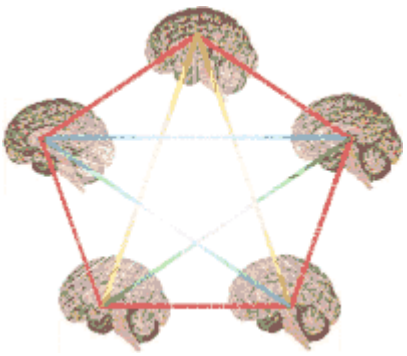

Collaborative Learning

The concept of collaborative learning, the grouping and pairing of learners for the purpose of achieving a learning goal, has been widely researched and advocated - the term "collaborative learning" refers to an instruction method in which learners at various performance levels work together in small groups toward a common goal. The learners are responsible for one another's learning as well as their own. Thus, the success of one learner helps other students to be successful.

Collaborative Learning is a relationship among learners that requires positive interdependence (a sense of sink or swim together), individual accountability (each of us has to contribute and learn), interpersonal skills (communication, trust, leadership, decision making, and conflict resolution), face-to-face promotive interaction, and processing (reflecting on how well the team is functioning and how to function even better).

Proponents of collaborative learning claim that the active exchange of ideas within small groups not only increases interest among the participants but also promotes critical thinking.There is persuasive evidence that cooperative teams achieve at higher levels of thought and retain information longer than learners who work quietly as individuals. The shared learning gives leanres an opportunity to engage in discussion, take responsibility for their own learning, and thus become critical thinkers.

Understanding Collaborative Learning

- What is collaborative learning?
- More about CL
- Terms and Definitions
- 44 Benefits of Collaborative Learning
- Intended Learning Objectives (ILOs) and Optimal Learning Methods

Strategies, Tools and Methods

- Four Collaborative Learning Strategies
- Collaborative Learning Structures and Techniques
- Think-Pair-Share

Making Collaborative Learning Work

- The Make-up of a CL Session
- Interactiveness in Collaborative Learning
- Hints for Better Learning Groups
- The Conditions for Effective Collaborative Learning

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What is collaborative learning?

Collaborative learning is an educational approach to teaching and learning that involves groups of learners working together to solve a problem, complete a task, or create a product. Collaborative learning is based on the idea that learning is a naturally social act in which the participants talk among themselves. It is through the talk that learning occurs.

There are many approaches to collaborative learning:

1. Learning is an active process whereby learners assimilate the information and relate this new knowledge to a framework of prior knowledge.
2. Learning requires a challenge that opens the door for the learner to actively engage his/her peers, and to process and synthesize information rather than simply memorize and regurgitate it.
3. Learners benefit when exposed to diverse viewpoints from people with varied backgrounds.
4. Learning flourishes in a social environment where conversation between learners takes place. During this intellectual gymnastics, the learner creates a framework and meaning to the discourse.
5. In the collaborative learning environment, the learners are challenged both socially and emotionally as they listen to different perspectives, and are required to articulate and defend their ideas. In so doing, the learners begin to create their own unique conceptual frameworks and not rely solely on an expert's or a text's framework.

Thus, in a collaborative learning setting, learners have the opportunity to converse with peers, present and defend ideas, exchange diverse beliefs, question other conceptual frameworks, and be actively engaged.

Source: National Institute for Science Education

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Return to Collaborative Learning

More About CL

Collaborative learning (CL) is instruction that involves students working in teams to accomplish a common goal, under conditions that include the following elements (Johnson, Johnson, and Smith, 1991):

1. **Positive interdependence.** Team members are obliged to rely on one another to achieve the goal. If any team members fail to do their part, everyone suffers consequences.

2. **Individual accountability.** All students in a group are held accountable for doing their share of the work and for mastery of all of the material to be learned.

3. **Face-to-face promotive interaction.** Although some of the group work may be parcelled out and done individually, some must be done interactively, with group members providing one another with feedback, challenging one another's conclusions and reasoning, and perhaps most importantly, teaching and encouraging one another.

4. **Appropriate use of collaborative skills.** Students are encouraged and helped to develop and practice trust-building, leadership, decision-making, communication, and conflict management skills.

5. **Group processing.** Team members set group goals, periodically assess what they are doing well as a team, and identify changes they will make to function more effectively in the future.

Collaborative learning is not simply a synonym for students working in groups. A learning exercise only qualifies as CL to the extent that the listed elements are present.

Source: Johnson, D.W., R.T. Johnson and K.A. Smith, *Cooperative Learning: Increasing College Faculty Instructional Productivity,* ASHE-ERIC Higher Education Report No. 4, George Washington University, 1991.

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Return to Collaborative Learning

Terms and Definitions

Collaborative Learning:
An instruction method in which learners work in groups toward a common academic goal.

Critical-thinking Items:
Items that involve analysis, synthesis, and evaluation of the concepts.

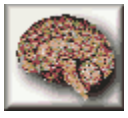
Drill-and-Practice Items:
Items that pertain to factual knowledge and comprehension of the concepts.

Formal learning groups
Teams established to complete a specific task, such as perform a lab experiment, write a report, carry out a project, or prepare a position paper. These groups may complete their work in a single session or over several weeks.

Individual Learning:
An instruction method in which learners work individually at their own level and rate toward an academic goal.

Informal learning groups
Ad hoc temporary clusterings of learners within a single session.

Study teams
Long-term groups with stable membership whose primary responsibility is to provide members with support, encouragement, and assistance in completing a learning session's requirements and assignments.



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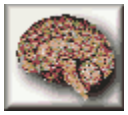
Return to Collaborative Learning

44 Benefits of Collaborative Learning

1. Develops higher level thinking skills
2. Promotes student-faculty interaction and familiarity
3. Increases student retention
4. Builds self esteem in students
5. Enhances student satisfaction with the learning experience
6. Promotes a positive attitude toward the subject matter
7. Develops oral communication skills
8. Develops social interaction skills
9. Promotes positive race relations
10. Creates an environment of active, involved, exploratory learning
11. Uses a team approach to problem solving while maintaining individual accountability
12. Encourages diversity understanding
13. Encourages student responsibility for learning
14. Involves students in developing curriculum and class procedures
15. Students explore alternate problem solutions in a safe environment
16. Stimulates critical thinking and helps students clarify ideas through discussion and debate
17. Enhances self management skills
18. Fits in well with the constructivist approach
19. Establishs an atmosphere of cooperation and helping schoolwide
20. Students develop responsibility for each other
21. Builds more positive heterogeneous relationships
22. Encourages alternate student assessment techniques
23. Fosters and develops interpersonal relationships
24. Modelling problem solving techniques by students' peers
25. Students are taught how to criticize ideas, not people
26. Sets high expectations for students and teachers
27. Promotes higher achievement and class attendance .
28. Students stay on task more and are less disruptive
29. Greater ability of students to view situations from others' perspectives (development of empathy)
30. Creates a stronger social support system
31. Creates a more positive attitude toward teachers, principals and other school personnel by students and creates a more positive attitude by teachers toward their students
32. Addresses learning style differences among students
33. Promotes innovation in teaching and classroom techniques
34. Classroom anxiety is significantly reduced
35. Test anxiety is significantly reduced
36. Classroom resembles real life social and employment situations
37. Students practice modeling societal and work related roles
38. CL is synergystic with writing across the curriculum
39. CL activities can be used to personalize large lecture classes
40. Skill building and practice can be enhanced and made less tedious through CL activities in and out of class.
41. CL activities promote social and academic relationships well beyond the classroom and individual course
42. CL processes create environments where students can practice building leadership skills.
43. CL increases leadership skills of female students
44. In colleges where students commute to school and do not remain on campus to participate

in campus life activities, CL creates a community environment within the classroom.

Source: Posted on Co-Learn mailing list by Ted Panitz TPANITZ@mecn.mass.edu



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Return to Collaborative Learning

Intended Learning Objectives (ILOs) and Optimal Learning Methods

Based on 122 research papers

Learning Objective	Optimal Learning Method		
	Individual	Competitive	Collaborative
Acquiring specific, concrete knowledge in a given field	●		
Developing simple skills e.g. spelling, using simple tools	●		
Developing knowledge that requires substantial practice e.g. species recognition		●	
Quick assessment of a certain amount of resource materia		●	
Applying and sharing knowledge, principles		●	
Understanding complex concepts			●
Problem-solving			●
Enhancing creativity, thinking differently			●
Understanding different perspectives			●
Valuing diversity			●
Managing prejudice, bias			●
Developing positive attitude towards learning			●
Developing positive self-esteem			●

Source: Susan Fountain, UNICEF, NY, USA (1991): Teaching and Learning Methodology of Global Education, in "Education in the Changing World", Hungary

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Return to Collaborative Learning

Four Collaborative Learning Strategies

THINK-PAIR-SHARE: (1) The instructor poses a question, preferable one demanding analysis, evaluation, or synthesis, and gives students about a minute to think through an appropriate response. This "think-time" can be spent writing, also. (2) Students then turn to a partner and share their responses. (3) During the third step, student responses can be shared within a four-person learning team, within a larger group, or with an entire class during a follow-up discussion. The caliber of discussion is enhanced by this technique, and all students have an opportunity to learn by reflection and by verbalization.

THREE-STEP INTERVIEW: Common as an ice-breaker or a team-building exercise, this structure can also be used also to share information such as hypotheses or reactions to a film or article. (1) Students form dyads; one student interviews the other. (2) Students switch roles. (3) The dyad links with a second dyad. This four-member learning team then discusses the information or insights gleaned from the initial paired interviews.

SIMPLE JIGSAW: The faculty member divides an assignment or topic into four parts with all students from each LEARNING TEAM volunteering to become "experts" on one of the parts. EXPERT TEAMS then work together to master their fourth of the material and also to discover the best way to help others learn it. All experts then reassemble in their home LEARNING TEAMS where they teach the other group members.

NUMBERED HEADS TOGETHER: Members of learning teams, usually composed of four individuals, count off: 1, 2, 3, or 4. The instructor poses a question, usually factual in nature, but requiring some higher order thinking skills. Students discuss the question, making certain that every group member knows the agreed upon answer. The instructor calls a specific number and the team members originally designated that number during the count off respond as group spokespersons. Because no one knows which number the teacher will call, all team members have a vested interest in understanding the appropriate response.
Again, students benefit from the verbalization, and the peer coaching helps both the high and the low achievers. Class time is usually better spent because less time is wasted on inappropriate responses and because all students become actively involved with the material

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Return to Collaborative Learning

Collaborative Learning Structures and Techniques

TOP

Three-step Interview

Three-step interviews can be used as an ice breaker for team members to get to know one another or can be used to get to know concepts in depth, by assigning roles to students.

- Faculty assigns roles or students can "play" themselves. Faculty may also give interview questions or information that should be "found."
- A interviews B for the specified number of minutes, listening attentively and asking probing questions.
- At a signal, students reverse roles and B interviews A for the same number of minutes.
- At another signal, each pair turns to another pair, forming a group of four. Each member of the group introduces his or her partner, highlighting the most interesting points.

TOP

Roundtable

Roundtable structures can be used to brainstorm ideas and to generate a large number of responses to a single question or a group of questions.

- Faculty poses question.
- One piece of paper and pen per group.
- First student writes one response, and says it out loud.
- First student passes paper to the left, second student writes response, etc.
- Continues around group until time elapses.
- Students may say "pass" at any time.
- Group stops when time is called.

The key here is the question or the problem you've asked the students to consider. It has to be one that has the potential for a number of different "right" answers. Relate the question to the course unit, but keep it simple so every student can have some input.

Once time is called, determine what you want to have the students do with the lists...they may want to discuss the multitude of answers or solutions or they may want to share the lists with the entire class.

TOP

Focused Listing

Focused listing can be used as a brainstorming technique or as a technique to generate descriptions and definitions for concepts. Focused listing asks the students to generate words to define or describe something. Once students have completed this activity, you can use these lists to facilitate group and class discussion.

Example: Ask students to list 5-7 words or phrases that describe or define what a motivated student does. From there, you might ask students to get together in small groups to discuss the lists, or to select the one that they can all agree on. Combine this technique with a number of the other techniques and you can have a powerful cooperative learning structure.

TOP

Structured Problem-solving

Structured problem-solving can be used in conjunction with several other cooperative learning structures.

- Have the participants brainstorm or select a problem for them to consider.
- Assign numbers to members of each group (or use playing cards). Have each member of the group be a different number or suit.
- Discuss task as group.
- Each participant should be prepared to respond. Each member of the group needs to understand the response well enough to give the response with no help from the other members of the group.
- Ask an individual from each group to respond. Call on the individual by number (or suit).

TOP

One Minute Papers

Ask students to comment on the following questions. Give them one minute and time them. This activity focuses them on the content and can also provide feedback to you as a teacher.

- What was the most important or useful thing you learned today?
- What two important questions do you still have; what remains unclear?
- What would you like to know more about?

You can use these one minute papers to begin the next day's discussion, to facilitate discussion within a group, or to provide you with feedback on where the student is in his or her understanding of the material.

TOP

Paired Annotations

Students pair up to review/learn same article, chapter or content area and exchange double-entry

journals (see below) for reading and reflection.

Students discuss key points and look for divergent and convergent thinking and ideas.

Together students prepare a composite annotation that summarizes the article, chapter, or concept.

TOP

Structured Learning Team Group Roles

When putting together groups, you may want to consider assigning (or having students select) their roles for the group. Students may also rotate group roles depending on the activity.

Potential group roles and their functions include:

- Leader - The leader is responsible for keeping the group on the assigned task at hand. S/he also makes sure that all members of the group have an opportunity to participate, learn and have the respect of their team members. The leader may also want to check to make sure that all of the group members have mastered the learning points of a group exercise.
- Recorder - The recorder picks and maintains the group files and folders on a daily basis and keeps records of all group activities including the material contributed by each group member. The recorder writes out the solutions to problems for the group to use as notes or to submit to the instructor. The recorder may also prepare presentation materials when the group makes oral presentations to the class.
- Reporter - The reporter gives oral responses to the class about the group's activities or conclusions.
- Monitor - The monitor is responsible for making sure that the group's work area is left the way it was found and acts as a timekeeper for timed activities.
- Wildcard (in groups of five) - The wildcard acts as an assistant to the group leader and assumes the role of any member that may be missing.

TOP

Send-A-Problem

Send-A-Problem can be used as a way to get groups to discuss and review material, or potential solutions to problems related to content information.

1. Each member of a group generates a problem and writes it down on a card. Each member of the group then asks the question to other members.
2. If the question can be answered and all members of the group agree on the answer, then that answer is written on the back of the card. If there is no consensus on the answer, the question is revised so that an answer can be agreed upon.
3. The group puts a Q on the side of the card with the question on it, and an A on the side of the card with an answer on it.
4. Each group sends its question cards to another group.
5. Each group member takes ones question from the stack of questions and reads one question at a time to the group. After reading the first question, the group discusses it. If the group agrees on the answer, they turn the card over to see if they agree with the first group's answer. If there again is consensus, they proceed to the next question. If they do not agree with the first group's answer, the second group write their answer on the back of the card as an alternative answer.
6. The second group reviews and answers each question in the stack of cards, repeating the

procedure outlined above.
7. The question cards can be sent to a third, fourth, or fifth group, if desired.
8. Stacks of cards are then sent back to the originating group. The sending group can then discuss and clarify any question

Variation: A variation on the send a problem is to use the process to get groups to discuss a real problem for which there may be no one set answer.

1. Groups decide on one problem they will consider. It is best if each group considers a different problem.
2. The same process is used, with the first group brainstorming solutions to a single problem. The problem is written on a piece of paper and attached to the outside of a folder. The solutions are listed and enclosed inside the folder.
3. The folder is then passed to the next group. Each group brainstorms for 3-5 minutes on the problems they receive without reading the previous group's work and then place their solutions inside the folders.
4. This process may continue to one or more groups. The last group reviews all the solutions posed by all of the previous groups and develops a prioritized list of possible solutions. This list is then presented to the group.

TOP

Value Line

One way to form heterogeneous groups, is to use a value line.

1. Present an issue or topic to the group and ask each member to determine how they feel about the issue (could use a 1-10 scale; 1 being strong agreement, 10 being strong disagreement).
2. Form a rank-ordered line and number the participants from 1 up (from strong agreement to strong disagreement, for example).
3. Form your groups of four by pulling one person from each end of the value line and two people from the middle of the group (for example, if you had 20 people, one group might consist of persons 1, 10, 11, 20).

TOP

Uncommon Commonalities

Uncommon Commonalities can be used to foster a more cohesive group.

Uncommon Commonalities

1	2	3	4
Team Name			

- Groups get together and first list individual things about themselves that define them as people).
- Groups then discussed each item, finding things that 1, 2, 3, or 4 of them have in common.
- When the group finds an item that all of them have in common, they list that item under 4; when they find something that 3 of them have in common, the list that item under 3, etc.

TOP

Team Expectations

Some of the common fears about working with groups include student fears that each member will not pull their weight as a part of the group. Students are scared that their grade will be lower as a result of the group learning vs. learning they do individually. One way to address this issue is to use a group activity to allow the group to outline acceptable group behavior. Put together a form and ask groups to first list behaviors (expectations) they expect from each individual, each pair and as a group as a whole.
Groups then can use this as a way to monitor individual contributions to the group and as a way to evaluate group participation.

TOP

Double Entry Journal

The Double Entry Journal can be used as a way for students to take notes on articles and other resources they read in preparation for class discussion.

- Students read and reflect on the assigned reading(s).
- Students prepare the double entry journal, listing critical points of the readings (as they see them) and any responses to the readings, in general, or specific critical points.
- Students bring their journal notes to class
- Once in class, students may use their double entry journal to begin discussion, to do a paired annotation, or for other classroom and group activity.

TOP

Guided Reciprocal Peer Questioning

The goal of this activity is to generate discussion among student groups about a specific topic or content area.

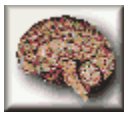
- Faculty conducts a brief (10-15 minutes) lecture on a topic or content area. Faculty may assign a reading or written assignment as well.
- Instructor then gives the students a set of generic question stems.
- Students work individually to write their own questions based on the material being covered.
- Students do not have to be able to answer the questions they pose. This activity is designed to force students to think about ideas relevant to the content area.
- Students should use as many question stems as possible.
- Grouped into learning teams, each student offers a question for discussion, using the different stems.

Sample question stems:

- What is the main idea of...?
- What if...?
- How does...affect...?
- What is a new example of...?
- Explain why...?
- Explain how...?
- How does this relate to what I've learned before?
- What conclusions can I draw about...?
- What is the difference between... and...?
- How are...and...similar?
- How would I use...to...?
- What are the strengths and weaknesses of...?
- What is the best...and why?

TOP

Source: University of Texas, Teaching Resource Center



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Return to Collaborative Learning

Think-Pair-Share

Think-pair-share is a relatively low-risk and short collaborative learning structure, and is ideally suited for instructors and learners who are new to collaborative learning.

In think-pair-share, the instructor poses a challenging or open-ended question and gives learners one minute to think about the question. Learners then pair with a collaborative group member or neighbor sitting nearby and discuss their ideas about the question for several minutes.

The think-pair-share structure gives all learners the opportunity to discuss their ideas. This is important because learners start to construct their knowledge in these discussions and also to find out what they do and do not know. This active process is not normally available to them during traditional lectures.

After several minutes the instructor solicits comments to be shared with the whole group. The responses received are often more intellectually concise since learners have had a chance to reflect on their ideas. The think-pair-share structure also enhances the student's oral communication skills as they discuss their ideas with the one another and with the whole group.

One variation of this structure is to skip the whole-group discussion. Another variation is to have learners write down their thoughts on notecards and collect them. This gives the instructor an opportunity to see whether there are problems in comprehension.

Lymna, F. (1981). "The responsive classroom discussion." In Anderson, A. S. (Ed.), *Mainstreaming Digest*, College Park, MD: University of Maryland College of Education.

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Return to Collaborative Learning

The Make-up of a CL Session

Members of effective collaborative learning groups have specific roles. Each member may assume several roles at a given session; in fact, for smaller groups it will be necessary for each member to have more than one duty.

- Chair or Leader
  - This person is the agenda-setting facilitator.
  - In other words, the chair or leader sets the agenda of the session, with input from the rest of the group.
- Time Keeper
  - This person is the agenda facilitator.
  - The time keeper keeps track of the amount of time spent on each activity in the session and makes sure pre-arranged time allocations in the agenda are followed.
- Room Scheduler
  - This person arranges the date, time and place of the study session with school administrators, if necessary.
  - The room scheduler may also be responsible for contacting study group members to remind them about sessions.
- Resource Arranger
  - This person arranges for supplies and resources for the session.
  - Resources may include reference books from the library, peer tutors, or overhead projectors.
- Group Process Evaluator
  - This person evaluates the effectiveness and efficiency of the session.
- Producer or Participant
  - This person takes part in the scheduled activities of the session.
  - In most cases, all members of the study group are participants.
- Resource Person
  - This person is not necessarily a constant member of the group.
  - The resource person is present when needed to provide additional resources to the group members.
  - The resource person may be a faculty member, a tutor, or another knowledgeable person.

Interactiveness in Collaborative Learning

1. **Pre and Post-Tests:** Before the session begins, learners can be given a 3-5 question quiz or asked to list 3-5 points they would cover in an essay on a particular question. If learners are provided access to correct or sample answers, the tests can be self-scoring. These tests can help focus learner attention on key ideas and provide feedback to learners on whether or not they understand the material. (This can work for online instruction, too.)

2. **Attention Span Breaks:** After every ten to twenty minutes of your session pose a question that summarizes the subtopic or foreshadows the next portion of the session. Or, you could ask learners to vote on an opinion question relevant to your topic. In pairs, you might ask learners to provide a written example appropriate to your topic, collect them, and discuss a few that are either excellent or erroneous examples.

3. **Reflecting on and Improving Note-taking, a three-session technique:** Provide a triple-spaced outline of your session as a guide for learners' note-taking. After 20 minutes, ask learners to compare their notes with two other people in the class. Give the next 20 minutes of the session without an outline, then ask learners to compare their notes with the same two learners. For the next session, provide an outline for only half the session but follow the same procedures as above, having learners compare notes twice during the session. At the beginning of the third session, conduct a short discussion as to what learners learned from comparing notes. Have learners compare notes once a week thereafter. You may want to join in and take a look at some of their notes as well.

4. **Checking Learner Understanding:** After 15-25 minutes of lecturing (or after a page or two of an online, textual session) ask learners to respond to one or two questions. Vary the questions, sometimes asking questions that check comprehension or summarize main points, other times asking learners to apply, analyze, or evaluate conceptual material.

5. **Think-Pair-Share:** This is a cooperative learning technique that can has dramatic results. After a bit of lecturing, ask a multiple-choice question that is fact-based or checks learner comprehension. After counting the vote to each choice, ask learners to pair-up and explain their answers, then take the vote again. Almost inevitably the number of votes for the right answer increases dramatically.

6. **Making Material Relevant:** After lecturing on an idea or concept, stop and ask learners for examples from their own experiences or readings. Or, you might show a news clip or a movie segment and ask learners how it relates to the session material. The variety of learner perceptions can be amazing and provide the instructor with feedback about how learners think.

7. **Changing People's Minds:** Sessions have been shown to be fairly ineffective at changing people's attitudes or values. Discussion and concrete experiences are better for meeting these types of learning goals. When appropriate, ask learners to discuss or write you a note at the end of class discussing how the course material has affected their thinking or beliefs.

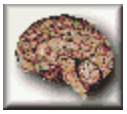
8. **Discussion Questions:** At some point during the session, groups of 2-4 learners respond

to a carefully prepared and written out discussion question. It is extremely useful to give learners the type of discussion question that they might find on an exam as a short answer to essay question.

9. **Group Activities:** A variation on discussion is to provide a small group activity instead of a discussion question. For example, learners could be asked to fill out a comparison chart between philosophers discussed in the session, list the causes of an event noted in the session, define terms used in session in their own words, or list attributes of theories identified in the session.

10. **Summarizing and Evaluating:** At the end of the session or a session segment, ask learners to summarize or evaluate the session in a short paragraph. Take these home and flip thought them. You will learn much.

Source: Office of Instructional Consulation, University of California, Santa Barbara



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Return to Collaborative Learning

Hints for Better Learning Groups

Below is a checklist adapted from Bowen and Jackson (1985-6) of things groups can do to function better. If appropriate for your class, distribute to your students.

I. Before the group begins:

- Expect to learn, to enjoy, and to discover.
- Team up with people you don't know.

II. As the group begins:

- Make a good first impression.
- Build the team.
  - Do something that requires self-disclosure.
  - Take interpersonal risks to build trust.
  - Establish team goals as appropriate.
- Start thinking about group processing.

III. While the group is in existence:

- Work at increasing self-disclosure.
- Work at giving good feedback.
- Get silent members involved.
- Confront problems.
  - Apply lessons from class work.
  - Work on issues in the group even if they appear at first to be just between two members.
  - Don't assume you can't work with someone just because you don't like or respect them.
  - If the group can't solve a problem, consult the instructor as a group.
- Regularly review your data.
- Vary the leadership style as needed.

IV. Wrapping up the group:

- Summarize and review your learning from group experiences.
  - Analyze the data to discover why the group was more effective or less so.
  - Provide final feedback to members on their contribution.
- Celebrate the group's accomplishments.

Bowen, D. D., and Jackson, C. N. (1985-6). "Curing those 'ol 'Omigod-Not-Another-Group-Class' blues". *Organizational Behavior Teaching Review*, 10(4), 21-23.

The Conditions for Effective Collaborative Learning

There are three key conditions for effective collaborative learning:

- Group composition
- Task features
- Communication media

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1. **Group composition**

   One factor that determines the efficiency of collaborative learning is the composition of the group. This factor is defined by several variables: the age and levels of participants, the size of the group, the difference between group members, etc.

   Regarding the number of members, small groups seems to function better than large groups in which some members tend be 'asleep' or excluded from interesting interactions. Most of the mechanisms described in the previous section, e.g. mutual regulation, social grounding, shared cognitive load, ..., can only occur between a few participants. This does not argue in disfavor of large group sessions. It simply means that distance learning activities should also include 'closed' sessions, in which a restricted number of subjects collaborate and/or 'monitored' session in which the teacher takes care that no learner is left out the interaction.

   Regarding the participants, some developmental level is necessary to be able to collaborate, but this is only an issue for children and does hence not directly concern current distance education activities which mainly concern adult learners.

   The most intensively studied variable is the heterogeneity of the group. It refers to the objective or the subjective differences (how subjects perceive each other) among group members. These differences can be general (age, intelligence, development, school performance, ...) or task specific. Results indicate there exists some 'optimal heterogeneity', i.e. some difference of viewpoints is required to trigger interactions, but within the boundaries of mutual interest and intelligibility. Heterogeneity can easily be understood as a condition to trigger conflicts and require social grounding, two important mechanisms described above. Heterogeneity is also implicit in the socio-cultural theory and its related mechanisms (internalization and appropriation) which rely on the observation of adult-child pairs or at least pairs with one member being more knowledgeable on the task than the other.

   Internet-based information and communication tools have a great potential with respect to heterogeneity: no infrastructure can better cross geographic, cultural and professional boundaries. Nevertheless, human beings have a natural trend to assemble with those who are the most similar to them. When participants join the group on their own decision, there is no control of heterogeneity. If the tutor observes too much homogeneity among the group members, he may modify some conditions in order to activate anyway the mechanisms that normally rely on heterogeneity. He may for instance allocate role to participants which will inevitably create conflict or provide them with contradictory

information.

2. **Task features**

The effects of collaboration vary according to the task. Some tasks prevent the activation of the mechanisms described above, while other tasks are appropriated. For instance, some tasks are inherently distributed and lead group members to work on their own, independently from each other. Interaction occurs when assembling partial results, but not during each individual's reasoning process. Without interaction, none of the described mechanisms can be activated. Some tasks are so straightforward that they do not leave any opportunity for disagreement or misunderstanding. Some tasks do not involve any planning and hence create no need for mutual regulation. Some tasks cannot be shared, because they rely on processes (e.g. perception) which are not open to introspection or on skills (e.g. motor skills) that leave no time for interaction.

If distance teachers want to take these features into account, a first attitude would be to use only collaborative learning for tasks for which it will get its optimal efficiency. Another solution is to modify the task, as explained in the previous paragraph, to make them more suited for collaboration. For instance, the 'jigsaw' method consists of providing group members with partial data. This method artificially turns a monolithic problem into a task which requires collaboration.

Task features also include the environment in which the task has to be performed. This is especially important in computer-based tasks. The software features may modify interactions among learners. For instance, if a computer-based task provides the learner immediately with a feed-back on their actions, it may prevent them to discuss the consequences of their action

3. **Communication media**

Whatever task and group members have been selected, the collaboration may not work because the medium used for communication is not adequate. It would be beyond the scope of this paper to describe each available media. Basically, most of current widely available Internet-based tools use text-based communication, synchronous or asynchronous, with mostly fixed graphics and images. Voice and video interaction or voice and video mail are of course available, but the overload of standard networks and the limits of currently available hardware has postponed their larger use in current distance education.

Most of the mechanisms described in the previous section can be conveyed via text-based communication, but with some perturbations. For instance, the cost of interaction being higher with text, the group members may reduce the number of disambiguating sub-dialogues used in social-grounding. At the opposite, in asynchronous text messages, they have more time to build sentences which are less ambiguous. Without video link, members also loose facial expressions which are useful to monitor the partner's understanding. Even with video images, they may see their partner but ignore where the partner looks, something which is important for understanding what she refers to. Some video system support eye contact with appear to be related to metacognitive aspects.

Source: Pierre Dillenbourg and Daniel Schneider, "Collaborative learning and the Internet" TECFA (unit of Educational Technology), School of Psychology and Education Sciences, University of Geneva, Switzerland