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Cooperative Learning: Review of Research and Practice

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Abstract: Cooperative learning is widely recognised as a pedagogical practice that promotes socialization and learning among students from pre-school through to tertiary level and across different subject domains. It involves students working together to achieve common goals or complete group tasks – goals and tasks that they would be unable to complete by themselves. The purpose of this paper is to review developments in research and practice on cooperative learning and to examine the factors that help to explain its success. In particular, the review focuses on the key elements that contribute to its success and the role teachers play in developing students' thinking and learning when implementing this pedagogical practice in their classrooms.

Background Research on Cooperative Learning

Interest in cooperative learning gathered momentum in the early 1980s with the publication of the first meta-analysis involving 122 studies on the effects of cooperative, competitive, and individualistic goal structures on students' achievement and productivity in a sample of North American schools (Johnson, Maruyama, Johnson, Nelson, & Skon, 1981). The results showed that cooperation was more effective than interpersonal competition and individualistic efforts; cooperation with intergroup competition was also superior to interpersonal competition and individualistic efforts; and, there were no significant differences between interpersonal competitive and individualistic efforts. Moreover, these results were consistent across all subject areas (language arts, reading, mathematics, science, social studies and physical education), for all age groups, and for all tasks involving conceptual understanding, problem solving, categorizing, and reasoning. In a similar vein, Slavin (1989) reported on a best-evidence synthesis of 60 studies across both elementary and secondary schools that compared cooperative learning to control groups studying the same material. The results showed that the overall effects of cooperative learning on achievement were clearly positive in 72% of the comparisons whereas only 15% favoured control groups with 13% recording no significant differences. These findings led Slavin to conclude that cooperative learning can be an effective strategy for increasing student achievement.

In a follow-up meta-analysis of 117 studies that was conducted on the Learning Together and Learning Alone method (Johnson & Johnson, 1994), Johnson and Johnson (2002) examined the effects of cooperative, competitive, and individualistic learning on a number of academic, personal and social dependent variables (i.e. achievement, interpersonal attraction, social support, self-esteem, perspective taking, learning together, and controversy) and found strong effect sizes between cooperative learning in comparison to competitive and individualistic learning. These effect sizes ranged from 0.58 to 0.70 or effect sizes that Hattie

(2009) believes are desirable because they can make "real world differences" (p. 17) in educational interventions. In short, the results of this meta-analysis and the Johnson et al. (1981) meta-analysis and Slavin's (1989) best-evidence synthesis found that cooperative learning in comparison to competitive and individualistic learning has very strong effects on a range of dependent variables such as achievement, socialization, motivation, and personal self-development.

Given the findings from these meta-analyses (Johnson et al., 1981; Johnson & Johnson, 2002; Slavin, 1989) that have highlighted the academic and social benefits students derived from working cooperatively together, Roseth, Johnson and Johnson (2008) examined the social-contextual view of the mechanisms and processes by which these benefits are promoted. In a meta-analysis of 148 studies that compared the effectiveness of cooperative, competitive, and individualistic goal structures in promoting early adolescents' achievement and peer relationships, Roseth et al. found that higher achievement and more positive peer relationships were cooperative rather than competitive or individualistic. Furthermore, cooperative goal structures were strongly associated with early adolescents' achievement and positive peer relationships. In short,

> *"the more early adolescent teachers structure students' academic goals cooperatively, (a) the more students will tend to achieve, (b) the more positive students' relationships will tend to be, and (c) the more higher levels of achievement will be associated with more positive peer relationships" (Roseth et al., p. 238).*

In a follow-up meta-analysis that investigated the degree to which achievement is positively associated with motivation in positive (i.e. students are linked together to achieve goals), negative (i.e. students compete to achieve goals), or no interdependence (i.e. students work individually) situations, Johnson, Johnson, Roseth and Shin (2014) found that situations characterized by positive interdependence resulted in greater motivation and achievement than did negative or no interdependence situations.

In a best evidence synthesis of research on primary and secondary mathematics and reading and programs for struggling readers, Slavin (2013) found that well-structured methods such as cooperative learning produce more positive effect sizes than those evaluating other instructional practices such as the use of innovative curriculum text books or the use of technology in reading and mathematics. Similar results were obtained in a best-evidence synthesis of elementary science programs by Slavin, Lake, Hanley, and Thurston (2014) who stated that: "science teaching methods focused on enhancing teachers' classroom instruction throughout the year, such as cooperative learning and science-reading integration, as well as approaches that give teachers technology tools to enhance instruction, have significant potential to improve science learning" (p. 901). In short, there is overwhelming evidence that cooperative learning as a pedagogical practice has had a profound effect on student learning and socialization (Slavin, 2014).

What Accounts for the Success of Cooperative Learning?

Placing students in groups and expecting them to work together will not necessarily promote cooperation. Group members often struggle with what to do and discord can occur as members grapple with the demands of the task as well as managing the processes involved in learning such as dealing with conflicting opinions among members or with students who essentially loaf and contribute little to the group's goal (Johnson & Johnson, 1990). In order to avoid these pitfalls, Johnson and F. Johnson (2009) propose that groups need to be

established so that the five key components of successful cooperative learning are embedded in their structure.

The first of these key components involves structuring positive interdependence within the learning situation so all group members understand that they are linked together in such a way that one cannot achieve success unless they all do, and they must learn to synchronize their efforts to ensure this occurs. Deutsch (1949) found that cohesiveness develops in the group as a direct result of the perception of goal interdependence and the perception of interdependence among group members. Positive interdependence is established in groups when students understand that they are each responsible for completing a part of the task which, in turn, all must achieve in order for the group to complete its goal. Teachers can ensure that this occurs by assigning different parts of the group's task to different group members to complete (Johnson & Johnson, 2002).

The second key component for successful cooperation is promotive interaction or the willingness of group members to encourage and facilitate each other's efforts to complete their tasks in order for the group to achieve its goal. Johnson and Johnson (1990) noted that promotive interaction is characterised by students: providing each other with the help they need; sharing needed resources; providing effective feedback to group members on their performances on specific tasks; challenging other's conclusions and reasoning in order to promote clearer insights into the problem issue; and, working constructively together to attain mutual goals. In so doing, students develop an awareness of what others do not understand and the need to provide explanations or assistance that can be readily understood. Willingness to engage with others not only benefits recipients but also helpers as giving help encourages helpers to reorganise and restructure the information in their own minds so they, in turn, develop clearer and more elaborate cognitive understandings than they held previously (Webb & Mastergeorge, 2003). Teachers can facilitate interaction in groups when they ensure students sit in close proximity to other group members so they can hear what is being discussed, see each other's faces, and participate in the group's discussion. When students are provided with opportunities to interact with their peers during small group discussions, they learn to read each other's non-verbal language, respond to social cues, and engage in general banter about the work they are completing (Gillies, 2003a,b).

The third key component is individual accountability or one's responsibility in ensuring that he or she completes his or her share of the work while also ensuring that others complete theirs. In fact, the more students perceive they are linked together, the more they feel personally responsible for contributing to the collective effort of the group. Johnson and Johnson (1990) maintain that teachers can establish individual accountability in two ways: firstly, by structuring positive interdependence among group members so they will feel responsible for facilitating others' efforts; and secondly, by holding students personally responsible for completing their part of the task and ensuring that their contributions can be clearly identified.

Assigning students to groups and expecting them to know how to cooperate does not ensure that this will happen. In fact, groups often implode because they lack the interpersonal skills required to manage disagreements among group members. These skills need to be explicitly negotiated (older students) or taught (younger children) and are the fourth key component in successful cooperative learning. In a series of studies that investigated the effects of structured and unstructured cooperative groups on students' behaviours and interactions, Gillies (2003a, 2003b, 2004, 2006, 2008) and Gillies and Ashman (1996, 1998) have consistently found that students who were trained to cooperate and help each other are: more inclusive of others; respectful and considerate of others' contributions; and, provide more detailed explanations to assist each other's learning than students who have not

participated in this training. The social skills that facilitate students' interactions during small group discussions include:

- Actively listening to each other;
- Sharing ideas and resources;
- Commenting constructively on others' ideas;
- Accepting responsibility for one's behaviours;
- Making decisions democratically.

In fact, Johnson and Johnson (2009) maintain that students need to be taught the social skills needed for high quality cooperation and they must be motivated to use them if they are to facilitate learning in themselves and others. Furthermore, providing students with feedback on how they use these skills not only helps to create more positive relationships among group members, but it also helps to increase students' achievement.

The final key component of successful cooperative learning is group processing. Group processing involves students reflecting on their progress and their working relationships. Questions such as the following are often used to stimulate this type of reflection:

- What have we achieved?
- What do we still need to achieve?
- How might we do this?

In a study that investigated the effect of group processing on the achievement of 48 high school seniors and college students, Johnson, Johnson, Stanne, and Garibaldi (1990) found that students had higher achievement gains when they participated in group processing discussions in comparison to peers who did not have these experiences. In this study, group processing involved ensuring that everyone in the group engaged in summarizing ideas and information, participated in the discussion, and checked to see that decisions made by the group were supported by members. The additional benefits of group processing included enhanced respect among group members from each other which, in turn, increased members' commitment to the group, acceptance of group norms, and contributed to an increase in members' collective identification (Johnson & Johnson, 2009).

Group Composition and Task

Given the importance of establishing cooperative groups that include the five key components outlined above, other issues that teachers need to consider are the composition of the group and its size. In a meta-analysis of 66 studies that examined the effects of within-class grouping (i.e., establishing small groups in classes) on student achievement at the elementary, secondary and post-secondary levels, Lou, Abrami, Spence, Poulsen, Chambers, & d'Apollonia (1996) found that students achieved higher outcomes when they worked in small cooperative groups than when they were not grouped, such as occurs in traditional whole-class settings. Students also worked better and achieved more when they worked in groups of 3-4 members than in groups of 5-7 members, possibly because the latter arrangement was closer to whole class teaching where information was transmitted rather than constructed. Interestingly, the effects of group ability composition were different for students of different relative ability with low-ability students learning more in heterogeneous or mixed ability groups while medium-ability students benefited significantly more in homogeneous groups. Composition made no difference to high ability students who worked equally well in heterogeneous or homogeneous groups. Similar results were also obtained in a meta-analysis of small group and individual learning with technology by Lou et al. (2001), with small group learning having significantly more positive effects than individual learning on students'

individual achievement and group task performance. Group performance was higher in smaller groups (3-5 members) than those working individually and students gained more individual knowledge when they worked in small groups than those working individually with computer technology.

In a theory-based meta-analysis of 123 studies that used technology to support undergraduate student learning in distance education, Lou, Bernard and Abrami (2006) found that when media were used to support collaborative discussions among students in asynchronous distance education (i.e., through discussion boards, email), the distance education students out-performed their peers who received classroom instruction only. This finding is consistent with previous findings (Lou et al, 1996, 2001) that reported that students involved in small group discussions (with and without technology) achieved significantly higher learning outcomes than students who did not participate in discussions with their peers. Lou et al. proposed that the asynchronous discussions among students not only provided opportunities for elaborated feedback and help but these discussions may also have provided opportunities for students to learn reflectively and actively through peer modelling and mentoring. This modelling and mentoring, in turn, may have helped them to develop better metacognitive and self-regulated learning skills; skills which are strongly associated with successful learning.

The type of task students undertake in their groups is also important because Cohen (1994) found that it affects student interactions. Interaction among group members is critically important to the success of small group activities with Shachar and Sharan (1994) arguing that this will only happen when teachers create conditions that enable students to work in small groups on tasks that require cooperation among group members. This includes ensuring that students are given a group task that is open and discovery-based where there is no right answer and successful completion requires students to interact with each other and share and exchange resources (information, knowledge, heuristic problem-solving strategies, materials and skills). These are resources that no single individual possesses so input from others is required. Cohen has consistently found that when this occurs, it is the frequency of task-related interactions that are related to gains on computation and mathematical concepts and applications, as well as on content referenced tests in science with the most consistent predictor of achievement being giving detailed or elaborate information (Webb, 1991; Webb & Matergeorge, 2003).

Furthermore, Cohen (1994) proposes that the importance of arriving at a synthesis of everyone's contributions, and the expectation that the group product will be presented to the wider class, are structures that are designed to foster group cohesion and motivate students to complete the task. When teachers structure small group activities so that these conditions are met, students are more interactive, use more words per turn of speech, communicate more equitably so ideas are shared among group members, and elaborate more to explain the problem at hand.

In summary, the results of these meta-analyses (Lou et al., 1996, 2001, 2006) indicate students derive both academic and social benefits when they work cooperatively together rather than when they compete or work individually. Students are likely to achieve more when they work in groups of four or less members, preferably in mixed-ability groups rather than homogeneous groups, and when they work on tasks that require them to cooperate or tasks where students are interdependently linked so they are required to interact and share resources (Cohen, 1994).

The Teacher's Role in Promoting Cooperation among Students

There is no doubt that teachers play a key role in establishing cooperative learning experiences in their classrooms. This includes structuring the groups and the tasks so that students understand what they are expected to do and how they are expected to behave. It also includes teachers understanding that they have a role in promoting student interactions during small group discussions. Helping students to interact and work together not only enables students to learn from each other but also to accept responsibility for the tasks they have to complete and the decisions they have to make.

Sadly, research indicates that high-level cognitive talk which incorporates task-related talk about facts, concepts, and thinking only appears with low frequency when left to emerge as a by-product of small group learning (Meloth & Deering, 1999). Students do not elaborate on information, do not ask thought-provoking questions, and do not spontaneously draw upon prior knowledge without some relevant external guidance (King, 2002). Chinn, O'Donnell and Jinks (2000) also observed that students rarely engage in high-level discourse or explanatory behaviour or provide reasons for their conclusions unless explicitly taught to do so. However, when students are taught to talk and reason together and apply those skills in their interactions with each other (in this case, science), Mercer, Dawes, Wegerif, and Sams (2004) found that they were able to talk and reason effectively together. Furthermore, these talk-based group activities helped in the development of individuals' reasoning, problem-solving and learning.

In a similar vein, Gillies (2004) found that when teachers were taught how to mediate students' learning by engaging in dialogic exchanges where they probed and clarified issues, confronted discrepancies in students' thinking, offered tentative suggestions, and acknowledged and validated students' responses, the children's responses to each other mirrored many of the responses they gave their teachers, that is, they were detailed or elaborated. In a study of teachers' and students' verbal behaviours in secondary classrooms, Gillies (2006) found that teachers who implement cooperative learning demonstrate more mediated-learning interactions than teachers who implement group-work only. Furthermore, students in the cooperative groups engaged in more verbal behaviours that are generally regarded as helpful and supportive of group endeavours than their peers in the group-work only groups (i.e., ad hoc groups where students had not been taught to cooperate). Gillies argued that many of these verbal behaviours may have, in part, emerged from the types of reciprocal interactions their teachers modelled as they interacted with group members where the students learned to provide more explanations and detailed responses to other students' requests for help or perceived need for help. The frequency of the multidirectional responses that occurred in the cooperative groups both among the students and with their teachers may also have emerged from the group tasks which were generally open and discovery-based and required students to exchange information and ideas in order to find a solution to the problem. In short, the research (Gillies, 2004, 2006; Mercer et al., 2004) shows that teachers can teach students how to talk and reason together to promote student interactions and learning.

Teacher's Mediation of Students' Learning

The vignette below provides an example of how one Year 6 teacher mediates her students' learning during a discussion on human body systems - a topic from the science curriculum. The students are working in groups of 3-4 members using the Six Thinking Hats (de Bono, 1990) to help them ask questions of each other that elicit facts (white hat), feelings

(red hat), generate ideas (green hat), drawbacks (black hat), actions (yellow hat), and summaries of key ideas (blue hat). The purpose of the activity is for each group to develop a report on a topic that they can share with younger children in their school (e.g., effects of drugs on the body; healthy eating; exercise; positive mindset).

The vignette begins with the teacher directing her comments at all the small groups in her classroom. The interactions that occur between the teacher (T) and the students (S) represent only a few minutes of the teacher's time as she moves among the groups to monitor progress, provide assistance and actively challenge the children's thinking and ideas.

(T. comments directed at all the groups in the classroom)

1. T: Ok. So, there's been some good conversation going on in your groups and you all know the purpose of this task. Can someone remind us what the purpose of this task is? Jasmine, what's the purpose of this task? ***(T. challenges students to think of the purpose of the activity)***
2. S: We're doing group work so help each other. ***(S. provides short explanation)***
3. T: Yes, we need to make sure we fully understand all the information we've been learning in our groups about body systems because we're going to take that information and make a presentation to children at our primary school on things that they can do to help them be healthy. ***(T. focuses on the issue)*** OK. Remember each group is responsible for telling us about your discussion, for linking your ideas and explaining them to the rest of the class. Are there any questions? ***(T. prompts students to link ideas)***
4. S: Are we writing these ideas on paper?
5. T: Yes or on the board if you don't have paper.

(Teacher then settles students into their groups).

The teacher moves to a group. This group are discussing human nutritional needs.

6. T: Tell me about that, Elvis. ***(T. asks open question to elicit information)***

7. S: We need calcium, vitamins, and grains to keep us strong. As we get older, we need more calcium so our bones will grow strong. We want to be like a normal person. ***(S. provides explanation with reason)***

8. T: So, if we're aiming this presentation at little kids, what are the sorts of things they need to do to ensure that they always have healthy bones? ***(T. focuses students' thinking on how to present the information to younger children)***

9. S: Don't eat junk foods. Always eat calcium, grains. ***(S. provides explanation)***

10. T: Where do we get our calcium from, Kenny? ***(T. asks open question)***

11. S: Grains, milk, weetbix, eggs. We have to have that three times a day to keep our bodies strong. ***(S. provides explanation with reason)***

12. S: If we don't eat that, we'll get weak and our bones won't be strong. ***(S. provides reason)***

13. S: We won't get strong and we'll get weaker. ***(S. reiterates explanation)***

14. T: Yes, lots of good thinking going on here. ***(T. acknowledges and validates students' thinking)*** So it's to help adults to have healthier bones. Is that what you're saying to me? OK. So you also mentioned to me that kids now have to eat the correct food. When you're thinking about some of the problems, why is it do you think children are not eating some of those foods now? ***(T. challenges students to provide reasons)***

15. S: Students are not eating the right quantities of those foods and they're getting smaller and weaker. ***(S. provides reason)***

16. T: Elvis, do you feel children understand about eating the right quantities of those foods? ***(T. models how to ask a feeling question)***

17. S: No because they don't understand what's happening to you until you get older. ***(S. provides reason)***

18. S: What will help us when we get older? ***(S. asks open question)***

19. T: You've already told us what will help us so they will have healthy bones as they get older. It is helping children to eat the right foods at present so they will grow healthily. ***(T. makes statement)***

20. S: Some children grow at different times. Some children grow quickly and some grow slowly. ***(S. provides explanation with reason)***

21. T: Yes, Nathan and it's perfectly normal for children to grow at different rates. When you see them in Years 7, 8 and 9 they are about the same size and then some children start to shoot up after that whereas in comparison, some children take longer to grow. ***(T. acknowledges and validates student response)***

22. T: Let's see what you can write on this sheet. OK. Can you explain to me, Wilson, how we feel about this problem because Jeremiah is putting this point under the red hat? ***(T. models how to ask a feeling question) (T. challenges students to provide reason)***

23. S: People are friends and they can get osteoporosis ***(S. makes statement)***

24. T: Can you explain to them what osteoporosis is? ***(T. encourages students to provide an explanation of osteoporosis)***

25. S: When you have it, you can fall down and break your bones. ***(S. provides explanation)***

26. T: Yes, so when people have a simple fall they may break a hip that requires physiotherapy and other medical help. Yes, we can see the impact of that on our families as well. Older men can also suffer from that disease. You look as if you've got some good ideas there. Can you explain to me what some of those ideas are? ***(T. challenges students to explain their ideas)*** So the topic you're discussing is, *Is what you're doing to yourself making you healthy or unhealthy?* So you're trying to get to the bottom of that issue. So in relation to that, what are some ways of solving that problem of making people aware of what they're doing to their bodies. ***(T. challenges students to identify some solutions)***

(Students discuss among themselves)

27. T: I think that what you may be doing here is that your topic is far too broad. It's about us telling little kids about the things they can do for themselves to make themselves healthy. Do you mind if I change it and make it a little more specific and then you should be able to respond to the task a little more easily. ***(T. makes tentative suggestion)*** What do we know about the problem about people being unhealthy because of what they eat? ***(T. asks open question)*** (Teacher writes ideas on whiteboard as group give suggestions and children discuss junk food.) What do we think of when we think of junk food – think of the things they advertise on TV – peanut butter, cereal foods with sugar, coco pops, foods with a lot of oil, fats, sugar? ***(T. prompts students)*** (students discuss ideas) So do you want to put that down

do you want to start with Many foods… and then finish off the statement with your ideas? Many foods have lots of fat and sugar and we need to eat them in moderation.

28. S: TV ads encourage children to eat junk food…That's a good contribution there Jaylon. ***(S. acknowledges and validates other S's response)***

29. T: Just looking at what you're doing with the red hats. Would you like to explain how you feel about that? ***(T. challenges students to identify feeling)***

30. S: If we eat healthy foods we'd feel better. We'd be healthy. ***(S. provides explanation)***

31. T: How would society feel about that? ***(T. models feeling question)(T. challenges students to identify feeling)***

32. S: They'd feel healthy.

33. T: Are you saying to me if people are healthy they feel better? ***(T. challenges students' thinking)*** What do you feel about this problem? ***(T. models feeling question)***

34. S: People would live longer. People would be happier if they were healthy. ***(S provides explanation with reason)***

35. T: What are the minuses of solving this problem – people living longer. Could there be any minuses in there? ***(T. scaffolds children's thinking)***
S: Students suggest minuses.

36. T: It's a very difficult problem to solve because people have minds of their own. I wonder what the implications might be if people lived to say 95 years? ***(T. challenges students to think of the consequences)***

37. S: People would get better and live longer. ***(S. provides explanation)***

38. T: Maybe we'd need more nursing homes for elderly people…? ***(T. asks tentative question)***

39. S: Some old people live long but can be very sick or weak and not able to move around or do things for themselves. ***(S. elaborates)***

40. T: How do you know their skeletal system is not strong as they get older? ***(T. models how to ask a white hat question that focuses on seeking information)(T. challenges student to provide reason)***

41. S: Their bones get thinner and they're weaker. So they can break easily. ***(S. elaborates with reason)***

42. T: Maybe a point that you need to put there to help with that is to give them help with that particular disease. It can affect their families and society. ***(T. makes tentative suggestion)***

In the vignette above the teacher 'sets the scene' by stimulating the children's thinking about the purpose of the activity (Turn 1), focuses their attention on the topic to be investigated, and prompts them to link their ideas and explain them to the rest of the class (Turn 3). The interaction with the students is positive and they clearly understand that they are going to be working together to help each other with the topic they are going to discuss (Turn 2).

Once she is satisfied that the students understand what they are to do in their groups, she moves on to the first group where she engages the students in a series of dialogic exchanges designed to elicit information on *healthy eating*, the topic they are discussing (Turn 6), focuses their thinking on how to present the information (Turn 8) and seek specific information on what foods provide calcium (Turn 10). In each instance, students respond with an explanation or elaborated response (Turn 7, 9) and in some instances there is a snowballing set of responses as the students build on the responses of others (Turns 11, 12, 13).

It is interesting to note that this dialogic pattern of teacher-student interaction continues until the last turn (Turn 41) with the teacher actively engaging the students by asking questions designed to challenge their ideas (Turns 14, 22, 24, 26, 29, 36), scaffold and guide their responses (Turns 27, 31, 33, 35, 38, 40, 42), and acknowledge and validate their efforts (Turns 14, 21,). On the 19 occasions in which the teacher challenged the children's thinking or scaffolded and guided their responses, the students responded with an explanation or elaborated response on 15 of those occasions (78%), an indication that they were thinking about the task.

The teacher in the vignette above was clearly engaged in dialogic teaching or teaching that involves using the power of talk to stimulate and extend students' thinking and learning. Alexander (2008a) proposed that dialogic talk is characterized by the teacher and students addressing learning tasks together. It is reciprocal where participants share ideas and consider alternative views, support each other's learning, and build on each other's ideas while the teacher plans and guides the discussion with the purpose of achieving specific task-related goals. During dialogic teaching, teachers structure questions so they are challenging and designed to provoke thoughtful responses, answers build on previous dialogic interactions and are cogently linked to lines of inquiry, students are encouraged to ask questions and provide explanations, and reflection and evaluation are encouraged (Alexander, 2008b).

When teachers engage in dialogic teaching or *teaching talk* (Alexander, 2008a, p.103), students learn to listen more attentively to others, encourage others to participate and share ideas, actively work to co-construct new ideas and knowledge together, and strive to reach consensus over issues while respecting the views and ideas of others. By behaving in these ways, students learn to engage in *"learning talk"* (Alexander, p. 104) or a way of talking that includes being able to narrate, explain, direct, question, analyze and resolve difficulties, speculate and hypothesize, discuss, reason and justify, and negotiate.

Students mediating each other's learning

In the vignette below, the students are discussing the effects of drugs on the body with the purpose of preparing a report that they can present to younger children to help them understand some of the issues. The students are working independently as a group and the transcript represents a few minutes of continuous reciprocal interactions among the students, although the teacher (above) does intervene briefly as she challenges the students to consider how they intend to present the information. These students, as with the ones in the previous vignette, have been taught to use the Six Thinking Hats (de Bono, 1990) to help them ask different types of questions to elicit the information they need.

1. S: OK, how can drugs affect our bodies? ***(S. asks white hat question –seeks information)***
2. S: I think…

3. S: Alisha, we've going to start off with the white hat. How does it affect our bodies? ***(S. asks white hat question –seeks information)***

4. S: Bad oxygen. ***(S. statement)***

5. S: The problems with drugs is that drugs can make us psycho. ***(S. explanation)***

6. S: It can affect us visually, and it can fill us and all that kind of stuff. ***(S. explanation)***

7. S: OK, we've got to figure out how they affect us ***(S. statement)***

8. S: Our lungs can go real bad when our major organs are affected. ***(S. explanation)***

9. S: It can affect your major organs and the way you breathe. ***(S. explanation)***

10. T: OK, Greg, can you think of any way drugs can affect your major organs? ***(T. challenges student to provide information)***

11. S: Drugs…I'm not sure. ***(S. unsure, short response)***

12. T: You've probably got some information on drugs that you can use. Think of how you can present it to the children. ***(T. prompts)***

13. S: I think that that should go in the white hat section. ***(S. prompts)***

14. S: Only certain drugs make us go psycho. ***(S. statement)***

15. S: What else do we know about drugs? That it can make our families go against us and that stuff. ***(S. open question)***

16. S: Feelings. I feel that taking drugs is a bad thing. ***(S. statement)***

17. S: This problem can affect us and our families and our children. ***(S. explanation)***

18. S: I think those go together because they are dangerous. ***(S. explanation)***

19. S: It was a very good answer to your question. ***(S. acknowledges and validates response)***

20. S: OK. Alisha, how do you feel about this problem? ***(S. asks a red hat question –feeling question)***

21. S: How do people feel who take drugs? ***(S. asks open question)***

22. S: I feel sick in the stomach. ***(S. statement)***

23. S: Thank you for saying that. What else people? ***(S. acknowledges student's response and seeks additional information)***

24. S: I would like to say something about this problem. I feel that if people take drugs it will form a habit and it will affect lots of people because of their families and their health and that. ***(S. explanation with reason)***

25. S: Why do you feel you don't like it? ***(S. asks a red hat question to solicit reasons for feelings)***

26. S: It will affect all the people around them***…(S. statement)***

27. S: Have you heard anyone you know taken drugs? ***(S. asks open question)***

28. S: No. I think people who take drugs want to be cool and show off to their friends and their exs (ex-partners). ***(S. statement)***

29. S: Yeah! That true. They think that it will be cool but it's not. It is just uncool. ***(S. statement)***

30. S: It just doesn't affect them it affects all the people around them. ***(S. explanation)***

31. S: So now we should go to the Black hat (identify drawbaks). ***(S. statement)***

32. S: What are the ideas we have in our heads that haven't come out yet. ***(S. asks open question)***

33. S: The black hat is what are some ways of exploring the ideas in our heads – the ideas in our heads that haven't come out yet? ***(S. solicits minuses)***

34. S: No we should go to the green hat. ***(S. statement)***

35. S: Ok, what are some ways of solving this problem? ***(S. solicits creative ways of solving the problem)***

36. S: Alsiha, do you have some ways of solving this problem? The green hat question is, What are some ways of solving this problem? Any ideas? ***(S. continues to probe for ideas)***

37. S: People that like that …they should make new harsher rules to stop people from importing drugs. ***(S. reason)***

38. S: Do you want to say something that is related to that. ***(S. probes)***

39. S: Yes, they should check their t-shirts because people wrap drugs around their bodies or in their backpack such as ….(name of convicted drug dealer is mentioned). ***(S. statement)***

While the vignette above represents only a few minutes of the students' interactions as they discuss the effects of drugs on the body, it is apparent that they are actively involved in seeking information from each other (Turns 1, 3, 23), soliciting input from others (Turns 15, 21, 25, 27, 32, 33, 35,38), and acknowledging others' contributions (Turns 19, 23). In turn, group members respond with statements (Turns 4, 7, 14, 16, 22, 26, 28,29, 31, 34, 39) or explanations or elaborations (Turns 5, 6, 8, 9, 17, 18, 24, 30) relevant to the topic; a clear indication that they have appropriated many of the characteristics of dialogic teaching that their teacher, in the previous vignette, had modelled. Their identity as a group or collective was apparent from the use of terms such as "our, we", and "us" or the implied use of these collective pronouns (Gillies, 2003a) in their dialogic exchanges. Their interactions were reciprocal with questions often followed by a series of statements or explanations that snowballed (Turns 5, 6, 7, 8, 9), indicating that they had developed stratagems for talking and thinking with each other which Anderson et al. (2001) proposes contribute to the development of students' language and thought.

Cooperative Learning: Implications for Education

The purpose of this paper is to review developments in research on cooperative learning and to examine the factors that contribute to its success. In particular, the review focuses on the key elements that underpin successful cooperative learning and the role

teachers' play in developing students' thinking and learning when implementing this pedagogical practice in their classrooms.

The evidence for the success of cooperative learning as a pedagogical practice that promotes both socialization and learning is overwhelmingly supported with meta-analyses by Johnson et al. (1981), Johnson and Johnson (2002), Roseth et al. (2008), and Slavin (1989) attesting to the benefits students derive when they cooperate with others. Working together to achieve a common goal produces higher achievement and greater productivity than working alone. Johnson and Johnson (2009) maintain that this is so well confirmed by the large volume of research that has been published that it stands as one of the strongest principles in social and organizational psychology. In fact, Johnson et al. (2014) suggest that organisations that wish to maximize the motivation and achievement of their members would be well advised to structure positive interdependence among members while minimizing negative or no independence. In schools, opportunities for students to work in situations where they experience positive interdependence would seem to be a better choice than situations based on negative or no independence. This suggestion is particularly pertinent to secondary schools where there tends to be a significant decrease in motivation after the transition from elementary schools and the opportunity to work closely with others may help to ameliorate this trend.

It is well recognized that students do not necessarily cooperate during group work and that groups need to be structured so that the five key components that mediate successful cooperation are evident. These include: establishing positive interdependence among group members; facilitating promotive interaction; encouraging individual accountability; explicitly teaching the appropriate social skills; and, encouraging groups to reflect on both the processes involved in managing the task and interacting with their peers. When these key components are embedded in groups, students are more likely to: feel motivated to work together to achieve both their own and the group's goals; accept personal responsibility for their contributions to the group and their behaviours towards group members; respect others' contributions: commit to resolving disagreements democratically: and, work constructively towards managing the task and maintaining effective working relationships.

Teachers not only play a key role in structuring groups so that the key components likely to facilitate successful cooperation are evident but they also have a role in promoting interaction among students because research indicates that students rarely provide quality explanations or engage in high-level discourse unless they are taught to do so (King, 2002). However, students can be taught to talk and reason and problem-solve together which, in turn, has been shown to contribute to the development of individual reasoning, problem-solving and learning (Gillies, 2004, 2006, 2008; Mercer et al., 2004). Furthermore, teachers can mediate students' learning by engaging in dialogic teaching or teaching talk where they model how to engage in reciprocal dialogues to resolve problems, ask questions that challenge current understandings, build on the ideas of others so they are linked cogently together, and reflect and evaluate on outcomes achieved (Alexander, 2008a,b). When teachers model these ways of talking, students, in turn, learn how to talk or use talk to ask questions, to explain their thinking, to analyse and solve problems, explore and evaluate ideas, argue, reason and justify. In short, they learn to develop stratagems for talking, thinking, and learning.

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