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CHAPTER 7

Making thinking audible and visible via cooperative learning

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Group activities are becoming increasingly common in education. However, groups of students can sit together and even produce a group product without cooperating at a high level. Cooperation can be enhanced when students share their thinking with each other by telling and showing each other what is going on in their minds as they go about a task. Cooperative learning principles and techniques can help teachers encourage such enhanced cooperation among students.

Introduction

This chapter begins with a section that describes cooperative learning and explains eight cooperative learning principles. The second section looks briefly at why making thinking audible and visible enriches students' thinking. Making thinking audible means that teachers and students speak out what is going through their minds as they do a task, while making thinking visible means that teachers and students show what is going on in their minds as they go about a task. This visibility can be achieved via such means as writing out the steps in a mathematics equation while doing the task or using a graphic organizer such as a mind map to illustrate one's thinking. Section three shows cooperative learning techniques that can be used to make thinking audible and visible. As cooperative learning is a generic methodology, it can be used in any content area, with any age of student and at any stage in a unit of instruction, from introducing concepts to reviewing before an examination. Furthermore, cooperative learning fits well with other modes of instruction, such as teacher talk and individual work. Thus, in any one lesson students can usefully listen to the teacher, work cooperatively with peers and study alone.

Cooperative learning

This section begins with background on cooperative learning in terms of history, research, theoretical support and definition. Then, eight cooperative learning principles are described, with mention made of each principle's possible role in encouraging thinking.

What is cooperative learning? Cooperative learning, also known as collaborative learning, is a body of concepts and techniques for helping to maximize the benefits of cooperation among students. A wide range of theoretical perspectives on learning – including behaviourism, socio-cultural theory, humanist psychology, cognitive psychology, social psychology and Piagetian developmental psychology - have been used to develop and justify different approaches to cooperative learning. Similarly, various principles have been put forward in the cooperative learning literature (e.g., Baloche 1998; Jacobs, Power & Loh 2002; Johnson & Johnson 1999; Kagan 1994; Slavin 1995).

Cooperative learning is certainly not a new concept or a new term for educators in Malaysia or elsewhere. For thousands of years, humans have utilized the power of cooperation in a broad range of endeavours, including education. For example, Malays talk about *gotong-royong*, a spirit of working together and helping one another. The term *cooperative learning* dates back at least to the 1970s when a great deal of research and practical work began on discovering how best to harness the power of cooperation to promote learning. This work continues to this day. Thus, cooperative learning has a strong foundation in research. Many hundreds of studies - by now thousands - across a wide range of subject areas and age groups have been conducted (for reviews, see Cohen 1994b; Johnson, Johnson & Stanne 2000; Slavin 1995).

The overall findings of these studies suggest that group activities structured along cooperative learning lines are associated with gains on a host of key variables: achievement, higher level thinking, self-esteem, liking for the subject matter and for school and inter-group (e.g., inter-ethnic) relations. Indeed, at a conference on cooperative learning in Penang, David Johnson claimed that cooperative learning is one of the, if not the, best-researched approaches in education, and that when the public asks educators what we know that works in education, cooperative learning is one of our surest answers.

The first author of this chapter initially came upon cooperative learning in the mid-1980s. He had only been teaching for a few years, but right from the start, he was drawn to the use of group activities. Maybe it was because he was not such a good lecturer or because he tends to be an introvert who does not enjoy being up in front of a class talking. Maybe he did not like seeing the glazed-over look in his students' eyes when he talked and talked. While all that has some truth to it, we prefer to put a more positive spin on his attraction to group activities. We prefer to believe that his main attraction to the use of cooperation as one, not the only, way of learning comes from his positive experiences with cooperation, whether on sports teams, in his own family, with friends or in school, and from his negative experiences when cooperation was lacking. Furthermore, he used group activities because they were consistent with the communicative pedagogy that was prevalent in language teaching in the 1980s and still is today.

Whatever the reasons, he was using group activities in my English classes at Chiang Mai University. However, he faced problems, problems that we are sure the readers of this chapter have also faced, such as students who did not want to share with their groupmates and students for whom a disagreement was not an opportunity to discuss and learn but a call to confrontation and rancour. In the hope of addressing these problems, he went searching in the University's library. It was there that he came upon his first article on cooperative learning, written by David and Roger Johnson, whose works are cited in this chapter and in almost everything else we have ever written on cooperative learning.

In the more than 20 years since that fortuitous encounter in the Chiang Mai University Library, the first author has used cooperative learning in almost every class he has taught including ones attended by the other three authors of this chapter. What we are sharing with you in this chapter is what he has have learned since his days in Chiang Mai and what we four have learned from further reading, from interacting with colleagues and from observing students. Thus, almost none of the ideas in this chapter are our own ideas. We include them because we believe they are important ideas, and it is our humble wish that this chapter may serve for you as the kind of introduction to cooperative learning that the Johnson and Johnson article did for the first author of this chapter and that watching a video by David Johnson did for the rest of us.

Cooperative learning principles

The next part of this chapter discusses eight cooperative learning principles and how they can shape teaching practice.

1. Heterogeneous grouping

This principle means that when engaged in cooperative learning students usually participate in groups that are mixed on one or more of a number of variables including gender, ethnicity, social class, religion, personality, age, language proficiency and diligence. Table 1 contrasts heterogeneous grouping with homogeneous grouping.

Heterogeneous grouping	**Homogeneous grouping**
More peer tutoring, as groups contain members of past achievement levels.	Less peer tutoring, as students tend to be fairly close in terms of past achievement levels.
Students see more perspectives, as they interact with groupmates different from themselves.	Students see fewer perspectives, as they interact with those similar to themselves.
Thus, the value of diversity is on display for students to appreciate.	Students have fewer opportunities to appreciate the value of diversity.
Students have more opportunities to learn about people different from themselves and how to collaborate with them.	Students have fewer opportunities to learn about people different from themselves and how to collaborate with them.
Students come to know a larger number of their classmates.	Students stay with the same classmates who they already know.
Students may come to feel more confident that they can work with anyone.	Students feel less confident about working with new people because they have less experience doing so.
Initial difficulties in group cohesion are more likely, as groupmates may not feel comfortable working together, making teambuilding activities even more	Initially, groups may work together better because students already know each other or, at least, have many similarities.

important.	

To achieve heterogeneous groups, teachers often make conscious decisions about which students should work together, rather than leaving the matter to chance or to students' choice. The latter option often results in groups with low levels of heterogeneity. When students work in heterogeneous groups, they may want to spend some time on ice breaking (also known as teambuilding) activities because as Slavin (1995) notes, the combination of students that results from teacher-selected groups is likely to be one that would never have been created had it not been for our intervention. The hope is that by interacting with a wide variety of classmates, students' thinking will be stretched, as they encounter different perspectives.

Other ideas for helping heterogeneous groups cooperate effectively are presented below. Here, we would like to highlight three. One, students can select a group leader. Many teachers report finding that this and other rotating roles, such as Quiet Captain, can be useful. Two, the teacher can ask one group to demonstrate for the class how to do a particular task. This demonstration can involve not just the task itself but also how to interact with groupmates. Three, groups that finish ahead of others can assist those groups that are struggling.

2. Cooperative skills

Cooperative skills are those skills needed to work effectively with others. Secondary school students, even adults, often lack these skills. Thus, teachers need to consciously teach them. Which cooperative skill to teach will depend on the particular students and the particular task they are undertaking. Just a few of the many skills important to successful collaboration are: checking that others understand, asking for and giving reasons; disagreeing politely and responding politely to disagreement and encouraging others to participate and responding to encouragement to participate. As is readily apparent, many of these skills help group engage in deeper thinking.

3. Group autonomy

This principle encourages students to look to themselves for help instead of relying only on the teacher. When student groups are having difficulty, it is very tempting for teachers to intervene either in a particular group or with the entire class. Sometimes teachers cannot resist this temptation to come to the rescue, but as Roger Johnson writes, "Teachers must trust the peer interaction to do many of the things they have felt responsible for themselves" (http://www.clcrc.com/pages/qanda.html). Yes, teachers will sometimes intervene, but perhaps intervention should not always be the first option. Group autonomy encourages students to become more independent thinkers.

4. Maximum peer interaction

In classrooms in which group activities are not used, the normal way that people interact is for one person at a time – usually the teacher – to speak. For example, while lecturing, the teacher stops, asks a question to check students' comprehension, calls on a student to answer the question and evaluates that student's response.

In contrast, when group activities are used, one student per group is, hopefully, speaking. In a class of 48 divided into groups of four, ten students are speaking

simultaneously, that is, 48 students divided by 4 students per group = 12 students (1 per group) speaking at the same time. If the same class is working in groups of two (pairs are also groups), we may have 24 students speaking simultaneously. The hope is that greater participation leads to greater thinking.

Even when teachers use groups, it is common at the end of a group activity for each group, one at a time, to report to the class and the teacher. When this takes place, we are back to one-at-a-time interaction. Instead, we want maximum peer interaction because interaction promotes thinking and learning. In order to maximize peer interaction, many alternatives exist to this one-at-a-time reporting. For instance, one person from each group can go to another group. These representatives explain (not just show or tell) their group's ideas.

The principle of Maximum Peer Interaction also refers to the quality of the interaction, not just to the quantity. While there are clearly benefits in students practising rote learning tasks with partners, more benefits may accrue when students engage in deeper and broader thinking. Cooperative learning offers many ways to maximize peer interaction by deepening and broadening student thinking.

5. Equal opportunity to participate

A frequent problem in groups is that one or two group members dominate the group and make it difficult for other members to take part in the group activity. If students are not participating, there is less chance that they are thinking. Cooperative learning offers many ways of providing everyone with an equal opportunity to participate. Two of these are the use of rotating roles in a group, such as facilitator, checker (who checks to see that everyone understands what the group is doing or has done), questioner, praiser, encourager and paraphraser, and the use of multiple ability tasks (Cohen 1994a; Gardner 2006), that is, tasks that require a range of abilities, such as drawing, singing, acting and categorizing, rather than only language abilities.

6. Individual accountability

Individual accountability is, in some ways, the flip side of equal opportunity to participate. When we encourage equal participation in groups, we want everyone to feel they have opportunities to take part in the group. When we encourage individual accountability in groups, we hope that no one will attempt to avoid using those opportunities. Techniques for encouraging individual accountability seek to avoid the problem of groups known variously as social loafing or free riding. In other words, we want to avoid students letting their groupmates do the thinking for them.

These techniques, not surprisingly, overlap with those for encouraging equal opportunity to participate. They include giving each group member a designated turn to participate, keeping group size small, calling on students at random to share their group's ideas and assigning tasks to be done individually after the group activity is finished.

7. Positive interdependence

This principle is the most important one in cooperative learning. When positive interdependence exists among group members, they all feel that what helps one

member of the group helps the other members and that what hurts one member of the group hurts the other members. It is the “All for one, one for all”, “sink or swim together” feeling that leads group members to want to help each other and to see that they share a common goal.

That goal is for everyone in the group to learn. The group is not finished just because they have finished a task, such as completing an assignment. No, the group is not finished until everyone in the group has gained the ability to do that assignment on their own and until everyone can explain what the group has done and why they did it. Positive interdependence provides students with peer support to do the thinking necessary so that all group members reach that level.

Johnson and Johnson (1999) describe nine ways to promote positive interdependence. These are briefly explained below.

a. Goal positive interdependence: The group has a common goal that they work together to achieve.

b. Environmental positive interdependence: Group members sit close together so that all can easily see each other’s work and hear each other without using loud voices. This may seem trivial, but it can be important.

c. Role positive interdependence: In addition to the roles mentioned above, for example, checker and questioner, there are also housekeeping types of roles, such as timekeeper who reminds the group of time limits and ‘sound hound’ who tells the group if they are being too loud in their deliberations. These roles should rotate so that everyone has a chance to play a variety of roles.

d. Resource positive interdependence: Each group member has unique resources. These resources can be information or equipment, such as readings or a computer.

e. External Challenge positive interdependence: Students collaborate within their cooperative learning groups to do better than an external gage of quality, such as their own past achievement or another group’s achievement, or to alleviate the effects of a social ill.

f. Reward or Celebration positive interdependence: If groups meet a pre-set goal, they receive some kind of reward. If extrinsic rewards are used, Lynda Baloche (personal communication, May 14, 2001) recommends that teachers never begin an extrinsic reward programme without having a plan for how to end it.

g. Fantasy positive interdependence: Students imagine that they are a group of people in another place, time, or situation. For example, they could imagine that they are a group of sharks preparing a report for humans on the eating of sharks fin soup.

h. Identity positive interdependence: Groupmates form a common identity. This can be done via such means as a group name, motto, poem or handshake.

i. Task positive interdependence: Each group member has a separate task to perform, for example, in a science experiment. These tasks can rotate in subsequent experiments.

8. Cooperation as a value

This principle means that cooperation is not only a way to learn, that is, the *how* of learning. Cooperation also becomes part of the content to be learned, that is, the *what* of learning. This flows from the central cooperative learning principle, positive interdependence. Cooperation as a value takes the feeling of "All for one, one for all" and expands it beyond the small classroom group to encompass the whole class, the whole school and far beyond. In this way, increasingly greater numbers of people and other beings are welcomed into students' circle of cooperation. In this way, cooperation as a value encourages students to think beyond their classrooms and to explore further applications of their learning.

This concludes the introduction to cooperative learning as an overall approach to teaching that can be used with any subject area. The next section of the chapter looks at making thinking audible and visible.

Reflection

What problems have you encountered when your students were engaged in group activities? Do you think that applying cooperative learning principles might address some of those problems? When your students work in groups, how can you encourage equal opportunity to participate? In what ways could you foster positive interdependence among students? How might cooperative learning encourage quiet students to participate in group activities? Do you see any contradiction between group autonomy and individual autonomy? Other than the cooperative skills already mentioned in this chapter, what other cooperative skills do you think would facilitate effective cooperation among your students?

Making thinking audible and visible

The Merriam-Webster Online Dictionary defines the verb *think* as "to form or have in mind". Thus, thinking is seen as an internal process, which others can only access based on what the thinker does or says. Such internal thinking is insufficient in education. Instead, teachers and students need to externalize their thinking. When teachers externalize their thinking, they provide students with a model of how an expert goes about a task. This modelling invites students to join the community of practice (Wenger 1999). Wenger defines communities of practice as "[G]roups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly" (Wenger, no date).

For example, physics teachers think aloud and show the steps as they tackle a physics problem, thereby inviting their students to think and act like physicists and join the international community of practice of physicists. Of course, students are not likely to drop all their other studies and do cutting edge research in physics. That is not the point. The point is that when students think like physicists, learning comes alive, and students gain much greater insight into what they are doing and why they are doing it.

This relates to Marzano's first dimension of thinking: students' attitudes towards and perceptions of learning.

This externalized thinking fits with the process approach to education (Jacobs & Farrell 2003). The process approach represents a shift away from the formerly dominant product approach, in which teachers focus on what students produce, such as their answers on a test, rather than on how they go about arriving at those answers. The process approach still values student products, but the emphasis is now on helping students on the paths they set for themselves as they create those products. This fits with Marzano's fifth dimension of learning: developing habits of mind, such as being clear and seeking clarity.

Now that we have looked at why teachers should make their thinking audible and visible, let us next look at why students should externalize their thinking. First, by making their own thinking audible and visible, students encourage metacognitive thinking, in which they can assess their own strengths and weaknesses, and plan how to improve. Second, when teachers hear and see what students are doing as they go about a task, teachers are better able to assess their own teaching and to figure out how best to help their students. Third, and of most relevance to cooperative learning, when students' thinking is audible and visible, their peers are better able to help and to learn from them.

How can thinking be made audible and visible? As has already been mentioned, thinking aloud (Ericsson & Simon 1993) allows teachers and students to make their thinking audible. Originally developed as a research tool, thinking aloud is now used in classrooms. In thinking aloud, the thinkers say what is going through their minds as they go about a task. Most students are not accustomed to thinking aloud. As a result, teachers need to model the process and even provide students with think aloud scripts or guidelines. Questions also can be very effective in making thinking audible. For example, asking "Why do you say that?", "How did you arrive at that answer?", or "Could you please explain your thinking?" all push people to externalize their thinking.

Many ways exist to make thinking visible. For example, in mathematics, teachers and students can show the steps they take as they solve a problem. Another means of making thinking visible is via graphic organizers such as mind maps, tables, Venn Diagrams and flow charts. Furthermore, thinking can be made audible and visible simultaneously, for example, by thinking aloud while constructing a graphic organizer or explaining the thinking behind a graphic organizer or explaining the steps in solving a mathematics problem while writing all the calculations involved.

This section has discussed why and how to make thinking audible and visible. All of the ways of making thinking audible and visible fit well with cooperative learning. A few examples will be provided in the third and final section of this paper.

Cooperative learning techniques for making thinking audible and visible

Well over 100 cooperative learning techniques have been developed, and each cooperative learning technique has a range of variations, not to mention the fact that sometimes the same technique has more than one name. What will be done in this section is to explain the steps in several cooperative learning techniques and to highlight how each of these techniques can help students externalize their thinking. First, four general pointers on cooperative learning will be provided.

Pointers for getting started with cooperative learning

1. *Play to success*. It is our observation that the main reason why cooperative learning fails, whether our students are using it or we are observing other teachers' students using cooperative learning, is that the task is too difficult. Yes, research suggests that cooperative learning is a powerful pedagogy, but it is not magic. Before students begin a cooperative learning task, teachers should ask themselves if students are prepared to succeed at that task. This is especially true when students first use cooperative learning because initial failures may sour students on cooperative learning.

   One way to help cooperative learning groups succeed is for the teacher or students to demonstrate how to make audible and visible. These demonstrations can take place before groups begin the task. Also, once groups have started their task, when the teacher witnesses a group or individual working in an exemplary manner, it might be useful to stop the class and share this with the other students.

2. *Teachers need to start with success for themselves*. Just as students need to experience successful collaboration, so do teachers new to cooperative learning need to see it succeeding, if they are to persevere in using the method. Therefore, teachers are advised to begin with simple cooperative learning techniques (Sharan, Gobel & Sim 2006) and to first implement cooperative learning in those classes where it is most likely to thrive, before moving on to use cooperative learning in classes in which students may be less ready because of low motivation or lack of cooperative skills. This, however, is not to say that cooperative learning is only for highly motivated, high achieving students. Indeed, cooperative learning has succeeded in secondary school classes in which students had experienced mostly failure in their academic careers, as well as at secondary schools for special education students.

3. *Cooperating about what?* We need to ask what they are working on. Is it a task that encourages deeper thinking, or is it more of a rote learning task?

4. *Remember cooperative learning principles.* The first section of this chapter explained eight cooperative learning principles. These principles should be kept in mind by teachers as their students collaborate. For instance, the principle of positive interdependence directs teachers' attention to whether students seem to care about their groupmates' learning, and the section explained six types of positive interdependence, each of which can be a tool that teachers can use to promote this caring among group members.

Reflection

How do you make your own thinking audible and visible to students? What do your students already do to make their thinking audible and visible to you and their peers? What thinking skills do you teach? How does making thinking audible and visible connect with teaching effective habits of mind? Is it better if students are interrupted by peers or teachers while they are thinking audibly and visibly?

What follows is a short list of cooperative learning techniques for externalizing thinking:

1. *Everyone Can Explain*

Steps:

- Each member has a number: 1, 2, 3, 4, depending on the number of group members.
- The teacher asks a question or gives a task.
- Each student tries alone, then takes a turn to share with their groupmates.
- The group tries to reach a consensus.
- Everyone prepares to present and explain their group's ideas
- The teacher calls a number at random; students with that number give and explain their group's answer.

Pointers:

- Note that instead of calling on a group and letting the top student in that group answer, teachers call a number at random. This encourages everyone to be ready and to help their groupmates to be ready.
- Students need to do more than just give an answer. As the technique's name states, everyone must be ready to explain their group's answer.
- One way to help everyone to be ready to explain in case the teacher calls their number is for group members to rehearse their answers with their groupmates.
- To highlight the point that students are representing their group, not themselves as individuals, any feedback on an answer or explanation goes to the group, not to the person whose number was called.

2. *Thinker-Coach*

Steps:

- Students are in pairs: one is the Thinker and the other is the Coach. The group has a set of tasks to do or a task divided into steps.
- During the first task, the Thinker thinks aloud, while the Coach listens and gives feedback.
- The roles reverse.

Pointers:

- Thinking aloud works better when students have a script, rubric or guidelines to follow and when the teacher has modelled how to think aloud.
- Writing or drawing while thinking aloud may help the process.

3. *SUMMER*

Note: The technique is slightly adapted from one developed by Donald Dansereau and his colleagues at Texas Christian University. Here is how this pair technique works:

Steps:

Set the mood:
The group of two engage in a little chit-chat and make sure they are clear on the procedure to follow.

Understand by reading silently:
A reading passage (or a section from a textbook) has been divided into sections. Each student reads the first section silently.

Mention key ideas:
Without looking at the text, one of the group members acts as Recaller, summarizing the key ideas of the section.

Monitor:
The other group member looks at the text and acts as Monitor, pointing out any errors, omissions, or unnecessary information in the Recaller's summary and praising the Recaller for a job well done. The roles of Recaller and Monitor rotate for the next section.

Elaborate:
Both students elaborate on the ideas in the section. Types of elaborations include:

- connections with other things the students have studied
- links between the section and students' lives
- additions of relevant information not included in the section
- agreements or disagreements with views expressed
- reactions to the section such as surprise, gladness or anger
- applications of the ideas and information
- questions, either about things not understood or questions sparked by the section

Not all types of elaborations are relevant to every section. Groups repeat the Understand, Recall, Mention and Elaborate steps for all the sections of the passage.

Review:
The pair combines their thoughts to summarize the entire text.

Pointers:
- Research suggests that after doing SUMMER in groups, when students read alone, they continue to do the types of thinking encouraged by the SUMMER script.
- This highlights why the teaching of thinking skills prepares students to be life-long learners

4. Exchange-A-Question

Steps:

- Students work alone to write one or more questions or problems.
- They write answers, with explanations and perhaps illustrations, to their questions on another paper.
- Students exchange questions but not answers.

- After students have answered their partner's questions, they compare answers.

Pointers:

- Teachers need to demonstrate how to write thinking questions.
- Before exchanging questions with a groupmate, students can check their questions and answers with a different groupmate.

5. Group Mind-Mapping

Steps:

- The group begins with the central concept written as a word and/or image in the middle of the page.
- Each group member takes a turn to identify and draw the main ideas related to the central image. Each time someone adds to the group's map, they explain what they are adding and why it is being added in that particular place in the map.
- Group members continue taking turns to add other ideas that spring from and connect to the main ideas. In addition to words and images, different colours and sizes of letters are also used to make the Group Mind Map more understandable and memorable.
- Students display and perhaps explain their Group Mind Map to another group and/or the entire class.

Pointers:

- A similar taking of turns can be used to construct any other type of graphic organizer.
- Ways to encourage individual accountability while making thinking visible via a graphic organizer include: each student does their own graphic organizer before combining ideas with the group; each student is responsible for one section of the graphic organizer; each student uses a different colour when writing or drawing; and each student takes a turn to explain the group's graphic organizer to visitors from other groups.

6. Group Visualise-Draw-Pair-Switch

Steps:

- The teacher (or a student) describes a process, such as the stages in the life-cycle of a butterfly. Students have their eyes closed and visualize as the teacher speaks.
- Each student works alone to draw what they visualised. Students label their drawings.
- In a foursome, students show their drawing to one partner, who asks questions and makes suggestions. Students revised their drawings based on their discussions.
- Students exchange drawings with their partner and then switch partners within their foursome. Then, they explain their first partner's drawing to their second partner. Again, students try to improve on and learn from each other's drawings.

Pointers:

- Students can refer to resources, such as books, if they are having trouble with their drawings. It is hoped that they will see their groupmates and other groups as their resource of first resort.
- To differentiate the task, students who are less proficient in listening can be given a transcript of what the teacher (or fellow student) read during the visualisation.
- The discussion about the drawings Ways to encourage individual accountability while making thinking visible via a graphic organizer include: each student does their own graphic organizer before combining ideas with the group; each student is responsible for one section of the graphic organizer; each student uses a different colour when writing or drawing; and each student takes a turn to explain the group's graphic organizer to visitors from other groups.
- The same technique can be used with stories

Reflection

Have you already tried any of the six techniques described above or anything similar? Might any of the other techniques work with your students? If so, how would you use them? What variations could you develop for one of the techniques above? What are two examples of how the above techniques reflect cooperative learning principles?

Conclusion

The chapter began with a description of cooperative learning, a research-tested, generic teaching methodology that harnesses the peer power to help students learn. The section explained eight cooperative learning and linked each to promoting deeper thinking among students. The second section discussed why teachers and students should make their thinking audible and visible, and gave suggestions on how to do this. The chapter's final section described five cooperative learning techniques that encourage students to externalize their thinking.

Our ongoing experiences as learners and teachers, as well as our ongoing experiences as ordinary people coping with the everyday exigencies of life and enjoying the pleasures of life continually remind us of the benefits of cooperation. But, cooperation is not easy. Indeed, it can be extremely hard, and we often fall short, sometimes far short, in our efforts at collaboration, whether they be in the classroom or in life generally. These shortfalls sadden us, but they do not discourage us from continuing to try to cooperate more skilfully and more extensively.

We urge all teachers to persevere similarly in the use of cooperative learning. Today, we have a great advantage when we use cooperative learning, because

those who have come before us have, through trial and error and hard work, learned a great deal about how to foster cooperation. Much of this learning is available to us through the rich array of literature on cooperative learning and related fields, such as communities of practice, multiple intelligences, socio-cultural theory and thinking skills.

Reading this literature on cooperative learning and related fields is an act of cooperation with our teaching colleagues whenever or wherever they may have taught, whether it was 100 years ago or in a country on the other side of the world. In the here and now, we can share about cooperative learning with our students and fellow teachers. In this sharing, we make our thinking audible and visible to others, thus setting an example for them and bringing alive the theme of this chapter.

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Further reading

Bruffee, K. A. (1999). *Collaborative learning: higher education, interdependence, and the authority of knowledge*. (2nd ed.). Baltimore, MD: The Johns Hopkins University Press.

Bruffee emphasizes less structured cooperation at the tertiary level, particularly in the teaching of English composition to native speakers.

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Forest, L. (2001). *Crafting creative community: combining cooperative learning, multiple intelligences, and nature's wisdom*. San Clemente, CA: Kagan Publications.

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Johnson, D. W., & Johnson, R. T. (2003). *Assessing students in groups: promoting group responsibility and individual accountability*. Thousand Oaks, CA: Corwin Press.

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Millis has worked at various universities to help instructors on ways to enhance their teaching, including the use of cooperative learning. Cottell teaches accountancy.

Sapon-Shevin, M. (1999). *Because we can change the world: a practical guide to building cooperative, inclusive classroom communities.* Boston: Allyn & Bacon.

Sapon-Shevin is a professor of Inclusive Education and her book is especially strong on ways to make all students feel accepted in cooperative groups.

Sharan, S. (Ed.). (1994). *Handbook of cooperative learning methods*. Westport, CN: Greenwood Press.

This is an overview of well-known cooperative learning methods, with chapters written by the people who originated each method.

Sharan, Y., & Sharan, S. (1992). *Expanding cooperative learning through group investigation*. Colchester, VT: Teachers College Press.

Group Investigation is a cooperative learning method, based on the ideas of John Dewey, which involves students in cooperative projects.

Tan, I. G.-C., Sharan, S., & Lee, C. K.-E. (2006). *Group Investigation and student learning: An experiment in Singapore schools*. Singapore: Marshall Cavendish.

A study done in Singapore secondary schools of the use of the Group Investigation method of cooperative learning. The book also contains useful advice on doing research on cooperative learning.

In addition, these online resources are useful (but please be reminded that online resources move, disappear and change):

International Association for the Study of Cooperation in Education (IASCE). http://www.iasce.net

IASCE is the major international networking organisation on cooperative learning. They have a newsletter and many weblinks.

Cooperative Learning Center at the University of Minnesota (USA)
http://www.co-operation.org

The co-directors of this center, Roger T. Johnson and David W. Johnson, are two of the gurus of cooperative learning. Their site contains some of their articles, a Q&A section, newsletters and book information.

The Jigsaw Classroom
http://www.jigsaw.org/index.html

This site contains information on Jigsaw, one of the oldest and best-known cooperative learning techniques. The site is run by Eliot Aronson, one of the

originators of Jigsaw, and also contains some of his work on issues such as school violence.

Kagan Publishing and Professional Development
http://www.kaganonline.com
This company has published many useful books on cooperative learning and related topics. The site also offers an online magazine.

Richard Felder's Homepage
http://www2.ncsu.edu/unity/lockers/users/f/felder/public/RMF.html
Felder teaches engineering at North Carolina State (USA) University. His site contains many useful ideas on applying cooperative learning, as well as many articles from his work on Learning Styles, including a validated Learning Styles instrument which can be done online.

Ted Panitz's Homepage
http://home.capecod.net/~tpanitz
Panitz teaches mathematics at Cape Cod (USA) Community College. His site includes two E-books, one on CL and one on Writing Across the Curriculum.

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Merriam Webster Online Dictionary (Retrieved November 6, 2006 from http://www.m-w.com/cgi-bin/dictionary?book=Dictionary&va=think)

Middle Atlantic Association for Cooperation in Education (MAACIE). (1998, September). How to use the 'Scripts' Menu in an ESR (Every Student Response) Classroom. *MAACIE Cooperative News*. Retrieved August 23, 2002, from http://www.geocities.com/~maacie/art22.html#Top%20of%20Page%20Article%2022 [under the title *Nineteen Scripts for Paired Activities*]

Mohammed Abdullah Zaid (1995). Semantic mapping in communicative language teaching. *English Teaching Forum, 33*(3), 6-11. [available online at http://exchanges.state.gov/forum/vols/vol33/no3/p6.htm]

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About the authors **(Please complete and edit this whole section)**

George Jacobs (www.georgejacobs.net) has written and edited widely on cooperative learning, including four books and more than 50 articles and book chapters. His books include *The Teachers' Sourcebook for Cooperative Learning* (Corwin), *Cooperative Learning and Second Language Teaching* (Cambridge) and *Learning Cooperative Learning via Cooperative Learning* (Kagan). He serves on the Executive Board of the International Association for the Study of Cooperation in Education (www.iasce.net) and edits the IASCE's newsletter. George also does presentations, workshops and consultation on cooperative learning. Furthermore, he not only writes and talks about cooperative learning, he actually uses it in the courses he teaches for teachers and for ESL students.

Other areas of education in which George is involved include multiple intelligences, environmental education, extensive reading, reading aloud by teachers and teacher education. Not surprisingly, he connects all these to cooperative learning. He lives and works in Singapore, where he has a one-person company and teaches at a variety of local institutions. He also teaches distance education courses for teachers in the U.S. In his spare time, George serves as president of Vegetarian Society (Singapore)

(www.vegetarian-society.org) and enjoys badminton, tennis, yoga, children's literature and TV.

Wang Aili or Alice (teachinglearner@hotmail.com) teaches at a teacher education institution in Shanghai, China. She was a chemistry teacher and an English teacher in junior middle schools for twenty one years. Her interests include second language teaching, teacher education, cooperative learning and reading methodology. She met George while she, Lisa and Clark were part of a group of English language educators from Shanghai studying in Singapore. This is where her interest in cooperative learning began. However, she was already employing Communicative Language Teaching (CLT) methods in her second language teaching. In CLT, the emphasis is using the second language to communicate on matters related to students' lives and interests, while focus on language as object becomes secondary. Group activities feature prominently in CLT. Therefore, learning about cooperative learning was a natural next step for her.

Li Xishuang or Lisa (lisa20051972@126.com) graduated from Shanghai Teachers' University in 1994. She has taught English at the secondary school level in Shanghai for 13 years. In 1999, she participated in a training course for English teachers at Lancaster University where she learnt about Communicative Language Teaching. From November 2006 to January 2007, she studied with teachers from Shanghai at the National Institute of Education, Nanyang Technological University in Singapore. Areas of special interest for her in education include cooperative learning, communicative language teaching and reading methodology.

Chinese students learn English as a foreign language. She tries to make English learning effective as well as enjoyable. She learned a lot from George, Alice and Clark via cooperating on the writing of the present chapter. Recently, she has started to implement cooperative learning in her classes. She hopes students are able to learn not only from their teachers but also from their peers. She wishes to continue to collaborate with colleagues in Shanghai, elsewhere in China and in other countries via publications, conferences, workshops, email and face-to-face interaction.

Xie Yongye (Clark) likes teaching very much because he feels interested in working with young people and offering them ways of learning new things. He has taught in secondary schools for 23 years ago. The students are 15-18 years of age. Xie thinks highly of student-centered learning. He graduated from Anhui Institute of Education and had one year's training in East China Normal University and three months' training in the National Institute of Education, Nanyang Technological University in Singapore. Books about educational psychology and student-centered learning have influenced him greatly. His future plan is to increase his use of concepts derived from theories of educational psychology, such as student-centered learning and cooperative learning, in his classes as much as possible. He has already applied some of these concepts in his classes with positive results. He thinks that the most important aspect of teaching is to arouse students' interest and provide them

with opportunities to experience the learning process. This is because according to the Learning Pyramid, if in the class only the teacher talks, students' retention rate is only 5%. Thus, he thinks student-centered learning and cooperative learning are far better.