Communities of Learning & Cooperation in the College Classroom

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Texas State – San Marcos Faculty Workshop June 7, 2017

It is strange that we expect students to learn, yet seldom teach them anything about learning. **We expect students to solve problems, yet seldom teach them anything about problem solving.** And, similarly, we sometimes require students to remember a considerable body of material, yet seldom teach them the art of memory. It is time we made up for this lack…

D.A. Norman. 1980. Cognitive engineering and education. In D.T. Tuma and F. Reif (Eds.), *Problem solving and education: Issues in teaching and research. Erlbaum, pp. 97-107.*

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Session Layout

Welcome & Overview

Rationale for Evidence-Based Practices

Course Design Foundations

- How Learning Works
- How People Learn
- Understanding by Design

Cooperative Learning

- Rationale
- Key Elements

Applications of Cooperative Learning

3

Overall Goals

- Build your knowledge of Evidence-Based Practices for engaging students and your implementation repertoire

4

Workshop Objectives

Participants will be able to:

- Describe key features of evidence-based instruction and effective, interactive strategies for facilitating learning
- Summarize key elements of Course Design Foundations
  - *How Learning Works* and *How People Learn (HPL)*
  - *Understanding by Design* (UbD) process – Content (outcomes) – Assessment – Pedagogy
- Explain key features of and instructor's role for Pedagogies of Engagement – Cooperative Learning and Problem-Based learning
- Identify connections between cooperative learning and desired outcomes of courses and programs

Participants will begin applying key elements to the design on a course, class session or learning module

5

Reflection and Dialogue

Individually reflect on your favorite **rationale** for engaging students. Write for about 1 minute.

- Context/Audience? E.g., First Year course
- Why student engagement is important?
- What evidence do you have to support 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

6

Karl's Rationale

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

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Lila M. Smith

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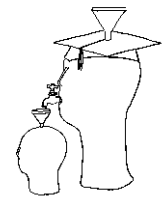
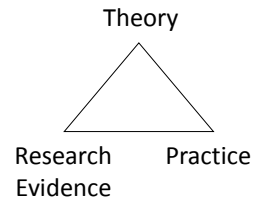
Somethings Missing

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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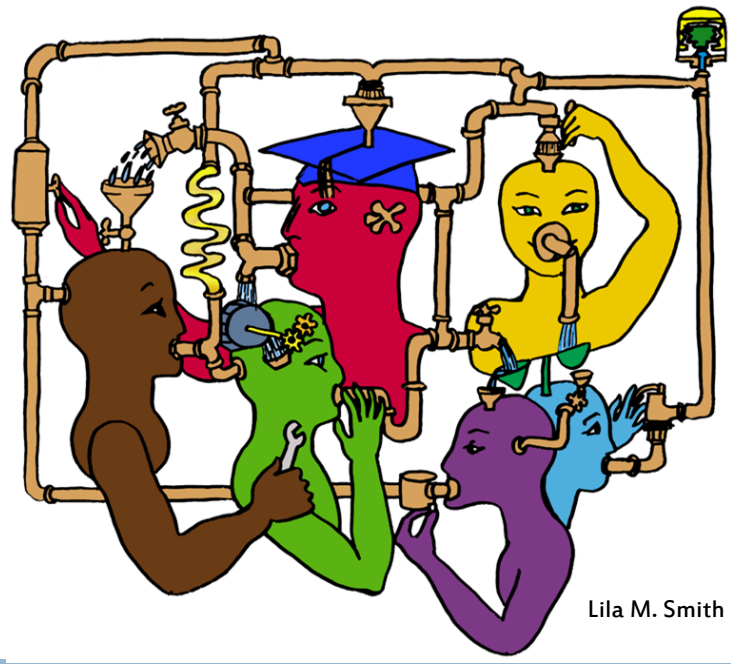

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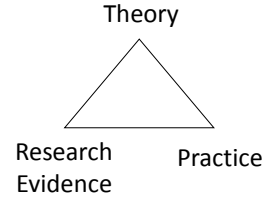
Cooperative Learning

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

http://personal.cege.umn.edu/~smith/links.html 13

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

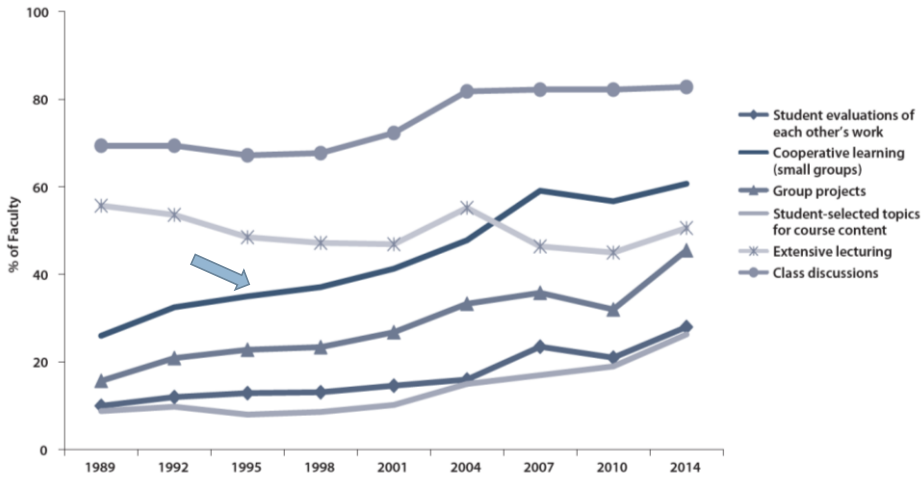
Karl A. Smith, David W. Johnson, and Roger T. Johnson
University of Minnesota

JEE December 1981

http://personal.cege.umn.edu/~smith/docs/Smith-Pedagogies_of_Engagement.pdf 14

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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The American College Teacher:

National Norms for 2007-2008

Methods Used in "All" or "Most"	All – 2005	All – 2008	Assistant - 2008
Cooperative Learning	48	59	66
Group Projects	33	36	61
Grading on a curve	19	17	14
Term/research papers	35	44	47

http://www.heri.ucla.edu/index.php

Undergraduate Teaching Faculty, 2011*

Methods Used in "All" or "Most"	STEM women	STEM men	All other women	All other men
Cooperative learning	60%	41%	72%	53%
Group projects	36%	27%	38%	29%
Grading on a curve	17%	31%	10%	16%
Student inquiry	43%	33%	54%	47%
Extensive lecturing	50%	70%	29%	44%

*Undergraduate Teaching Faculty. National Norms for the 2010-2011 HERI Faculty Survey,

www.heri.ucla.edu/index.php

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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Pedagogies of Engagement

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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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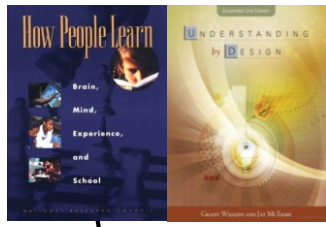
Course Design Foundations



Science of Instruction (UbD)

Science of Learning (HPL)

	No	Yes
Yes	Good Theory/ Poor Practice	Good Theory & Good Practice
No		Good Practice/ Poor Theory

Bransford, Brown & Cocking. 1999. *How People Learn*. National Academy Press.
Wiggins & McTighe, 2005. *Understanding by Design, 2ed*. ASCD.

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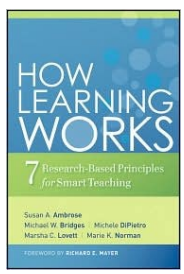

1. Students prior knowledge can help or hinder learning
2. How students organize knowledge influences how they learn and apply what they know
3. Students' motivation determines, directs, and sustains what they do to learn
4. To develop mastery, students must acquire component skills, practice integrating them, and know when to apply what they have learned
5. Goal-directed practice coupled with targeted feedback enhances the quality of students' learning
6. Students' current level of development interacts with the social, emotional, and intellectual climate of the course to impact learning
7. To become self-directed learners, students must learn to monitor and adjust their approach to learning

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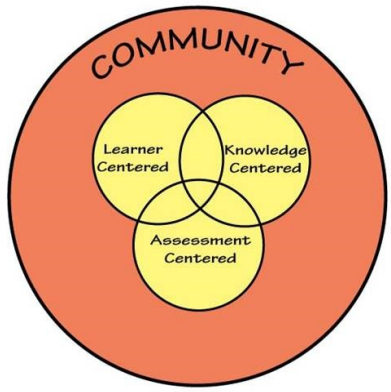
How People Learn

HPL Framework



Expertise implies (Ch. 2):

- a set of cognitive and metacognitive skills
- an organized body of knowledge that is deep and contextualized
- an ability to notice patterns of information in a new situation
- flexibility in retrieving and applying that knowledge to a new problem

Bransford, Brown & Cocking. 1999. *How people learn*. National Academy Press. 23

Understanding by Design Process

What should learners know, understand and be able to do?

How will we know if the learners have achieved the desired results?
What will be accepted as evidence of learners' understanding and proficiency?

What activities will equip learners with the needed knowledge and skills?
What materials and resources will be useful?

Identify the Desired Results

Determine Acceptable Evidence

Plan Learning Experience

Learning Activities Aligned

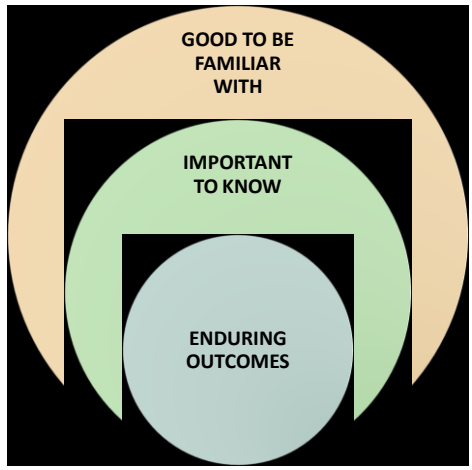
-Understanding by Design, Wiggins and McTighe (1998)

Understanding by Design Process and Engineering Design Process

Understanding by Design	Engineering Design
Identify the desired results	Determine requirements specifications
Determine acceptable evidence	Develop or use established metrics to measure against outcomes
Plan learning experiences	Plan and develop process, system, etc. to implement

Streveler, R.A, Smith, K.A., & Pilotte, M. 2012. Aligning course content, assessment, and delivery: Creating a context for outcomes-based education. In Khairiyah Mohd Yusof, Shahrin Mohammad, Naziha Ahmad Azli, Mohamed Noor Hassan, Azlina Kosnin & Sharifah Kamilah Syed Yusof (Eds.). *Outcome-based science, technology, engineering and mathematics: Innovative Practices*. (pp. 1 – 26). Hersey, PA: IGI Global.

Concept: Curricular Priorities



Things to Consider:

- Are the topics **enduring and transferable** big ideas having value beyond the classroom?
- Are the topics big ideas and **core processes** at the heart of the discipline?
- Are the topics **abstract, counterintuitive, often misunderstood, or easily misunderstood** ideas requiring uncoverage?
- Are the topics big ideas **embedded in facts, skills and activities**?

Understanding by Design, Wiggins and McTighe (1998)

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Identifying Big Ideas - Exercise

Individually identify 2-3 big ideas in a course you are designing or re-designing. Write them down. ~2 min

Break into pairs to discuss ~3 min

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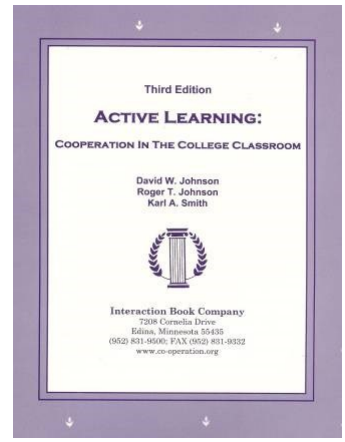
Active Learning: Cooperation in the College Classroom

- **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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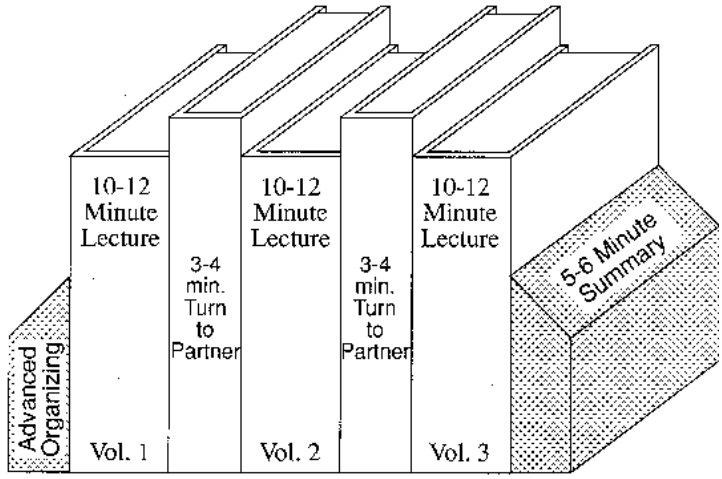
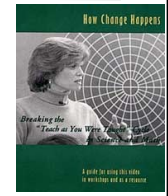
Book Ends on a Class Session





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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Book Ends on a Class Session

1. Advance Organizer
2. Formulate-Share-Listen-Create (Turn-to-your-neighbor) -- repeated every 10-12 minutes
3. Session Summary (Minute Paper)
   I. What was the most useful or meaningful thing you learned during this session?
   II. What question(s) remain uppermost in your mind as we end this session?
   III. What was the "muddiest" point in this session?

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Formulate-Share-Listen-Create

Informal Cooperative Learning Group
Introductory Pair Discussion of a

FOCUS QUESTION

1. Formulate your response to the question **individually**
2. Share your answer with a partner
3. Listen carefully to your partner's answer
4. Work together to Create a new answer through discussion

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Informal CL (Book Ends on a Class Session) with Concept Tests

Physics
- Eric Mazur - Harvard – http://galileo.harvard.edu
- Peer Instruction – http://mazur.harvard.edu/research/detailspage.php?rowid=8
- Richard Hake – http://www.physics.indiana.edu/~hake/

Chemistry
- Chemistry ConcepTests - UW Madison - http://chemcollective.org/tests
  Video: Making Lectures Interactive with ConcepTests
  http://www.wcer.wisc.edu/archive/cl1/flag/cat/contests/contests7.htm
- ModularChem Consortium – http://chemconnections.org/

STEMTEC - http://k12s.phast.umass.edu/stemtec/
- Video: How Change Happens: Breaking the "Teach as You Were Taught" Cycle – Films for the Humanities & Sciences – www.films.com

Harvard – Derek Bok Center
- Thinking Together & From Questions to Concepts: Interactive Teaching in Physics – http://bokcenter.harvard.edu/

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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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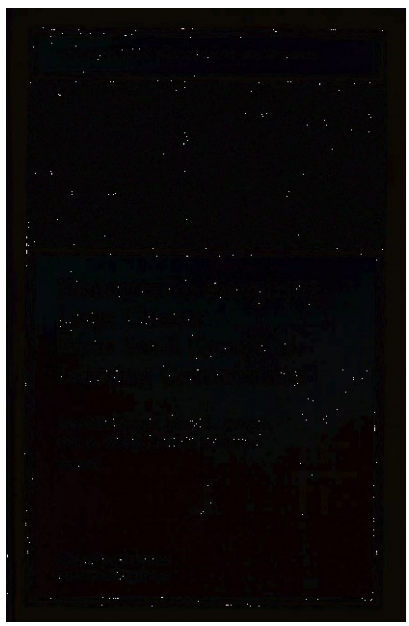

Strategies for Energizing Large Classes: From Small Groups to Learning Communities:

Jean MacGregor,
James Cooper,
Karl Smith,
Pamela Robinson

New Directions for Teaching and Learning, No. *81*, 2000.
Jossey- Bass

Informal Cooperative Learning Planning Form

Description of the Lecture

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):
   _____

Advanced Organizer Question(s)

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. _____

Cognitive Rehearsal Questions

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.

Summary Question(s)

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) precue the next class session.

1. _____
2. _____

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Session Summary (Minute Paper)

Reflect on the session

1. Most interesting, valuable, useful thing you learned.
2. Things that helped you learn.
3. Question, comments, suggestions.
4. Pace: Too slow 1 2 3 4 5 Too fast
5. Relevance: Little 1 2 3 4 5 Lots
6. Instructional Format: Ugh 1 2 3 4 5 Ah

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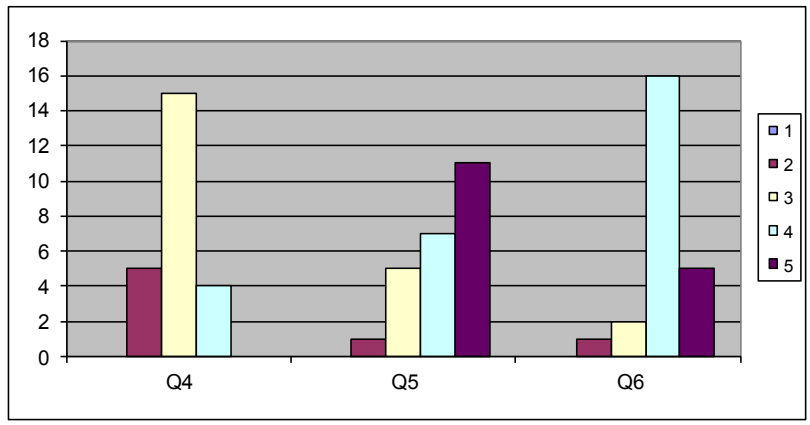
MOT 8221 – Spring 2017 – Session 1 (1/13/17)

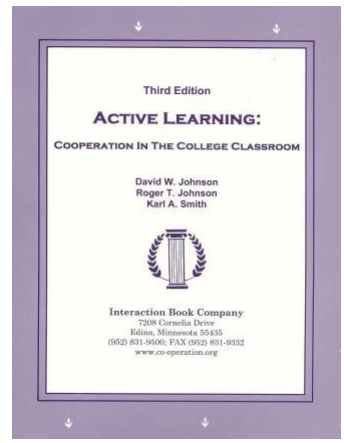


Q4 – Pace: Too slow 1 . . . . 5 Too fast (3.0)
Q5 – Relevance: Little 1 . . . 5 Lots (4.2)
Q6 – Format: Ugh 1 . . . 5 Ah (4.0)

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]



Structuring Teamwork in the Classroom

Formal Cooperative Learning Task Groups

Instructor's Role in Formal Cooperative Learning

1. Specifying **Objectives** (Academic and Interpersonal/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

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.

Group Processing Plus/Delta Format

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

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 "knee to knee 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 behaviors 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, reteach) 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 and one thing 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: _____

Objectives

Academic: _____

Social Skills: _____

Preinstructional Decisions

Group Size: _____ Method Of Assigning Students: _____

Roles: _____

Room Arrangement: _____

Materials: _____

- ◊ One Copy Per Group
- ◊ One Copy Per Person
- ◊ Jigsaw
- ◊ Tournament
- ◊ Other: _____

Explain Task And Cooperative Goal Structure

1. Task: _____
2. Criteria For Success: _____
3. Positive Interdependence: _____
4. Individual Accountability: _____
5. Intergroup Cooperation: _____
6. Expected Behaviors: _____

Monitoring And Intervening

1. Observation Procedure: _____ Formal _____ Informal
2. Observation By: _____ Teacher _____ Students _____ Visitors
3. Intervening For Task Assistance: _____
4. Intervening For Teamwork Assistance: _____
5. Other: _____

Evaluating And Processing

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: _____

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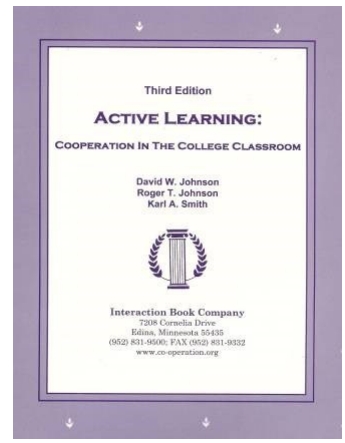

Notes: Cooperative Learning Handout (CL-College-814.doc)
[CL-College-814.doc]

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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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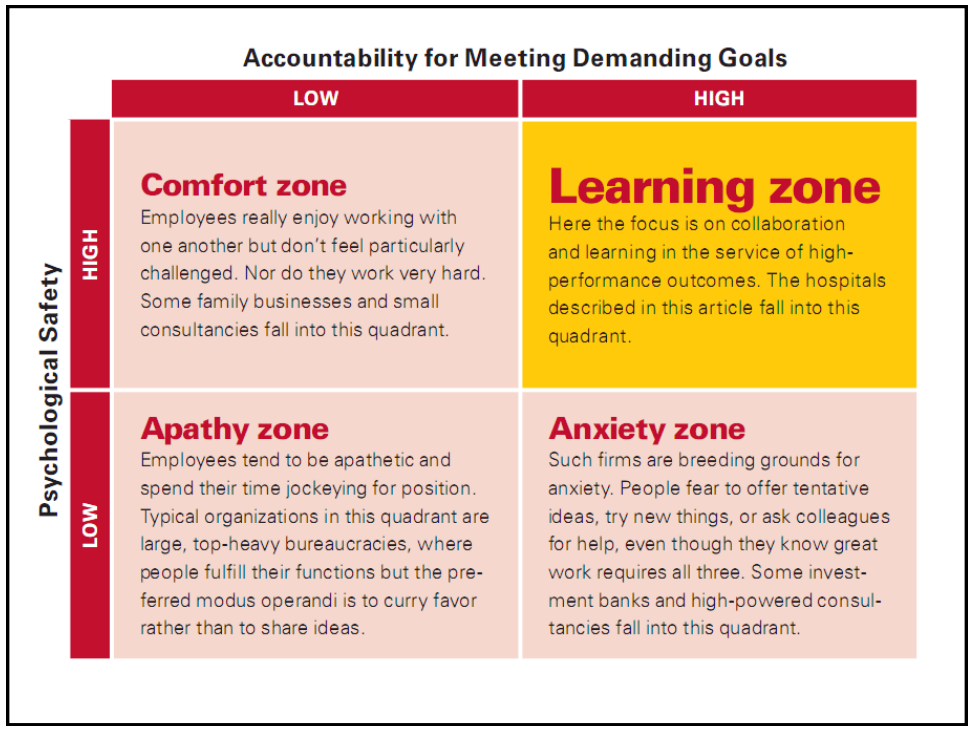

Designing and Implementing Cooperative Learning

Think like a designer

Ground practice in robust theoretical framework

Start small, start early and iterate

Celebrate the successes; problem-solve the failures