what might be the cause(s).	Prep: Med In class: Med Analysis: Med

Directed paraphrasing	Ask students to write a layman's "translation" of something they have just learned -- geared to a specified individual or audience -- to assess their ability to comprehend and transfer concepts.	Categorize student responses according to characteristics you feel are important. Analyze the responses both within and across categories, noting ways you could address student needs.	Prep: Low In class: Med Analysis: Med
One-sentence summary	Students summarize knowledge of a topic by constructing a single sentence that answers the questions "Who does what to whom, when, where, how, and why?" The purpose is to require students to select only the defining features of an idea.	Evaluate the quality of each summary quickly and holistically. Note whether students have identified the essential concepts of the class topic and their interrelationships. Share your observations with your students.	Prep: Low In class: Med Analysis: Med
Exam Evaluations	Select a type of test that you are likely to give more than once or that has a significant impact on student performance. Create a few questions that evaluate the quality of the test. Add these questions to the exam or administer a separate, follow-up evaluation.	Try to distinguish student comments that address the fairness of your grading from those that address the fairness of the test as an assessment instrument. Respond to the general ideas represented by student comments.	Prep: Low In class: Low Analysis: Med
Application cards	After teaching about an important theory, principle, or procedure, ask students to write down at least one real-world application for what they have just learned to determine how well they can transfer their learning.	Quickly read once through the applications and categorize them according to their quality. Pick out a broad range of examples and present them to the class.	Prep: Low In class: Low Analysis: Med

Student-generated test questions	Allow students to write test questions and model answers for specified topics, in a format consistent with course exams. This will give students the opportunity to evaluate the course topics, reflect on what they understand, and what are good test items.	Make a rough tally of the questions your students propose and the topics that they cover. Evaluate the questions and use the goods ones as prompts for discussion. You may also want to revise the questions and use them on the upcoming exam.	Prep: Med In class: High Analysis: High (may be homework)

[1] Details on these and others available from Angelo & Cross, Classroom Assessment techniques, 1993.
[2] The Bureau of Evaluative Studies and Testing (BEST) can administer the Minute Paper electronically.

Published Resources:

Angelo, T.A. & Cross, P.K. (1993). *Classroom Assessment Techniques* (2nd ed.). San Francisco: Jossey-Bass.

Davis, B.G. (1993). *Tools for Teaching*. San Francisco: Jossey-Bass.

Linking Cooperative Learning to the Research on How People Learn

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

Overall 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, including classroom assessment techniques;
- Reflect on the nature of their own approaches to teaching and learning;
- 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 CATs

Agenda, Continued

- **A Look at a Second Key Learning Principle**
- A Memory Test
- **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" examples
- 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

Structure/Activity/Assignment	Ways I could Use It

Research that Has Stood the Test of Time

The Seven Principles

1. Encourages contact between students and faculty.
2. Develops reciprocity and cooperation among students.
3. Uses active learning techniques.
4. Gives prompt feedback.
5. Emphasizes time on task.
6. Communicates high expectations.
7. Respects diverse talents and ways of learning.

The Seven Principles.
http://www.aahebulletin.com/public/archive/sevenprinciples1987.asp

? What is Cooperative Learning?

Enhancing Learning—and more!—Through Cooperative Learning
http://www.idea.ksu.edu/papers/Idea_Paper_38.pdf
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.


IDEA PAPER #38
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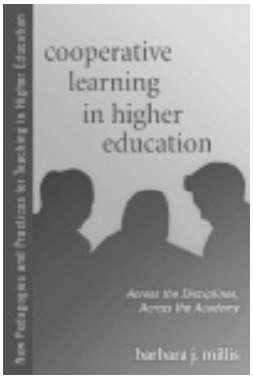
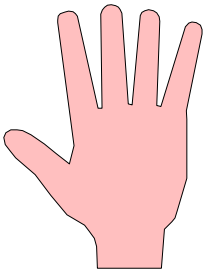
IDEA CENTER
Enhancing Learning—and More!—Through Cooperative Learning
Barbara J. Mills, U. S. Air Force Academy



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 ıto your students' learning and ttitudes. Often comments you ave overheard as you move rom group to group can be ıtegrated into a mini-lecture ıking into account what you ave learned about your tudents' 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:

Structure/Activity/Assignment	Ways I could Use It

Group Formation

- Students Self-Select

- Random

- Teacher-selected

- Combination of teacher and students by taking into account requests

Students have an individual team identity linked to roles that rotate each week within each group. Their playing card (heart, diamond, spade, club) within their team (Aces, Twos, Threes, etc.) remains the same.

Typical Student Team Roles

- Leader or Facilitator
- Recorder or "Scribe"
- Reporter or Spokesperson
- Folder Monitor

These roles typically rotate once a week. For some activities you will announce that whoever is called on will serve as the team's spokesperson.

Groups in Course Management Systems

- Course management systems allow students to participate in group activities;
- Each group can participate in their own discussion board and virtual classroom;
- Each group can file share and e-mail each other.

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.

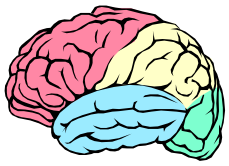
Roundtable
Your Class Applications:

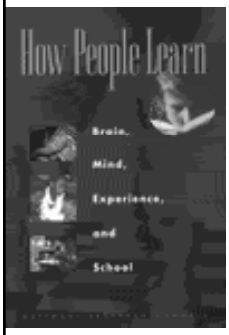
Structure/Activity/Assignment	Ways I could Use It

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 Deep Learning





How People Learn: Brain, Mind, Experience, and School

John D. Bransford, Ann L. Brown, and Rodney R. Cocking, *editors*

Committee on Developments in the Science of Learning

Commission on Behavioral and Social Sciences and Education

National Research Council

NATIONAL ACADEMY PRESS

Washington, D.C. 1999

http://www.nap.edu/html/howpeople1/notice.html

Three findings . . . have a solid research base to support them and strong implications for how we teach.

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

Three Key Learning Principles

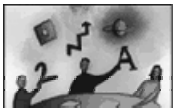
- **Prior Knowledge**: Students construct new knowledge based on what they already know (or don't know);
- **Deep Foundational Knowledge**: Students need a deep knowledge base and conceptual frameworks;
- **Metacognition**: Students must identify learning goals and monitor their progress toward them.

Learning Principle #1

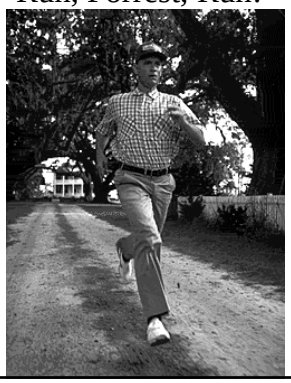
The contemporary view of learning is that people construct new knowledge and understandings based on what they already know and believe.

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

--Angelo, T. & Cross, P. (1993) *Classroom Assessment Techniques. 2nd Ed.* San Francisco: Jossey-Bass.

Background Knowledge Probe

Purposes

- (For students) BKP's highlight key information to be studied, offering both a preview of material to come and a review of prior knowledge;
- (For teachers) BKP's help determine the best starting point and the most appropriate level for a lesson;
- (For both) BKP's can be used for pre and post-lesson assessment of learning.

(BKP) Please respond to the following questions:

- How familiar are you with Angelo and Cross's Classroom Assessment Techniques: A Handbook for College Teachers?
- In the interests of time, simply raise your hand:
  - 5 fingers = know it well
  - 3 fingers = know something about it
  - 1 finger (Index finger, please!) = never looked at it.

Law 220 Bio Sheet

(from Capt Ratna Contractor, US Air Force Academy)

- Name: _____
- How you would like me to address you: _____
- Hometown:_____
- Finish the following sentence: I came to this institution because _____ _____.
- Career field choice once you graduate: _____.
- Extra Curricular Activities (my goal is to try and get our and watch each of my students doing "their thing"—I'm not always successful, but what are you doing that I should come to watch): _____
- Favorite book & movie: _____
- The best teacher I've had at this institution did these things:_____ _____
- Some things I would like to learn about are: _____ _____
- Please attach a photograph of your choice below the dotted line. Please check here ( ) if you want your photograph returned at the end of the semester. _____

Focused Listing

Graphic Organizer

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.

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"

Comedy Cottage

Key point = whether the manager violated the duty loyalty and competition by opening his business in the same location

---

Key point = issue injunction to stop lease order to prevent him from competing in the comedy club business within a certain distance

Comedy Cottage

No idea what this case is about. Don't remember.

One principle is that of loyalty. In a corporation you are required to be loyal and not take their secrets and go create you own business (copy cat)

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

Structure/Activity/Assignment	Ways I could Use It

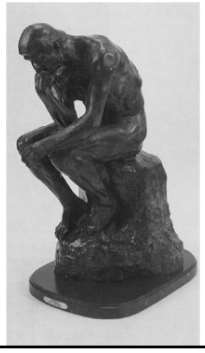
Learning Principle #2

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.

Going Deeply into Deep Learning

In the afternoon, we will look at some of the international research on deep learning (sort of like hypertext!)

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.

Bousfield, W.A. (1953). The occurrence of clustering in the recall of randomly arranged associates. Journal of General Psychology, 30, 149-165.

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

—Sousa, D. A. (2001). How the Brain Learns: A Classroom Teacher's Guide. 2nd Ed. Corwin: Sage.

Structured Problem-Solving Numbered Heads Together

- 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

A Rapid Report-Out Method

"Luck of the Draw"

Gallery Walk

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."

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

Metacognition and Studying

Son, L.K., & Metcalfe, J. (2000). Metacognitive and control strategies in study-time allocation. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 26*, 204-221.

In a perfect world, one would hope that:

–Students spend the bulk of their time studying the most difficult material (after all, that is the material that will be hardest to get!)

Metacognition and Studying, cont.

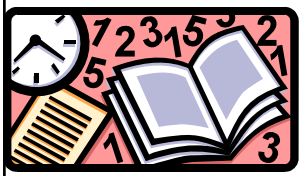
Under real-world constraints students allocate study time strategically:

- Students spend disproportionate amounts of time studying the easiest material;
- Students also spend more time studying material rated as "interesting" rather than material rated as less interesting;
- Students get the maximum accomplished in the smallest amount of time.

Punctuated Lectures

- 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?

Minute Paper



- What was the most important thing you learned during this session?
- What important question remains unanswered?

Minute Paper for Papers

Before students hand in their papers, they answer questions or complete sentences such as the following:

- I'm most satisfied with, I'm least satisfied with … I'm having problems with …
- In writing this essay, what did you learn that surprised you? When editing your paper, what were you unsure about?
- What changes would you make to this assignment?
- This lesson/assignment is important to my role as an Air Force officer because…

Paired Talk-Aloud Problem Solving

- Have students pair.
- A student takes a difficult problem and talks through it, going into his/her thought process.
- The second student does the same with a second problem.

"[E]ducators can . . .provid[e] explicit opportunities for students to test themselves. Students could take a quiz about their learning, estimate how well they think they have done on the quiz, and then compare that estimate with the reality of their performance."

Dunning, D. (May 5, 2006). Not knowing thyself. *Chronicle of Higher Education.* Point of View, B24

Please close your notes in preparation for a quiz. (If Time Permits)

On a scale of one to ten (ten = highest; one = lowest) please predict your success on a quiz based on this workshop material.

How did you fare?

- How many predicted correctly, estimating the number of answers you got right?
- How many scored better than you predicted?
- How many scored lower than you predicted?

Three Key Learning Principles (Review: Applications)

•**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."

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

The End!

Happy Teaching!

Here is a memory test …

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

To Be Successful …

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

Quiz

- What are Bransford, Brown, and Cocking's three key learning principles? (3 points)
- Describe the three steps in a Three-Step Interview. (3 points)
- A Roundtable activity can be used for prediction: T or F? (1 point)
- Cooperative learning encourages one group grade: T or F? (1 point)
- In Structured Problem Solving (Numbered Heads Together) the spokesperson directs the discussion: T or F? (1 point)
- There are _____ (#) Principles of Good Practice in Undergraduate Education. (1 point)

IDEA PAPER #38

THE IDEA CENTER
Insight.Improvement.Impact.

Enhancing Learning — and More! — Through Cooperative Learning

Barbara J. Millis • U.S. Air Force Academy

Some of higher education's most challenging goals include enhancing critical thinking, promoting "deep" (as opposed to superficial) learning, encouraging both self-esteem and the acceptance of others, and improving interpersonal effectiveness (with an emphasis on team skills). This paper describes cooperative learning, an instructional approach designed especially with these objectives in mind.

What is Cooperative Learning?

Cooperative learning, like collaborative learning, entails small groups working on specific tasks. It seeks to overcome some of the weaknesses of traditional small group approaches by structuring activities carefully. Cooper (1990, p. 1), in fact, regards the key to successful cooperative learning as ''Structure! Structure! Structure!'' Macaulay and Gonzalez (1996, p. 2) characterize it as:

> The instructional use of small groups so that learners are able to work together in a manner that enhances both group and individual learning. The key to cooperative learning is the careful structuring of learning groups. There are many ways to structure such groups, but some of the key elements are the building of interdependence, the designing of interactive processes, and accountability. The building of social skills around such areas as decision-making, communication, and conflict management is also fundamental to cooperative learning.

Tang (1998, p. 116) offers an international perspective on cooperative learning, emphasizing some of its practices and effects:

> Co-operative learning provides a non-threatening learning context for interaction between students. During co-operative learning, students are exposed to other perspectives and alternatives, they share and exchange ideas, criticise and provide feedback. Peer feedback can help students increase their awareness of their learning aims, and of the strategies to employ to achieve those aims. Collaboration provides "scaffolding" for mutual support and enables students to learn from each other. The function is a teaching function, although the major interaction is student-student, rather than teacher-student, as teaching is normally understood.

Regardless of the definition of cooperative learning, most experts agree that its foundation rests on several significant premises.

The Premises Underlying Cooperative Learning

The first premise underlying cooperative learning is respect for students — regardless of their ethnic, intellectual, educational, or social backgrounds — and a belief in their potential for academic success. Sapon-Shevin, Ayres, and Duncan (1994, p. 46) suggest: ''Cooperative learning . . . builds upon heterogeneity and formalizes and encourages peer support and connection. . . . ***All*** students need to learn and work in environments where their individual strengths are recognized and individual needs are addressed. ***All*** students need to learn within a supportive community in order to feel safe enough to take risks.''

Second, cooperative learning promotes a shared sense of community. Learning, like living, is inherently social. This approach offers students support and encouragement through systematic classroom interactions. An intellectual synergy develops, and positive relationships typically develop.

Third, cooperative learning is predicated on the premise that learning is an active, constructive process. Myers and Jones (1993, xi) find that such learning ''provides opportunities for students to ***talk and listen, read, write,*** and ***reflect*** as they approach course content through problem-solving exercises, informal small groups, simulations, case studies, role playing, and other activities — of all which require students to ***apply*** what they are learning." As a result, learning is not passively absorbed nor are facts simply added systematically to existing knowledge. Students often take new material — including conflicting viewpoints — and integrate, reinterpret, and transform it until new knowledge is forged. Thus, learning is produced, not reproduced.

The role of the instructor changes from a deliverer-of-information to a facilitator of learning. This does not mean that faculty members, who will always remain authorities in the definitive sense, abdicate their responsibility to students; rather, it means that they assume the role of "midwife professors" who ''assist . . . students in giving birth to their own ideas, in making tacit knowledge explicit and elaborating on it'' (Belenky, Clinchy, Goldberger, & Tarule, 1986, p. 217).

Theory and Research

Establishing a cooperative classroom entails understanding the underlying theory in order to select effective teaching approaches. Leamnson (1999, p. 8) emphasizes that "a good pedagogy *selects* what is appropriate and is not wedded to a method, no matter how innovative or popular." Similarly, Palmer (1996, p. 12) reminds us that, "Our challenge is not to reduce good teaching to a particular form, model, methodology, or technique, but to understand its dynamics at the deeper levels, the underpinnings, to understand the dynamics that make connectedness a powerful force for learning in whatever forms it takes."

Using a connected, cooperative approach also reinforces the concepts of "deep learning." Four key components — totally consistent with cooperative learning practices — characterize a deep, rather than a surface approach to learning. Rhem (1995, p. 4) summarizes them as follows:

> **Motivational context:** We learn best what we feel a need to know. Intrinsic motivation remains inextricably bound to some level of choice and control. Courses that remove these take away the sense of ownership and kill one of the strongest elements in lasting learning.
>
> Learner activity: Deep learning and "doing" travel together. Doing in itself isn't enough. Faculty must connect activity to the abstract conceptions that make sense of it, but passive mental postures lead to superficial learning.
>
> **Interaction with others:** As Noel Entwistle put it in a recent email message, "The teacher is not the only source of instruction or inspiration." Peers working as groups enjoin dimensions of learning that lectures and readings by themselves cannot touch.
>
> A well-structured knowledge base: This doesn't just mean presenting new material in an organized way. It also means engaging and reshaping the concepts students bring with them when they register. Deep approaches and learning for understanding are integrative processes. The more fully new concepts can be connected with students' prior experience and existing knowledge, the more it is they will be impatient with inert facts and eager to achieve their own synthesis.

Deep learning and cooperative learning mesh perfectly when teachers capitalize on the underlying theories by — among other things — assigning motivating homework assignments that get students involved with the knowledge base. Students often become motivated when the material is relevant to their own lives and learning. When students can place content knowledge in a personal context, they are more likely to retain the information and be able to retrieve it (the "self-referral" effect). This research is the basis for Jensen's (2000, p. 282) advice to help students "discover their own connections rather than imposing your own" and encouraging "learners to use their own words with regard to new learning."

What becomes of the out-of-class homework assignment is critically important. Too often, teachers merely collect and grade homework, suggesting to students that their work is merely an artificial exercise intended for evaluation by a bored expert (the teacher). To avoid this perception and to build in the active learning and interaction with peers in the deep learning/cooperative learning models, teachers should consider peer reviews or other meaningful uses of the out-of-class assignment. Because students have already prepared individually, group activities based on that preparation should result in deeper learning.

The cooperative use of homework assignments also builds on what we know about cognitive development. Leamnson (1999, p. 5), for example, defines learning as "stabilizing, through repeated use, certain appropriate and desirable synapses in the brain." Teachers preparing lectures strengthen their own synapses, but the real test of learning is how students' synapses are affected. When a teacher deliberately couples well-thought-out home work assignments with cooperative in-class activities and targeted feedback, the repetition needed for student learning occurs through various approaches to the same content material, not through rote memorization.

Bransford, Brown, and Cocking (2000, p. 59) emphasize that "students need feedback about the degree to which they know when, where, and how to use the knowledge they are learning." The value of repetition is apparent when cooperative learning is added to a "learning to write" out-of-class activity such as the Double Entry Journal (DEJ).

With a DEJ, students identify on the left side of a grid (a Word table template e-mailed or distributed to students) the key points of an article, chapter, or guest lecture. Just opposite the key point they respond, linking the point to other academic material, current events, or their personal experiences and opinions (see Exhibit A). To avoid overloading students, faculty members can limit either the length of the DEJ or the number of key points.

Instead of jamming the DEJs into a briefcase for later evaluation, cooperative teachers can pair students, encouraging them to engage in discussions of their key points and responses. This paired discussion builds on the premises of critical thinking. Brookfield (1987) and others have emphasized that critical thinking depends on

Exhibit A • Sample Double Entry Journal (Two Points Cited Only)

Name: Barbara J. Millis
Article: "Investing in Creativity: Many Happy Returns"
by Robert J. Sternberg

Key Points	Responses
Creative thinking is every bit as malleable as critical thinking.	Judging from the academic literature and discussions with faculty, critical thinking is not easy to define, let alone to teach. I believe that critical thinking is taught by ''doing'' and by doing things specifically within the discipline. Activities such as The Double Entry Journal encourage critical thinking. Creativity is even more elusive. For me, creativity emerges from thinking—you can't separate the creative from the critical. I'm not certain I understand Sternberg's point about "malleability."
The investment theory of creativity holds that creatively gifted people share common characteristics.	Do we find gifted people and look for these characteristics or do we find the people who have these characteristics in common and then look for their creativity!?

identifying and challenging assumptions and subsequently exploring and conceptualizing alternatives.

This linking of out-of-class work with in-class "processing" also results in meaningful on-target repetition with students more likely to complete an assignment they know will be shared with peers. The reading is exposure one. Then, crafting the DEJ draws the student back into the material — with personally relevant responses — for repetition two. The paired discussion in class provides a third repetition. (Students coming unprepared do not pair: they sit in the back of the class and work on their DEJ.) As a fourth repetition, students are likely to review their DEJ when the teacher returns them with marginal comments. (Although marked, DEJs need not receive a labor-intensive letter grade: a pass-fail grade — with a "pass," for example, counting 10 points counting toward a criterion referenced point-based final grade — motivates students without adding significantly to the grading load.) A fifth repetition occurs when teachers "coach" students on preparing an ideal DEJ by presenting exemplary examples as an in-class follow-up.

Faculty reluctant to consider cooperative learning can be reassured by the fact that the research base supporting it is long-standing and solid. Both the learning outcomes and the social dynamics of cooperative learning have been studied under a number of conditions. Slavin (1989–1990, p. 52) regards it as ''one of the most thoroughly researched of all instructional methods.'' Johnson, Johnson and Smith (1991, p. 43) describe the amount of research conducted over the past 90 years as ''staggering.'' In addition to cooperative learning's positive effect on student achievement, they also find that it significantly affects interpersonal relations:

> As relationships within the class or college become more positive, absenteeism decreases and students' commitment to learning, feeling of personal responsibility to complete the assigned work, willingness to take on difficult tasks, motivation and persistence in working on tasks, satisfaction and morale, willingness to endure pain and frustration to succeed, willingness to defend the college against external criticism or attack, willingness to listen to and be influenced by peers, commitment to peer's success and growth, and productivity and achievement can be expected to increase.

Cooper and Mueck (1990, p. 71) note: ''The most consistent positive findings for cooperative learning... have centered on affective or attitudinal change. Outcome measures such as racial/ethnic relations, sex difference relations, self-esteem, and other prosocial outcomes have all been documented in the Cooperative Learning research."

Knowing only the underlying theory and the research base, however, will not result in a smoothly functioning cooperative classroom: teachers need to know how to establish and maintain a cooperative classroom.

Effective Cooperative Learning Experiences

Conducting the Cooperative Classroom

Much of the well-intentioned literature on higher education reform tends to be theoretical and exhortative: ''Use active learning techniques;'' ''Be responsive in the classroom;'' ''Promote respect for diversity;'' "Foster critical thinking." Too often such challenges leave faculty with a sense of schizophrenic overload, feeling almost like an early Picasso with eyes, ears, and mouth — to say nothing of brain! — permanently askew. How can they respond simultaneously and responsibly to these multiple demands? Inserting new elements into existing courses without a clear sense of purpose, commitment, or competence can result in a half-hearted ''Band-Aid'' approach. A strength of cooperative learning is that it provides a practical means to operationalize these new challenges in pedagogically sound, systematic ways.

When structuring a cooperative classroom, the following key principles should guide all decisions:

1. Positive interdependence fosters cooperative behaviors. Johnson, Johnson, and Smith (1991, p. 3) describe positive interdependence in these words:

> Cooperation results in participants' striving for mutual benefit so that all members of the group benefit from each other's efforts (your success benefits me and

my success benefits you), their recognizing that all group members share a common fate (we sink or swim together) and that one's performance depends mutually on oneself and one's colleagues (we cannot do it without you), and their feeling proud and jointly celebrating when a group member is recognized for achievement (You got an A! That's terrific!).

In a traditional educational setting, students tend to work either on their own or in competition with one another. In a cooperative, group-oriented setting, all class members, particularly those grouped in instructor-selected teams, contribute to each other's learning. Through careful planning, positive interdependence can be established by having students achieve: (a) mutual goals, such as reaching a consensus on specific solutions to problems or arriving at team-generated solutions; (b) mutual rewards, such as individually assigned points counting toward a criterion-referenced final grade, points which only help, but never handicap; (c) structured tasks, such as a report or complex problem with sections contributed by each team member; and (d) interdependent roles, such as having group members serve as discussion leaders, organizers, recorders, and spokespersons.

2. Individual accountability promotes fair evaluation.
No matter how much mutual support, coaching, and encouragement they receive, students must be individually responsible for their own academic achievements. Because students have been acclimated to academic settings where they compete against fellow classmates, this aspect of cooperative group work is reassuring: final course grades will be based on personal efforts, uncompromised and uncomplicated by the achievements of others. Teachers can grade quizzes, projects, and final exams just as they would in a class where group work is not the norm.

Positive interdependence and individual accountability can be fostered through carefully structured in-class activities. For example, when students receive a specific task such as worksheet or case study to complete cooperatively, teachers can tell students that one group member — unidentified ahead of time — will be responsible for reporting the group's work. This is a cooperative structure called "Numbered Heads Together" (Kagan, 1989), "Problem Solving Lesson" (Johnson, Johnson, and Smith, 1991), or "Structured Problem-Solving" (Millis and Cottell, 1998). Such an approach has several positive outcomes: (a) It encourages all students to learn the material because they don't know who will be called upon; (b) It encourages weaker students to request — and typically receive — peer coaching; (c) It encourages shyer or less-able students to accept leadership roles because their selection as the spokesperson is random and the report they give is not their personal report, but the team's.

3. A clear, non-competitive, criterion-referenced grading scheme encourages cooperation.
Both positive interdependence and individual accountability can also be affected by the grading system adopted. Nothing undercuts a cooperative classroom more than a grading system that pits students against one another in competition for a set number of A's or B's. In contrast, a criterion-referenced grading scheme allows all students to receive appropriate grades. Standards should be high, but they should theoretically be within the grasp of all students who work cooperatively toward the established benchmark.

Another grading concern relates to grades for team projects. Undifferentiated group grades for a single project, particularly if the majority of the work is expected out-of-class, invite inequity problems — or even ethical or legal issues — and undermine individual accountability. Too often one student ends up doing the majority of the work. That student often relishes the power associated with this role but resents the lack of input from students who will benefit from the same grade. The students who contribute little receive signals that their efforts are unappreciated or unwanted, and they learn a negative lesson: they can receive a grade they did not earn. Thus, it is important to build in accountability through responsible peer and self-assessment so that all students receive grades reflecting their contributions. Some instructors, especially those in preprofessional disciplines, may argue that ''real world'' preparation should put students in situations where one team member's performance — or lack of performance — drags down the achievement of the team as a whole. In reality, no savvy corporate leader allows teams to dissolve in bickering or exclusive behavior when a contract or a job deadline is looming. Nor do responsible supervisors write the same performance appraisals for all their personnel.

4. Students and teachers should monitor group behaviors.
Group processing of behaviors and of social skills, such as listening and providing constructive feedback, often distinguish cooperative learning from less structured forms of group work. These proactive practices allow students to reflect on their learning process and outcomes. Group processing involves evaluating skills such as leadership, decision-making, communication, and conflict resolution. "Process" focuses not on the content, but on how the group is functioning. After an assignment or activity, for instance, students could respond to questions such as: ''Did all members of the group contribute?'' ''What could be done next time to make the group function better?'' or ''What were the most important things I learned today?"

Social skills are important, although students may not initially see their connection with academic learning. Interpersonal skills go well beyond mere politeness. Students should understand the value of cooperative interaction and mutual respect in adult living. Teachers should model appropriate social skills, including ways of providing constructive feedback or eliciting more in-depth responses through probing questions. They can also reinforce these social skills by publicly commenting on ways students use them effectively.

In a cooperative classroom, the teacher monitors group behavior and learning by moving group to group as teams complete cooperative tasks. Teachers benefit by: (a) discovering what students actually know or when and why they are struggling; (b) encouraging, through their proximity, students to remain on task; (c) building rapport by showing obvious interest in students' progress; (d) being perceived as "approachable," a special advantage for students afraid to ask "dumb" questions in front of the entire class; (e) learning new ways to approach material by hearing students translate ''professorese'' into concepts their peers can understand; and (f) acquiring opportunities to integrate ideas overheard into a follow-up mini-lecture, building self-esteem in the designated students and their teams and signaling to the class as a whole that student insights are valued.

5. Classroom Assessment Techniques (CATs) can shed light on student progress.
Monitoring can also include written exercises designed to find out if students are learning what teachers think they are teaching. Angelo and Cross (1993) offer fifty techniques for assessing student learning. Many of these, such as the One-Minute Paper or the Muddiest Point, can be conducted, analyzed, and "debriefed" rapidly. Classroom assessment practices not only help teachers understand the extent of student learning, but they also get students involved in monitoring their own academic progress. Most cooperative activities, when properly monitored, have assessment value.

A Visible Quiz (Staley, 2003, 104–110), for example, when conducted cooperatively, can help both students and teachers determine how well students are grasping content and concepts. In a Visible Quiz, students in pairs or small groups discuss the appropriate response to quiz questions typically displayed on an overhead screen. The answers can be multiple choice (A, B, C, or D) or True (T) and False (F). Each team has a set of color-coded cards (all A's could be orange, for example, and all T's, blue). At a given signal, one person from each team displays the team's choice. A quick survey of the room shows how well students understood the question. If most students gave inappropriate responses, then an impromptu mini-lecture can capitalize on the "teachable moment." Groups can also explain the rationale for their inappropriate selection, a process that may uncover misconceptions or poorly constructed, ambiguous questions. Besides proving immediate feedback for both students and teachers, this technique also promotes peer coaching when the teams discuss each question. Johnston and Cooper (1997, p. 4) label a variation of the Visible Quiz, ''Select the Best Response.''

Even in-class activities as relatively straightforward as a Visible Quiz need to be appropriately introduced.

Establishing a Cooperative Activity

Four important guidelines can help teachers and students establish — and value — cooperative activities.

1. Teachers should think through the proposed group activity by answering key questions.
A pundit once quipped: "If you don't know where you're going, you'll probably end up somewhere else." This saying is certainly true for group activities. As a general rule, teachers will want to ask themselves the following questions: What will I do? Why am I doing it? How will this activity further my course objectives? How will I introduce this activity to students? How will I form groups? How will I monitor students' interactions and learning? How will I foster positive interdependence (goal, resource materials, evaluation methods, roles, etc.)? How will I maintain individual accountability? How will I access student learning, student interactions/contributions, and the overall success of the activity? What problems/challenges do I expect? Careful planning tied to course objectives is essential.

2. Students need to understand the nature and value of the proposed activity.
Many students will come to classes with learning styles that predispose them to work independently. Furthermore, they may have been "burned" in the past by ineptly managed group work. Thus, they must understand why group interactions will further immediate course goals and lead to other desirable outcomes such as acquiring the teamwork skills needed in the modern work place.

3. Clear instructions are essential.
Group work can be frustrating for both students and faculty if instructions are unclear. Students may question a teacher's organizational skills, and they may waste precious class time puzzling over directions. For complex tasks, teachers can provide instructions as handouts given either to individuals or to teams. Projecting tasks and expectations on a screen or writing them on a chalkboard can prove helpful. For simpler activities, asking a single student or the class to repeat the instructions will reinforce them.

Clear instructions not only explain the task, but they also specify the time involved. Students cannot manage their time wisely, even during short in-class activities, if they cannot plan ahead. As a general rule, it is better to allow too little time and then expand it as needed rather than to give students a twenty-minute in-class activity that many groups will complete in ten.

Studies, such as *The Seven Principles for Good Practice in Undergraduate Education* (Chickering and Gamson, 1987), have identified "time on task" as a factor critical to student achievement. To maximize time on task, teachers can include in the instructions a "sponge" or extension activity that teams turn to if they complete the initial assignment early. This "sponge" typically involves more challenging problems to solve or more complex issues to discuss.

4. Students appreciate a sense of closure.
As indicated earlier, students may be unwilling group members unless they see the value of cooperative learning. The instructor must avoid the appearance of "toying" with

students by withholding information while a group struggles with a difficult problem. Generally, it is appropriate to offer help when all group members admit that they need it. A better tactic might be to send a student "adviser" from a different learning team.

Sometimes the instructor, as the authority, will need to summarize a lesson, validating the learning that has occurred in groups. Report-outs — particularly those that do not take too much time — can provide a sense of closure. When time is short, reporters can e-mail the group report for later circulation or for posting on a course web page.

E-mail reports work well, for example, for class summaries of an activity called Roundtable. Roundtable, a cooperative learning structure useful for brainstorming, reviewing, predicting, or practicing a skill, uses a single sheet of paper and pen for each cooperative learning group. In response to a question or problem, students in turn state their ideas aloud as they write them on the paper. Team members ideally should not skip turns, but if their thoughts are at a standstill, then they are allowed to say ''Pass'' rather than turn the brainstorm into a brain drizzle.

Roundtable is most effective when used in a carefully sequenced series of activities. The brainstorming can reinforce ideas from the readings or can be used to set the stage for upcoming discussions. Students, for example, could identify the characteristics of an effective leader or the attributes of terrorism before these topics are formally introduced. Comparing a student-generated list with those of "experts" creates interest. The multiple answers encourage creativity and deeper thinking. This activity builds positive interdependence among team members because of the shared writing surface. More importantly, it builds team cohesion and reinforces the power of teamwork because students see in action the value of multiple viewpoints and ideas.

Organizing Groups/Teams Effectively

Three guidelines can optimize team cohesion and eliminate many of the dysfunctional aspects of groups.

1. Group size should remain small.
Most teachers experienced with group work advocate groups composed of three to four students. Four, or a quad, is generally considered the ideal because the group is large enough to contain students who will bring diverse opinions, experiences, and learning styles to aid in problem solving. If a group member is absent, the group can continue to function smoothly. A group of four is not so large, however, that students can hide. All must carry their fair share of the workload. A quad has the additional advantage of offering easy pair formation within the group.

2. Teacher-selected heterogeneous groups usually function better than randomly selected or student-selected groups.
Stein and Hurd (2000, p. 12) state: "Teams should be heterogeneous: diverse in gender, ethnic background, and academic ability." Felder and Brent (1994, p. 7) give a reasoned case for heterogeneity in ability:

> The drawbacks of a group with only weak students are obvious, but having only strong students in a group is equally undesirable. First, the strong groups have an unfair advantage over other groups in the class. Second, the team members tend to divide up the homework and communicate only cursorily with one another, omitting the dynamic interactions that lead to most of the proven benefits of cooperative learning. In mixed ability groups, on the other hand, the weaker students gain from seeing how better students study and approach problems, and the strong students gain a deeper understanding of the subject by teaching it to others.

Besides enhancing the likelihood of success with academic tasks, heterogeneous grouping will typically permit students to work constructively with varied individuals who bring different strengths and approaches to academic tasks. Positive interactions with diverse individuals prepare students for the modern work place and for society as a whole.

It is wise to explain to students the rationale for grouping them rather than allowing them to select their own teammates. Self-selected groups tend to be homogenous, reducing the likelihood of divergent thinking. Roles and expectations tend be more fixed, eliminating the "dating dance" where students unknown to one another are on their best behaviors.

3. Groups should remain together long enough to establish positive working relationships and to develop team-building.
It is dangerous to assume that students will bring with them the skills needed to function effectively in cooperative groups. Permanent learning teams should remain together long enough to pass through the "forming," "storming," "norming," "performing," and "adjourning" phases cited in the group dynamics literature (Tuckman, 1965; Tuckman & Jensen, 1977). Students need time to become acquainted, to identify one another's strengths, and to learn to support and coach one another. Most practitioners recommend that groups remain together for the duration of an extended project or for a series of ongoing activities, usually for about half a semester. It is important to clearly explain to students when and why they will be re-grouped to forestall the inevitable laments that come from closely bonded teams "rent asunder."

Managing Group Activities

Instructors concerned about wasted time want to move quickly in and out of group work. Thus, students noisily engaged in group activities must understand that when they receive a given signal, they must give the teacher their immediate attention. In small classes, merely calling "time" may suffice. In larger classes, it may be necessary to use a visual signal such as a raised hand (called a quiet signal,

students raise their hand also as they cease talking to create a ripple effect). Combining the quiet signal with an auditory signal such as a timer beep helps to conclude the activity as well as to keep track of time.

With effective classroom management, many cooperative activities can be completed within a few minutes. A Think-Pair-Share, for example, gives students thirty-seconds of "wait time" to ***think*** independently on the answer to a content-related question or a critical question such as, "I've been lecturing for the past fifteen minutes. Please summarize the three most important points I've made." (To contribute to classroom assessment, many instructors allow two minutes for students to write their responses on index cards for later collection and review.) Then students ***pair*** to compare their responses, rehearse their answers, and receive feedback on their ideas. During the third phase, students are called on to respond (***share***). Those with raised hands will now typically include introverts who have had time for reflection; shy students who have received reinforcement; and thoughtful students who have "processed" the question in depth. A quiet signal helps teachers move through these phases expeditiously.

Time is also saved by using team folders — even in a small class — when students are assigned to permanent (course-long) or semi-permanent groups (typically half-a-term). At the beginning of each class session, a designated group member picks up the team folder, which contains all relevant class materials and papers to be returned. During class, students put in the folder their homework and any in-class written activities, including classroom assessment responses such as the Think-Pair-Share index cards or a Roundtable sheet. The designated student returns the folder to the instructor at the conclusion of class. Students can use sheets stapled in the folder to keep track of attendance or homework completion.

To delineate tasks and assign roles rapidly, it is important to identify quickly both teams and team members. Students can number off within their teams (one, two, three, four), or teams and team members can be identified through the use of playing cards. The playing cards allow teachers to communicate readily to the students their group assignments (by the rank of the card) and the roles they are to play within that group (by the suit of the card). They also enable the instructor to keep track of students already called upon — an equity concern — by checking off from an ongoing list, for example, the "Jack of Hearts" or the "Two of Clubs." When extra members are added, bringing some team totals to five, jokers (called "wild cards") can be used for the fifth member, who fills in for anyone absent. For ready identification in larger classes, two or more decks of cards can be used — red and blue-backed, for example — with different colored folders corresponding to each different deck of cards.

The roles assigned within the groups — typically leader, recorder, reporter, and folder monitor — should be rotated frequently to form positive interdependence. This practice discourages domination by one person, a problem common in less structured group work, and gives all students an opportunity to practice various social, communication, and leadership skills.

Team-building activities can build team cohesion, but they should never be frivolous, off-task exercises. Content-based activities, such as a Three-Step Interview, encourage students to focus on the course material, while interacting positively with one another. In a Three-Step Interview, one student interviews another within specified time limits (step one). An extra question can be added for pairs working more rapidly than others, the ''extension'' or ''sponge'' recommended for many cooperative learning activities. The two then reverse roles and conduct the interview again (step two). The students then form a quad where students share not their own viewpoints, but the information or insights gleaned from their partners (step three). This structure reinforces listening and probing skills, helps students process and rehearse information, and results in shared insights. Teachers can encourage preparation by announcing, "Chapter Eight is so important that I will be asking you to interview one another to be certain that you understand the critical concepts." Used at the beginning of a class period, the content-based questions give students immediate feedback on their understanding of the assigned material. As teachers monitor the interviews, they can determine how well the students have responded to the readings and incorporate some of their ideas in a follow-on lecture/discussion.

No matter how carefully teachers plan, some things will invariablygo wrong. Risk-taking, however, is essential for professional growth. The point is not to give up ("Oh, I tried cooperative learning, and it didn't work at all"). A myriad of helpful books, articles, and websites, such as those found in the references or at http://www.tltgroup.org/resources/millis.html, offer constructive advice. Faculty members can ask knowledgeable colleagues or faculty development consultants to observe their classes, or they can sit in on theirs. Faculty can also attend cooperative learning workshops that model classroom management techniques and activities such as the Double Entry Journal, Structured Problem Solving, Think-Pair-Share, Visible Quiz, Roundtable, and Three-Step Interview discussed here.

Conclusion

Faculty understanding the research and theory behind cooperative learning — and the classroom management techniques that insure smooth implementation — can adapt it to virtually any curriculum. As a result, learning can be deepened, students will enjoy attending classes, and they will come to respect and value the contributions of their fellow classmates. Millis (2000–2001, p. 4) explains why cooperative learning is far from a "trendy" fad:

> It allows us to be student-centered without abrogating the responsibility of shaping a class based on our experience and expertise. It provides us with the tools

to structure activities that maximize learning. It helps us foster not only learning, but also a host of other positive outcomes such as increased self-esteem, respect for others, and civility. It can transform our large, diverse lecture classes into a community of supportive teams. Cooperative learning satisfies, for students, a human desire for connection and cooperation. In addition to keeping them energized and awake, it gives them the social support to tackle complex tasks impossible to complete alone. It gives them essential social and communication skills needed for success in the workplace. Finally, for both teachers and students, cooperation makes learning fun.

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Roundtable

Passing this sheet of paper rapidly from one person to another, please jot down in any order the barriers to active/cooperative learning—your own, your students', your colleagues, or your institution's.

Structured Problem Solving/Numbered Heads Together

Be certain that every person in your group has a playing card with a suit identity. Working as a team, focus on ***one*** of the barriers you identified above. Think of as many viable solutions as you can. How might these barriers be overcome? If you conclude your discussion about one barrier in the allotted time, please focus on a second one.