Design and Implementation of Cooperative Learning In Large Classes

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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

2

Overall Goals

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

3

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

4

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 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

5

Seven Principles for Good Practice in Undergraduate Education

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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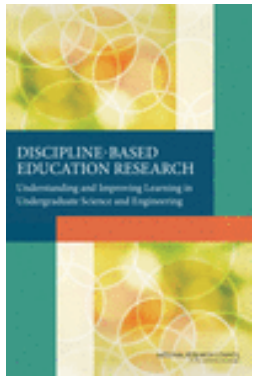
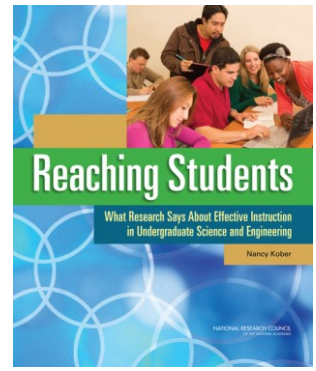
Discipline-Based Education Research (DBER) Report



National Research Council Summer 2012 – http://www.nap.edu/catalog.php?record_id=13362

ASEE *Prism Summer 2013*

Journal of Engineering Education – October, 2013

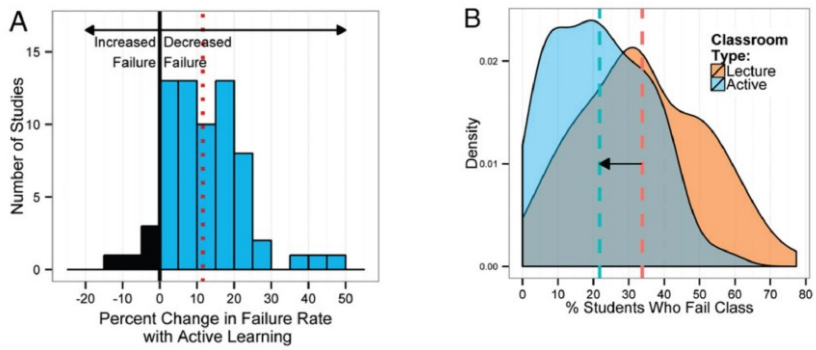


National Research Council – 2015 http://www.nap.edu/catalog/18687/reaching-students-what-research-says-about-effective-instruction-in-undergraduate

7

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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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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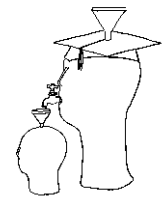
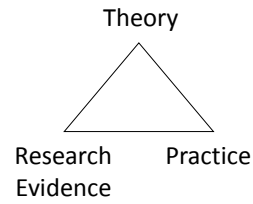
Engineering Education

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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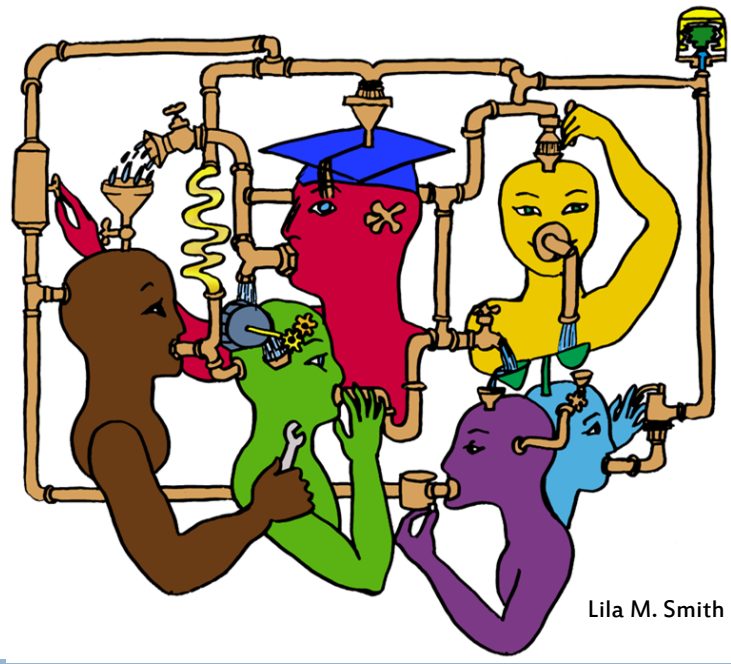

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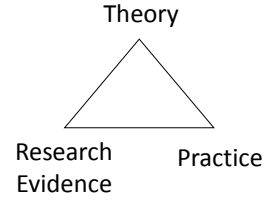
Cooperative Learning

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

Research – Randomized Design Field Experiments

Practice – Formal Teams/Professor's Role



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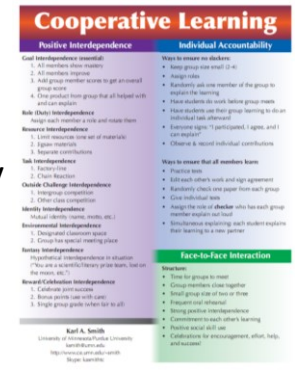
Cooperative Learning is instruction that involves people working in teams to accomplish a common goal, under conditions that involve both *positive interdependence* (all members must cooperate to complete the task) and *individual and group accountability* (each member is accountable for the complete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

Key Concepts

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



http://personal.cege.umn.edu/~smith/links.html 15

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

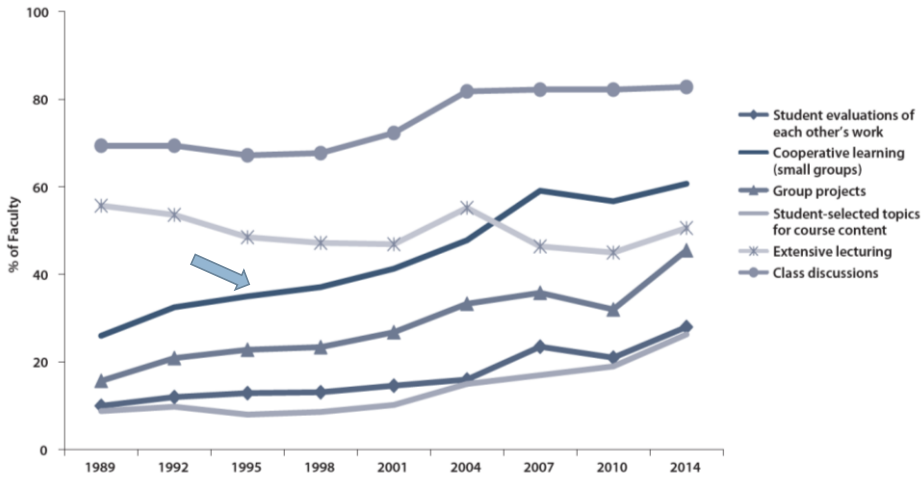
Karl A. Smith, David W. Johnson, and Roger T. Johnson
University of Minnesota

JEE December 1981

http://personal.cege.umn.edu/~smith/docs/Smith-Pedagogies_of_Engagement.pdf 16

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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Pedagogies of Engagement

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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

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- Teamwork Skills
- Group Processing

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

"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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What is your experience with course (re)design?

1. Little 1
2. Between 1&3
3. Moderate 3
4. Between 3&5
5. Extensive 5

Record your response (1, 2, 3, 4 or 5) on a Post-It note and add it to the histogram

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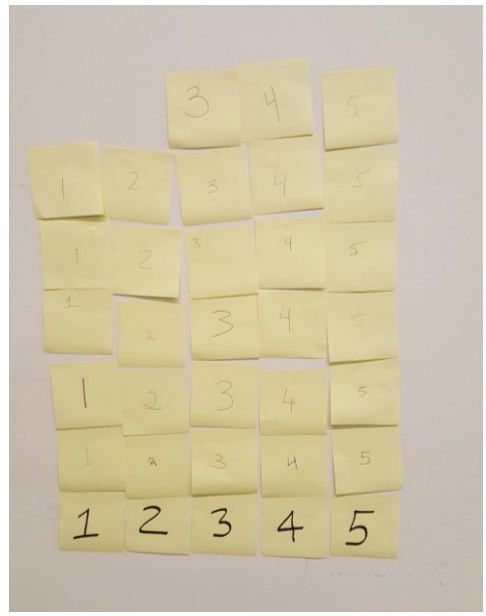

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What do you already know about course design?

Short Answer Questions

What do you feel are important considerations about course (re)design?

What are challenges you have faced with course (re)design?

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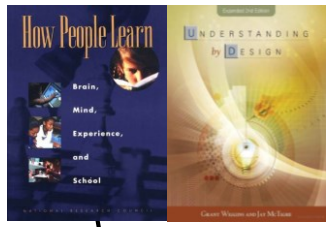
Course Design Foundations



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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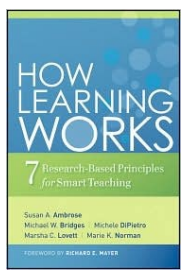

1. Students prior knowledge can help or hinder learning
2. How student organize knowledge influences how they learn and apply what they know
3. Students' motivation determines, directs, and sustains what they do to learn
4. To develop mastery, students must acquire component skills, practice integrating 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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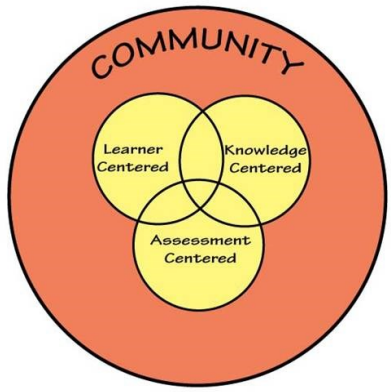
How People Learn

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

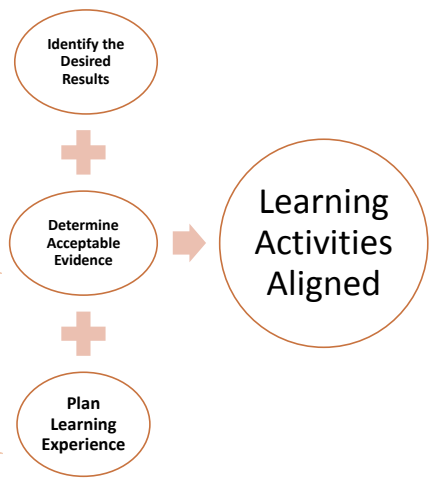
Bransford, Brown & Cocking. 1999. *How people learn.* National Academy Press. 27

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?



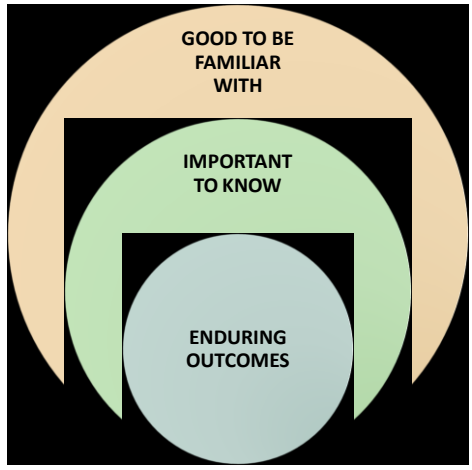
-Understanding by Design, Wiggins and McTighe (1998)

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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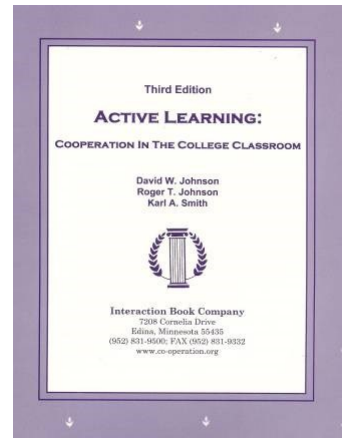
Active Learning: Cooperation in the College Classroom

- **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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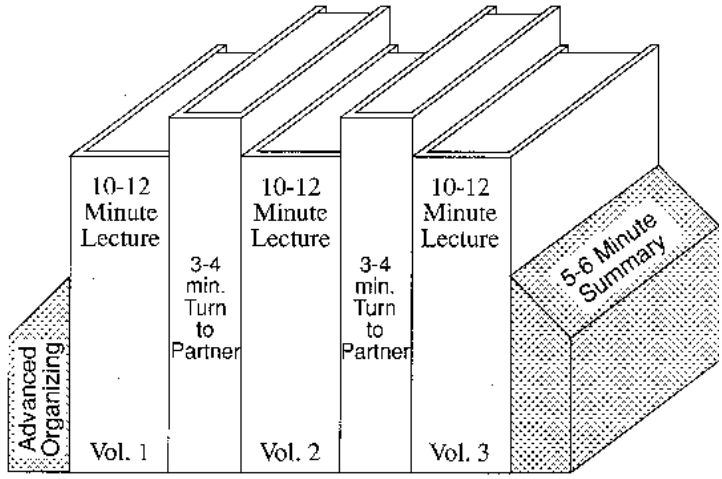
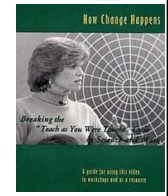
Book Ends on a Class Session





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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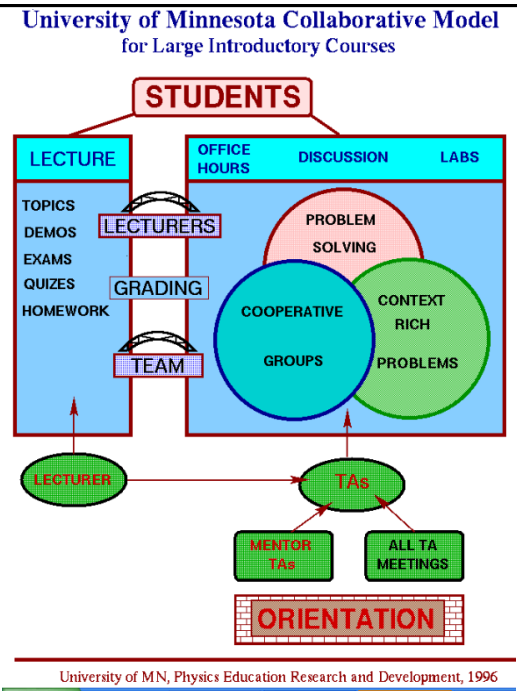
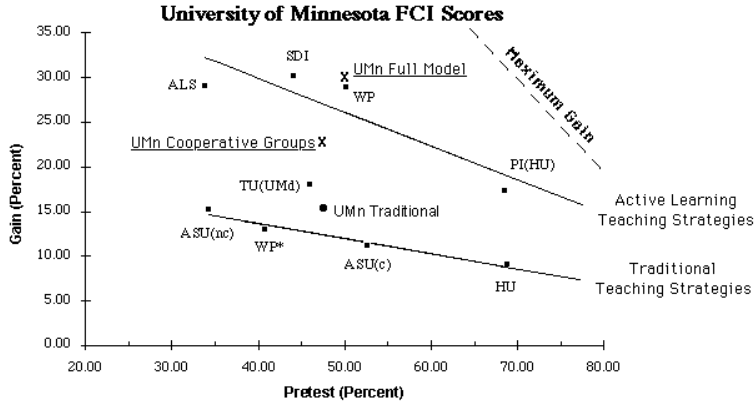


http://groups.physics.umn.edu/physed/Research/MNModel/Model.html

Conceptual Understanding



http://groups.physics.umn.edu/physed/Research/MNModel/FCI.html

Physics (Mechanics) Concepts: The Force Concept Inventory (FCI)

- A 30 item multiple choice test to probe student's understanding of basic concepts in mechanics.
- The choice of topics is based on careful thought about what the fundamental issues and concepts are in Newtonian dynamics.
- Uses common speech rather than cueing specific physics principles.
- The distractors (wrong answers) are based on students' common inferences.

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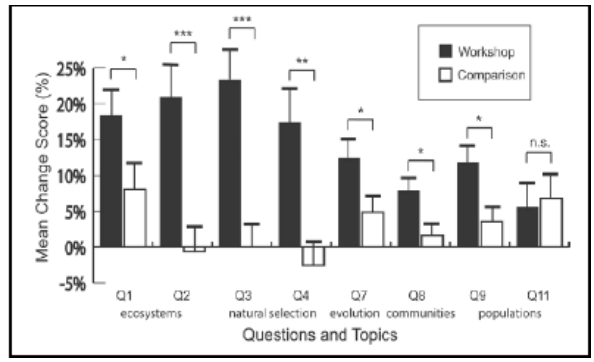
Workshop Biology

Traditional passive lecture vs. "Workshop biology"



Source: Udovic et al. 2002

Biology

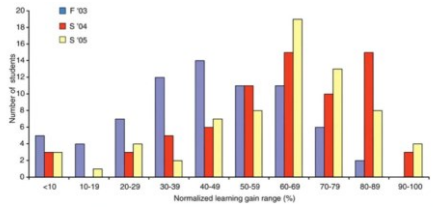


Figure 3. Comparison of normalized learning gains (% of possible maximum) in 10% increments on 12 common pretest and posttest questions for students in one traditional (F'03) and two interactive (S'04, S'05) classes. Normalized learning gains were computed as in Figure 2.

Table 4. Comparison of average performance on different assessments for all three courses

Assessment	F'03	S'04	S'05
Pretest (12 questions)[a]	34	31	37
posttest (12 questions)[a]	65	74	72
Raw learning gain	31	43	38
Normalized learning gain[b]	46	62	61
Hourly exams	71	71	73
Final exam	77	71	76
Problem sets	82	85	90
Participation	N/A	86	86
Final total points	76	81	81

[a]Data based only on the 12 questions that were common to all three pretests and posttests (see Appendix A).
[b]Average for each class is shown. Normalized learning gains were computed as described in the text and the legend to Figure 2.

Source: Knight, J. and Wood, W. (2005). Teaching more by lecturing less. *Cell Biol Educ*. 4(4): 298–310.

Informal Cooperative Learning Groups

Can be used at any time

Can be short term and ad hoc

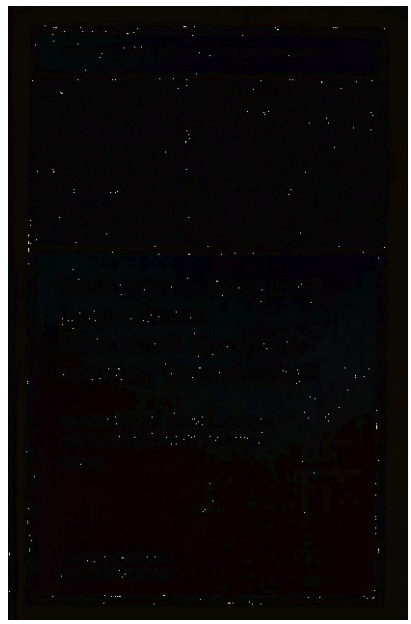
May be used to break up a long lecture

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



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. _____

http://personal.cege.umn.edu/~smith/ 44

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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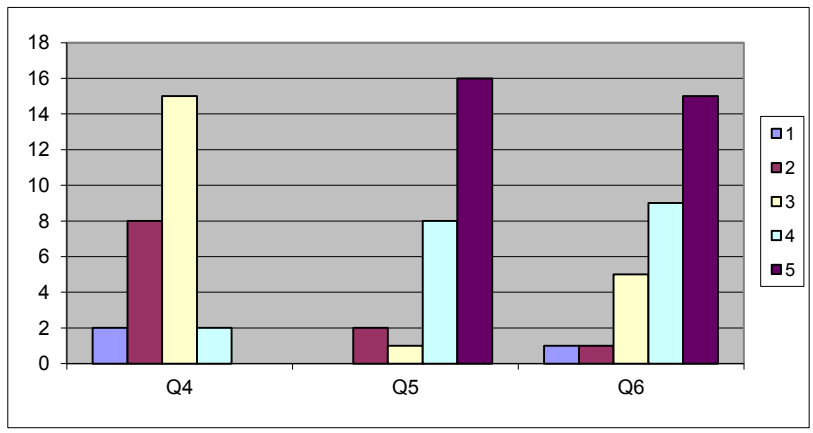
MSU - Workshop (3-4-16)



Q4 – Pace: Too slow 1 . . . . 5 Too fast (3.3)
Q5 – Relevance: Little 1 . . . 5 Lots (4.6)
Q6 – Format: Ugh 1 . . . 5 Ah (4.5)

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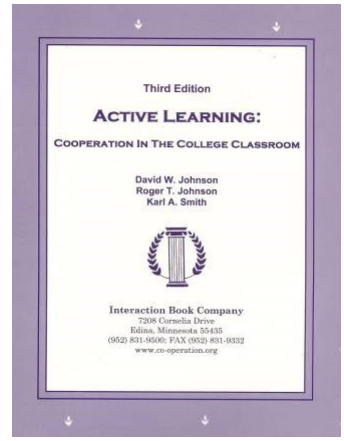
Active Learning: Cooperation in the College Classroom

- **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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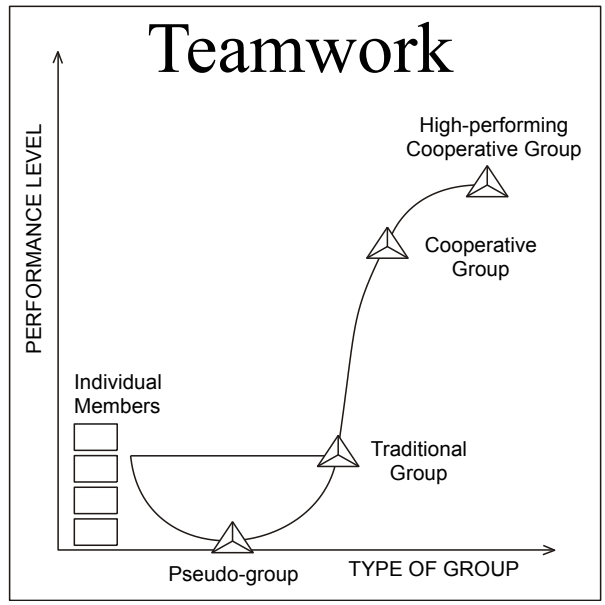
Structuring Teamwork in the Classroom

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

- ?
- ?

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)

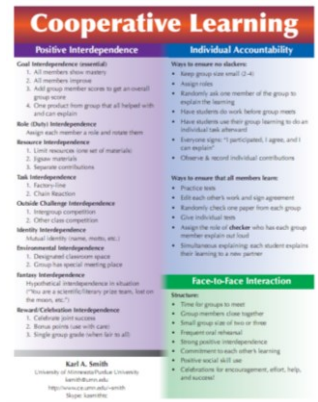
The Wisdom of Teams

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



Six Basic Principles of Team Discipline

Keep membership small

Ensure that members have complimentary skills

Develop a common purpose

Set common goals

Establish a commonly agreed upon working approach

Integrate mutual and individual accountability

Katzenbach & Smith (2001) *The Discipline of Teams*

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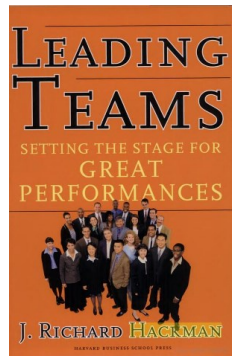
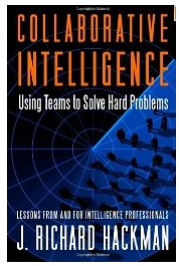
Hackman – Leading Teams





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

Team Diagnostic Survey (TDS)

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

55

Real Team

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

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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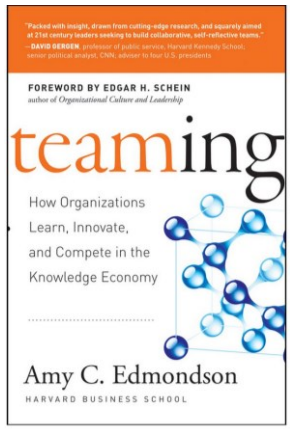
Edmondson - *Teaming*



"Teaming is the engine of organizational learning."

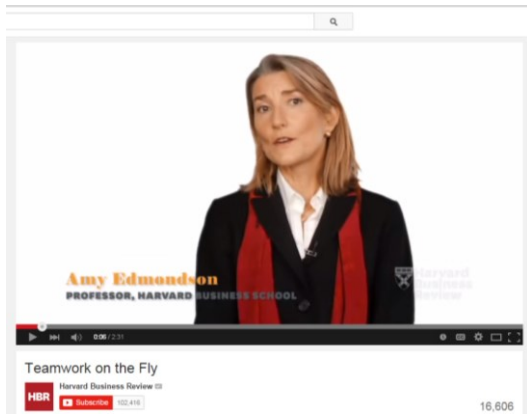
Learning to team, teaming to learn

Teaming process (bottom-up)

- Teaming mindset adopted
- Reflection/feedback
- Interdependent action unfolds
- Coordination of steps and hand-offs
- Individuals communicate
- Recognize need for teaming

Four pillars of effective teaming

- Speaking up
- Collaboration
- Experimentation
- Reflection



https://www.youtube.com/watch?v=pV15JvPwOOE

Teamwork on the Fly

1. Speak Up
2. Listen intensely
3. Integrate different facts and points of view
4. Experiment interactively
5. Reflect on your ideas and actions

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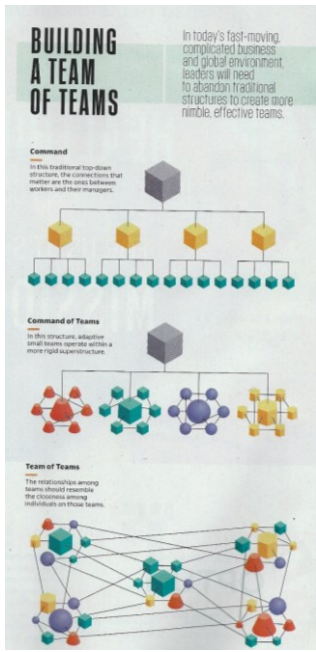
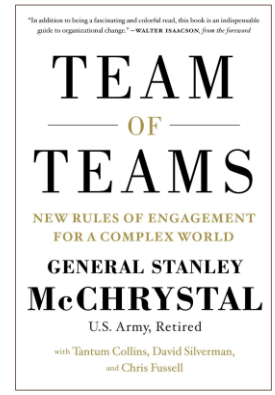


Goodbye org chart

Team of Teams author General Stanley McChrystal and Co-authors explain why **adaptability trumps hierarchy**

Work Smart – Fast Company
June 2015 http://www.fastcompany.com/3045477/work-smart/goodbye-org-chart



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The most valuable form of communication is face-to-face. E-mail and texting are least valuable. Pentland (2012)

Successful teams share several defining characteristics:

1. Everyone on the team talks and listens in roughly equal measure, keeping communication short and sweet.
2. Members face one another, and their conversations and gestures are energetic.
3. Members connect directly with one another – not just with the team leader
4. Members carry on back-channel or side conversations.
5. Members periodically break, go exploring outside the team, and bring information back.

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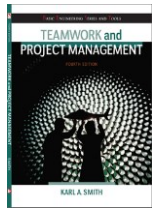
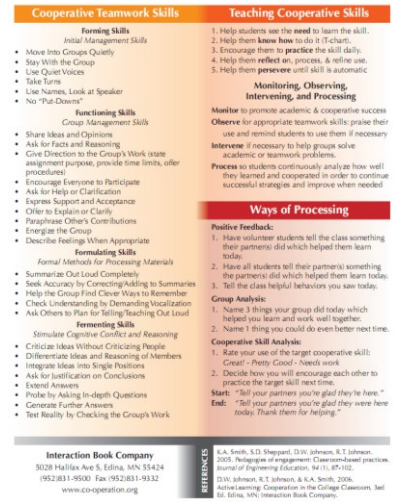
https://hbr.org/2012/04/the-new-science-of-building-great-teams

Teamwork Skills

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



Chapters 3, **4**, 5 & 6



Cooperative Teamwork Skills

Forming Skills
Initial Management Skills
- Move Into Groups Quietly
- Stay With the Group
- Use Quiet Voices
- Take Turns
- Use Names, Look at Speaker
- No "Put-Downs"

Functioning Skills
Group Management Skills
- Share Ideas and Opinions
- Ask for Facts and Reasoning
- Give Direction to the Group's Work (state assignment purpose, provide time limits, offer procedures)
- Encourage Everyone to Participate
- Ask for Help or Clarification
- Express Support and Acceptance
- Offer to Explain or Clarify
- Paraphrase Other's Contributions
- Energize the Group
- Describe Feelings When Appropriate

Formulating Skills
Formal Methods for Processing Materials
- Summarize Out Loud Completely
- Seek Accuracy by Correcting/Adding to Summaries
- Help the Group Find Clever Ways to Remember
- Check Understanding by Demanding Vocalization
- Ask Others to Plan for Telling/Teaching Out Loud

Fermenting Skills
Stimulate Cognitive Conflict and Reasoning
- Criticize Ideas Without Criticizing People
- Differentiate Ideas and Reasoning of Members
- Integrate Ideas into Single Positions
- Ask for Justification on Conclusions
- Extend Answers
- Probe by Asking In-depth Questions
- Generate Further Answers
- Test Reality by Checking the Group's Work

Teaching Cooperative Skills

1. Help students see the **need** to learn the skill.
2. Help them **know how** to do it (T-chart).
3. Encourage them to **practice** the skill daily.
4. Help them **reflect on**, process, & refine use.
5. Help them **persevere** until skill is automatic

Monitoring, Observing, Intervening, and Processing

Monitor to promote academic & cooperative success

Observe for appropriate teamwork skills: praise their use and remind students to use them if necessary

Intervene if necessary to help groups solve academic or teamwork problems.

Process so students continuously analyze how well they learned and cooperated in order to continue successful strategies and improve when needed

Ways of Processing

Positive Feedback:
1. Have volunteer students tell the class something their partner(s) did which helped them learn today.
2. Have all students tell their partner(s) something the partner(s) did which helped them learn today.
3. Tell the class helpful behaviors you saw today.

Group Analysis:
1. Name 3 things your group did today which helped you learn and work well together.
2. Name 1 thing you could do even better next time.

Cooperative Skill Analysis:
1. Rate your use of the target cooperative skill:
   Great! - Pretty Good - Needs work
2. Decide how you will encourage each other to practice the target skill next time.

Start: *"Tell your partners you're glad they're here."*
End: *"Tell your partners you're glad they were here today. Thank them for helping."*

Interaction Book Company
5028 Halifax Ave S, Edina, MN 55424
(952)831-9500 Fax (952)831-9332
www.co-operation.org

REFERENCES

K.A. Smith, S.D. Sheppard, D.W. Johnson, R.T. Johnson. 2005. Pedagogies of engagement: Classroom-based practices. *Journal of Engineering Education*, 94 (1), 87-102.

D.W. Johnson, R.T. Johnson, & K.A. Smith. 2006. Active Learning: Cooperation in the College Classroom, 3ed Ed. Edina, MN: Interaction Book Company.

TEAMWORK

Teaching Cooperative Skills

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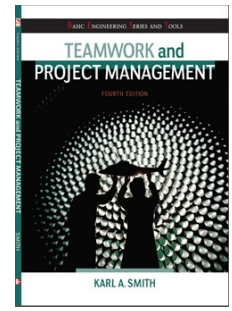
Team Charter

- 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

Code of Cooperation

•EVERY member is responsible for the team's progress and success.
•Attend all team meetings and be on time.
•Come prepared.
•Carry out assignments on schedule.
•Listen to and show respect for the contributions of other members; be an active listener.
•CONSTRUCTIVELY criticize ideas, not persons.
•Resolve conflicts constructively,
•Pay attention, avoid disruptive behavior.
•Avoid disruptive side conversations.
•Only one person speaks at a time.
•Everyone participates, no one dominates.
•Be succinct, avoid long anecdotes and examples.
•No rank in the room.
•Respect those not present.
•Ask questions when you do not understand.
•Attend to your personal comfort needs at any time but minimize team disruption.
•HAVE FUN!!
•?

Adapted from Boeing Aircraft Group Team Member Training Manual

Team Charter Examples & Research

Team Charter – Developed by Vivian Corwin and Marilyn A. Uy for COM 321 (Organizational Behaviour) Gustavson School of Business, University of Victoria

Mathieu, John E. & Rapp, Tammy L. 2009. Laying the foundation for successful team performance trajectories: The role of team charters and performance strategies. *Journal of Applied Psychology, 94*(1), 90-103

Group Ground Rules Contract Form – Developed by Deborah Allan, University of Delaware (Recommend using with student teams)

Many more examples available online

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TEAM CHARTER[1]

Team Name & Logo:

Team Vision:

Team Values:

Analogy or Metaphor to Describe Your Team:

Roles: (*each of these roles should have a description of the tasks, not just the name of the person assigned to that role*)

- Leader/Chair
- Coordinator
- Recorder
- Time Keeper
- Researcher
- Writer
- Editor
- Facilitator
- Process Observer
- Quality Checker
- …… others as appropriate for your team

Processes: (*each of these processes should have a detailed description of your agreed-upon process*)

- Communication
- Decision Making
- Conflict Resolution
- Innovation
- Accountability
- Meetings – F2F and virtual
- Gantt chart of all assignments (individual and team) for all the courses for the term
- …… other processess as appropriate for your team

Relationships:

- DISC Styles – highlight key points from each person's profile
- Highlight 3 Dos and 3 Don'ts When Communicating for each team member
- Our experience
- Any special requirements (i.e. work schedules)
- Managing our cultural differences
- ……any other pertinent information

Team Strengths & Challenges:

- Team Wheel
- Strategies to use our strengths and compensate for our weaknesses (if not discussed in roles and/or processes)

Individual Goals (for each member):

Individual Rewards (for each member):

Team Goals:

Team Rewards:

Signatures and Date:

[1] Developed by Vivian Corwin and Marilyn A. Uy for COM 321 (Organizational Behaviour) Gustavson School of Business, University of Victoria

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Appendix

The Team Charter

The Team Charter was a lengthy, structured exercise that was introduced and explained during class time. It was framed in terms of how the team would function to compete in the business simulation. It contained three major parts, as detailed below. Teams could complete it in any way they chose (methods ranged from completing it together in person to exclusive use of virtual communications). Teams had a week to complete the assignment outside of class time.

Part 1: Individual Preparation
(Each member completed separately)

Members were asked to detail, in writing, their personal characteristics in terms of their

personal background (whatever they chose to share; usually, it was where they grew up, major, hobbies, personality features);

contact information and preferred medium or mediums (e.g., text, e-mail, voice, face-to-face);

availability in terms of hours and days, as well as preferred work times;

individual business-related strengths and weaknesses, including factors such as content knowledge and work experiences;

preferred work styles, particularly as related to teamwork, and;

anything else they believe the team should know.

Part 2: Team Roles, Expectations, and Processes
(One version for the entire team)

Members were to meet and share their individual information from Part 1 and then to determine, as a team, how they would operate and what types of norms they wished to establish. They were provided with a series of questions to prompt such a discussion:

What are your goals for the simulation, performance and otherwise?

Who will be responsible for what activities (including, perhaps, backup roles)? and

What is your timetable for activities?

As for norms, they were prompted to address specific expectations regarding

meeting attendance;

task performance and quality;

idea contributions;

cooperation and attitudes; and

anything else they wanted.

Part 3: Rewards and Sanctions
(One version for the entire team)

Members also determined, as a group, how they would

Ensure expected contributions and performance levels;

Reward members and the team for successes; and

Manage or sanction poor performance (often tied to peer evaluations, which contributed to students' course participation grades).

Teams were required to circulate a single copy to all members and to incorporate any edits or changes that were warranted. The final integrated document was passed in for the team grade and was posted in their team web space.

Received January 27, 2006
Revision received May 9, 2008
Accepted June 2, 2008 ■

Mathieu, John E. & Rapp, Tammy 69 2009. Laying the foundation for successful team performance trajectories: The role of team charters and performance strategies. *Journal of Applied Psychology, 94*(1), 90-103

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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PROJECT TEAM CONTRACT

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:

_____ _____

_____ _____

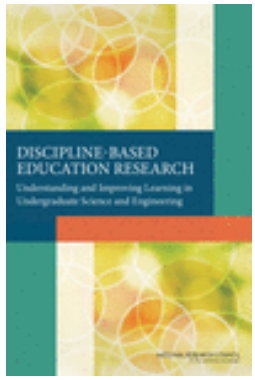
_____ _____

For more **FreeBIEs** visit **bie.org** ©2011 BUCK INSTITUTE FOR EDUCATION

Why Emphasize Teamwork?

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

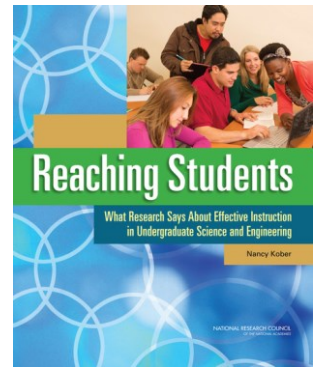
Discipline-Based Education Research (DBER) Report



National Research Council Summer 2012 – http://www.nap.edu/catalog.php?record_id=13362

ASEE *Prism Summer 2013*

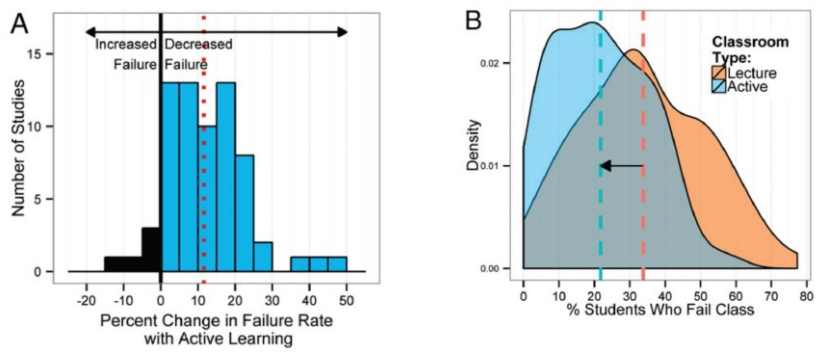
Journal of Engineering Education – October, 2013



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

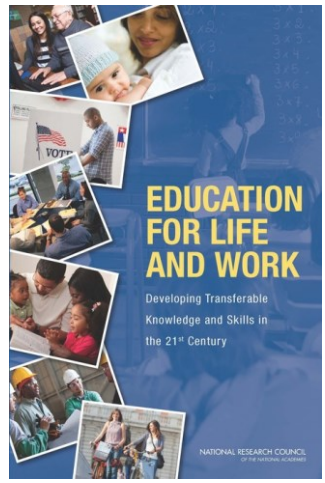
Engaged Pedagogies = Reduced Failure Rates

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



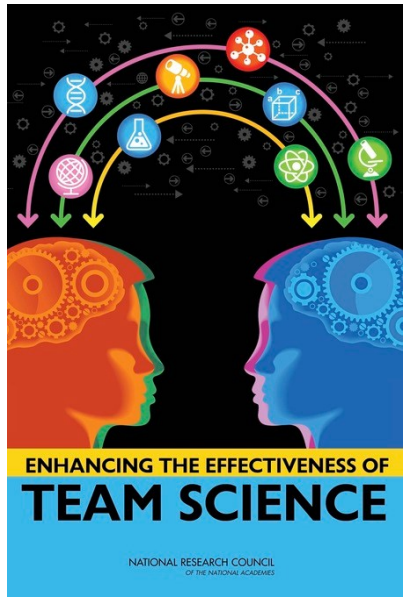
Freeman, Scott; Eddy, Sarah L.; McDonough, Miles; Smith, Michelle K.; Okoroafor, Nnadozie; Jordt, Hannah; Wenderoth, Mary Pat; Active learning increases student performance in science, engineering, and mathematics, 2014, Proc. Natl. Acad. Sci.

Education for Life and Work



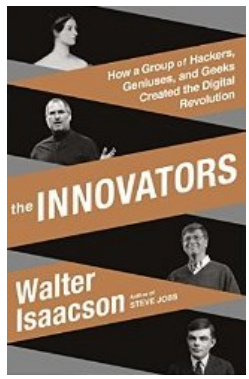
1. Introduction 15
2. A Preliminary Classification of Skills and Abilities 21
3. Importance of Deeper Learning and 21st Century Skills 37
4. Perspectives on Deeper Learning 69
5. Deeper Learning of English Language Arts, Mathematics, and Science 101
6. Teaching and Assessing for Transfer 143
7. Systems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

HART RESEARCH ASSOCIATES

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)

	Employers %
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

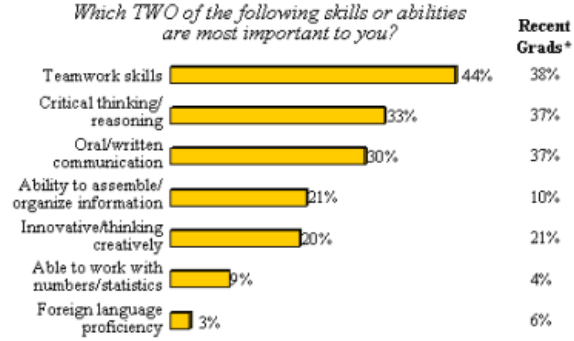
Conducted On Behalf Of:
The Association Of American Colleges And Universities

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/

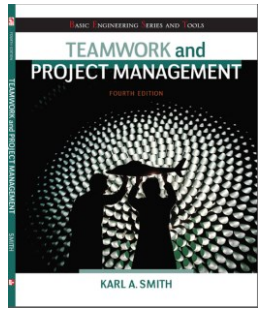
Top Three Main Engineering Work Activities

Engineering Total

- Design – 36%
- Computer applications – 31%
- Management – 29%

Civil/Architectural

- Management – 45%
- Design – 39%
- Computer applications – 20%

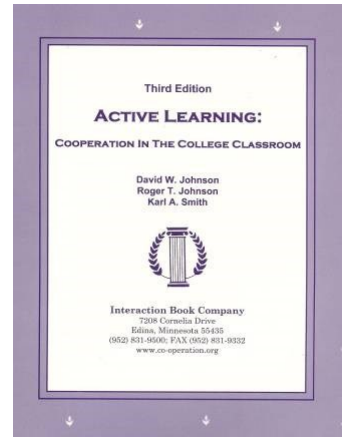


Burton, L., Parker, L, & LeBold, W. 1998. U.S. engineering career trends. *ASEE Prism*, *7*(9), 18-21.

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]



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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

Instructor's Role in Formal Cooperative Learning

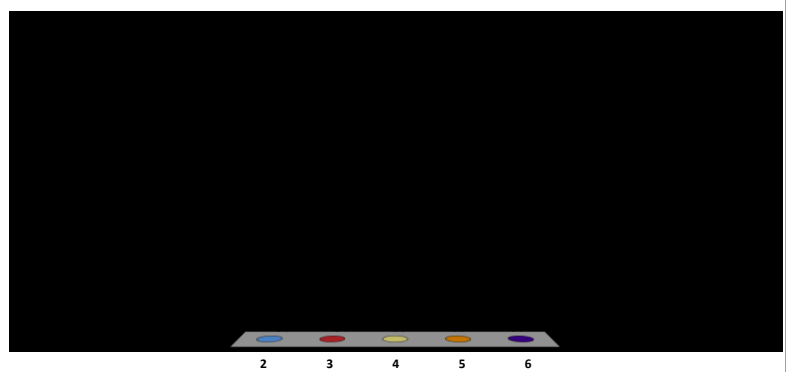
1. Specifying **Objectives** (Academic and Social/Teamwork)
2. Making **Decisions**
3. Explaining **Task**, **Positive Interdependence**, and **Individual Accountability**
4. **Monitoring** and Intervening to Teach Skills
5. **Evaluating** Students' Achievement and Group Effectiveness

Decisions, Decisions…

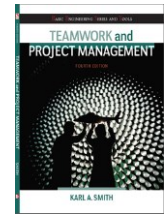
- Group size?
- Group selection?
- Group member roles?
- How long to leave groups together?
- Arranging the room?
- Providing materials?
- Time allocation?

Optimal Group Size?

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

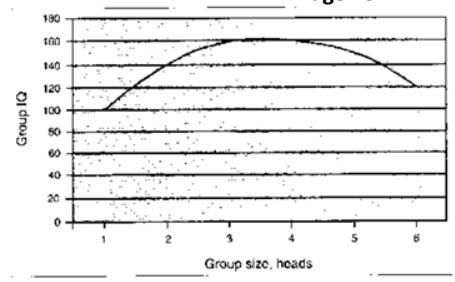


Formal Cooperative Learning Task Groups



Page 48

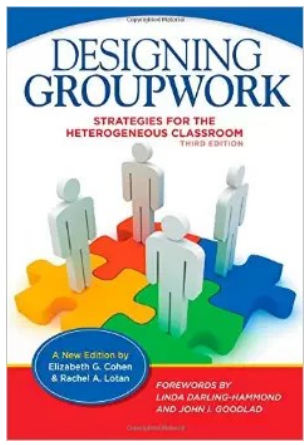
Perkins, David. 2003. *King Arthur's Round Table: How collaborative conversations create smart organizations.* NY: Wiley.



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

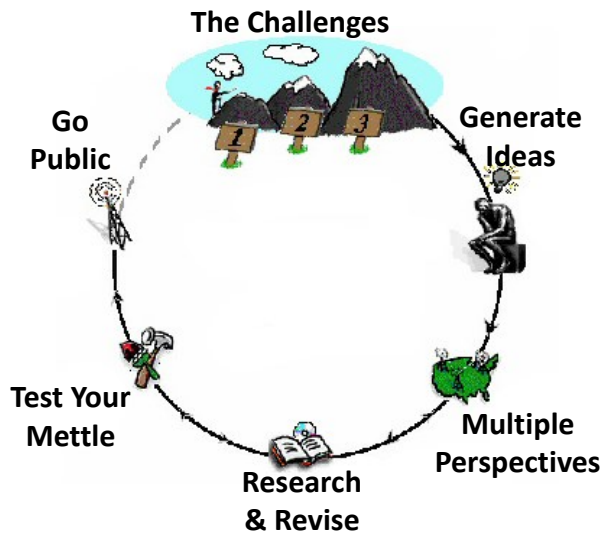
Group Processing Plus/Delta Format

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

Challenge-Based Learning



http://eecs.vanderbilt.edu/courses/ee213/challenge-based_Lab_design_concept.htm

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

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Team Member Roles

- Task Recorder
- Skeptic/Prober
- Process Recorder

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.

Model 1 (lower bound)

let L be the length of the room,
let W be its width,
let H be its height,
and let D be the diameter of a ping pong ball.

Then the volume of the room is

$$V_{room} = L * W * H,$$

and the volume of a ball (treating it as a cube) is

$$V_{ball} = D^3,$$

so number of balls = $(V_{room}) / (V_{ball}) = (L * W * H) / (D^3)$.

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Model 2 (upper bound)

let L be the length of the room,
let W be its width,
let H be its height,
and let D be the diameter of a ping pong ball.

Then the volume of the room is
$V_{room} = L * W * H,$

and the volume of a ball (treating it as a sphere) is
$V_{ball} = 4/3\ \pi r^3,$

so number of balls = $(V_{room}) / (V_{ball}) = (L * W * H) / (4/3\ \pi\ r^3)$.

99

Model 1 (V_{room} / D^3_{ball}) B Lower Bound

Model 2 ($V_{room} / (4/3\ \pi r^3_{ball})$) B Upper Bound

Upper Bound/Lower Bound = $6/\pi \approx 2$

How does this ratio compare with

1. The estimation of the diameter of the ball?
2. The estimation of the dimensions of the room?

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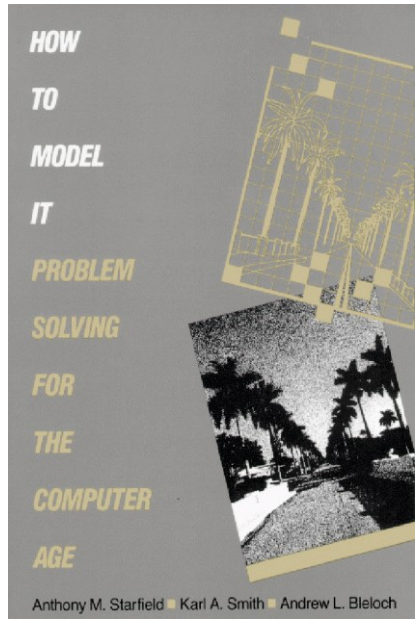
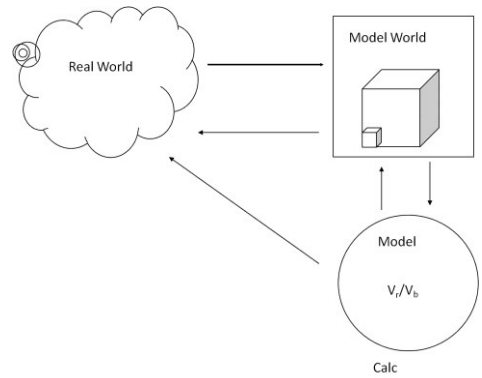
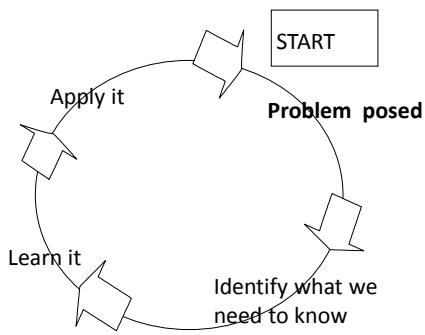


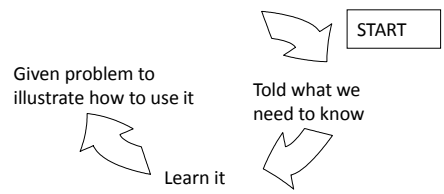


*Based on First Year Engineering course – Problem-based cooperative learning *How to Model It* published in 1990.

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.

Problem-Based Learning (PBL)

Problem-based learning is the learning that results from the process of working toward the understanding or resolution of a problem. The problem is encountered first in the learning process – Barrows and Tamlyn, 1980

Core Features of PBL

- Learning is student-centered
- Learning occurs in small student groups
- Teachers are facilitators or guides
- Problems are the organizing focus and stimulus for learning
- Problems are the vehicle for the development of clinical problem-solving skills
- New information is acquired through self-directed learning

Group Processing Plus/Delta Format

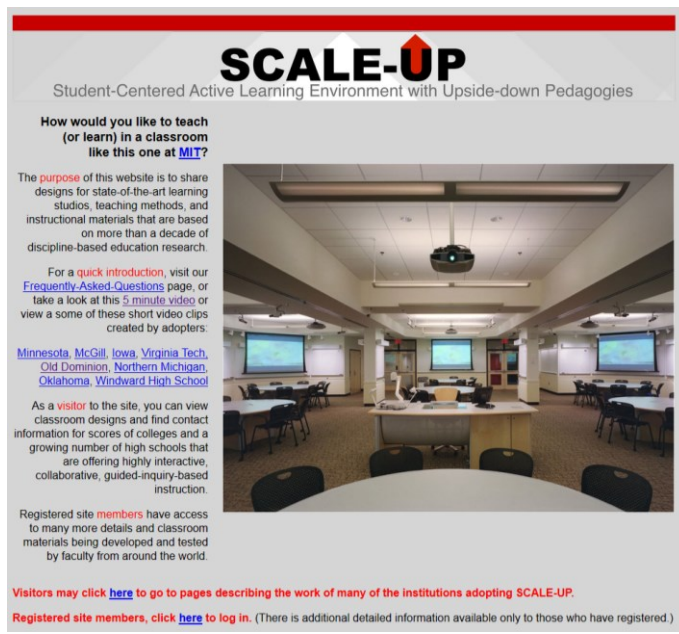
Plus (+) Things That Group Did Well	Delta (Δ) Things Group Could Improve

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).

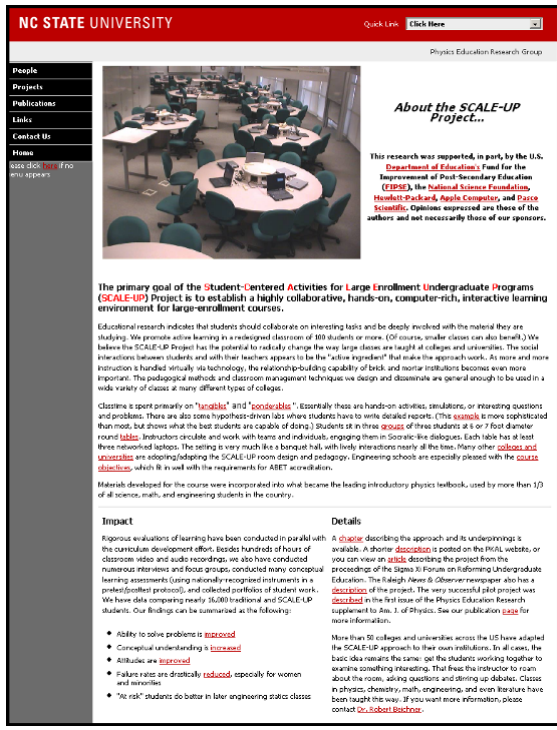
Key Concepts

- Positive Interdependence
- 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



http://scaleup.ncsu.edu/



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

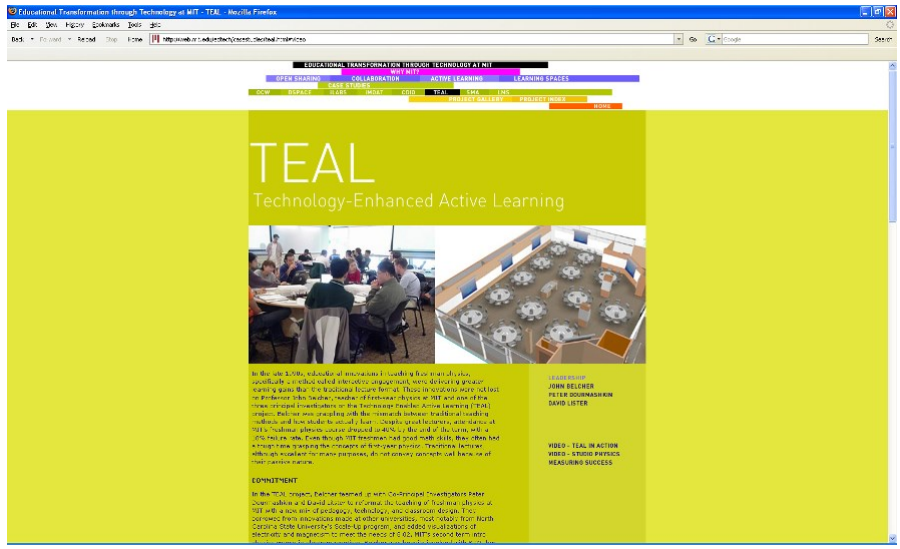
The Massachusetts Institute of Technology has changed the way it offers some introductory classes. Prof. Gabriella Sciolla of a class on electricity and magnetism.

By SARA RIMER
Published: January 12, 2009

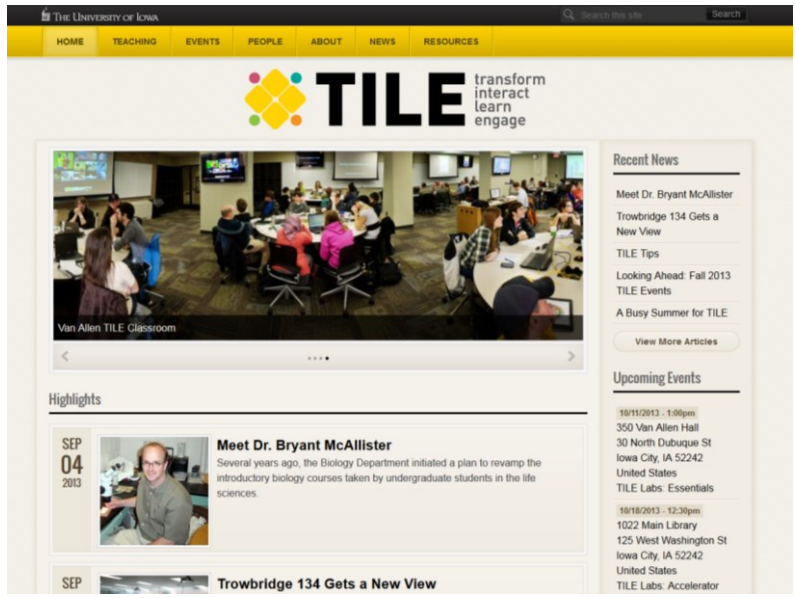
COMMENTS (00)
E-MAIL
PRINT
SINGLE PAGE

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,

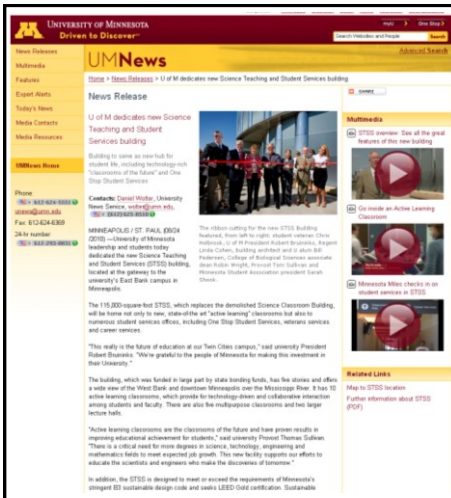
January 13, 2009—New York Times – http://www.nytimes.com/2009/01/13/us/13physics.html?em



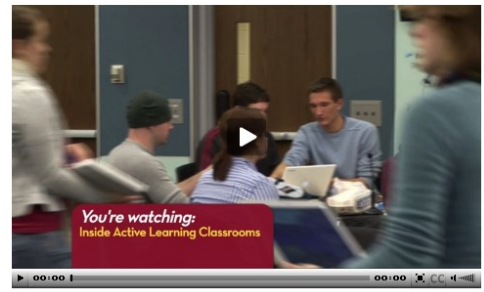
http://web.mit.edu/edtech/casestudies/teal.html#video



http://tile.uiowa.edu/



http://www1.umn.edu/news/news-releases/2010/UR_CONTENT_248261.html



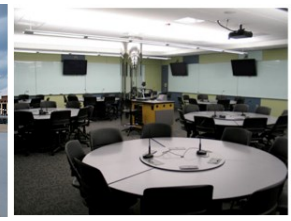
http://mediamill.cla.umn.edu/mediamill/embed/78755

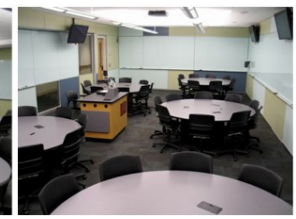
http://www.youtube.com/watch?v=lfT_hoiuY8w

Inside an Active Learning Classroom

STSS at the University of Minnesota

http://vimeo.com/andyub/activeclassroom



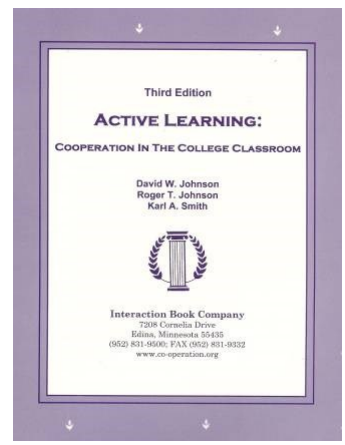


"I love this space! It makes me feel appreciated as a student, and I feel intellectually invigorated when I work and learn in it."

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

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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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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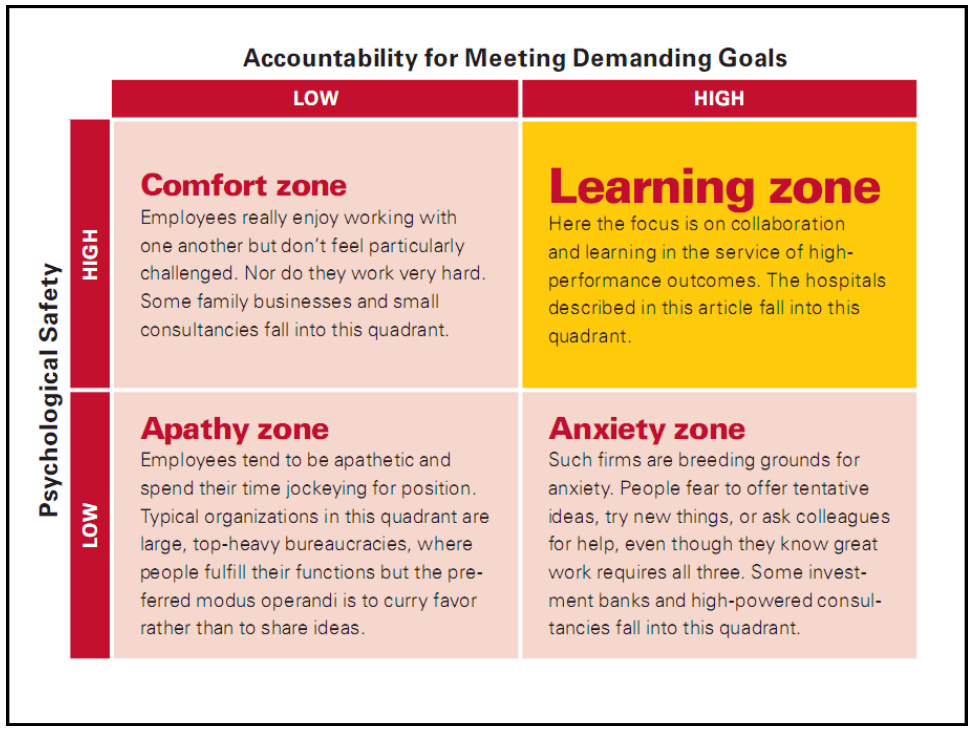
Does Psychological Safety Hinder Performance?

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

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 "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: _____

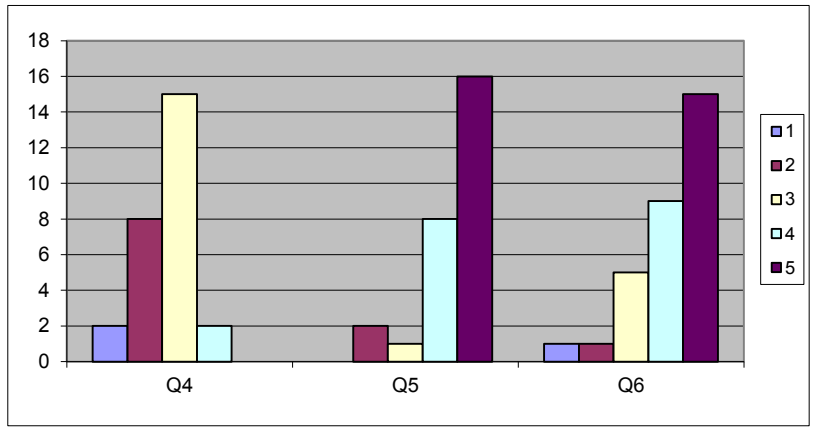
Monitoring And Intervening

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: _____

MSU - Workshop (3-4-16)



Q4 – Pace: Too slow 1 . . . . 5 Too fast (3.3)
Q5 – Relevance: Little 1 . . . 5 Lots (4.6)
Q6 – Format: Ugh 1 . . . 5 Ah (4.5)

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