



Annual review

The teacher's role in promoting collaborative dialogue in the classroom

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Background. Research on student-led small-group learning in schools going back nearly four decades has documented many types of student participation that promote learning. Less is known about how the teacher can foster effective groupwork behaviours.

Aims. This paper reviews research that explores the role of the teacher in promoting learning in small groups. The focus is on how students can learn from their peers during small-group work, how teachers can prepare students for collaborative group work, and the role of teacher discourse and classroom norms in small-group dialogue.

Method. Studies selected for review focused on student-led small-group contexts for learning in which students were expected to collaborate, reported data from systematic observations of group work, and linked observational data to teacher practices and student learning outcomes.

Results and conclusions. This review uncovered multiple dimensions of the teacher's role in fostering beneficial group dialogue, including preparing students for collaborative work, forming groups, structuring the group-work task, and influencing student interaction through teachers' discourse with small groups and with the class. Common threads through the research are the importance of students explaining their thinking, and teacher strategies and practices that may promote student elaboration of ideas.

Research on student-led small-group learning in schools goes back nearly four decades, with prominent reviews by Johnson and Johnson (1974) and Slavin (1977) documenting a surge in research that started in the early 1970s. A predominance of research findings continues to show the positive effects of small-group methods on student achievement, especially compared to other forms of instruction that involve less interaction between students (e.g. O'Donnell, 2006; Slavin, 1995). The keen interest in utilizing small-group learning appears in schools around the world. Recognizing that students can learn by working with and helping each other, school districts, departments of education,

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national research organizations, and curriculum specialists recommend, and even mandate, the use of peer-based learning. Teachers can choose from many commercially available guides and programs designed to help them plan, implement, and manage small-group learning. Notably, whole schools have been organized around students cooperating with each other as the primary mode of instruction.

While small-group work has great potential to foster student learning, most researchers agree that simply placing students in small groups does not guarantee that learning will occur. Rather, the extent to which students benefit from working with other students depends on the nature of students' participation in group work. In particular, such benefits derive from the quality and depth of students' discussion, such as the extent to which students give and receive help, share knowledge, build on each others' ideas and justify their own, and the extent to which students recognize and resolve contradictions between their own and other students' perspectives (Bossert, 1988–1989; Webb & Palincsar, 1996).

Despite the growing knowledge about the types of student activity that promote learning, less is known about how the teacher can foster these behaviours. This article reviews research that explores the role of the teacher in promoting learning in small groups. The following sections address how students can learn from their peers during small-group work, how teachers can prepare their students for collaborative group work, and the role of teacher discourse and classroom norms in small-group dialogue. The literature selected for discussion focuses on student-led small-group contexts for learning in which students were expected to collaborate. The literature search focused on studies that reported data from systematic observations of group work and linked the observational data to learning outcomes or to teacher practices or, preferably, both.

Student learning during small-group work

Theoretical perspectives

A number of theoretical perspectives describe mechanisms by which collaboration with others may foster learning. From a cognitive elaboration perspective (O'Donnell, 2006), interacting with others may encourage students to engage in cognitive restructuring, through which they restructure their own knowledge and understanding. This occurs when students elaborate on their thinking during conversations with others. Specifically, explaining the material to others may promote learning by encouraging the explainers to rehearse information, reorganize and clarify material, recognize their own misconceptions, to fill in gaps in their own understanding, to strengthen connections between new information and previously learned information, to internalize and acquire new strategies and knowledge, and to develop new perspectives and understanding (Bargh & Schul, 1980). In the process of formulating an explanation, students may think about the salient features of the problem and generate self-explanations that help them to internalize principles, to construct specific inference rules for solving the problem, and to repair imperfect mental models (Chi, 2000). This process may help them develop a better awareness of what they do and do not understand (Cooper, 1999). In addition, tailoring explanations to the difficulties of other students may push helpers to construct more elaborate conceptualizations than they would otherwise. Receiving explanations may help students to correct their misconceptions and to strengthen connections between new information and previous learning (Wittrock, 1990), as well as to bridge their previous knowledge to the new information (Rogoff, 1990). Giving and receiving non-elaborated help (such as the

answer to a problem without any accompanying explanation of how to solve it), on the other hand, is expected to have fewer benefits because it may involve less cognitive restructuring or clarifying on the part of the help-giver and may not enable help-receivers to correct their misconceptions or lack of understanding.

The importance of cognitive elaboration is also an integral part of three other perspectives on learning from peers. In the Piagetian perspective, cognitive conflict leads to higher levels of reasoning and learning (Piaget, 1932). Cognitive conflict arises when a learner perceives a contradiction between her existing understanding and what she hears or sees in the course of interacting with others. This contradiction and its disturbance to a student's mental equilibrium can lead the learner to re-examine and question her own ideas and beliefs, to seek additional information in order to reconcile the conflicting viewpoints, and to try out new ideas. Elaborating on Piaget's perspective, Doise and Mugny (Doise, 1990; Doise & Mugny, 1984; Mugny & Doise, 1978) illustrated how socio-cognitive conflict, the production of different cognitive approaches to the same problem that emerge during social interaction, leads to progress when a student takes into account his perspective while considering another's incompatible viewpoint. Confronting others' contradictory ideas may involve explaining and justifying one's own position, with the positive attendant effects on student learning.

In the Vygotskian perspective, the benefits of collaboration occur when a more-expert person helps a less-expert person (Vygotsky, 1978). With the help of a more-skilled person, a process of negotiation and transformation enables the less-competent person to carry out a task that the student could not perform without assistance, a process sometimes called scaffolding or guided participation. Through practice and internalization, the new skills and knowledge become part of the student's individual repertoire (Tudge, 1990). In the Vygotskian perspective, explaining his own thinking and understanding constitutes part of the process through which the less-capable person constructs his own knowledge (see also Vedder, 1985, on the importance of students applying explanations they have received).

Cognitive elaboration also figures prominently in the process of co-construction, during which students can learn by co-constructing knowledge with their peers. Students can contribute different pieces of information or build-upon others' explanations to jointly create a complete idea or solution (Hatano, 1993), and can collaboratively build knowledge and problem-solving strategies that no group member has at the start by acknowledging, clarifying, correcting, adding to, building upon, and connecting each others' ideas, suggestions, and perspectives (Hogan, Nastasi, & Pressley, 2000; Schwartz, 1995). Co-construction requires a high degree of coordination among group members, with students justifying their own ideas, acknowledging and repeating each other's ideas, and elaborating on others' proposals (Barron, 2003).

Empirical evidence

Research documents the strong relationship between elaborated discussion and learning outcomes, especially the power of giving explanations and its connection to achievement in small groups (Chinn, O'Donnell, & Jinks, 2000; Fuchs *et al.*, 1997; Howe *et al.*, 2007; Howe & Tolmie, 2003; Nattiv, 1994; Webb & Palincsar, 1996). Typical of the research findings is the strong positive correlation found by Veenman, Denessen, van den Akker, and van der Rijt (2005) between providing explanations as part of arguments or justifications and sixth-grade students' mathematics performance scores.

Receiving explanations positively relates to achievement when students actively use the explanations to try to solve problems for themselves or when they reformulate the explanations in their own words (Webb & Mastergeorge, 2003; Webb, Troper, & Fall, 1995). An important component in this process is receiving explanations that are timely, relevant, and understandable. In her comprehensive help-seeking model, Nelson-Le Gall (1992) described the responsibilities of help seekers in obtaining the help they need: students must realize that they need help, must willingly seek help, must identify someone who can provide help, must use effective strategies to elicit help, and must willingly reassess their strategies for obtaining help if previous attempts prove unsuccessful (for an expanded model of adaptive help-seeking behaviour in the classroom, see Newman, 1998).

Effective help-seeking strategies include asking explicit, precise, and direct questions that clearly convey the help-seeker's area of difficulty or lack of understanding (Peterson, Wilkinson, Spinelli, & Swing, 1984). Specific questions enable other group members to understand the nature of a student's confusion or uncertainty and to formulate appropriate and precise responses. Specific questions may also signal that the help seeker possesses characteristics that favourably dispose group members to provide positive responses, specifically, that the help seeker is motivated to learn how to solve the problem, that she already has at least some understanding of the problem in order to pinpoint a specific area of uncertainty, and that she will profit from the explanations provided (characteristics of students with an orientation towards learning, who strive to master the task at hand, and who are confident in their ability to learn, Ames, 1992; Ryan & Pintrich, 1997; Schunk, 1989).

Less effective help-seeking strategies include asking general questions ('How do you do this?') and giving general declarations of confusion that do not clearly pinpoint any specific part of the problem or task ('I don't understand'). Non-specific questions give little guidance to group members about what explanations to provide. Moreover, such questions may signal attributes about the help seeker that make groups reluctant to provide explanations. Peers may interpret general questions as an indication that the help seekers lack motivation, ability, or both (Salomon & Globerson, 1989), that they lack sufficient comprehension of the problem to formulate specific questions, or that they lack awareness of what aspects of the problem they do not understand to such an extent that they cannot formulate a specific question (Markman, 1981). In response to non-specific questions, groups may resort to dictating solutions to problems without providing explanations, or even ignoring such requests altogether (Webb & Mastergeorge, 2003).

Other research attests to the power of co-construction of knowledge and strategies in which the lines between providing and receiving explanations are blurred. For example, in a series of studies, King has shown strong relationships between groups' elaboration of their strategies and problem-solving success (King, 1999). Group discussion of reasoning also figures prominently in Mercer's (1996) distinction between ways of talking that differ in terms of whether and how group members refer to and build-upon each other's contributions. In disputational talk, students disagree with others' ideas (without giving reasons) and assert their own, without any attempt to come to a consensus. In cumulative talk, students acknowledge each other's ideas without disagreement (e.g. by repeating or confirming them) and try to come to a consensus, but do not justify, challenge, or question each other's ideas. In exploratory talk, students explain their own ideas and engage with others' ideas by questioning them and by challenging others to justify their thinking. In exploratory talk, unlike in the

other two types of talk described by Mercer, reasoning is in the foreground. Mercer and colleagues (e.g. Mercer, Wegerif, & Dawes, 1999) have shown in multiple studies that engagement in exploratory talk is related to students' performance on reasoning tasks.

Negative group processes. In contrast to the beneficial processes described above, researchers have documented a variety of communication difficulties in groups that are negatively related to group and individual outcomes. Barron (2003) has identified the lack of coordination among group members' efforts and participation as an impediment to group functioning and to individual learning. Low levels of attention to, and uptake of, group members' suggestions may inhibit group progress, even when those suggestions are correct and potentially productive. In incoherent conversations, students advocate and repeat their own positions and ideas, ignore others' suggestions, reject others' proposals without elaboration or justification, and interrupt others or talk over them. In highly coordinated groups, in contrast, speakers' turns are tightly connected, with group members paying close attention to, and responding to, what other members do and say, giving space for others' contributions, and monitoring how the unfolding contributions relate to the problem-solving goal. Proposed ideas are directly linked to the preceding conversation, and are acknowledged and discussed and not rejected or ignored. Kumpulainen and Kaartinen (2004) documented similar contrasts in coordination among students, in which students in some dyads continually referred to each other's ideas and suggestions (even repeating each other's words) in an attempt to build shared understanding while students in other dyads did not respond to each other's suggestions but focused instead on their own ideas. Other detrimental processes involve sub-optimal levels of conflict. Bearison, Magzamen, and Filardo (1986) showed that although students can learn by resolving discrepancies in ideas, too little or too much conflict can be detrimental. Infrequent conflict may reflect suppression of disagreements, or pseudoconsensus or pseudoagreement, in which students minimize disagreements or pretend they don't exist. In these cases, incorrect ideas may go unchallenged. Too much conflict, on the other hand, may prevent group members from seeking new information to resolve their disagreements. If students spend all of their time arguing (especially if their aim is to win the argument regardless of if they are right or wrong), they may never develop new insights.

Negative socio-emotional processes have also been shown to short-circuit effective elaboration in group work. Chiu and Khoo (2003, p. 507) showed that rudeness (especially rude criticisms of others' ideas, such as 'You're wrong' compared to the more polite criticism 'If 6 is multiplied by 2, we don't get 10') reduced the likelihood that group members would be able to agree on problem solutions and also reduced the quality of groups' solutions to problems. Webb, Nemer, and Zuniga (2002) also found that negative socio-emotional behaviour (insulting, domineering, and off-task behaviour) negatively impacted group functioning. Students in groups that exhibited these behaviours withheld important knowledge they had about the task, with negative consequences for the quality of group performance.

Other debilitating processes that involve purposeful withdrawal of participation include social loafing, or diffusion of responsibility, in which one or more group members sit back and let others do the work, possibly because they believe that their efforts can't or won't be identified or are dispensable. Social loafing, in turn, can lead to the sucker effect which emerges when the group members who complete all of the work discover that they were taken for a free ride and start to contribute less to the group work in order to avoid being a sucker (Salomon & Globerson, 1989).

While research has shed light on the kinds of verbal interaction that benefit (or detract from) learning, groups do not necessarily engage in beneficial dialogue without help. A common observation (e.g. Ross & Cousins, 1995) is that students infrequently request or provide explanations. Moreover, when students do describe their reasoning, their explanations are often confusing, incomplete, and incorrect (Ross, 2008). Teachers, then, have an important role to play in fostering beneficial group dialogues and preventing debilitating processes. I examine four dimensions of the teacher's role here: preparing students to collaborate, forming groups, structuring group work to guide or require students to engage in certain processes, and engaging in certain types of discourse with groups and the class.

Preparing students for collaborative work

Educators universally recommend that teachers prepare students to collaborate with each other. Preparation can range from as little as describing the behaviours that are expected during group work to extensive training and practice in social skills. Two approaches studied systematically are providing instruction in communication, explaining, or reasoning skills; and altering status relationships among students, thereby changing students' expectations about each other's capabilities. Research finds that these approaches have positive effects on the nature of group collaboration, on group task performance, and often on student achievement.

Providing instruction in communication, explaining, or reasoning skills

Many studies have incorporated instruction in communication, explaining, or group reasoning skills into small-group learning programs. For example, preparation in communications skills is a central feature of the SPRinG (Social Pedagogic Research into Group work) program developed by Baines *et al.* (2008; see also Baines, Blatchford, & Chowne, 2007; Blatchford, Baines, Rubie-Davies, Bassett, & Chowne, 2006) to help teachers create inclusive and supportive classrooms. Baines *et al.*'s (2008) teacher handbook on promoting effective group work provides numerous activities for teachers to use in classrooms in order to develop students' skills in the following areas: taking turns speaking; engaging in active listening; asking and answering questions; making and asking for suggestions; expressing and requesting ideas and opinions; brainstorming suggestions, ideas and opinions; giving and asking for help; giving and asking for explanations; explaining and evaluating ideas; arguing and counter-arguing; using persuasive talk; and summarizing conversations. For example, classroom activities help students to understand distinctions between the different kinds of helping, such as showing, telling, and guiding. As another example, students engage in debates and follow-up debriefing to help them understand what reasons are, the importance and benefits of giving reasons, and possible words to use when providing or requesting reasons.

Many other studies include training students in similar constellations of skills. For example, in a research program by Gillies and colleagues (e.g. Gillies, 2003, 2004), teachers taught students to actively listen to each other, to provide constructive feedback for each others' suggestions and ideas, to encourage all group members to contribute to the group task, to try to understand other group members' perspectives, and to monitor and evaluate the progress of the group. To increase group reasoning (jointly analyzing problems, comparing possible explanations, making joint decisions),

teachers in a set of studies by Mercer and colleagues prepared students to share all relevant suggestions and information, to provide reasons to justify assertions, opinions, and suggestions, to ask for reasons, to listen to others attentively, to discuss alternatives before making decisions, and to accept and respond to constructive challenges (Fernandez, Wegerif, Mercer, & Rojas-Drummond, 2001; Mercer, 1996, 2000; Mercer, Dawes, Wegerif, & Sams, 2004; Mercer, Wegerif, & Dawes, 1999; Rojas-Drummond, Pérez, Vélez, Gómez, & Mendoza, 2003; Rojas-Drummond & Mercer, 2003; Wegerif, Linares, Rojas-Drummond, Mercer, & Vélez, 2005). Some training programs include specific activities designed to improve students' explanation-giving and help-seeking skills (e.g. giving explanations rather than answers, asking clear and precise questions; Veenman, Denessen, van den Akker, & van der Rijt, 2005). Other programs focus on preparing students to engage in specific kinds of reasoning. Teachers in Reznitskaya, Anderson, and Kuo's (2007) study, for example, provided students with teaching about the abstract principles of argumentation. Students received instruction on the definition, purpose, and uses of arguments, as well as the parts of arguments, the position, the reasons supporting the position, the supporting facts, the objections that might be raised, and the responses to the objections. Similarly, Chinn, Anderson, and Waggoner (2001) instructed students in argumentation processes, including providing reasons and evidence for and against positions, challenging others with counter-arguments, and weighing reasons and evidence. Results of these and other studies show that preparation in communicating, explaining, and reasoning skills can increase the depth of group discussion and, often, group performance and/or student achievement.

Altering expectations and status relationships

Students don't always participate actively in groups. While personality characteristics may explain why some students participate more actively than others (extroverted, outgoing, and energetic members may talk the most), researchers have also found that status characteristics can produce inequities in participation by determining relative activity and influence in the group (Cohen & Lotan, 1995; Mulryan, 1992, 1995). High-status students, especially those with high academic standing or peer status characteristics (perceived attractiveness or popularity), tend to be more active and influential than low status individuals; while low status individuals tend to be less assertive and more anxious, to talk less, and to give fewer suggestions and less information than high-status individuals (e.g. Bianchini, 1997, 1999; Esmonde, in press). Individuals' characteristics, such as gender or race, may also operate as status characteristics in heterogeneous small groups, with boys and White students often being more active than girls and Black students. (For some specific examples of the dominance of boys over girls and high-achievers over low-achievers, see Baxter, Woodward, & Olson, 2001; King, 1993; Mulryan, 1992, 1995.) Even artificially created status differences (such as classifying students' competence on the basis of fictitious test scores) can alter group members' participation and influence. Dembo and McAuliffe (1987) found that, regardless of actual competence and ability to give help, students designated as 'high status' dominated group interaction, were more influential and were perceived to be more capable than 'low status' students.

To prevent low status students from being marginalized in group interaction, Cohen and colleagues (e.g. Cohen & Lotan, 1995) developed two status interventions based on broadening the notions of status and student competence. In the multiple ability treatment, the teacher raises students' awareness of the multiple skills necessary to

accomplish a task. The teacher discusses with students the multiple abilities needed to solve complex problems (e.g. visual thinking, intuitive thinking, and reasoning) and stresses the fact that no single student possesses all of the needed abilities but that all students have some of them. In the second treatment, teachers assign competence to low status students by observing groups at work to spot instances of low status students exhibiting intellectual abilities relevant to the task, publicly identifying the contributions, and commenting on the importance and value of them. Cohen and Lotan noted that, as high-status persons, teachers' evaluations have a strong influence on students' beliefs about their own and others' competence. To carry out these interventions, a teacher must have a deep and comprehensive understanding of the multiple competencies relevant to the task and must be a very astute observer to look for abilities that may not be noticed by students in the group. For example, Cohen and Lotan described how teachers might observe the work of quiet students to pick out accurate, informative, or creative work that they are doing, bring it to the group's attention, and encourage the group to listen to the quiet students describe and explain their work.

These approaches have shown success in reducing the relationship between status (based on, for example, language background, ethnicity, race, socio-economic status, or academic ability, for example) and behaviour in small groups (Cohen & Lotan, 1997). The more frequently teachers talk about the multiple abilities needed for a task (and the fact that no one has all of the abilities), as well as comment on the value of low status students' contributions, the more low status students participate, and the smaller the gap between high-status and low status students' participation rates.

Assigning students to groups

Also under the teacher's control is how to compose groups. Most often compared empirically are group compositions in terms of the gender and ability mix of groups (Webb & Palincsar, 1996), but results are not sufficiently clear cut to produce recommendations for teachers about optimal groupings. Moreover, as some studies have demonstrated, whether a particular group composition is optimal for its members depends on the group processes that ensue, and similar groupings may produce different processes and, consequently, different outcomes for students. For example, in an investigation of why high-ability students performed better in homogeneous than in heterogeneous ability groups (as had been reported by Webb, Nemer, Chizhik, & Sugrue, 1998), Webb, Nemer, and Zuniga (2002) found that high-ability students in some heterogeneous groups performed very well whereas high-ability students in other heterogeneous groups did not. Outcomes for high-ability students corresponded to the quality of their groups' functioning, rather than to the composition of the group, such as the level of help that high-ability students received, the level of contributions they made, and whether their group engaged in negative socio-emotional behaviour. Such results suggest that manipulating group composition cannot by itself guarantee optimal participation; teachers may more productively focus on ways to maximize group functioning for all students such as preparing students for collaborative work (as described above), and structuring group interaction (as described below).

Structuring group interaction

Some small-group approaches structure group interaction in specific ways or implement activities to guide groups' cooperation and to improve the quality and depth of

discussion. Features of these methods include requiring groups to carry out certain strategies or activities, assigning students to play certain roles, or both. Research finds that these approaches have positive effects on the nature of group collaboration, on group task performance, and, often, on student achievement.

Explanation prompts

Some peer-learning approaches give students specific prompts in order to encourage them to engage in high-level discourse about the task. Teachers give written prompts to students to help them to construct explanations, to find patterns in experiment results, to justify answers and beliefs, to relate prior learning to the task at hand, and to use as well as distinguish between 'scientific' and 'everyday' definitions and explanations (Coleman, 1998; Palincsar, Anderson, & David, 1993). Coleman (1998, p. 406f) gave the following examples of explanation prompts:

- Explain why you believe that your answer is correct or wrong.
- Can you compare how you used to think about this with how you think about it now?
- How does your explanation compare with the scientific definitions that we learned in class?
- Is this explanation a scientific definition or an everyday definition?

In Mevarech and Kramarski's (1997) metacognitive questioning method, teachers give the groups questions to answer in order to enhance mathematical reasoning. Comprehension questions ('What is the problem/task all about?') help students reflect on problems before solving them; strategic questions ('Why is this strategy/tactic-principle most appropriate for solving the problem/task?') prompt students to propose and explain problem-solving strategies; and connection questions ('How is this problem/task different from/similar to what you have already solved? Explain why') prompt students to find similarities and differences between current and past problems they have solved or tasks they have completed (Mevarech & Kramarski, 2003, p. 469).

Reciprocal questioning

In reciprocal questioning, teachers train students to ask each other high-level questions about the material to help students monitor their own and each others' comprehension as well as to encourage students to describe and elaborate on their thinking (Fantuzzo, Riggio, Connelly, & Dimeff, 1989). For example, students may be given 'how' and 'why' question stems to guide their discussions of text, such as, 'Why is . . . important? How are . . . and . . . similar?' (King, 1992, p. 113). Or students may be given questions to help them co-construct and explain strategies for solving problems, such as 'What is the problem?', 'What do we know about the problem so far?', 'What information is given to us?', and 'What is our plan?' (King, 1999, p. 101). Similarly, Fuchs, Fuchs, Kazdan, and Allen's (1999) teachers trained students to ask each other questions that begin with who, what, when, where, why, or how.

Structured controversy

In order to promote the benefits that can arise when students try to resolve conflicting ideas, Johnson and Johnson (1995) built controversy into the group's task by subdividing groups into teams and requiring the teams to master material on different

sides of an issue (e.g. should there be more or fewer regulations governing hazardous waste disposal), to present their views to the other team, to switch roles and repeat the process, and then to synthesize the two positions. Compared with groups required to seek concurrence by working cooperatively and compromising, groups required to discuss opposing ideas often carried out more high-level discussion of the material and less description of the facts and information; they also showed higher achievement.

Cognitive role specialization

Teachers can also give students specific roles to play so that they will carry out particular cognitive activities. Students may be assigned such roles as recaller (also-called learning leader or summarizer) and listener (also-called active listener, learning listener, or listener/facilitator: Hythecker, Dansereau, & Rocklin, 1988; Yager, Johnson, & Johnson, 1985), which can be incorporated into scripts for groups to follow (O'Donnell, 1999). The recaller summarizes the material and the listener is responsible for detecting errors, identifying omissions, and seeking clarification. Students then work together to elaborate on the material; they change roles for the next part of the task. In a variation of this scripted cooperation approach, Lambiotte *et al.* (1987) suggested that instead of the summarizer and listener studying the same material, students should study and teach each other different material. Lambiotte *et al.* hypothesized that listeners in this situation will be more likely to ask questions of clarification (because they have not already studied the material), and summarizers will be forced to organize the material more effectively and clearly, and to remember it better to present it to others (because they cannot assume that others have knowledge about the material). Finally, students in both roles will worry less about how others will evaluate their questions and summaries, and can focus better on the task.

Teachers can also train students in reciprocal peer tutoring, in which students playing the tutor role model strategies such as summarizing text as well as how to give explanations, corrections, and feedback about other students' work. To promote high-level discourse during paired discussions, teachers can train tutors to give highly-elaborated conceptual rather than algorithmic explanations to their partners (e.g. using real-life examples, discussing why an answer does or does not make sense: Fuchs *et al.*, 1997). Reflecting the importance of the activity of the help-receiver, some peer tutoring models guide the tutor in helping the *tutee* to give high-level explanations (King, 1999). The tutor asks questions designed to encourage the tutee to provide explanations of the material, asks further questions to push the tutee to elaborate upon or justify their explanations as well as to correct incomplete or incorrect explanations, and asks questions to push tutees to make connections among ideas and to link new material to their prior knowledge.

It should be noted that teacher and learner role specialization was a part of some of the earliest cooperative learning methods. In the *Jigsaw* (Aronson, Blaney, Stephan, Sikes, & Snapp, 1978) classroom, students are assigned responsibility for mastering a portion of the material (and discussing that material with other students assigned the same topic) and then for teaching their topic to the other members of their groups. In *Group Investigation* (Sharan & Hertz-Lazarowitz, 1980), in which students carry out research on their piece of a group project and then come together as a team to integrate their findings and plan their class presentations, students are involved in teaching their own project pieces to the group and in learning from their peers about the remaining portions of the project.

Reciprocal teaching

In reciprocal teaching, students carry out certain strategies designed to improve their comprehension of the text, including generating questions about the text they have read, clarifying what they don't understand, summarizing the text, and generating predictions (Brown & Palincsar, 1989; Palincsar & Brown, 1984, Palincsar & Herrenkohl, 1999). The teacher has an explicit role during group work to help students become proficient in these strategies. Teachers initially take the leadership in small groups, explaining the strategies and modelling their use in making sense of the text. Then teachers ask students to demonstrate the strategies, but give them considerable support. For example, in order to help a student generate questions to ask her groupmates, the teacher might probe what information the student gleaned from the text and help the student phrase a specific question using that information. The teacher gradually assumes the less active role of coach, giving students feedback and encouraging them. Students then carry out the text-comprehension strategies in their small groups.

Group processing

Some social psychologists maintain that groups will function most effectively if they discuss their group's interaction and how they might improve it, sometimes called 'group processing.' Such discussions may help groups identify, understand, and solve general communication problems (e.g. lack of student participation, disruptive or bullying behaviour) and may reinforce student collaboration (Johnson, Johnson, & Holubec, 1988). Gillies (2007) suggested example checklists and activities that teachers and students can use in order to evaluate group processes. Ross (1995) added another group processing component. In addition to having groups complete and discuss a self-appraisal instrument, Ross provided groups with feedback about their group functioning in the form of five-page excerpts of the transcripts of their conversations, and transcript scores that rated their levels of requesting help, of giving help, and of being on task. Ross observed that groups gave more help (in terms of procedures, explanations, acknowledgments, and evaluations of each other's work) after they received this feedback than before.

The group-work task

To encourage the participation of all group members, Cohen (1994b) recommended that teachers give groups complex tasks or open-ended problems without clear-cut answers or that require procedures that cannot be completed very well by a single individual and that utilize the combined expertise of everyone in the group. Such tasks encourage groups to recognize the multiple skills and perspectives needed in order to complete the task, and to value the different contributions that each student makes. Tasks or problems that can be completed by one student with the requisite skills, on the other hand, are more likely to limit the participation of students without those skills.

In a series of studies that supported Cohen's views, Chizhik and colleagues (Chizhik, 2001; Chizhik, Alexander, Chizhik, & Goodman, 2003) compared group collaboration and learning on open-ended or ill-structured tasks (e.g. designing a swimming pool and estimating its volume) versus single-answer or well-structured tasks (e.g. calculating the volume of a swimming pool with given dimensions). These studies showed smaller differences in participation rates between high-status and low status group members

(whether artificially-assigned status scores or social characteristics such as ethnic background) with ill-structured than with well-structured tasks.

Other research, however, raises questions about the correspondence between task type and patterns of participation within groups. Esmonde (in press) showed that groups may interpret the same task in different ways, with some groups approaching the task as if following a procedure in which one student was expert and could direct other group members, and other groups approaching the same task as a problem to solve in which all students collaborated. One task, for example, was a group quiz (e.g. a mathematics quiz asking groups to determine the number of cakes a dessert shop should bake to maximize profits, subject to certain constraints). Esmonde described the interaction in some groups as asymmetrical in which some students who positioned themselves as 'experts' taught 'novices' and the novices deferred to the experts. In other groups, the interaction was more symmetrical, with no students positioned as experts or novices, and all students asking for and providing help and jointly collaborating. Esmonde's results suggest that groups' beliefs about-group members' relative expertise and groups' perceptions about whether the task can be completed by a small number of experts are important predictors of group participation patterns beyond how a teacher conceives the task initially.

Influencing student interaction through teacher discourse

In contrast to the considerable volume of research on the effectiveness of preparing students for collaborative work and on the various ways to structure the group experience, little research focuses on the effects of teacher discourse on interaction among students. Given that students may model teachers' behaviour, even adopting teachers' words and phrases (Speidel, 1987; Tharp & Gallimore, 1988), the teacher's influence may be considerable. Research on the influence of teacher discourse on group functioning examines both teacher interventions with small groups and teacher discourse in the whole-class context.

Intervening with small groups

Many prominent cooperative learning researchers and theorists advise teachers to monitor small group progress and to intervene when necessary (e.g. Johnson & Johnson, 2008). What are the conditions that call for teacher intervention? And how should teachers intervene? Ding, Li, Piccolo, and Kulm (2007) describe three situations that may require teacher intervention: when no group member can answer the question, when students exhibit problems communicating with each other, and when students dominate group work without allowing true dialogue. Similarly, Tolmie *et al.* (2005) suggested that teacher guidance may help counteract students' tendencies to control group work or to disagree in unproductive ways (e.g. failing to provide reasons for their opinions and ideas), as well as enable children to explore ideas more effectively.

Cohen (1994a) provided a number of guidelines for teacher intervention when groups fail to progress or seem to be functioning ineffectively, such as asking open-ended questions to redirect groups' discussions and telling students they all need to be able to explain what the task is about. In all cases, Cohen cautioned teachers to carefully listen to group discussions, to make hypotheses about the groups' difficulties before deciding on what questions to ask or suggestions to make, and to keep interventions to a

minimum. She argued that students will be more likely to initiate ideas and to take responsibility for their discussions if teachers provide little direct supervision (such as guiding students through tasks, or answering individual student's questions before the group has attempted to work collectively to solve a problem). Evidence supporting this position comes from Galton and Williamson's (1992) detailed account of two teachers, one who initially withdrew her participation from group-work activities to foster student reliance on each other and started to ask questions and challenge group conclusions only after students had experience collaborating with each other, and the other who initially worked closely with students and offered support and advice when they ran into trouble. In the former classroom, students collaborated with each other to produce joint solutions and engaged in challenging conversations, whereas students in the latter classroom tended to produce individual rather than joint solutions and engaged in conversations about practical rather than abstract matters (e.g. making mechanical suggestions about how to make a timing device vs. proposing, justifying, and challenging each other's ideas about why certain strategies for making the timing device would or would not work, Galton & Williamson, 1992, pp. 84–86).

Despite the widespread recommendations about how teachers should interact with groups, scant empirical evidence exists about specific teacher interventions that may lead to improved group functioning. The studies systematically examining the relationship between teacher interventions and student behaviour during group work generally use two types of research designs. In one design, the small-group episode serves as the unit of analysis, in which teacher practices and small-group behaviour within the same episodes are linked. The other research design focuses on the classroom as the unit of analyses, in which the relationship between teacher practices and small-group behaviour is examined at the classroom level. Research using each design is explored in turn below.

Research linking teacher interventions to student behaviour

Four recent studies examined teacher and student behaviour occurring within the same episodes of group work. Two of the studies addressed whether and how teachers should provide help that is directly related to the content of the task. The results suggest that the effects of content-related help may depend on how well teachers link their help to the ongoing work of the group. Not surprisingly, content-related help may be more beneficial when teachers tie the help to the progress of the group on the task than it would be otherwise. Chiu (2004) examined the explicitness of teachers' content-related help, ranging across a four-point scale – no help, focusing student attention on certain concepts or aspects of the problem, explaining a concept or a part of the problem, and giving the solution procedure, as well as how often they issued directives to the group about which steps to take in order to solve the problem, ranging from none to all of their interactions with the group. Chiu found that the explicitness of teachers' content-related help was negatively related to students being on task immediately after the teacher's intervention and to groups' performance on that problem. Providing low levels of help content, and issuing few directives seemed to benefit student performance.

As Chiu (2004) observed, the explicitness of teachers' content help and how often they issued directives were linked to whether the teachers evaluated student work (marked by agreeing or disagreeing with students' suggestions). Teachers who evaluated student work tended to provide less-explicit help and issued fewer directives.

Conversely, teachers who did not evaluate the group's ideas tended to give explicit help and issue many directives, which reduced group productivity especially when groups were already making progress when the teacher intervened. Chiu described how the teacher evaluations of student work served an important gatekeeping function. Evaluating student work required teachers to make the effort to become aware of the strategies that the group was using. The knowledge of these strategies made it possible for teachers to work with students' ideas and to help in less direct ways, such as asking students to formulate a plan for answering part of a problem that the group had not yet addressed, or asking students to reread a part of the problem that they had misinterpreted. Explicit teacher help and a high incidence of teacher commands tended to occur when teachers did not first inquire about students' ideas. For example, in one episode, the teacher did not inquire about the group's work and so missed the group's misinterpretation of a problem, told the group the steps to carry out to solve the problem (but did not stay with the group to ensure that the students could solve the problem correctly), and the group failed to make further progress after the teacher left. As this episode shows, when teachers do not have, and do not seek, information about the group's ideas, their options for how to provide help are limited. These results suggest that a key element in determining the effectiveness of teacher interventions is whether the teacher's help is tied to students' ideas.

The importance of teachers tying their help to student thinking also figures prominently in Meloth and Deering's (1999) examination of teachers who provided high-content help (e.g. gave direct instruction about the task) or only issued non-specific teacher monitoring statements addressed to the group (e.g. 'You guys doing OK?'). High-content help facilitated productive group discussion (in terms of students communicating their ideas and supporting their ideas with explanations and elaborations) when the teacher listened to the group's ideas (for example, to find out whether groups were focusing on irrelevant information) before providing specific instruction, but had no effect on group discussion otherwise. When teacher help did not relate to a group's discussion, the groups were able to disregard the teacher's suggestions without reducing the quality of their conversations. Teachers' non-specific teacher monitoring statements did not change the nature of group discussions.

The two other studies examined teacher interventions that would probably be categorized as low on Chiu's (2004) explicitness-of-content-help scale. The key teacher dimension was whether teachers pushed students to explain their thinking, which in turn was positively related to group functioning. In Webb *et al.*'s (in press) study, teachers rarely provided direct instruction or issued directives to groups and infrequently provided direct instruction. Instead, these teachers, who had participated in professional development activities focusing on eliciting details of student thinking, asked students questions about their thinking, problem-solving strategies, or answers, and did not tell students which strategies to use or provide students with explanations. This study differentiated between the different kinds of indirect help teachers provided, especially the extent to which teachers pressed students to explain their thinking, and examined how these teacher practices related to the accuracy and completeness of students' explanations.

The teacher intervention that nearly always produced more student explaining and often resulted in groups giving correct and complete explanations about how to solve the problem was teachers probing student thinking so that students gave further details about their problem-solving strategies beyond their initial explanations (Webb *et al.*, in press). Moreover, probing students' explanations was most likely to result in additional student explaining (especially correct/complete explanations) when teachers used the

details of students' strategies given in initial explanations to drive their probing questions, when teachers persisted in asking questions in order to push students to clarify the ambiguous aspects of their explanations, and when teachers did not interject their own thinking (or their own assumptions about what students were thinking) into their probing questions. Other kinds of teacher interventions with groups (e.g. accepting a group's initial explanation of how to solve the problem without asking for further details, engaging only around the answer to the problem, only addressing norms for behaviour such as asking students to share their thinking with one another) did not often prompt groups to give explanations about how to solve the problem, especially correct and complete explanations, if they had not done so before the teacher's intervention.

In Hogan, Nastasi, and Pressley's (2000) study comparing group collaboration with and without teacher intervention, teacher interactions with groups in many respects resembled the types of probing of student thinking that Webb *et al.* (in press) found to be positively linked with student explaining. In all group interactions, the teachers in Hogan *et al.*'s study asked a variety of questions meant to elicit the details of students' thinking about how to create a mental model of the nature of matter. For example, teachers asked students to describe their initial thinking, asked students to elaborate on specific points they made in their initial explanation, asked students to clarify the language they used, and asked rhetorical questions to expand and extend student thinking. When teachers did make statements, they were repetitions or restatements of *students'* ideas and were meant to clarify students' proposals or to emphasize certain points in students' statements.

Hogan *et al.* found that whether this intense probing of students' ideas was beneficial for the complexity of scientific reasoning that groups attained (e.g. how well students' ideas were supported and explained; the logical coherence of their thinking) depended on the groups' collaborative practices when the teacher was not present. While all groups exhibited a moderate level of scientific reasoning when the teacher intervened, some groups produced a higher level of reasoning when the teacher was not present, whereas other groups exhibited a lower level of reasoning without the teacher's presence. The groups that exhibited higher reasoning when the teacher was absent showed a tendency to persist in tackling difficult issues, especially in continuing to elaborate on ideas. Hogan *et al.* speculated that, when with the teacher, the relatively formal tone of teacher-student interactions may have reduced the students' tendency to generate ideas and take intellectual risks. The groups that attained a lower level of reasoning when the teacher was absent, on the other hand, tended not to pursue weak or ill-formed ideas, but instead accepted ideas without elaborating on them. This behaviour contrasted with their behaviour when the teacher was present; the teacher pushed students to elaborate their ideas and to clarify their thinking.

The results of the studies just described suggest that teachers need to carefully evaluate group progress before deciding to intervene, where 'progress' is defined as the extent to which students respond to, and elaborate on, each other's ideas. These results provide support for Cohen's (1994a) recommendation that teachers listen to group conversations and prompt students to explain their ideas if they were not doing so.

Classroom differences in teacher interventions and group dialogues

Two other studies specifically trained teachers to intervene with groups in different ways, and compared the effects of the different intervention practices on group

interaction, on student achievement, and on both. As did the research described above, these studies addressed the themes of teachers providing content-related to help to groups and pushing students to clarify their thinking. In the first study, Dekker and Elshout-Mohr (2004) instructed one teacher to provide only content help (about mathematical content and strategies) and instructed another teacher to interact with small groups only around process issues (e.g. encouraging students to explain and justify their work). Students in the content-help classroom improved less from pre-test to posttest than did students in the process-help classroom. Dekker and Elshout-Mohr observed that the content-help teacher sometimes provided help (including telling groups the solution process) before asking about the group's thinking and work up to that point. The process-help teacher, in contrast, asked questions that stimulated students to participate more equitably and to consider each other's ideas.

In some respects, then, the content-help teacher in Dekker and Elshout-Mohr's study exhibited engagement with students that resembled the behaviour of the teachers in Chiu's (2004) study who were coded as high on his explicitness-of-content help scale. An interesting question is whether the comparison of content-only and process-only help might have been different if content-help teachers provided indirect help (such as Chiu's teachers who focused student attention on aspects of the problem instead of giving the solution procedure), or provided content help in the form of extensively probing students' thinking and asking students questions that pushed them to clarify and elaborate on their ideas (as in Hogan *et al.*, 2000; Webb *et al.*, in press).

In the other study, Gillies (2004) examined teacher and student verbal behaviour as well as student learning among teachers who were trained to implement cooperative group work, but where some teachers received further training in specific communication skills to use with students during cooperative learning and other teachers did not. While all teachers were asked to set and discuss ground rules for how students should talk in cooperative groups (e.g. share information, give reasons, challenge others, consider alternatives before a decision is reached), the subset of teachers who received further training were instructed to ask students probing and clarifying questions ('Can you tell me a little more about what you're intending to do here?'), acknowledge and validate students' ideas ('I can see you've worked really hard to find out how these items are related. I wonder what you could do now to identify a key category they can all fit into?'), identify discrepancies in students' work and clarify the options they may take ('I wonder how you can include . . . when you've already mentioned . . .?'), and offer suggestions in a tentative fashion ('I wonder if you've considered doing it this way?'; Gillies, 2004, p. 260).

Gillies' observations of teachers engaging with groups showed that the teachers trained in communications skills asked more questions and carried out more mediated-learning behaviours (e.g. challenging students to provide reasons, highlighting inconsistencies in student thinking, prompting students to focus on particular issues, asking tentative questions to suggest alternative perspectives, see Gillies, 2006). Importantly, Gillies' (2004) examples of teachers who had received communications skills training showed teachers ascertaining students' ideas and strategies before offering suggestions or focusing the group's attention on specific aspects of the task. Untrained teachers exhibited more controlling, disciplining, and encouraging, as well as maintenance-related behaviour, which included, for example, instructing and lecturing. Corresponding differences appeared between the two conditions in the nature of group discussions. Students of the teachers who received further communications skills training provided more detailed explanations, more often expanded on other students'

suggestions, asked each other more questions, and exhibited greater learning than did the students of the teachers who did not receive this further training.

The results of these studies examining teacher interventions with small groups suggest that the distinctions between whether teachers provide help that focuses on the subject matter content (content-related help) or guidance about what collaborative processes groups should carry out (process-related help), and between whether teachers provide more-explicit versus less-explicit content help, may matter less than whether teachers first try to ascertain student thinking and the strategies they are using and then base their help on what they learn about students' strategies and thinking about the task. Even Cohen (1994a) acknowledged a role for explicit teacher help, as long as it was based on their careful observations of group progress and not meant to supplant group efforts. For example, Cohen (1994a, p.109) suggested some teacher interventions for groups struggling to analyse a difficult text: 'You point out some of the key parts. You check for their understanding of what is being asked. You may even fill them in on missing parts of their knowledge.' Such teacher behaviours, as Cohen described them, did not constitute the teacher doing the task for the group or directing them in how to carry out the task, but rather were the types of help that could enable groups to negotiate the task.

Beyond intervening with groups: Teachers' practices within the whole class

The previous section focused on ways teachers might intervene with small groups to improve their functioning. Such interventions represent only a fraction of the teacher practices that may be important for how students interact with one another. Also influential are teacher practices that help establish the classroom context in which group work takes place: teacher discourse with students in the context of classroom instruction and the norms teachers negotiate with the class about expected interpersonal exchanges. As I discuss below, these two aspects are not independent.

Teachers' instructional discourse

A large body of research addresses the relationship between teacher discourse and student participation during classroom instruction, especially how teachers' questioning practices can limit or enhance students' opportunities for participation (Cazden, 2001). Recitation-style discourse (Nystrand & Gamoran, 1991) in which teachers ask students questions and evaluate their responses in a rapid-fire sequence of questions and answers with little or no wait time (Black, Harrison, Lee, Marshall, & Wiliam, 2002; Turner *et al.*, 2002) places limits on student discourse, especially when teacher queries consist of short-answer, low-level questions that require students to recall facts, rules, and procedures (Ai, 2002; Galton, Hargreaves, Comber, Wall, & Pell, 1999; Graesser & Person, 1994), rather than high-level questions that require students to draw inferences and synthesize ideas (Hiebert & Wearne, 1993; Wood, 1998). Teachers can foster student participation by encouraging students to provide justifications for their work (Boaler, 1997) and by creating opportunities for argumentation (Forman, Larreamendy-Joerns, Stein, & Brown, 1998), although many do not do so. International comparisons of teacher discourse have found considerable variation among countries in, for example, the extent to which students have opportunities to discuss connections among mathematical ideas and to reason with others about mathematical concepts (Third International Mathematics and Science Study, Hiebert *et al.*, 2003; Stigler & Hiebert, 1999).

How teachers' instructional discourse, especially their questioning practices, relates to student-student collaboration has received less attention. Emerging from the studies investigating this relationship is the consistent theme that teachers pressing students to explain their thinking is important for the depth of students' discussion in collaborative groups. Kazemi and Stipek (2001) contrasted elementary school mathematics classrooms in which teachers pressed students to explain and to justify their problem-solving strategies mathematically (they termed these practices high-press) with classrooms in which teachers asked students to describe the summarize steps they used to solve problems but did not ask students to link their strategies to mathematical reasons or to explain why they chose particular procedures (low-press). For example, whereas a low-press teacher may have asked students to explain how they could divide nine brownies among eight people and then accepted the description as given, a high-press teacher may have pressed students to further explain each step in their procedure, including why they cut four brownies in half and the significance of the eight halves, as well as to demonstrate their procedure in different ways (e.g. verbal description, shading diagrams, adding fractions). In the collaborative group work that took place in high-press classrooms, students used mathematical arguments to explain why and how their solutions worked as well as to arrive at a mutual understanding, whereas students in low-press classrooms summarized, but did not explain, their steps for solving problems and did not debate the mathematics involved in the problems.

Similarly, Webb *et al.* (2008; also Webb *et al.*, in press) found that differences between teachers in the extent to which they asked students to elaborate on their problem-solving strategies strongly corresponded to the nature and extent of student explanations during collaborative conversations in mathematics. In classrooms in which teachers pushed students to make explicit the steps in their mental processes (whether students' answers and strategies were correct or incorrect), collaborative groups engaged in frequent explaining and provided explanations that were correct and complete. In classrooms in which teachers infrequently pushed students to explain their thinking and generally accepted students' first explanations as sufficient even if they were incomplete or even incorrect, or in which teachers led students through teacher-conceived problem-solving strategies, students less frequently gave explanations, especially correct ones.

In a detailed look at 'low press' classrooms, Webb, Nemer, and Ing (2006) observed teachers engaging in recitation-style discourse. When interacting with students, teachers assumed most of the responsibility for setting up the steps in the mathematics problem and asked students simply to provide the results of specific calculations that the teachers themselves had posed. Teachers rarely invited students to provide explanations or to share their thinking. In their cooperative groups, students often mirrored the kinds of participation they engaged in during whole-class interaction; they exchanged low-level information such as answers and procedural descriptions much more frequently than explanations, and they rarely shared their thinking and problem-solving strategies nor did they ask their peers to do so.

Correspondences between teacher and student discourse do not appear only in mathematics classrooms. In a study of literature interpretation, Smagorinsky and Fly (1993) found that teachers differed in the extent to which they invited students to participate in interpreting text (as opposed to teachers informing the class of their own interpretation), how often they prompted students to elaborate on their responses (by directly requesting elaboration, or by repeating portions of the students' statements in the form of questions in order to prompt them to elaborate), and the depth of reasoning required by teachers'

questions (e.g. describing facts or text vs. generalizing from the text). Small-group discussions differed across classrooms in ways that corresponded to students' roles during whole-class discussion. In classrooms in which the teacher pushed students to help interpret the story and asked them questions in order to encourage them to elaborate on their ideas and to generalize from the text, students in small groups engaged in deep reasoning (generalizing from the text vs. describing facts or literal interpretations), elaborated on their ideas, and frequently asked each other to explain their reasoning. In classrooms in which the teacher assumed responsibility for interpreting the text and did not often ask students to contribute, small-group discussions largely consisted of students giving brief interpretations of the text without elaborating on their suggestions.

Negotiating norms for student behaviour

The teacher can also play an important role by working with students to mutually construct classroom norms for student engagement. Yackel and colleagues (Yackel *et al.*, 1990; Yackel, Cobb, & Wood, 1991) described the strategies that teachers used to develop norms around student explanations. Teachers invented scenarios or used specific situations that arose spontaneously during group work (e.g. one student completing the activities without his partners' being able to understand his solutions or being able to construct their own solutions) as springboards for whole-class discussions about students' responsibilities during group work, such as their obligations to create and explain their own meaningful problem-solving approaches, and to probe and challenge other students' thinking and solutions.

Negotiating norms for active student participation can also head off debilitating processes such as social loafing or diffusion of (Salomon & Globerson, 1989). Emphasizing students' responsibilities to explain, defend, and evaluate their own and others' thinking (Turner *et al.*, 2002) may also encourage students to ask for help from their peers when they need it, and to engage in more effective help seeking.

It is important to emphasize that a teacher's instructional discourse and norms for his classroom's student behaviour are interrelated. How teachers engage with students during instruction communicates expectations about desired student behaviour. For example, teachers' frequent probing of student thinking probably communicates the expectation that students should explain their thinking. In contrast, when teachers assume the primary responsibility for solving problems and solicit little student input, or accept student answers without asking for elaboration, they likely communicate that students are not expected to provide explanations. Whether teachers ask questions about student thinking also sends signals about the desirability of challenging others to explain and justify their thinking versus passively accepting others' transmitted knowledge (Webb, Nemer, & Ing, 2006). Moreover, certain types of instructional discourse and norms for classroom behaviour go hand in hand in practice. For example, high-press teachers in Kazemi and Stipek's (2001) study discussed with students how to come to a consensus with their partners about their solutions, and how to communicate their thinking to each other, whereas low-press teachers did not address expected student behaviour except for general instructions for students to 'work together' when in groups.

Further research directions

As shown in this research review, teachers have multiple responsibilities for establishing productive group work and can influence groups' interactions in many ways. However,

researchers have only begun to explore how teachers influence a group's dialogue. More research is needed on when it will be productive for teachers to intervene with small groups, how they should interact with students, and the consequences of those interactions.

Moreover, as has been noted, intervening with groups in productive ways requires considerable teacher observational and monitoring skills. Some communication problems that may call for teacher intervention may be fairly easy to recognize (e.g. some members dominating group work; students withdrawing from group work or being shut out of discussions; student hostility towards one another). Others, such as groups providing answers without justifying them with explanations, may require greater teacher attention.

A further complexity is deciding what communication patterns constitute problems that warrant intervention. For example, Bearison *et al.*'s (1986) work cited previously showed that a high level of conflict in the group may be detrimental for student learning. But recognizing productive and unproductive levels and types of conflict may be very difficult. Nussbaum (2002; see also Keefer, Zeitz, and Resnick, 2000; Resnick, Salmon, Zeitz, & Wathen, 1993) showed that students may engage in different, but equally effective, styles of argumentation. Nussbaum observed students constructing and critiquing arguments during small-group oral discussions. He found that extroverted students engaged in a conflictual style of argumentation, in which they gave statements backing their own positions, contradicted others, and gave counterexamples in order to win others over to their position. Introverted students engaged in a co-constructive style of argumentation in which the students worked together in order to critique positions and design new problem solutions. Students engaging in both argumentation styles frequently provided or requested reasons for the claims made by others. Thus, an adversarial style of argumentation does not necessarily preclude a high level of reasoning and explanation.

Another rich area for further study is teachers' indirect influences on group dialogue. For example, the classroom goal structure, whether teachers communicate a goal of demonstrating ability and outperforming others (a performance goal structure) or a goal of learning and mastering the material (a mastery goal structure), may influence small-group dialogue. Links between the classroom goal structure and self-reports of student behaviour suggest implications for small-group work. Turner *et al.* (2002), for example, found that classrooms focusing on learning and mastery (emphasizing understanding procedures and concepts rather than providing correct answers) instead of performance (emphasizing the accuracy of answers without any support for explaining them) may increase students' willingness to seek help and decrease students' avoidance strategies such as withdrawing effort on a task. It seems likely that classroom goal structures may also translate into how students engage with one another. For example, a focus on mastery may encourage students to seek explanations and to justify their thinking to others, whereas a focus on performance may steer students towards sharing answers without an explanation, or even impede sharing if students perceive that they are competing against one another.

Teacher beliefs may also indirectly influence the quality of group dialogue. A number of researchers have suggested that teachers' beliefs about teaching and learning may influence their perceptions about the value of student collaboration as well as whether and how they use group work in the classroom (Brody, 1998; Rich, 1990; Palincsar, Stevens, & Gaveleck, 1989; Woolfolk Hoy & Tschannen-Moran, 1999). Researchers commonly observe that teachers with a transmission view of teaching and an absorptionist view of learning, as well as those who see cooperative work as valuable for

improving social but not academic skills, may be reluctant to use student collaboration as an opportunity for academic development or may incorporate elements (e.g. competition between individuals) that derail effective group functioning (Meloth & Deering, 1999). Whether and how these beliefs may impede teachers from promoting effective group dialogue needs further study. Similarly, how to change a teacher's beliefs to be more consonant with the potential of group collaboration to promote learning is an important topic for further investigation. Interestingly, some research suggests that changes in teacher beliefs and teacher practices may go hand in hand. For example, in Wood et al.'s (1991) study described above, the teacher grew to value student thinking and developed an awareness and appreciation of students' abilities to learn from each other as she provided opportunities for students to share their thinking and witnessed the changing quality of student discussions. This teacher's beliefs, then, changed alongside her changing practices and the changing role of student participation in the classroom. Whether this process of teacher change can take place without guidance and support from professional development experts is not known.

Also needing further exploration are the reciprocal influences of teachers and students on each other. Consider, for example, the relationship between teachers' questioning practices and student explaining. When teachers ask students to explain, the teachers learn about their students' thinking. This knowledge, in turn, enables teachers to ask targeted questions that elicit further information about students' thinking. This interplay between teacher and student behaviour has been demonstrated in research by Franke and colleagues (Franke, Carpenter, Levi, & Fennema, 2001) in which the more teachers know about students' thinking, the more effectively they can adapt their own instructional practices to uncover students' misconceptions and thereby support student learning. Wood *et al.* (1991) also described the reciprocal influences between teachers and students that took place during a year-long process of classroom change from teacher-centered instruction in which the teacher directed students through her intended procedure step-by-step to student-centered instruction in which students provided their own complex explanations and created their own meaningful problem-solving approaches. These changes occurred as a result of the teacher learning how to listen to students and relinquishing control over the students' methods. Changes in the teacher's practices both influenced, and were influenced by, changes in student participation during classroom and small-group dialogue.

Finally, to what extent the teacher's role in promoting collaborative dialogue depends on specific features of the classrooms and the students in them is largely unknown. Whether and how the teachers' practices discussed in this paper should be modified to take into account the age of students in the classroom, subject matter or discipline, classroom composition (e.g. heterogeneity in terms of ability, demographic characteristics, language backgrounds), classroom and school climate, and students' instructional history is a rich area for further exploration. In conclusion, teachers have many roles to play when using small-group work in the classroom, including preparing students for collaborative work, making decisions about the group-work task and the composition of groups, making decisions about the structure and requirements of group work, monitoring groups' functioning and intervening when necessary, and helping groups reflect on and evaluate their progress. Teachers' practices in the wider classroom, including their instructional discourse, negotiation with the class around norms for student participation, and establishment of classroom climate, are also important influences. More research is needed to show how teachers can best carry out these responsibilities in ways that will be effective in promoting beneficial small-group dialogue.

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