

# Cooperative Learning

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<http://personal.cege.umn.edu/~smith/links.htm>

Phys 5072

February 29, 2016

## Session Layout

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Welcome & Overview

Cooperative Learning

- Description & Rationale
- Cooperative Learning
  - Key Concepts
  - Types of Cooperative Learning

Teamwork – High Performing Teams & Teamwork Skills

Implementing Cooperative Learning

- Practice
- Examples
- Applications

## Overall Goals

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- ☐ Build your knowledge of Evidence-Based Teaching Practices and your implementation repertoire
- ☐ Implement practices to improve student learning

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## Cooperative Learning Objectives

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Participants will be able to list and describe essential features of the instructor's role in implementing cooperative learning

Participants will be able to elaborate on multiple ways Positive Interdependence and Individual Accountability were structured

Participants will identify features to implement in their own courses

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## Reflection and Dialogue

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Individually reflect on your favorite **rationale** for Cooperative Learning. Write for about 1 minute.

- Context/Audience? E.g., First Year course
- Why cooperative learning is important?
- What support do you have for your rationale?

Discuss with your neighbor for about 2 minutes

- Select/create a response to present to the whole group if you are randomly selected

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## Seven Principles for Good Practice in Undergraduate Education

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Good practice in undergraduate education:

- Encourages student-faculty contact
- Encourages cooperation among students
- Encourages active learning
- Gives prompt feedback
- Emphasizes time on task
- Communicates high expectations
- Respects diverse talents and ways of learning

Chickering & Gamson. (1987). <http://learningcommons.evergreen.edu/pdf/fall1987.pdf>

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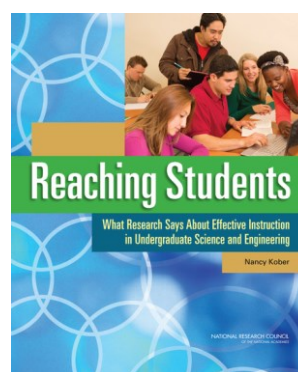
# Discipline-Based Education Research (DBER) Report



National Research Council  
Summer 2012 –  
[http://www.nap.edu/catalog.php?record\\_id=13362](http://www.nap.edu/catalog.php?record_id=13362)



ASEE Prism Summer 2013  
*Journal of Engineering Education* – October, 2013

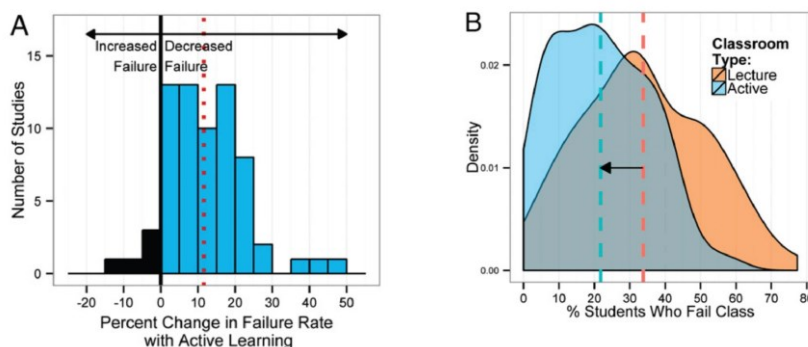


National Research Council – 2015  
<http://www.nap.edu/catalog/18687/reaching-students-what-research-says-about-effective-instruction-in-undergraduate>

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## Engaged Pedagogies = Reduced Failure Rates

Evidence-based research on learning indicates that when students are actively involved in their education they are more successful and less likely to fail. A new PNAS report by Freeman et al., shows a significant decrease of failure rate in active learning classroom compared to traditional lecture



Freeman, Scott; Eddy, Sarah L.; McDonough, Miles; Smith, Michelle K.; Okoroafor, Nnadozie; Jordt, Hannah; Wenderoth, Mary Pat; Active learning increases student performance in science, engineering, and mathematics, 2014, *Proc. Natl. Acad. Sci.*

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“It could well be that faculty members of the twenty-first century college or university will find it necessary to set aside their roles as teachers and instead become **designers** of learning experiences, processes, and environments.”

James Duderstadt, 1999  
Nuclear Engineering Professor; Former  
Dean, Provost and President of the  
University of Michigan



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## Karl's Rationale

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First Teaching Experience – Third-year  
course in metallurgical reactions –  
thermodynamics and kinetics

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Lila M. Smith

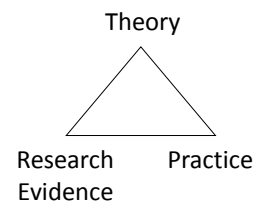
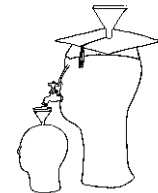
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## Engineering Education

Practice – Third-year course in metallurgical reactions – thermodynamics and kinetics

Theory – ?

Research – ?

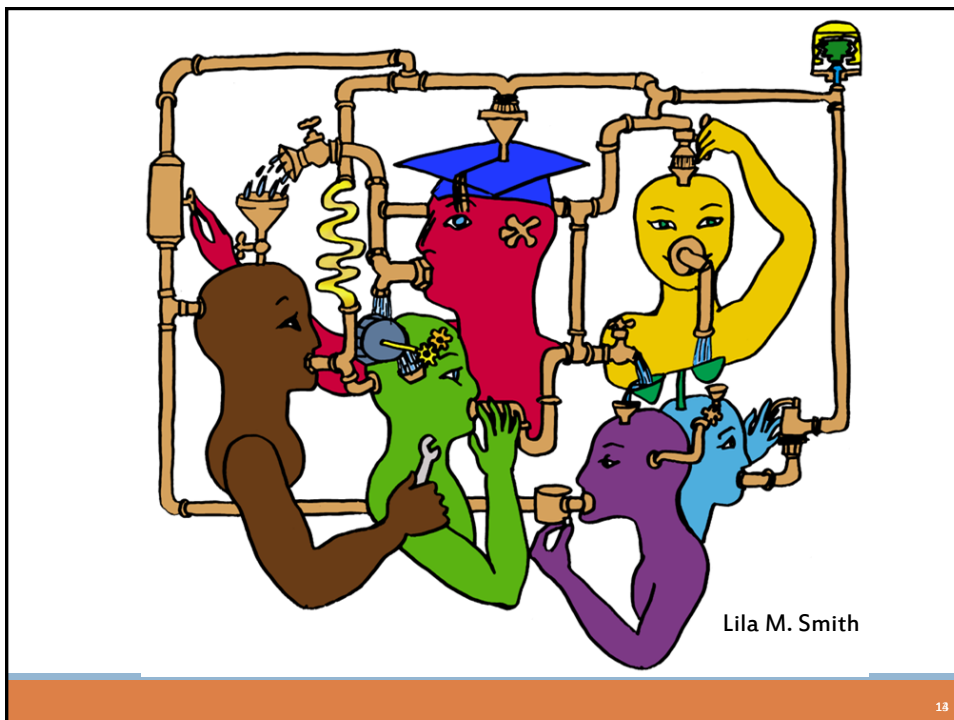


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## University of Minnesota College of Education Social, Psychological and Philosophical Foundations of Education

- Statistics, Measurement, Research Methodology
- Assessment and Evaluation
- Learning and Cognitive Psychology
- Knowledge Acquisition, Artificial Intelligence, Expert Systems
- Development Theories
- Motivation Theories
- Social psychology of learning – student – student interaction

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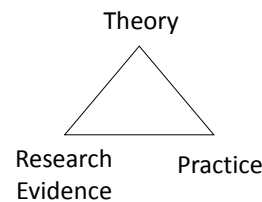
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# Cooperative Learning

Theory – Social Interdependence – Lewin –  
Deutsch – Johnson & Johnson

Research – Randomized Design Field  
Experiments

Practice – Formal Teams/Professor's Role



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**Cooperative Learning** is instruction that involves people working in teams to accomplish a common goal, under conditions that involve both *positive interdependence* (all members must cooperate to complete the task) and *individual and group accountability* (each member is accountable for the complete final outcome).

## Key Concepts

- Positive Interdependence
- Individual and Group Accountability
- Face-to-Face Promotive Interaction
- Teamwork Skills
- Group Processing

Cooperative Learning	
Positive Interdependence	Individual Accountability
<p><b>Goal Interdependence</b> essential:</p> <ol style="list-style-type: none"> <li>1. All members share resources</li> <li>2. All members improve</li> <li>3. All group members agree to get personal group score</li> <li>4. One product from group that all helped with and can explain</li> </ol> <p><b>Role Interdependence</b></p> <p>Assign each member a role and make them</p> <p><b>Resource Interdependence</b></p> <ol style="list-style-type: none"> <li>1. Limit resources (one set of materials)</li> <li>2. Assign resources</li> <li>3. Separate contributions</li> </ol> <p><b>Task Interdependence</b></p> <ol style="list-style-type: none"> <li>1. Randomize</li> <li>2. Check functions</li> </ol> <p><b>Outside Challenge Interdependence</b></p> <ol style="list-style-type: none"> <li>1. Assign group competition</li> <li>2. Other class competition</li> </ol> <p><b>Ability Interdependence</b></p> <p>Mix ability (strong, middle, weak)</p> <p><b>Individual Interdependence</b></p> <ol style="list-style-type: none"> <li>1. Designated classroom space</li> <li>2. Group has special meeting place</li> </ol> <p><b>Timing Interdependence</b></p> <p>Physical interdependence in classroom</p> <p>"You are a scientist/library of the team, find on the movie, etc."</p> <p><b>Reward/Consequence Interdependence</b></p> <ol style="list-style-type: none"> <li>1. Challenge group reward</li> <li>2. Bonus points (one with each)</li> <li>3. Single group points (one for all)</li> </ol>	<p><b>Steps to ensure no shirkers</b></p> <ul style="list-style-type: none"> <li>• Keep group size small (3-4)</li> <li>• Assign roles</li> <li>• Randomly select one member of the group to represent the group</li> <li>• Have students do work before group meets</li> <li>• Have students use their group learning to do an individual task afterward</li> <li>• Randomize signs ("participated," "agreed," "can explain")</li> <li>• Observe &amp; record individual contributions</li> </ul> <p><b>Steps to ensure that all members learn</b></p> <ul style="list-style-type: none"> <li>• Practice role</li> <li>• Ask each other's work and sign agreement</li> <li>• Randomly check one paper from each group</li> <li>• Give individual task</li> <li>• Assign the role of teacher who has each group member explain task</li> <li>• Encourage explaining each student explains their learning to a new partner</li> </ul> <p><b>Face-to-Face Interaction</b></p> <p><b>Structure</b></p> <ul style="list-style-type: none"> <li>• Time for groups to meet</li> <li>• Group members share together</li> <li>• Small group size of four or three</li> <li>• Reward and external</li> <li>• Strong positive interdependence</li> <li>• Commitment to each other's learning</li> <li>• Positive social skill use</li> <li>• Collaborative for encouragement, effort, help, and success</li> </ul>

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# Cooperative Learning Introduced to Engineering – 1981

Smith, K.A., Johnson, D.W. and Johnson, R.T., 1981. The use of cooperative learning groups in engineering education. In L.P. Grayson and J.M. Biedenbach (Eds.), *Proceedings Eleventh Annual Frontiers in Education Conference*, Rapid City, SD, Washington: IEEE/ASEE, 26-32.

## Structuring Learning Goals To Meet the Goals of Engineering Education

Karl A. Smith,  
David W. Johnson, and Roger T. Johnson  
University of Minnesota

The growing concern about engineering education in the United States has led to a re-examination of the goals of engineering education and a search for ways to meet these goals. This paper is devoted to the development of learning goals and the design of instruction to meet these goals. The authors argue that the goals of engineering education are to prepare students to solve problems, to work with others, and to learn to learn. The authors argue that the goals of engineering education are to prepare students to solve problems, to work with others, and to learn to learn.

The three major goals of engineering education are to prepare students to solve problems, to work with others, and to learn to learn. The authors argue that the goals of engineering education are to prepare students to solve problems, to work with others, and to learn to learn. The authors argue that the goals of engineering education are to prepare students to solve problems, to work with others, and to learn to learn.

the interaction between society and technology.

### Needs of Engineering Graduates

Many studies have been conducted on engineering education since it began in 1780, and there have been many recommendations. The authors argue that the goals of engineering education are to prepare students to solve problems, to work with others, and to learn to learn.

1. There is a general consensus that, despite many efforts, engineering education is not yet meeting what is called the "humanistic goals" of engineering education.

2. Engineering education must be more socially oriented, that is, engineering must build bridges between science and the needs of society.

3. Engineers must be made more aware of the importance of engineering in American life, engineers have not taken a correspondingly important part in the decision-making process.

The recommendations of these studies are similar and consistent, but the need for change in engineering education remains. Currently, there appears to be a more away from the stage of applied science to engineering education. The task of the next period change is the growing realization that technology and economic feasibility are not the sole or even the most important of engineering education.

The results of the major studies of engineering education lead to strong work the need for developing social-technical competence and interpersonal competence in engineering graduates. Supporting this need, a major study at the University of California, Los Angeles, concluded that engineering graduates must be capable of communicating with and working with people of other professions to solve the interaction between society and technology.

JEE December 1981

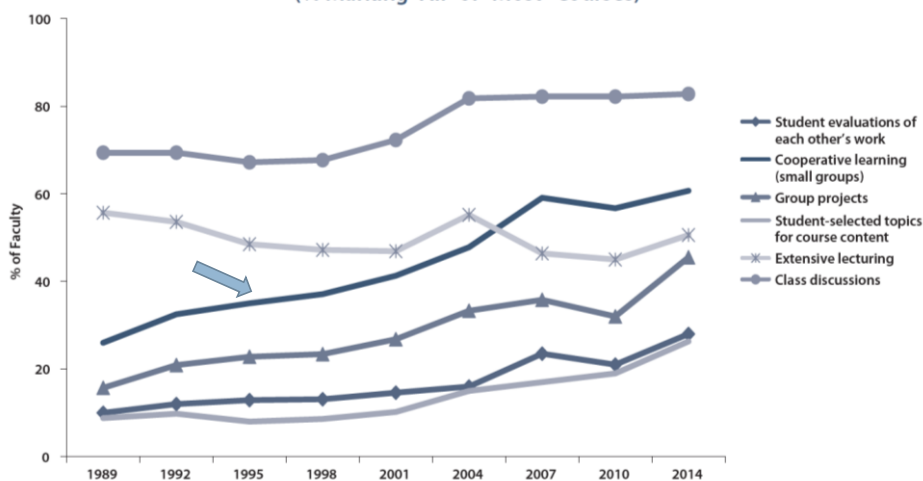
PROCEEDINGS EDUCATION 1981 / 321

[http://personal.cege.umn.edu/~smith/docs/Smith-Pedagogies\\_of\\_Engagement.pdf](http://personal.cege.umn.edu/~smith/docs/Smith-Pedagogies_of_Engagement.pdf)

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## Undergraduate Teaching Faculty: The 2013–2014 HERI Faculty Survey

Figure 2. Changes in Faculty Teaching Practices, 1989 to 2014  
(% Marking "All" or "Most" Courses)



<http://heri.ucla.edu/monographs/HERI-FAC2014-monograph.pdf>

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## Cooperative Learning Research Support

Johnson, D.W., Johnson, R.T., & Smith, K.A. 1998. Cooperative learning returns to college: What evidence is there that it works? *Change*, 30 (4), 26-35.

- Over 300 Experimental Studies
- First study conducted in 1924
- High Generalizability
- Multiple Outcomes

### Outcomes

1. Achievement and retention
2. Critical thinking and higher-level reasoning
3. Differentiated views of others
4. Accurate understanding of others' perspectives
5. Liking for classmates and teacher
6. Liking for subject areas
7. Teamwork skills



January 2005



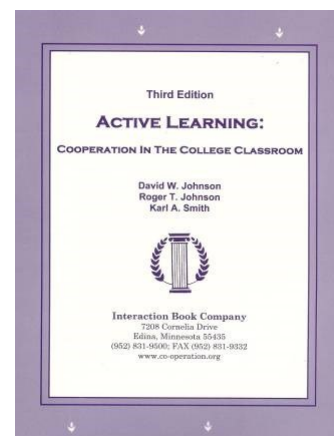
March 2007

Johnson, D. W., Johnson, R. T., & Smith, K. A. (2014). Cooperative learning: Improving university instruction by basing practice on validated theory. *Journal on Excellence in College Teaching*, 25(3&4)

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## Active Learning: Cooperation in the College Classroom

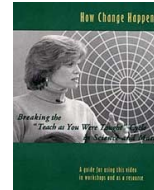
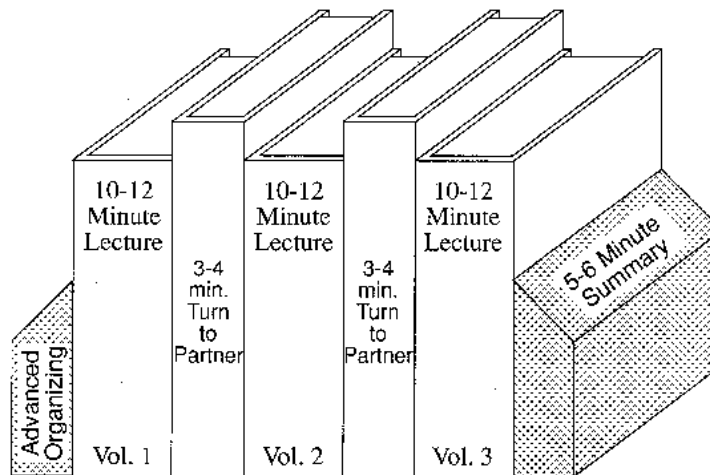
- ➔ **Informal Cooperative Learning Groups**
- Formal Cooperative Learning Groups**
- Cooperative Base Groups**



Notes: Cooperative Learning Handout (CL-College-814.doc)  
[\[CL-College-814.doc\]](#)

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## Book Ends on a Class Session



Smith, K.A. 2000. Going deeper: Formal small-group learning in large classes. Energizing large classes: From small groups to learning communities. *New Directions for Teaching and Learning*, 2000, 81, 25-46. [NDTL81Ch3GoingDeeper.pdf]

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## Informal Cooperative Learning Groups

Can be used at any time

Can be short term and ad hoc

May be used to break up a long lecture

**Provides an opportunity for students to process material they have been listening to (Cognitive Rehearsal)**

Are especially effective in large lectures

Include "book ends" procedure

Are not as effective as Formal Cooperative Learning or Cooperative Base Groups

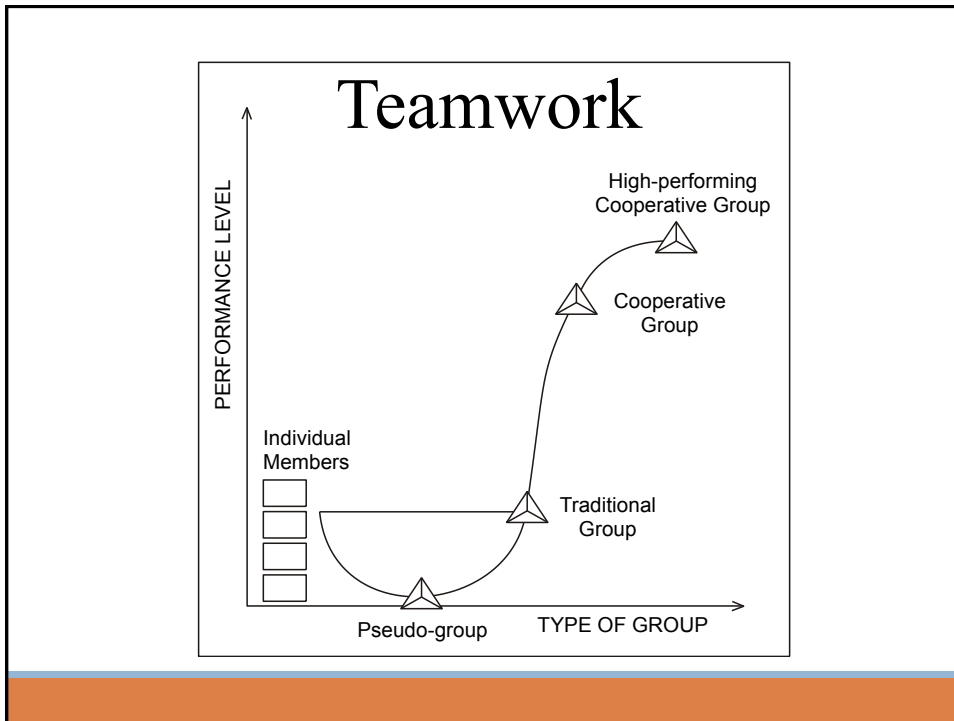
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Informal Cooperative Learning Planning Form	
<b>DESCRIPTION OF THE LECTURE</b>	
1. Lecture Topic: _____	
2. Objectives (Major Understandings Students Need To Have At The End Of The Lecture):	
a. _____	
b. _____	
3. Time Needed: _____	
4. Method For Assigning Students To Pairs Or Triads: _____	
5. Method Of Changing Partners Quickly: _____	
6. Materials (such as transparencies listing the questions to be discussed and describing the formulate, share, listen, create procedure): _____	
<b>ADVANCED ORGANIZER QUESTION(S)</b>	
Questions should be aimed at promoting advance organizing of what the students know about the topic to be presented and establishing expectations as to what the lecture will cover.	
1. _____	
2. _____	
3. _____	
<b>COGNITIVE REHEARSAL QUESTIONS</b>	
List the specific questions to be asked every 10 or 15 minutes to ensure that participants understand and process the information being presented. Instruct students to use the formulate, share, listen, and create procedure.	
1. _____	
2. _____	
3. _____	
4. _____	
Monitor by systematically observing each pair. Intervene when it is necessary. Collect data for whole class processing. Students explanations to each other provide a window into their minds that allows you to see what they do and do not understand. Monitoring also provides an opportunity for you to get to know your students better.	
<b>SUMMARY QUESTION(S)</b>	
Give an ending discussion task and require students to come to consensus, write down the pair or triad's answer(s), sign the paper, and hand it in. Signatures indicate that students agree with the answer, can explain it, and guarantee that their partner(s) can explain it. The questions could (a) ask for a summary, elaboration, or extension of the material presented or (b) preface the next class session.	
1. _____	
2. _____	
<a href="http://personal.cege.umn.edu/~smith/">http://personal.cege.umn.edu/~smith/</a>	
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## Structuring Teamwork in the Classroom



### Formal Cooperative Learning Task Groups



## Reflection and Dialogue

Individually reflect on the Characteristics of High Performing Teams. Think/Write for about 1 minute

- Base on your experience on high performing teams,
- Or your facilitation of high performing teams in your classes, or
- Or your imagination

Discuss with your team for about 2 minutes and record a list

## Characteristics of High Performing Teams

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☐ ?

☐ ?

A team is a small number of people with complementary skills who are committed to a common purpose, performance goals, and approach for which they hold themselves mutually accountable:

- ☐ SMALL NUMBER
- ☐ COMPLEMENTARY SKILLS
- ☐ COMMON PURPOSE & PERFORMANCE GOALS
- ☐ COMMON APPROACH
- ☐ MUTUAL ACCOUNTABILITY

--Katzenbach & Smith (1993)

*The Wisdom of Teams*

**Cooperative Learning** is instruction that involves people working in teams to accomplish a common goal, under conditions that involve both *positive interdependence* (all members must cooperate to complete the task) and *individual and group accountability* (each member is accountable for the complete final outcome).

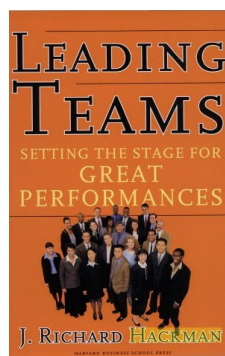
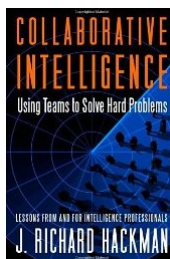
## Key Concepts

- ☐ Positive Interdependence
- ☐ Individual and Group Accountability
- ☐ Face-to-Face Promotive Interaction
- ☐ Teamwork Skills
- ☐ Group Processing

<http://personal.cege.umn.edu/~smith/docs/Smith-CL%20Handout%2008.pdf>

Cooperative Learning	
Positive Interdependence	Individual Accountability
<p><b>Goal Interdependence (essential):</b></p> <ol style="list-style-type: none"> <li>1. All members share resources</li> <li>2. All members improve</li> <li>3. Add group member scores to get overall group score</li> <li>4. One product from group that all helped with and can explain</li> </ol> <p><b>Role (Choir) Interdependence</b> Assign each member a role and make them:</p> <p><b>Resource Interdependence</b> Assign each member a role and make them:</p> <ol style="list-style-type: none"> <li>1. Limit resources (one set of materials)</li> <li>2. Explain materials</li> <li>3. Separate contributions</li> </ol> <p><b>Task Interdependence</b></p> <ol style="list-style-type: none"> <li>1. Random roles</li> <li>2. Chain Reaction</li> </ol> <p><b>Outside Challenge Interdependence</b></p> <ol style="list-style-type: none"> <li>1. Inter-group competition</li> <li>2. Other class competition</li> </ol> <p><b>Identity Interdependence</b> (Mutual identity: names, motto, etc.)</p> <p><b>Environmental Interdependence</b></p> <ol style="list-style-type: none"> <li>1. Designated classroom space</li> <li>2. Group has specific meeting place</li> </ol> <p><b>Positive Interdependence</b> Interpersonal interdependence or obligation ("You are a specific person's partner, team, etc.")</p> <p><b>Reward/Collaboration Interdependence</b></p> <ol style="list-style-type: none"> <li>1. Collaborate joint success</li> <li>2. Bonus points (one with each)</li> <li>3. Single group grade (refer to all)</li> </ol>	<p><b>Ways to ensure no slackers</b></p> <ul style="list-style-type: none"> <li>• Assign group size (2-4)</li> <li>• Assign roles</li> <li>• Randomly ask one member of the group to explain the learning</li> <li>• Have students do work before group meets</li> <li>• Have students use their group learning to do an individual task afterward</li> <li>• Everyone signs "I participated, I agree, and I can explain"</li> <li>• Observe &amp; record individual contributions</li> </ul> <p><b>Ways to ensure that all members learn:</b></p> <ul style="list-style-type: none"> <li>• Practice tests</li> <li>• Ask each other's work and sign agreement</li> <li>• Randomly check one paper from each group</li> <li>• Give individual tests</li> <li>• Assign the role of checker who has each group member explain out loud</li> <li>• Randomness explaining each student explains their learning to a new partner</li> </ul> <p><b>Face-to-Face Interaction</b></p> <p><b>Structure:</b></p> <ul style="list-style-type: none"> <li>• Time for groups to meet</li> <li>• Group members close together</li> <li>• Small group size of two or three</li> <li>• Frequent and rehearsal</li> <li>• Strong positive interdependence</li> <li>• Commitment to each other's learning</li> <li>• Positive social skill set</li> <li>• Collaborations for encouragement, effort, help, and success</li> </ul>

## Hackman – Leading Teams



Real Team  
Compelling Direction  
Enabling Structure  
Supportive Organizational Context  
Available Expert Coaching

Team Diagnostic Survey (TDS)

<https://research.wjh.harvard.edu/TDS/>

## Real Team

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clear boundaries

team members are **interdependent** for some **common purpose**, producing a potentially assessable outcome for which members bear **collective responsibility**

at least moderate stability of membership

## Compelling Direction

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Good team direction is:

- challenging (which energizes members)
- clear (which orients them to their main purposes)
- consequential (which engages the full range of their talents)



# Enabling Structure

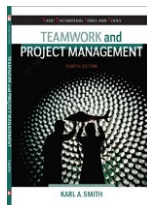
## Key structural features in fostering competent teamwork

- **Task design:** The team task should be well aligned with the team's purpose and have a high standing on "motivating potential."
- **Team composition:** The team size should be as small as possible given the work to be accomplished, should include members with ample task and interpersonal skills, and should consist of a good diversity of membership
- **Core norms of conduct:** Team should have established early in its life clear and explicit specification of the basic norms of conduct for member behavior.

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# Teamwork Skills

- ☐ Communication
  - Listening and Persuading
- ☐ Decision Making
- ☐ Conflict Management
- ☐ Leadership
- ☐ Trust and Loyalty



Chapters 3, 4, 5 & 6

Cooperative Teamwork Skills	Teaching Cooperative Skills
<b>Forming Skills</b> <i>Initial Management Skills</i> <ul style="list-style-type: none"> <li>Move Into Groups Quietly</li> <li>Stay With the Group</li> <li>Use Quiet Voices</li> <li>Take Turns</li> <li>Use Names, Look at Speaker</li> <li>No "Put-Downs"</li> </ul> <b>Functioning Skills</b> <i>Group Management Skills</i> <ul style="list-style-type: none"> <li>Share Ideas and Opinions</li> <li>Ask for Facts and Reasoning</li> <li>Give Direction to the Group's Work (state assignment purpose, provide time limits, offer procedure)</li> <li>Encourage Everyone to Participate</li> <li>Ask for Help or Clarification</li> <li>Express Support and Acceptance</li> <li>Offer to Explain or Clarify</li> <li>Paraphrase Others' Contributions</li> <li>Energize the Group</li> <li>Describe Feelings When Appropriate</li> </ul> <b>Formulating Skills</b> <i>Formal Methods for Processing Materials</i> <ul style="list-style-type: none"> <li>Summarize Out Loud Completely</li> <li>Seek Accuracy by Connecting/Adding to Summaries</li> <li>Help the Group Find Clever Ways to Remember</li> <li>Check Understanding by Demanding Vocalization</li> <li>Ask Others to Plan for Telling/Teaching Out Loud</li> </ul> <b>Forming Skills</b> <i>Stimulate Cognitive Conflict and Reasoning</i> <ul style="list-style-type: none"> <li>Criticize Ideas Without Criticizing People</li> <li>Differentiate Ideas and Reasoning of Members</li> <li>Integrate Ideas into Single Positions</li> <li>Ask for Justification on Conclusions</li> <li>Extend Answers</li> <li>Probe by Asking In-depth Questions</li> <li>Generate Further Answers</li> <li>Test Reality by Checking the Group's Work</li> </ul>	<ol style="list-style-type: none"> <li>Help students see the <b>need</b> to learn the skill.</li> <li>Help them <b>know how</b> to do it (T-chart).</li> <li>Encourage them to <b>practice</b> the skill daily.</li> <li>Help them <b>reflect on</b> process, &amp; refine use.</li> <li>Help them <b>persist</b> until skill is automatic.</li> </ol> <b>Monitoring, Observing, Intervening, and Processing</b> <i>Monitor</i> to promote academic & cooperative success <i>Observe</i> for appropriate teamwork skills; praise their use and remind students to use them if necessary <i>Intervene</i> if necessary to help groups solve academic or teamwork problems <i>Process</i> so students continuously analyze how well they learned and cooperated in order to continue successful strategies and improve when needed
	<b>Ways of Processing</b> <b>Positive Feedback:</b> <ol style="list-style-type: none"> <li>Have volunteer students tell the class something their partners did which helped them learn today.</li> <li>Have all students tell their partner(s) something the partner(s) did which helped them learn today.</li> <li>Tell the class helpful behaviors you saw today.</li> </ol> <b>Group Analysis:</b> <ol style="list-style-type: none"> <li>Name 3 things your group did today which helped you learn and work well together.</li> <li>Name 1 thing you could do even better next time.</li> </ol> <b>Cooperative Skill Analysis:</b> <ol style="list-style-type: none"> <li>Rate your use of the target cooperative skill: Great - Pretty Good - Needs work</li> <li>Decide how you will encourage each other to practice the target skill next time.</li> </ol> <b>Start:</b> "Tell your partners you're glad they're here." <b>End:</b> "Tell your partners you're glad they were here today. Thank them for helping."

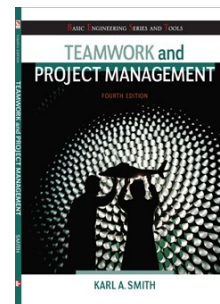
Interaction Book Company  
 3020 Madison Ave. S. Edina, MN 55424  
 (952)831-9500 Fax (952)831-9332  
 www.co-operation.org

**REFERENCES**  
 K.A. Smith, S.D. Sheppard, D.M. Johnson, & T. Johnson.  
 2005. Pedagogies of engagement: Classroom-based practices.  
*Journal of Engineering Education*, 94 (1), 85-102.  
 D.M. Johnson, K.T. Johnson, & K.A. Smith, 2006.  
*Active Learning Cooperation in the College Classroom*, 3rd  
 ed. Edina, MN: Interaction Book Company.

TEAMWORK	Teaching Cooperative Skills
	<ol style="list-style-type: none"> <li>1. Help students see the <b>need</b> to learn the skill.</li> <li>2. Help them <b>know how</b> to do it (T-chart).</li> <li>3. Encourage them to <b>practice</b> the skill daily.</li> <li>4. Help them <b>reflect on</b>, process, &amp; refine use.</li> <li>5. Help them <b>persevere</b> until skill is automatic</li> </ol> <p style="text-align: center;"><b>Monitoring, Observing, Intervening, and Processing</b></p> <p><b>Monitor</b> to promote academic &amp; cooperative success</p> <p><b>Observe</b> for appropriate teamwork skills: praise their use and remind students to use them if necessary</p> <p><b>Intervene</b> if necessary to help groups solve academic or teamwork problems.</p> <p><b>Process</b> so students continuously analyze how well they learned and cooperated in order to continue successful strategies and improve when needed</p>

## Team Charter

- ☐ Team name, membership, and roles
- ☐ Team mission
- ☐ Anticipated results (goal)
- ☐ Specific tactical objectives
- ☐ **Ground rules/ Guiding principles for team participation**
- ☐ Shared expectations/aspirations



pp. 60-61, 204-205

**Group Ground Rules Contract Form**

(Adapted from a form developed by Dr. Deborah Allen, University of Delaware)

Project groups are an effective aid to learning, but to work best they require that all groups members clearly understand their responsibilities to one another. These project group ground rules describe the general responsibilities of every member to the group. You can adopt additional ground rules if your group believes they are needed. Your signature on this contract form signifies your commitment to adhere to these rules and expectations.

All group members agree to:

1. Come to class and team meetings on time.
2. Come to class and team meetings with assignments and other necessary preparations done.

Additional ground rules:

1.

2.

If a member of the project team repeatedly fails to meet these ground rules, other members of the group are expected to take the following actions:

Step 1: (fill in this step with your group)

If not resolved:

Step 2: Bring the issue to the attention of the teaching team.

If not resolved:

Step 3: Meet as a group with the teaching team.

The teaching team reserves the right to make the final decisions to resolve difficulties that arise within the groups. Before this becomes necessary, the team should try to find a fair and equitable solution to the problem.

Member's Signatures:

Group Number: \_\_\_\_\_

1. \_\_\_\_\_

3. \_\_\_\_\_

2. \_\_\_\_\_

4. \_\_\_\_\_

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**P R O J E C T   T E A M   C O N T R A C T**

Project Name:

Team Members:

**Our Agreement**

- We all promise to listen to each other's ideas with respect.
- We all promise to do our work as best as we can.
- We all promise to do our work on time.
- We all promise to ask for help if we need it.
- We all promise to \_\_\_\_\_

If someone on our team breaks one or more of our rules, the team may have a meeting and ask the person to follow our agreement. If the person still breaks the rules, we will ask our teacher to help find a solution.

Date: \_\_\_\_\_

Team Member Signatures:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

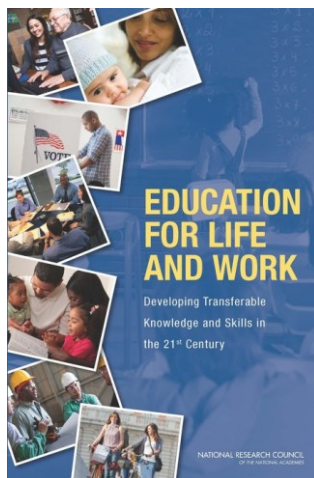
For more [FossilEdu](http://www.FossilEdu.com) visit [bie.org](http://www.bie.org)

©2011 BUCK INSTITUTE FOR EDUCATION

## Why Emphasize Teamwork?

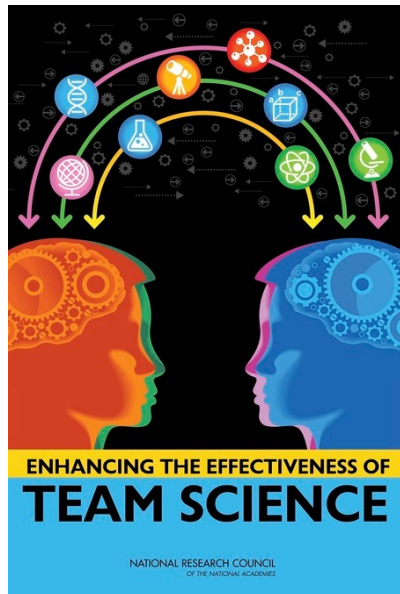
- ☐ **Student learning**
- ☐ Essential **transferrable skill** development
- ☐ Key to **innovation**
- ☐ High priority for **Employers**

## Education for Life and Work



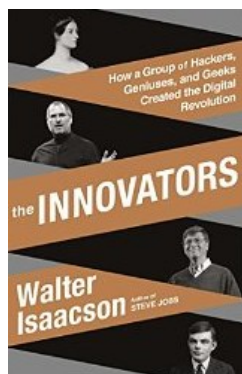
1. Introduction 15
2. A Preliminary Classification of Skills and Abilities 21
3. Importance of Deeper Learning and 21st Century Skills 37
4. Perspectives on Deeper Learning 69
5. Deeper Learning of English Language Arts, Mathematics, and Science 101
6. Teaching and Assessing for Transfer 143
7. Systems to Support Deeper Learning 185

<http://www.nap.edu/catalog/13398/education-for-life-and-work-developing-transferable-knowledge-and-skills>



*Conclusion. A strong body of research conducted over several decades has demonstrated that **team processes** (e.g., shared understanding of team goals and member roles, conflict) **are related to team effectiveness**. Actions and interventions that foster positive team processes offer the most promising route to enhance team effectiveness; they target three aspects of a team: team composition (assembling the right individuals), team professional development, and team leadership. (p. 7)*

<http://www.nap.edu/catalog/19007/enhancing-the-effectiveness-of-team-science>



This is the story of these pioneers, hackers, inventors, and entrepreneurs – who they were, how their minds worked, and what made them so creative. It's also a narrative of **how they collaborated and why their ability to work as teams made them even *more* creative**. The tale of their teamwork is important because we don't often focus on how central that skill is to innovation.



### Falling Short? College Learning and Career Success

Selected Findings from Online Surveys of  
Employers and College Students  
Conducted on Behalf of  
the Association of American Colleges & Universities

By Hart Research Associates

Embargoed Until January 20, 2015, 12:01 a.m.

### Learning Outcomes Four in Five Employers Rate as Very Important (Proportion of employers who rate each outcome an 8, 9, or 10 on a zero-to-10 scale)

	<u>Employers</u> %
The ability to effectively communicate orally	85
The ability to work effectively with others in teams	83
The ability to effectively communicate in writing	82
Ethical judgment and decision-making	81
Critical thinking and analytical reasoning skills	81
The ability to apply knowledge and skills to real-world settings	80

<http://www.aacu.org/leap/public-opinion-research/2015-survey-results>

### How Should Colleges Prepare Students To Succeed In Today's Global Economy?

Based On Surveys Among  
Employers And Recent College Graduates

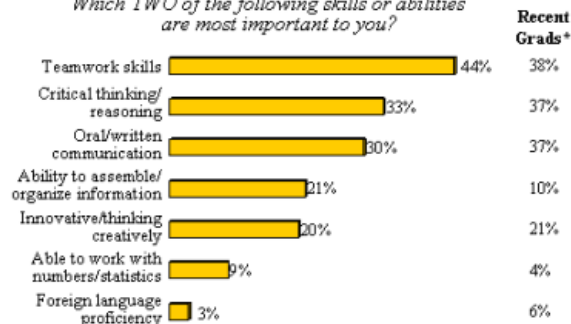
Conducted On Behalf Of:  
The Association Of American Colleges And Universities

By Peter D. Hart Research Associates, Inc.

December 28, 2006

### Most Important Skills Employers Look For In New Hires

Which TWO of the following skills or abilities  
are most important to you?



\* Skills/abilities recent graduates think are the two most important to employers

<http://www.aacu.org/advocacy/leap/documents/Re8097abcombined.pdf>

## The College Degrees And Skills Employers Most Want In 2015 (National Association of Colleges and Employers (NACE))

The NACE survey also asked employers to rate **the skills they most value in new hires**. Companies want candidates who can think critically, solve problems, work in a team, maintain a professional demeanor and demonstrate a strong work ethic. Here is the ranking in order of importance:

Competency	Essential Need Rating*
Critical Thinking/Problem Solving	4.7
Teamwork	4.6
Professionalism/Work Ethic	4.5
Oral/Written Communications	4.4
Information Technology Application	3.9
Leadership	3.9
Career Management	3.6

\*Weighted average. Based on a 5-point scale where 1=Not essential, 2=Not very essential; 3=Somewhat essential; 4=Essential; 5=Absolutely essential

<http://www.forbes.com/sites/susanadams/2015/04/15/the-college-degrees-and-skills-employers-most-want-in-2015/>

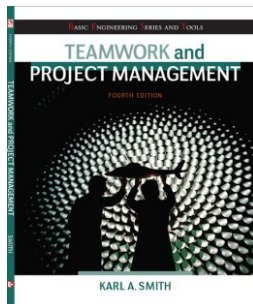
## Top Three Main Engineering Work Activities

### Engineering Total

Design – 36%

Computer applications – 31%

Management – 29%



### Civil/Architectural

Management – 45%

Design – 39%

Computer applications – 20%

Burton, L., Parker, L., & LeBold, W. 1998. U.S. engineering career trends. *ASEE Prism*, 7(9), 18-21.

# Active Learning: Cooperation in the College Classroom

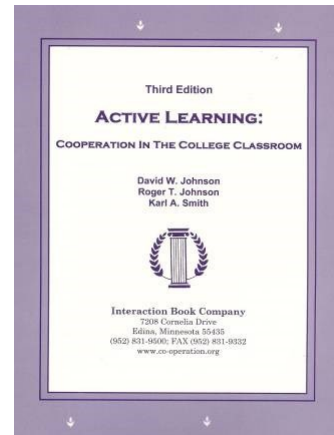
☐ Informal Cooperative Learning Groups



☐ Formal Cooperative Learning Groups

☐ Cooperative Base Groups

**Notes: Cooperative Learning Handout (CL-College-814.doc)**  
[\[CL-College-814.doc\]](#)



**Cooperative Learning** is instruction that involves people working in teams to accomplish a common goal, under conditions that involve both *positive interdependence* (all members must cooperate to complete the task) and *individual and group accountability* (each member is accountable for the complete final outcome).

## Key Concepts

- ☐ Positive Interdependence
- ☐ Individual and Group Accountability
- ☐ Face-to-Face Promotive Interaction
- ☐ Teamwork Skills
- ☐ Group Processing

<http://personal.cege.umn.edu/~smith/docs/Smith-CL%20Handout%2008.pdf>

Cooperative Learning	
Positive Interdependence	Individual Accountability
<p><b>Goal Interdependence (essential):</b></p> <ol style="list-style-type: none"> <li>All members share a common goal.</li> <li>All members improve.</li> <li>Each group member's success is dependent on the success of the group.</li> <li>One person from the group that all helped with and can explain.</li> </ol> <p><b>Role (Chari) Interdependence</b></p> <p>Assign each member a role and make them:</p> <ol style="list-style-type: none"> <li>Learn to use a set of materials.</li> <li>Learn to use a set of materials.</li> <li>Learn to use a set of materials.</li> <li>Learn to use a set of materials.</li> </ol> <p><b>Task Interdependence</b></p> <ol style="list-style-type: none"> <li>Randomize</li> <li>Chain Reaction</li> </ol> <p><b>Outside Challenge Interdependence</b></p> <ol style="list-style-type: none"> <li>Inter-group competition</li> <li>Other class competition</li> </ol> <p><b>Identity Interdependence</b></p> <p>(Mutual identity, name, motto, etc.)</p> <ol style="list-style-type: none"> <li>Designated classroom space</li> <li>Group-specific meeting place</li> </ol> <p><b>Resource Interdependence</b></p> <p>(Physical interdependence in situation (You are a specific person, you have, but not the others, etc.))</p> <p><b>Revised Collaborative Interdependence</b></p> <ol style="list-style-type: none"> <li>Collaborate with others</li> <li>Be a person who can help</li> <li>Be a person who can help</li> </ol>	<p><b>Ways to ensure no shirkers:</b></p> <ul style="list-style-type: none"> <li>Keep group size small (2-4)</li> <li>Assign roles</li> <li>Randomly ask one member of the group to explain the learning.</li> <li>Have students do work before group meets.</li> <li>Have students use their group learning to do an individual task afterward.</li> <li>Everyone signs "I participated, I agree, and I can explain"</li> <li>Observe &amp; record individual contributions</li> </ul> <p><b>Ways to ensure that all members learn:</b></p> <ul style="list-style-type: none"> <li>Practice tests</li> <li>Let each other's work and sign agreement</li> <li>Randomly check one paper from each group</li> <li>Give individual quiz</li> <li>Assign role of checker who has each group member explain out loud</li> <li>Randomize explaining each student explains their learning to a new partner</li> </ul> <p><b>Face-to-Face Interaction</b></p> <p><b>Interactions:</b></p> <ul style="list-style-type: none"> <li>Time for groups to meet</li> <li>Group members close together</li> <li>Small group size of two or three</li> <li>Frequent and reciprocal</li> <li>Being positive interdependence</li> <li>Commitment to each other's learning</li> <li>Positive social skill set</li> <li>Calculations for encouragement, effort, help, and success</li> </ul>

Karl A. Smith  
 University of Minnesota  
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 Email: karl@cege.umn.edu



## Instructor's Role in Formal Cooperative Learning

---

1. Specifying **Objectives** (Academic and Social/Teamwork)
2. Making **Decisions**
3. Explaining **Task, Positive Interdependence, and Individual Accountability**
4. **Monitoring** and Intervening to Teach Skills
5. **Evaluating** Students' Achievement and Group Effectiveness

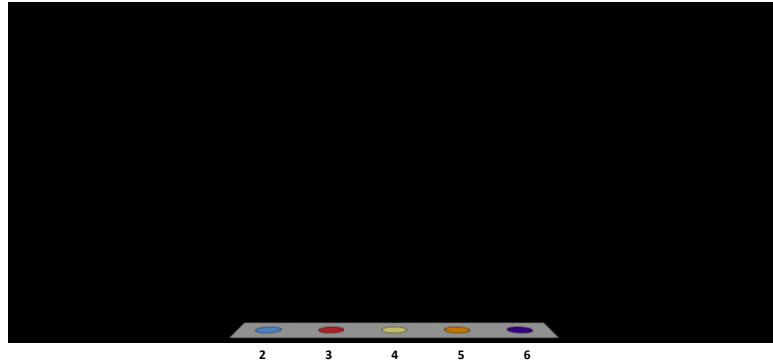
## Decisions, Decisions...

---

- ☐ Group size?
- ☐ Group selection?
- ☐ Group member roles?
- ☐ How long to leave groups together?
- ☐ Arranging the room?
- ☐ Providing materials?
- ☐ Time allocation?

## Optimal Group Size?

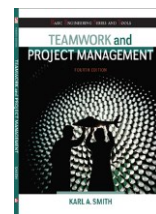
- A. 2
- B. 3
- C. 4
- D. 5
- E. 6



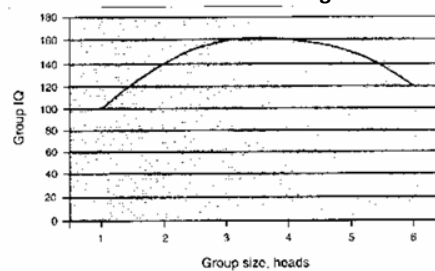
## Formal Cooperative Learning Task Groups



Perkins, David. 2003. *King Arthur's Round Table: How collaborative conversations create smart organizations*. NY: Wiley.



Page 48



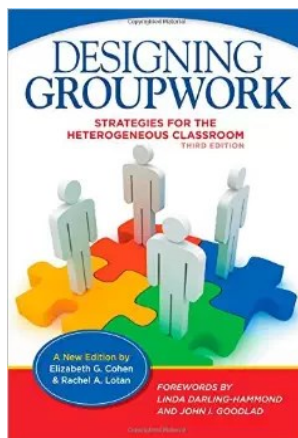
## Group Selection?

---

- A. Self selection
- B. Random selection
- C. Stratified random
- D. Instructor assign
- E. Other

## Assigning Roles

---



### Chapter 8: Group Roles and Responsibilities

- Roles
  - Facilitator
  - Checker
  - Set-Up
  - Materials Manager
  - Safety Officer
  - Reporter
- Dividing the labor

## Group Processing Plus/Delta Format

Plus (+)  
Things That Group Did Well

Delta ( $\Delta$ )  
Things Group Could Improve

## Formal Cooperative Learning – Types of Tasks

1. Problem Solving, Project, or Presentation
2. Jigsaw – Learning new conceptual/procedural material
3. Group Tests
4. Review/Correct Homework
5. Peer Composition or Editing
6. Reading Comprehension/Interpretation
7. Constructive Controversy

## Cooperative Problem-Based Learning Format

**TASK:** Solve the problem(s) or Complete the project.

**INDIVIDUAL:** Develop ideas, Initial Model, Estimate, etc. Note strategy.

**COOPERATIVE:** One set of answers from the group, strive for agreement, make sure everyone is able to explain the strategies used to solve each problem.

**EXPECTED CRITERIA FOR SUCCESS:** Everyone must be able to explain the model and strategies used to solve each problem.

**EVALUATION:** Best answer within available resources or constraints.

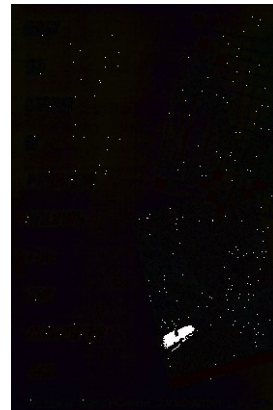
**INDIVIDUAL ACCOUNTABILITY:** One member from your group may be randomly chosen to explain (a) the answer and (b) how to solve each problem.

**EXPECTED BEHAVIORS:** Active participating, checking, encouraging, and elaborating by all members.

**INTERGROUP COOPERATION:** Whenever it is helpful, check procedures, answers, and strategies with another group.

## First Course Design Experience UMN – Institute of Technology

- ☐ Thinking Like an Engineer
- ☐ Problem Identification
- ☐ Problem Formulation
- ☐ Problem Representation
- ☐ Problem Solving



## Team Member Roles

---

- ☐ Task Recorder
- ☐ Skeptic/Prober
- ☐ Process Recorder

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## Technical Estimation Problem

---

### **TASK:**

**INDIVIDUAL:** Quick Estimate (10 seconds). Note strategy.  
Note strategy.

**COOPERATIVE:** Improved Estimate (~5 minutes). One set of answers from the group, strive for agreement, make sure everyone is able to explain the strategies used to arrive at the improved estimate.

**EXPECTED CRITERIA FOR SUCCESS:**  
Everyone must be able to explain the strategies used to arrive at your improved estimate.

**EVALUATION:** Best answer within available resources or constraints.

**INDIVIDUAL ACCOUNTABILITY:** One member from your group may be randomly chosen to explain (a) your estimate and (b) how you arrived at it.

**EXPECTED BEHAVIORS:** Active participating, checking, encouraging, and elaborating by all members.

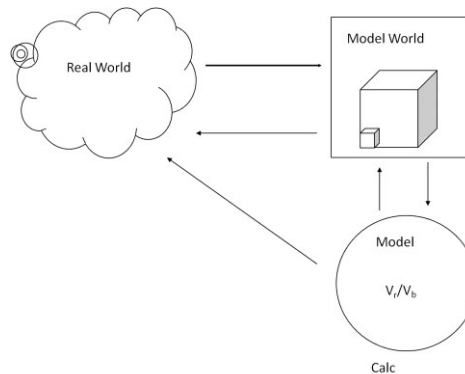
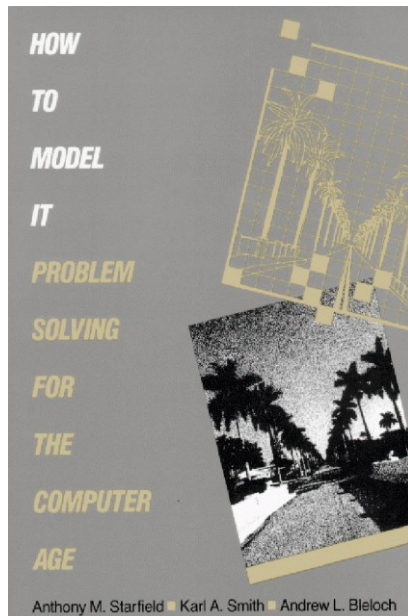
**INTERGROUP COOPERATION:**  
Whenever it is helpful, check procedures, answers, and strategies with another group.

# Group Reports

## Estimate

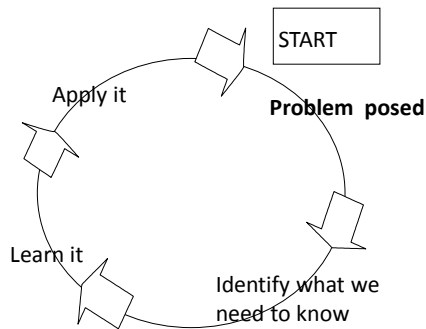
- Group 1
- Group 2
- ...

Strategy used to arrive at estimate – assumptions, model, method, etc.

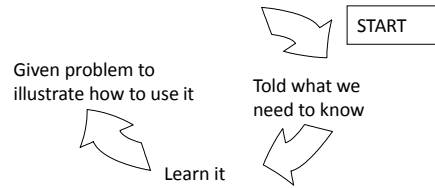


\*Based on First Year Engineering course  
 – Problem-based cooperative learning  
*How to Model It* published in 1990.

## Problem-Based Learning



## Subject-Based Learning



### Normative Professional Curriculum:

1. Teach the relevant basic science,
2. Teach the relevant applied science, and
3. Allow for a practicum to connect the science to actual practice.

## Group Processing Plus/Delta Format

Plus (+) Things That Group Did Well	Delta (Δ) Things Group Could Improve



**Cooperative Learning** is instruction that involves people working in teams to accomplish a common goal, under conditions that involve both *positive interdependence* (all members must cooperate to complete the task) and *individual and group accountability* (each member is accountable for the complete final outcome).

## Key Concepts

- ☐ Positive Interdependence
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- ☐ Teamwork Skills
- ☐ Group Processing

<http://personal.cege.umn.edu/~smith/docs/Smith-CL%20Handout%2008.pdf>

Cooperative Learning	
Positive Interdependence	Individual Accountability
<p><b>Goal Interdependence (essential):</b></p> <ol style="list-style-type: none"> <li>1. All members share a common goal.</li> <li>2. All members agree to get involved.</li> <li>3. All group members agree to get involved.</li> <li>4. One person from group that all helped with and can explain.</li> </ol> <p><b>Role Interdependence</b></p> <p>Assign each member a role and make them:</p> <ol style="list-style-type: none"> <li>1. Understand the role of their materials.</li> <li>2. Explain materials.</li> <li>3. Separate contributions.</li> </ol> <p><b>Task Interdependence</b></p> <ol style="list-style-type: none"> <li>1. Random role.</li> <li>2. Chain Reaction.</li> </ol> <p><b>Outside Challenge Interdependence</b></p> <ol style="list-style-type: none"> <li>1. Inter-group competition.</li> <li>2. Other class competition.</li> </ol> <p><b>Identity Interdependence</b></p> <p>(Mutual identity: names, motto, etc.)</p> <p><b>Environmental Interdependence</b></p> <ol style="list-style-type: none"> <li>1. Designated classroom space.</li> <li>2. Group has special meeting place.</li> </ol> <p><b>Partner Interdependence</b></p> <p>Personal interdependence in classroom (You are a specific person in your team, but you are not alone.)</p> <p><b>Reward/Collection Interdependence</b></p> <ol style="list-style-type: none"> <li>1. Collaborative joint success.</li> <li>2. Bonus points (see with class).</li> <li>3. Single group grade (see with class).</li> </ol>	<p><b>Ways to ensure no slackers:</b></p> <ul style="list-style-type: none"> <li>• Assign group size (2-4)</li> <li>• Assign roles</li> <li>• Randomly ask one member of the group to explain the learning.</li> <li>• Have students do work before group meets.</li> <li>• Have students do their group learning to do an individual task afterward.</li> <li>• Everyone signs "I participated, I agree, and I can explain"</li> <li>• Observe &amp; record individual contributions</li> </ul> <p><b>Ways to ensure that all members learn:</b></p> <ul style="list-style-type: none"> <li>• Practice tests</li> <li>• Ask each other's work and sign agreement</li> <li>• Randomly check one paper from each group</li> <li>• Give individual tests</li> <li>• Assign the role of checker who has each group member explain out loud</li> <li>• Randomness explaining each student explains their learning to a new partner</li> </ul> <p><b>Face-to-face Interaction</b></p> <p><b>Interdependence:</b></p> <ul style="list-style-type: none"> <li>• Time for groups to meet</li> <li>• Group members close together</li> <li>• Small group size of two or three</li> <li>• Frequent and relevant</li> <li>• Strong positive interdependence</li> <li>• Commitment to each other's learning</li> <li>• Positive social skill set</li> <li>• Collaborations for encouragement, effort, help, and success</li> </ul>

**Karl A. Smith**  
University of Minnesota  
http://personal.cege.umn.edu/~smith/docs/Smith-CL%20Handout%2008.pdf

# SCALE-UP

Student-Centered Active Learning Environment with Upside-down Pedagogies

**How would you like to teach (or learn) in a classroom like this one at MIT?**

The purpose of this website is to share designs for state-of-the-art learning studios, teaching methods, and instructional materials that are based on more than a decade of discipline-based education research.

For a quick introduction, visit our [Frequently Asked Questions](#) page, or take a look at this [5 minute video](#) or view a some of these short video clips created by adopters:


[Minnesota](#), [McGill](#), [Iowa](#), [Virginia Tech](#), [Old Dominion](#), [Northern Michigan](#), [Oklahoma](#), [Windward High School](#)

As a [visitor](#) to the site, you can view classroom designs and find contact information for scores of colleges and a growing number of high schools that are offering highly interactive, collaborative, guided-inquiry-based instruction.

Registered site [members](#) have access to many more details and classroom materials being developed and tested by faculty from around the world.

Visitors may click [here](#) to go to pages describing the work of many of the institutions adopting SCALE-UP.

Registered site members, click [here](#) to log in. (There is additional detailed information available only to those who have registered.)



<http://scaleup.ncsu.edu/>

NC STATE UNIVERSITY

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Physics Education Research Group

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[Projects](#)  
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## About the SCALE-UP Project...

This research was supported, in part, by the U.S. Department of Education's Fund for the Improvement of Post-Secondary Education (FIPSE), the National Science Foundation, Hewlett-Packard, Apple Computer, and Pace Scientific. Opinions expressed are those of the authors and not necessarily those of our sponsors.

The primary goal of the Student-Centered Activities for Large Enrollment Undergraduate Programs (SCALE-UP) Project is to establish a highly collaborative, hands-on, computer-rich, interactive learning environment for large-enrollment courses.

Educational research indicates that students should collaborate on interesting tasks and be deeply involved with the material they are studying. We promote active learning in a redesigned classroom of 160 students or more. (Of course, smaller classes can also benefit.) We believe the SCALE-UP Project has the potential to radically change the way large classes are taught at colleges and universities. The social interactions between students and with their teachers appear to be the "active ingredient" that make the approach work. As more and more instruction is handled virtually via technology, the relationship-building capability of brick and mortar institutions becomes even more important. The pedagogical methods and classroom management techniques we design and disseminate are general enough to be used in a wide variety of classes at many different types of colleges.

Classes are spent primarily on "usable" and "considerable". Essentially these are hands-on activities, simulations, or interesting questions and problems. There are also some hypothesis-driven labs where students have to write detailed reports. (The [example](#) is more sophisticated than most, but shows what the best students are capable of doing.) Students sit in three groups of three students at a 7 foot diameter round table. Instructions circulate and work with teams and individuals, engaging them in Socratic like dialogues. Each table has at least three networked laptops. The setting is very much like a banquet hall, with lively interactions nearly all the time. Many other [colleges](#) and [universities](#) are adopting/inspiring the SCALE-UP room design and pedagogy. Engineering schools are especially pleased with the [course description](#), which fits in well with the requirements for ABET accreditation.

Materials developed for the course were incorporated into what became the leading introductory physics textbook, used by more than 1/3 of all science, math, and engineering students in the country.

### Impact

Diagnose evaluations of learning have been conducted in parallel with the curriculum development effort. Inside hundreds of hours of classroom video and audio recordings, we also have conducted numerous interviews and focus groups, conducted many conceptual learning assessments (using a variety of integrated instruments in a pretest/posttest protocol), and collected portfolios of student work. We have data comparing nearly 36,000 traditional and SCALE-UP students. Our findings can be summarized as the following:

- Ability to solve problems is [increased](#)
- Conceptual understanding is [improved](#)
- [Attitudes](#) are [improved](#)
- Failure rates are [dramatically reduced](#), especially for women and minorities
- "At risk" students do better in later engineering statics classes

### Details

A [chapter](#) describing the approach and its underpinnings is available. A shorter [description](#) is posted on the PERL website, or you can view an [audio](#) describing the project from the proceedings of the Sigma Xi Forum on Reforming Undergraduate Education. The [teaching team's](#) Open-Source webpage also has a [description](#) of the project. The very successful pilot project was [described](#) in the first issue of Physics Education Research Supplement to Am. J. of Physics. See our publication [page](#) for more information.

More than 50 colleges and universities across the US have adopted the SCALE-UP approach to their own institutions. In all cases, the basic idea remains the same: get the students working together to examine something interesting. That frees the instructor to roam about the room, asking questions and driving up debates. Classes in physics, chemistry, math, engineering, and even literature have been taught this way. If you want more information, please contact [Dr. Robert Bevilacqua](#).

<http://www.ncsu.edu/PER/scaleup.html>

## Cooperative Problem-Based Learning

## At M.I.T., Large Lectures Are Going the Way of the Blackboard



Jodi Hilton for The New York Times

The Massachusetts Institute of Technology has changed the way it offers some introductory classes. Prof. Gabriela Scudlark

By SARA RIMER  
Published: January 12, 2009

CAMBRIDGE, Mass. — For as long as anyone can remember, introductory physics at the [Massachusetts Institute of Technology](#) was taught in a vast windowless amphitheater known by its number,

COMMENTS (00)


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Educational Transformation through Technology at MIT - TEAL - Mozilla Firefox

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TEAL  
Technology-Enhanced Active Learning



In the late 1990s, educators at MIT began to realize that many of their available resources could be leveraged to create a more dynamic learning environment. By the late 2000s, the MIT Learning Research and Development Center (LRDC) had created a new model for teaching and learning, the Technology-Enhanced Active Learning (TEAL) program. This new model, which emphasizes the use of technology to enhance learning, has been adopted by many other institutions of higher learning.

**LEADERSHIP**  
JOHN BELCHER  
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**VIDEO - TEAL IN ACTION**  
VIDEO - STUDENT PHYSICS  
REACHING SUCCESS

**EDUCATION**  
In the TEAL program, students learn in a more dynamic, interactive environment. They are encouraged to work together, to share ideas, and to learn from each other. This approach has been shown to be more effective than traditional lecture-based learning.


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<http://web.mit.edu/edtech/casestudies/teal.html#video>

The University of Iowa

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**TILE** transform interact learn engage



Van Allen TILE Classroom

**Highlights**

**SEP 04 2013**

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Several years ago, the Biology Department initiated a plan to revamp the introductory biology courses taken by undergraduate students in the life sciences.

**Trowbridge 134 Gets a New View**

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**Upcoming Events**

10/11/2013 - 1:00pm  
350 Van Allen Hall  
30 North Dubuque St  
Iowa City, IA 52242  
United States  
TILE Labs: Essentials

10/18/2013 - 12:30pm  
1022 Main Library  
125 West Washington St  
Iowa City, IA 52242  
United States  
TILE Labs: Accelerator

<http://tile.uiowa.edu/>



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**News Release**

U of M dedicates new Science Teaching and Student Services building

Building to serve as new hub for student life, including technology-rich classrooms of the future and One Stop Student Services

**Contact:** David Miller, University News Service, [dmiller@um.edu](mailto:dmiller@um.edu), 612-625-5555

**MINNEAPOLIS (STP) (PR)** — The University of Minnesota today dedicated the new Science Teaching and Student Services (STSS) building, located at the gateway to the university's East Bank campus in Minneapolis.

The 115,000-square-foot STSS, which replaces the demolished Science Classroom Building, will be home not only to new, state-of-the-art "active learning" classrooms but also to numerous student services offices, including One Stop Student Services, veterans services and career services.

"This really is the future of education at our Twin Cities campus," said university President Robert D. Lipton. "We're grateful to the people of Minnesota for making this investment in their University."

The building, which was funded in large part by state bonding funds, has the steepest and offers a wide view of the West Bank and downtown Minneapolis over the Mississippi River. It has 10 active learning classrooms, which provide for technology-driven and collaborative interaction among students and faculty. There are also five multipurpose classrooms and two large lecture halls.

"Active learning classrooms are the classrooms of the future and have proven results in improving educational achievement for students," said university President Thomas S. Nelson. "There is a critical need for more degrees in science, technology, engineering and mathematics fields to meet regional and global needs. This new facility supports our efforts to educate the scientists and engineers who make the difference of tomorrow."

In addition, the STSS is designed to meet or exceed the requirements of Minnesota's stringent B3 sustainable design code and carries LEED Gold certification. Sustainable

**Multimedia**

STSS overview: One of the great features of this new building

Go inside an Active Learning Classroom

Minnesota Miles checks in on student services in STSS

**Related Links**

Map to STSS location

Further information about STSS (PDF)



**You're watching:**  
Inside Active Learning Classrooms

<http://mediamill.cla.umn.edu/mediamill/embed/78755>

# Inside an Active Learning Classroom

STSS at the University of Minnesota

<http://vimeo.com/andyub/activeclassroom>



"I love this space! It makes me feel appreciated as a student, and I feel intellectually invigorated when I work and learn in it."

**UNIVERSITY OF DELAWARE**

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**PBL@UD**
Institute for Transforming Undergraduate Education  
Problem-Based Learning at University of Delaware

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In the News

### The Motivation to Learn Begins with a Problem

In a problem-based learning (PBL) model, students engage complex, challenging problems and collaboratively work toward their resolution. PBL is about students connecting disciplinary knowledge to real-world problems—the motivation to solve a problem becomes the motivation to learn.

[PBL@UD](#)

For more than ten years, the Leaders and Fellows of the Institute for Transforming Undergraduate Education (ITUE) have encouraged the adoption of student-centered and active classroom pedagogies—and in particular—the use of PBL in the undergraduate classroom. On- and off-campus workshops are held for faculty and students to enhance their understanding of PBL.

**Recipient of a Hesburgh Certificate of Excellence**

The Theodore M. Hesburgh Award was created to acknowledge and reward successful, innovative faculty development programs that enhance undergraduate teaching. ITUE is a recipient of the Hesburgh Certificate of Excellence for its work in implementing problem-based learning in the classroom.

### What we offer

**PBLclearinghouse**

**Find great problems for your**

In this peer-reviewed online resource, educators have the opportunity to submit and publish their own problems and articles on problem-based learning.

[Learn more](#)

**PBL Training at a lower cost: Attend our January 4-6 Workshop for an Introduction to PBL!**

This workshop will demonstrate problem-based learning (PBL) and model ways that PBL can be used effectively in all disciplines. We will begin with a problem, and participants will work in teams to experience first hand what this instructional approach entails. We will then move to the main focus of this program: writing effective problem-based materials. Participants will leave the session with new or revised problems for use in their courses.

[Learn more](#)

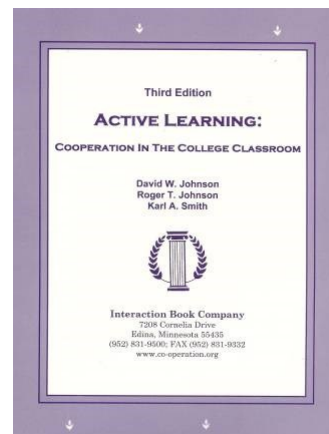
<http://www.udel.edu/inst/>

PBL@UD • [info@pbl.udel.edu](mailto:info@pbl.udel.edu)

## Active Learning: Cooperation in the College Classroom

- **Informal** Cooperative Learning Groups
- **Formal** Cooperative Learning Groups
- • **Cooperative Base** Groups

**Notes: Cooperative Learning Handout (CL-College-814.doc)**  
[\[CL-College-814.doc\]](#)



## Cooperative Base Groups

- Are Heterogeneous
- Are Long Term (at least one quarter or semester)
- Are Small (3-5 members)
- Are for support
- May meet at the beginning of each session or may meet between sessions
- Review for quizzes, tests, etc. together
- Share resources, references, etc. for individual projects
- Provide a means for covering for absentees

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### Does Psychological Safety Hinder Performance?

Psychological safety does not operate at the expense of employee accountability; the most effective organizations achieve high levels of both, as this matrix shows.

		Accountability for Meeting Demanding Goals	
		LOW	HIGH
Psychological Safety	HIGH	<b>Comfort zone</b> Employees really enjoy working with one another but don't feel particularly challenged. Nor do they work very hard. Some family businesses and small consultancies fall into this quadrant.	<b>Learning zone</b> Here the focus is on collaboration and learning in the service of high-performance outcomes. The hospitals described in this article fall into this quadrant.
	LOW	<b>Apathy zone</b> Employees tend to be apathetic and spend their time jockeying for position. Typical organizations in this quadrant are large, top-heavy bureaucracies, where people fulfill their functions but the preferred modus operandi is to curry favor rather than to share ideas.	<b>Anxiety zone</b> Such firms are breeding grounds for anxiety. People fear to offer tentative ideas, try new things, or ask colleagues for help, even though they know great work requires all three. Some investment banks and high-powered consultancies fall into this quadrant.

Edmonson-Competitive\_Advantage\_of\_Learning-HBR-2008.pdf



# Designing and Implementing Cooperative Learning

Think like a designer

Ground practice in robust theoretical framework

Start small, start early and iterate

Celebrate the successes; problem-solve the failures

## The Instructor's Role in Cooperative Learning

### Make Pre-Instructional Decisions

**Specify Academic and Teamwork Skills Objectives:** Every lesson has both (a) academic and (b) interpersonal and small group (teamwork) skills objectives.

**Decide on Group Size:** Learning groups should be small (groups of two or three members, four at the most).

**Decide on Group Composition (Assign Students to Groups):** Assign students to groups randomly or select groups yourself. Usually you will wish to maximize the heterogeneity in each group.

**Assign Roles:** Structure student-student interaction by assigning roles such as Reader, Recorder, Encourager of Participation and Checker for Understanding.

**Arrange the Room:** Group members should be "knees to knees and eye to eye" but arranged so they all can see the instructor at the front of the room.

**Plan Materials:** Arrange materials to give a "sink or swim together" message. Give only one paper to the group or give each member part of the material to be learned.

### Explain Task And Cooperative Structure

**Explain the Academic Task:** Explain the task, the objectives of the lesson, the concepts and principles students need to know to complete the assignment and the procedures they are to follow.

**Explain the Criteria for Success:** Student work should be evaluated on a criteria-referenced basis. Make clear your criteria for evaluating students' work.

**\*Structure Positive Interdependence:** Students must believe they "sink or swim together." Always establish mutual goals (students are responsible for their own learning and the learning of all other group members). Supplement goal interdependence with celebration/reward, resource, role, and identity interdependence.

**Structure Intergroup Cooperation:** Have groups check with and help other groups. Extend the benefits of cooperation to the whole class.

**\*Structure Individual Accountability:** Each student must feel responsible for doing his or her share of the work and helping the other group members. Ways to ensure accountability are frequent oral quizzes of group members picked at random, individual tests, and assigning a member the role of Checker for Understanding.

**\*Specify Expected Behaviors:** The more specific you are about the behavior you want to see in the groups, the more likely students will do them. Social skills may be classified as **forming** (staying with the group, using quiet voices), **functioning** (contributing, encouraging others to participate), **formulating** (summarizing, elaborating), and **fermenting** (criticizing ideas, asking for justification). Regularly teach the interpersonal and small group skills you wish to see used in the learning groups.

### Monitor and Intervene

**\*Arrange Face-to-Face Promotive Interaction:** Conduct the lesson in ways that ensure that students promote each other's success face-to-face.

**Monitor Students' Behavior:** This is the fun part! While students are working, you circulate to see whether they understand the assignment and the material, give immediate feedback and reinforcement, and praise good use of group skills. Collect observation data on each group and student.

**Intervene to Improve Taskwork and Teamwork:** Provide taskwork assistance (clarify, restate) if students do not understand the assignment. Provide teamwork assistance if students are having difficulties in working together productively.

### Evaluate and Process

**Evaluate Student Learning:** Assess and evaluate the quality and quantity of student learning. Involve students in the assessment process.

**\*Process Group Functioning:** Ensure each student receives feedback, analyzes the data on group functioning, sets an improvement goal, and participates in a team celebration. Have groups routinely list three things they did well in working together on, done things they will do better tomorrow. Summarize as a whole class. Have groups celebrate their success and hard work.

Cooperative Lesson Planning Form	
Subject Area: _____	Date: _____
Lesson: _____	
<b>Objectives</b>	
Academic: _____	
Social Skills: _____	
<b>Preinstructional Decisions</b>	
Group Size: _____ Method Of Assigning Students: _____	
Roles: _____	
Room Arrangement: _____	
Materials: _____	
<input type="checkbox"/> One Copy Per Group <input type="checkbox"/> One Copy Per Person <input type="checkbox"/> Jigsaw <input type="checkbox"/> Tournament <input type="checkbox"/> Other: _____	
<b>Explain Task And Cooperative Goal Structure</b>	
1. Task: _____	
2. Criteria For Success: _____	
3. Positive Interdependence: _____	
4. Individual Accountability: _____	
5. Intergroup Cooperation: _____	
6. Expected Behaviors: _____	
<b>Monitoring And Intervening</b>	
1. Observation Procedure: _____ Formal _____ Informal	
2. Observation By: _____ Teacher _____ Students _____ Visitors	
3. Intervening For Task Assistance: _____	
4. Intervening For Teamwork Assistance: _____	
5. Other: _____	
<b>Evaluating And Processing</b>	
1. Assessment Of Members' Individual Learning: _____	
2. Assessment Of Group Productivity: _____	
3. Small Group Processing: _____	
4. Whole Class Processing: _____	
5. Charts And Graphs Used: _____	
6. Positive Feedback To Each Student: _____	
7. Goal Setting For Improvement: _____	
8. Celebration: _____	
9. Other: _____	