

Collaborative reasoning: a dialogic approach to group discussions

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(Received 20 May 2008; final version received 15 July 2008)

In this paper, we address the need to develop an empirically-based understanding of the use of dialogue in teaching by discussing theory and research related to a pedagogical approach called collaborative reasoning (CR). CR is an instructional method designed to engage elementary school children in group discussions about controversial issues raised in their readings. CR is grounded in social learning and schema-theoretic views of cognition, which are integrated to form a new model, called argument schema theory (AST). According to AST, students acquire generalizable knowledge of argumentation, or an argument schema, through participating in dialogic discussions with their peers. The article reviews empirical evidence from a variety of studies designed to evaluate the educational potential of dialogic interactions. The studies investigated group processes during CR discussions, individual student outcomes following participation in discussions, and the connections between the features of social interaction and individual student performance. We conclude that, despite its complexity, classroom dialogue can serve as a useful mechanism for promoting the development of individual argumentation.

Keywords: grouping; classroom communication

Introduction

Dialogue, as a communication form consistent with the pluralistic ideals of a democratic society, has long been embraced by educators concerned with empowering their students to become independent thinkers and active citizens (Dewey, 1966; Freire, 1970b; Kuhn, 1992). Unfortunately, numerous claims about the educational potential of participating in a dialogue did not bring about substantial changes in classroom practices, as studies in the US and the UK repeatedly document that the dominant discourse in schools remains teacher-fronted, monological, and traditional (Alexander, 2005; Cazden, 2001; Nystrand, 1997; Onosko, 1990). Burbules (1993) discusses various reasons for ‘the failure of dialogue’, which range from specific actions of participants, such as discouraging open participation, to the societal choices, such as crowded classrooms and test-driven instruction. He also warns educators against having an overly optimistic and simplified view of dialogue, pointing out to the often overlooked, yet very real, possibilities of a classroom dialogue turning into ‘a manipulative’, ‘obsessively narrow, ends-driven endeavor’ or ‘a meandering chat that leads nowhere important or interesting’ (p. 143). Similarly, Alexander (2005) distinguishes between ‘dialogic

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teaching' and 'pseudo-inquiry', the latter being characterized by the teacher use of 'an endless sequence of ostensibly open questions... [which are] unfocused and unchallenging, and are coupled with habitual and eventually phatic praise rather than meaningful feedback' (p.3). Thus, the apparent resistance to embracing dialogue in education may, at least partially, be attributed to the inherent complexity, inconsistency, and uncertainty associated with its actual classroom implementation.

The 'flaws' of a dialogue should not lead us to abandon this method, if only because potentially it *can* create classroom experiences that are authentic, inclusive, and rational. In the words of Burbules (1993), 'we engage in dialogical approaches not because they are methods guaranteed to succeed, but fundamentally because we are drawn to the spirit of equality, mutuality, and cooperation that animates them' (p. 143). However, in order to move from the idealized descriptions of what could or should happen during a dialogic discussion to its skillful application in today's classroom, we need a much deeper, *empirically supported* understanding of both dialogical processes and the related educational outcomes.

Unfortunately, dialogic approaches to classroom teaching have received little attention from researchers. Influenced primarily by sociocultural learning theories, several researchers recently have started designing and applying analytical frameworks for examining classroom discourse and its dialogic properties (Alexander, 2003; Mercer, Wegerif, & Dawes, 1999; Nystrand, Wu, Garmon, Zeiser, & Long, 2003). While still rare, these analyses provide important information regarding teacher-student, student-teacher, and student-student interactions in a classroom. They also describe much needed methodological strategies for measuring important aspects of argumentative discourse, such as mapping classroom interactions or examining topical relations among the ideas expressed by discussion participants.

Instead of focusing on the properties of group interactions, researchers in several other studies evaluated individual learning gains resulting from student engagement in dialogic discussions (see Dolz, 1996; Shipman, 1983; Sprod, 1998). While these studies generally indicate positive results for individual participants, empirical evidence generated so far is scarce and inconsistent. Further, several of these studies have serious methodological limitations, including inability to isolate dialogic interaction as the cause of the control *vs.* experimental group differences and the use of measurement tools that may not fully capture improvements in argumentative abilities, such as standardized tests of vocabulary, reading comprehension, and formal logic (see Dolz, 1996; Morehouse & Williams, 1998; Shipman, 1983).

A few researchers recently have explored the connections between the dialogic properties of social interaction and the quality of individual post-intervention performance. Studies researching such connections (see Applebee, Langer, Nystrand, & Gamoran, 2003; Chinn, O'Donnell, & Jinks, 2000; Kuhn, Shaw, & Felton, 1997) provide important insights into the particular discourse features that mediate student cognitive development. For example, Kuhn *et al.* (1997) traced the appearance of new argument elements in post-intervention writing to the presence of the same elements during dialogic exchanges among study participants. Unfortunately, as indicated by the authors themselves (Kuhn *et al.*, 1997), the generality of this finding and the primacy of dialogue as a mechanism for change have not been established.

While intriguing, the findings discussed above remain speculative, as rigorous empirical studies of dialogic teaching in relation to complex educational outcomes are rare. The paucity of such research is troublesome, considering the importance of understanding the mechanisms and educational benefits of engagement in dialogue for developing an individual ability to form and justify judgments. Despite the ongoing calls for 'fostering dialogue' in a classroom, we lack empirically-based pedagogical knowledge that can inform and support the instructional choices of today's practitioners. Thus, educators who wish to expand or modify their discourse practices have little to go on, except for the highly theoretical propositions made by such scholars as Freire, Dewey, or Bakhtin, whose arguments were developed in very different temporal, geographical, historical, and cultural contexts.

In this paper, we begin to address the existing gaps in knowledge about dialogic teaching by presenting a decades-long program of research focused on the use of dialogic discussions in elementary school classrooms. We will start by discussing argument schema theory (AST), a psycho-educational framework motivating our research, and describing collaborative reasoning (CR), a pedagogical model derived from AST. We will then present empirical evidence related to (1) discourse practices occurring during CR discussions; (2) individual student outcomes following participation in dialogic interactions; and (3) the relationships between the features of dialogic exchanges experienced by the students during CR and their post-intervention performance. Finally, we will discuss broader implications of our research and suggest directions for future studies.

The development of argumentation: theory and pedagogy

Our research is motivated by the assumption that it is important for students to develop the ability to use reasoned argumentation when resolving complex issues. This assumption is shared by many contemporary scholars (see Commeyras, 1994; Costa, 2001; Ennis, 1996), and it is reflected in various national educational standards (NAEP, 1998, 1999, 2002). The ability to engage in a rational argument is agreed to be crucial for active and mindful participation in a democratic society. But how does this ability develop and how can educators promote the acquisition of argumentative knowledge?

Our theory of the development of argumentation is heavily influenced by the perspectives that emphasize the priority 'in time and in fact' of social interaction in individual development (see Bakhtin, 1981; Mead, 1962; Rogoff, 1990; Vygotsky, 1962). 'One must seek the origins of conscious activity... in the external processes of social life' (Luria, as cited in Wertsch & Bivens, 1992). Through participation in a social activity, children experience and eventually internalize various 'psychological tools' that advance their cognitive development to higher levels (Vygotsky, 1981).

The educational value of a social activity comes, at least in part, from its dialogic organization (Bakhtin, 1981; Mead, 1962; Vygotsky, 1981). When elaborating the meaning of a 'genuine dialogue', Bakhtin distinguishes it from 'monologism, which pretends to possess a ready-made truth' (Bakhtin, 1984, p. 110). In monologic teaching, 'someone who knows and possesses the truth instructs someone who is ignorant of it and in error' (Bakhtin, 1984, p. 81). In contrast, in dialogic teaching 'truth... is born between people collectively searching for truth, in the process of their dialogic interaction' (Bakhtin, 1984, p. 110).

An essential characteristic of a genuine dialog is its egalitarian nature (see Bakhtin, 1984; Dewey, 1933; Freire, 1970a). Regardless of their relative status, participants can freely interact with each other in their search for new meanings and understandings. Notably, such a view of dialogue does not dismiss the authority of a teacher as a more knowledgeable partner in a discussion. Burbules (1993) argues that acknowledging authority based on one's expertise or experience does not necessarily threaten egalitarian relations and, instead, helps to enhance the potential of dialogic teaching.

Effective dialogical discussions provide for an external arena where every participant can observe and try out a variety of argumentation moves, including taking a position on the issue, supporting it with reasons and evidence, challenging the positions of others, and responding to counterarguments. As multiple experiences with argumentation get internalized, an individual acquires an abstract knowledge system, we call an *argument schema* (Reznitskaya & Anderson, 2002). Based on normative models of a rational argument (see Toulmin, 1958; Walton, 1996), an argument schema should include such elements as the statement of belief, reasons, grounds, warrants, backing, modifiers, counterarguments, and rebuttals. A person with a developed argument schema will have declarative knowledge of argument components as well as procedural and conditional knowledge of how and when to engage in argumentation, given specific contexts. An important component of a developed argument schema is an epistemological commitment to use reasoned discourse for exploring complex issues and forming conclusions. This commitment is similar to the 'evaluatist type of epistemology', which Kuhn (1993) describes as viewing knowledge as relative and contextual, while also recognizing that some judgments are more reasonable than others.

An argument schema can be further broken down into recurrent patterns, or *argument stratagems* (Anderson *et al.*, 2001). Argument stratagems are language structures representing 'tools of wide application' (Carey, 1985) that can be utilized in argumentation. For example, during a discussion of a story, participants may use such expressions as 'in the story, it said' or 'on page 23, she said', in order to explicitly mark the source of information, thus enhancing the credibility of their arguments. We labeled this stratagem with the general form 'In the story, it said [EVIDENCE]'. The capitalized, bracketed part of the stratagem will change in response to contextually different scenarios. However, the underlying purpose, form, possible consequences, and objections to this stratagem will remain the same.

To summarize, according to argument schema theory (AST), engagement in dialogic interactions promotes the development of an abstract internal representation of argumentative knowledge, or an argument schema. For example, an individual disposition to support his or her claim with reasons comes from participating in discussions where students are prompted to provide reasons for their positions or where they are able to appreciate the functional benefits of asking other participants to explain their reasoning. Abstract properties of an argument schema should enable its application to new situations, prompting individuals to rely on the process of rational argument to form and justify claims, as well as facilitating argument comprehension, construction, and evaluation.

The theoretical propositions just described have been put to an empirical test using an educational environment called collaborative reasoning (CR). Developed by the researchers from the Center for the Study of Reading at the University of

Illinois at Urbana-Champaign (Anderson, Chinn, Waggoner, & Nguyen, 1998; Waggoner, Chinn, Yi, & Anderson, 1995), CR is an educational approach that places dialogic inquiry at the center of its pedagogy. During CR, students in Grades 4 and 5 (ages 10–11) participate in small group discussions of controversial issues from their readings. Texts are chosen to embody themes that are engaging for young students and can stimulate thoughtful and lively dialogue. In a typical CR discussion, students start by taking initial positions on a ‘big question’. Big questions address moral or societal dilemmas that are both complex and central to human experience. For example, children explore such topics as friendship, honesty, betrayal, loneliness, animal rights, and professional obligations. During the discussions, students are expected to provide reasons and evidence for their positions, listen to and evaluate each others’ reasoning, and address the issues from multiple perspectives.

To illustrate the characteristic features of CR discussions, let us consider two contrasting episodes of fourth grade children in two classrooms in Central Illinois discussing the story *Amy’s goose* (Holmes, 1977). Children in both classrooms read the story by themselves before gathering for the group discussions. In the story, a lonely farm girl Amy rescues a wild goose that has been injured by a fox. Amy nurses the wounded goose back to health, and a special relationship develops between them. Amy must decide whether to keep the goose as a pet or to let it fly south with the rest of its flock.

Figure 1 compares the discussion of this story using the traditional discussion format of recitation (Column 1) and CR (Column 2). Although the quality of discussions in traditional and CR classrooms varies, we judge these excerpts to be representative of the differences in respective pedagogies.

During the traditional recitation sequence, the teacher starts by asking a series of questions focused on recall and interpretation of basic facts from the story. Later in the discussion, the teacher also questions children about their general knowledge of geese and other animals. The teacher already knows the correct answers and is the ultimate source of authority and expertise when evaluating students’ responses. There are no peer-to-peer exchanges, and all communications are mediated by the teacher. The teacher is controlling both the content and the form of the discussion, by initiating topical shifts, choosing the questions, evaluating the answers, and calling on students to respond.

In contrast, during the CR discussion, the teacher starts by asking the big question that is pertinent to the entire story and then leaves the floor open for students to deliberate together. The big question elicits more meaningful responses from the students because they are able to extend the story world and relate it to other complex issues relevant to them: Do animals deserve ‘a good life’? Should humans interfere with nature? Is dying a ‘part of nature’? How do we balance our own needs with the needs of others? The teacher is not evaluating whether student responses are right or wrong. Instead, students engage in forming their own judgments and responding to each other’s reasoning.

The contestable nature of big questions, where nobody, not even the teacher, knows the right answers, promotes the establishment of a truly egalitarian classroom community. In such a community, teachers and students can see themselves as co-inquirers, exploring complex concepts, improving their judgments, and discovering new meanings. Notice that the teacher is not controlling turn taking, as a distinctive

Recitation	Collaborative reasoning
<p>T: I want to know who's the main character in this story.</p> <p>Ss: [Raise hand]</p> <p>T: Shelby.</p> <p>S: The goose, Amy's goose.</p> <p>T: Ok, Amy's goose. And, one more, Brianna? [writes on blackboard]</p> <p>B: Amy.</p> <p>T: OK, Amy. [Writes on blackboard]. What is the characteristics that you, think, or [student raises hand] qualities, that you think that Amy has, and tell me why you think [two students raise hand] she has those qualities ... OK? Kobe?</p> <p>K: She cares about the environment because she's taking care of the goose.</p> <p>T: OK, so she's caring. [Writes on blackboard]. Good. Another one, Anthony.</p> <p>A: She doesn't try to kill the fox 'cause it, uh, tried to kill the goose.</p> <p>T: OK, so does that go with caring?</p> <p>A: Yeah.</p> <p>T: OK.</p> <p>[At around 4 minutes]</p> <p>T: What are some of the things that you know about the geese? And, how they relate to one another? OK, what do you know, Stephen?</p> <p>S: They communicate with each other?</p> <p>T: That's right, they communicate with each other, don't they? Aaaall, night, long, let me tell you. Renee.</p> <p>R: Uh, they like travel in big like, flocks.</p> <p>T: OK, they travel in flocks. What other animals travel in groups that you know of, Siera?</p> <p>S: Deer.</p> <p>T: Deer some times travel in groups, especially the female deer, Grant?</p> <p>G: Wolves.</p>	<p>T: OK. The big question for today is: Should Amy keep the goose? You may start.</p> <p>J: Um, I think Amy should keep the goose, 'cause the goose has to be with her, or else it will be dead again.</p> <p>M: I think Amy should let out the goose, because it um... deserve, it deserves to be free. And um //</p> <p>J: // Yeah, but it might [1] get bit by – It might die, because the fox might eat it [1]</p> <p>A: [1] [to Jeff about Mike] Let him finish... You have to let him finish. [1]</p> <p>M: Yeah but that's a um – but that's just part of nature. Everything dies. People go outside and squish bugs. And the fox comes out and eats a goose.</p> <p>A: I agree with that and I don't think she should keep the goose because I think a goose should be able to be free, fly around, go to lakes. Um, find its own food. And if it dies, it dies. It's just the way of life.</p> <p>J: I agree with Amber.</p> <p>M: It wouldn't. It wouldn't have a good life locked up, because it wouldn't have much places to fly. And then, if she decides to let him out the next summer, it would be fat, because it wouldn't be able to fly. It wouldn't be able to stretch its muscles. It would be locked up in place.</p> <p>[At around 4 minutes]</p> <p>K: I'm not changing anything, but at the end of the story when she said she saw a, a barn. Well, not, never mind. When she uh, when the, when she was kind of at the end of the story, I think she was sad because um, I think she didn't want to let the goose go.</p> <p>A: Yeah, I think um. I agree with Jamechia. I think that um she was kind at the end of the story because she knew that she would have to let the goose go, or it would die. Or if – if it even survived that winter, it'll die, because, it'll die, because it'll forget all the skills. And it'll forget almost everything about the wild.</p> <p>M: I agree with Amber and Keisha.</p> <p>A: Just like capturing, capturing a panda in captivity. ... And then they'll lose all their wild skills. Just like a goose would.</p>

Note: T = Teacher; A, B, J, K, M, etc = students; pseudonyms replaced names; [n] marks overlapping segments.

Figure 1. Comparing recitation to collaborative reasoning

feature of CR discussions is that they have an open participation structure. This means that students don't have to raise their hands and can communicate freely, without being nominated by the teacher. Interactional rights are negotiated by all discussion participants, and authority is shared, rather than role-given to the teacher.

Study participants in the CR excerpt shown in Figure 1 were not new to CR pedagogy. *Amy's goose* was their sixth CR discussion. Consistent with typical training procedures for CR facilitators, the teacher attended a one-day workshop on CR and received in-class coaching from a research team member, who acted as a participant observer in the classroom. During the workshop, teachers learn about CR pedagogical strategies that include: (a) prompting students for their positions and justification of reasons; (b) explicitly drawing attention to the use of effective argument stratagems; (c) modeling reasoning processes by thinking aloud; (d) challenging students with countering ideas; (e) keeping track of proposed arguments by summing up students' contributions; and (f) using the vocabulary of critical and reflective thinking (Waggoner *et al.*, 1995).

While teachers are encouraged to use CR strategies during the discussions, their ultimate goal is 'to transfer the responsibility for maintaining the flow of discussion to the students' (Waggoner *et al.*, 1995, p. 584). The type and degree of teacher participation hinge upon the quality of argumentation displayed by the students. For example, during the CR excerpt shown in Figure 1, the teacher is hardly involved, since students are successfully advancing their arguments and skillfully managing turn-taking.

To summarize, CR integrates both substantive and procedural aspects of dialogue-based pedagogy, thus representing a promising research site for investigating provocative, yet under-researched, propositions regarding the educative power of a dialogue for teaching students not *what* to think, but *how* to think. Over the years, CR has been examined from a variety of perspectives, ranging from assessing the logical soundness of children's naturally occurring arguments (Anderson, Chinn, Chang, Waggoner, & Yi, 1997) to exploring the roles of emergent child discussion leaders (Li *et al.*, 2007). In the next section, we will review several CR studies that are focused on (1) dialogic processes during the discussion; (2) individual outcomes following student participation in dialogic interactions; and (3) the connections between the properties of discussions and individual outcomes.

Collaborative reasoning research: processes, outcomes, connections

Analyzing group argumentation

The differences in group interactions and discussion content between CR and recitation, illustrated in Figure 1, were systematically compared in an empirical study conducted by Anderson and his colleagues (Anderson *et al.*, 1998). Sixteen groups of fourth grade students discussed two stories using both formats. The groups were first videotaped using recitation in order to minimize CR carry-over effects. Also, to adjust for the differences in the story content, eight groups discussed Story 1 during the recitation and Story 2 during CR, with the story order reversed for the other eight groups.

The analysis of the discussion transcripts focused on the features of group interactions related to the distribution and content of talk. In a dialogic discussion, one can expect students to take more control over the procedural and substantive aspects of interactions. Also, participants in a dialogic discussion should deliberate questions that are fundamentally open, divergent, and uncertain (Burbules, 1993). These expectations were fully confirmed by the data. During CR discussions, students talked at a higher rate, 111 words per minute, compared to 66 words during

the recitation. In addition, CR students engaged in more communication with each other, with 45% consecutive student turns during CR discussions and only 6% during recitation. The content of the discussions shifted from detailing already known story facts during recitation to reasoning about key moral and social issues raised in the story during CR. For example, the percentage of teacher questions designed to quiz students about the content of the story decreased from 53% during recitation to 9% during CR.

A further analysis of a sample of children's arguments generated during CR discussions revealed that children's arguments were often vague and incomplete, if one were to judge them by classic argumentation standards, such as those proposed by Toulmin (Anderson *et al.*, 1997). Children's arguments were characterized by missing premises, warrants, and conclusions, as well as by the frequent reliance on ambiguous referring expressions, such as 'it', 'this', 'he', etc. However, Anderson and his colleagues (1997) conclude that despite being elliptical, these arguments can be considered acceptable, if one reconstructs their 'logical integrity' by supplying the information given in the story, previous discussions, or other contexts shared by the students. Thus, fourth graders in CR discussions were 'as informative as they needed to be' (Anderson *et al.*, 1997, p. 138) since the unstated or ambiguous information was known or could be inferred by discussion participants. In addition to offering substantive interpretations, this study proposed alternative evaluation criteria for informal argumentation occurring with active and cooperating participants who can rely on shared context to interpret and reconstruct each other's reasoning.

The studies by Anderson and colleagues (1997, 1998) confirmed that the CR approach is distinguishable from the traditional format of recitation in terms of increased student participation, use of open-ended questions, as well as the content of discussions, consisting of imperfect, but functional student arguments. Thus, during CR, students engage in more dialogic interactions focused on making reasoned judgments. Would such interactions be effective for helping students further develop their argumentative abilities? This question was addressed in another study focused on examining social mechanisms of cognition (Anderson *et al.*, 2001). In this study, Anderson and his colleagues (2001) hypothesized that during group discussions, children pick up and reuse effective argument stratagems they see other children using, an idea referred to as the *snowball hypothesis*. According to the snowball hypothesis, useful stratagems spread among children and tend to occur in discussions with increasing frequency.

The snowball hypothesis was evaluated by analyzing 48 transcripts of fourth grade students engaging in CR discussions. Sifting through the discussion transcripts, the researchers tracked the occurrence of 13 argument stratagems. These speech acts served various functions, including managing participation, positioning oneself in relation to a classmate's argument, acknowledging uncertainty, extending the story world, using story information as evidence, etc. Anderson and his colleagues (2001) wanted to examine the possibility of diffusion or contagion of identified argument stratagems from a single child to others in a group. They used several methodological techniques in order to systematically examine the hypothesized social mechanisms of argumentation development. One technique was to evaluate the conditional probability that the event (E) will happen again, given that it has occurred a certain number of times already. The symbolic expression for conditional probability is $P(E+1|E)$. Table 1 displays the results of this analysis for

Table 1. Likelihood and spacing of a stratagem 'In the story, it said [EVIDENCE]'

	Number of occurrences				
	First	Second	Third	Fourth	Fifth
Conditional probability $P(E+1 E)$	0.79	0.87	0.76	0.64	0.84
Number of lines before the event	47	33	19	19	14

the previously discussed stratagem, 'In the story it said [EVIDENCE]' across all 48 CR discussions.

The table shows that the initial occurrence of effective argument stratagems increases the likelihood of their later use. Also, there were more lines before the first occurrence than before the second, and more lines before the second than before later occurrences. Similar patterns were found for other argument stratagems identified through the analysis, providing support to the snowball hypothesis. Table 2 presents the overall analysis of stratagem use, showing the mean conditional probabilities for all 13 stratagems and the median number of lines before a given occurrence.

An important question related to these analyses is whether the increased use of argument stratagems can be attributed to the same child who is repeatedly using each stratagem, or whether other children in the discussion begin to use the stratagems. Table 3 presents the analysis of breadth of use of all 13 stratagems. The number of children who use argument stratagems increases, supporting the idea that the use of stratagems spreads from child to child.

The investigation of the snowball hypothesis illuminated psychological mechanisms that promote the acquisition of argumentative discourse during group

Table 2. Likelihood and spacing of all 13 argument stratagems

	Number of occurrences				
	First	Second	Third	Fourth	Fifth
Mean conditional probability $P(E+1 E)$	0.50	0.82	0.75	0.75	0.79
Median number of lines before the event	46	23	11	14	12

Table 3. Number of children who use a stratagem as a function of the number of instances

Instances of stratagem use	Number of children using stratagems
1	1.0
2	1.8
3	2.3
4	2.7
5	3.4
6	3.8
7	4.2
8+	5.2

interactions. In addition, the study demonstrated creative uses of statistical modeling to represent the theorized processes of social learning theories, such as internalization and scaffolding. The question to consider next is whether or not engagement in group argumentation helps students to perform better on argument-related tasks performed independently, when the social support is no longer available.

Analyzing individual argumentation

Argument schema theory suggests that abstract properties of knowledge structures acquired from enriching experience with argumentation should enable the flexible use of these structures in different contexts and communicative modes. Just like entering a new restaurant activates a 'restaurant schema' (Schank & Abelson, 1977) abstracted from multiple prior experiences with eating out, an encounter with a task requiring the use of argumentation should trigger a set of cognitive and social practices that constitute an argument schema.

Four studies were conducted to investigate the transfer potential of dialogic discussions, employing the same posttest-only quasi-experimental design (Dong, Anderson, Kim, & Li, 2008; Kim, 2001; Reznitskaya, Anderson, & Kuo, 2007; Reznitskaya *et al.*, 2001). Intact elementary school classrooms (Grades 4 and 5) were assigned to treatment conditions. Across the four studies, argumentation development was examined in ten experimental classrooms that participated in CR and in ten control classrooms that did not.¹ Experimental and control classrooms were matched based on relevant demographic characteristics, including grade level, geographic location, and socio-economic level.

In three studies, students in CR condition participated in four CR discussions (Dong *et al.*, 2008; Kim, 2001; Reznitskaya *et al.*, 2007). In one study (Reznitskaya *et al.*, 2001), CR students engaged in 10 CR discussions. In all four studies, students in the control condition engaged in their regular reading instruction. Within one or two weeks of completing their respective educational interventions, all students were given the same posttest. In the posttest, students were asked to write a reflective essay in response to a three-page story that was similar to those that served as a basis for CR discussions, although students did not discuss this particular story or a story presenting the same type of moral dilemma. In the post-test story, an unpopular boy named Thomas wins the school pinewood derby race, but he breaks the rules by not making his car by himself. He confides to his classmate, Jack, that he has received help from his older brother in making his car. The students were asked to write an essay reflecting on whether or not Jack should tell on Thomas.

All essays were scored by raters blind to whether the essay was written by a student from a CR classroom or a control classroom. The raters used an analytic scoring system that allowed for generation of low-inference quantitative measurements of students' argumentative abilities. The raters first parsed each essay into idea units that represented the distinct parts of a proposition. Next, they assigned different codes to distinct idea units. These codes represented (1) statements supporting a chosen position, or supporting reasons; (2) statements opposing a chosen position, or counterarguments; and (3) statements given in response to anticipated objections, or rebuttals. Thus, each student essay received three scores corresponding to these outcome variables. In addition, the categories representing

distinct argument elements were combined to form a summary measure, indicating the total number of argument-relevant propositions.

Descriptive statistics from the four studies are presented in Table 4. Students who participated in CR discussions generally wrote essays that contained a greater number of satisfactory arguments, counterarguments, and rebuttals than the essays of similar students who did not experience CR. In all studies, the analysis of variance indicated a statistically significant effect of CR discussions versus control condition ($p < .05$), although not all multiple comparisons conducted to examine group differences within individual schools or on separate outcome variables reached statistical significance. To further evaluate treatment effects, we calculated effect sizes for the differences in total number of arguments components proposed by students in CR vs. control conditions. Because CR affects both means and standard deviations in treatment groups, we used Glass delta for effect size calculations. The treatment differences in all four studies were in the expected direction, with large treatment effects ($0.64 < \Delta < 1.03$).²

We also conducted a qualitative analysis of selected student compositions in order to examine treatment differences in greater detail. Consider, for example, a composition written by a fourth grade student from the CR condition in a study by

Table 4. Summary of student performance on reflective essay in four studies

Outcome variable	Treatment condition			
	<i>CR</i>		<i>Control</i>	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Number of supporting reasons				
Study 1 (Reznitskaya et al., 2001)	8.70	6.74	6.95	4.41
Study 2 (Dong et al., 2008)	12.74	6.66	8.62	4.97
Study 3 (Reznitskaya, Anderson, & Kuo, 2007)	11.05	8.09	6.28	3.41
Study 4 (Kim, 2001)	6.80	8.60	5.97	4.44
Number of counterarguments				
Study 1	2.02	2.63	.94	1.62
Study 2	4.00	4.34	2.88	4.30
Study 3	1.98	2.50	1.74	2.27
Study 4	1.26	2.86	.57	1.24
Number of rebuttals				
Study 1	.88	1.68	.50	.97
Study 2	1.98	2.52	1.17	2.17
Study 3	1.09	1.48	.64	.93
Study 4	.26	1.04	.29	.83
Total number of argument components				
Study 1*	11.60	7.92	8.39	5.02
Study 2*	18.72	9.70	12.67	7.94
Study 3*	14.12	10.80	8.66	5.29
Study 4*	8.32	4.16	6.83	2.17
Total number of argument components pooled over four studies	13.41	8.84	9.09	6.12

Note: *Significant treatment effects were found at $p < .05$.

Reznitskaya and colleagues (2001). This essay was selected as an example because it had a total number of coded units that approximated the mean for the essays written by the students in CR condition.

I say yes Jack should tell on Thomas yet, I also say no, too. *I say yes because* Jack worked really hard on his car and Thomas didn't. *I say No because* this is probably the first time Thomas ever actually felt good about himself. *A way someone might disagree with me on yes*, because like it said in the book, nobody likes a tattletale. *A way someone might disagree with me on a reason for no* is maybe that's not true.

I'd feel bad for Thomas if Jack told on him. Also if Jack told on Thomas, Jack would probably feel bad too. If Thomas worked on his own, his pinewood race car would be worse. So, it is partly good that his brother did his race car for him, but mostly not.

A distinctive feature of the above composition is its dialogic quality. The student is consistently shifting her frame of reference, arguing with imagined 'someones'. Although the assignment was completed silently and individually, the student's thinking processes appear to be modeled after discussions with others, where multiple points of view are present and each is given careful consideration.

The student's comfort with uncertainty and willingness to entertain multiple solutions may represent an important departure from an absolutist, right-or-wrong view of the world. Granted, the student's ability to resolve the controversial issues she entertains needs further refinement. Yet, it is encouraging to observe the fundamental shift from monological to dialogical thinking in this composition, especially since studies consistently document students' tendency to favor propositions that support their own opinions (see Kuhn *et al.*, 1997; Pontecorvo & Girardet, 1993).

The consistency of results across the four studies summarized here supports the pedagogical potential of dialogic interaction for the development of individual competency in argumentation. We suggest that students, who participate in group discussions focused on co-construction of reasoned judgments, are able to generalize some common elements of argumentation, including formulating a position, supporting it with reasons, anticipating counterarguments, and offering rebuttals. In other words, engagement in a genuine dialogue with others helps students develop and refine their argument schemas. Armed with an argument schema, students are better able to generate argument relevant propositions, consider alternatives, and reconcile opposing perspectives.

Analyzing connections between dialogic processes and learning outcomes

CR research studies described so far focused separately on either the processes of dialogic teaching or on the individual learning outcomes. In the most recent CR studies (Jadallah *et al.*, in press; Kuo *et al.*, 2007), instructional processes and related outcomes were examined concurrently, helping to create a more comprehensive picture of argumentation development. For example, Kuo and her colleagues (2007) took a closer look at how the argumentation skills experienced during CR discussions were internalized and represented through individual argumentation by analyzing both the transcripts from the group discussions during CR intervention and the individual reflective essays during the post-intervention assessment. The essays and transcripts were coded and scored using the analytical scoring system described earlier with a focus on the number of different reasons and

counterarguments. The scoring yielded two *outcome* measures that served as dependent variables in subsequent regression analyses: reason-essay and counterargument-essay. In addition, four *process* variables were derived indicating the number of reasons and counterarguments at individual and discussion group levels: reason-CR-individual, counterargument-CR-individual, reason-CR-group, and counterargument-CR-group, which served as the independent variables in the multiple regression analysis.

Preliminary findings from the analysis of six discussions and 40 essays provided direct empirical evidence demonstrating the role social interaction plays in the development of individual argumentation. In the analysis that focused on individual ability to generate multiple reasons (i.e., reason-essay as the dependent variable), it was found that the number of reasons produced during CR discussions at the individual level (i.e., reason-CR-individual variable) accounted for an additional 12% of variance ($p < .05$) beyond the contribution of reasons contributed at the group level (i.e., reason-CR-group variable). However, when Reason-CR-Individual variable was entered into the equation first, the contribution of the group-level measure of reasons was not significant. The results suggest that fourth grade students who actively generated different reasons during CR discussions were more likely to produce more reasons during an individual argumentation task.

In the analysis that focused on the ability to simultaneously weigh both the pros and cons of a decision (i.e., counterargument-essay as the dependent variable), it was found that the number of counterarguments produced during CR discussions at a group level (i.e., counterargument-CR-group variable) accounted for an additional 11% of variance in the outcome measure of the counterarguments ($p < .05$) beyond the contribution of the counterarguments at the individual level (i.e., counterarguments-CR-individual). When the group-level measure of counterarguments was entered into the equation first, the contribution of the individual-level measure was not significant. The results suggest that being exposed to dialogical discourse rich in counterarguments plays an important role in the development of an individual's ability to consider opposing perspectives in writing. Taken together, these findings show that measures of argumentation during small group discussions are strong predictors of measures of argumentative skills observed in an individual writing task. In particular, the development of argumentation can be facilitated through being involved in dialogical discourse rich in arguments and counterarguments.

Jadallah and her colleagues also examined the relations between discussion quality and individual learning in a study that extended the use of CR beyond its typical focus on ethical and moral dilemmas raised in children's literature (Jadallah *et al.*, in press). In this study, CR was adapted to teaching fourth grade students about a complex environmental and social science topic, using a variety of informational texts. This effort was motivated by research suggesting that the use of argumentative discourse in science results in the development of both argumentative skill and a deeper understanding of the subject matter knowledge (Driver, Newton, & Osborne, 2001; Rivard & Straw, 2000).

Children in this study experienced a multidisciplinary unit about the topic of wolf reintroduction and management. The wolf reintroduction controversy uses scientific and social science information to make a fundamentally value-laden decision, in which there is no scientifically canonical answer. The curriculum unit employed a modified jigsaw structure (Aronson, 1978) to help children learn about

specific issues surrounding wolf reintroduction, by role-playing as officials at a Wolf Management Agency. The unit began with some introductory information, and then children had an initial CR discussion, deliberating on the big question of whether a town should be given permission to shoot the wolves near its border. Children then worked in expert panels to examine one of three facets of the controversy: ecology, economics, and ranching. Each panel gave a poster presentation sharing their expertise with the class. To complete the jigsaw, students met in new CR groups containing several members of each expert panel to revisit the big question. Finally, each student wrote an individual letter on the same big question, which served as a post-test.

To evaluate how effective the Wolf Unit was in improving the content and complexity of children's group and individual arguments, the researchers examined the themes of the discussions in five groups from two fourth grade classrooms. In the final discussion, children talked significantly ($p < .01$) more about ecological and economic concepts derived from the Wolf Unit, as measured by the number of words devoted to each theme. Further, the themes in the posttest letters strongly correlated ($r = .85$) with the themes in the final CR discussion. This suggests that children were able to internalize ecological and economic explanations explored during the discussions and use them to support their individually-constructed arguments. This is not to imply that children made no factual or conceptual errors, but they were able to broaden their thinking about the issue by considering and incorporating the ideas of others. Perhaps, further CR discussions of the individually-written letters would help to address existing misconceptions and refine students' understanding of the material. Moreover, 45% of the words children wrote in the posttest letters described information they learned from children in other expert panels, indicating deeper processing of subject-matter knowledge and an ability to transfer this knowledge from the original social learning context to a written task performed individually.

Conclusions

The role of dialogue in the development of argumentation is an important topic that has both theoretical and practical implications.

If discourse is indeed the social scaffold from which individuals' argumentative reasoning develops, it stands to reason that analysis of its development is of interest not only in its own right but because of the insight it promises into the developing cognitive competence of individuals. (Kuhn & Udell, 2003, p. 1258)

Importantly, when assessing the educational effectiveness of a dialogue we need to move beyond the basic notions of achievement and productivity. To date, the vast majority of studies investigating group processes in school settings have relied on such indicators of academic achievement as task completion, (i.e., solving a math problem or a puzzle), number of accomplished tasks, improved grades, and higher scores on standardized tests (see Neber, Finsterwald, & Urban, 2001; Qin, Johnson, & Johnson, 1995; Slavin, 1991). Yet, the commonly advocated benefits of dialogic teaching are of much greater magnitude and lie not in the students' ability to learn the right answers, but in their acquired disposition to reflect upon and question these answers (Bakhtin, 1984; Burbules, 1993; Freire, 1997; Lipman, 1991; Paul, 1986). According to Burbules (1993), 'answers, solutions, and agreements are fleeting things

in human history – while the fabric of dialogical interchange sustains the very human capacity to generate and revise those provisional outcomes’ (p. 144).

The research on collaborative reasoning reviewed in this paper offered new ways of assessing the value of classroom dialogue. The effectiveness of dialogic teaching was defined neither in terms of student knowledge of correct answers, nor in terms of their ability to solve a dilemma and reach a consensus on an issue. Instead, the indicators of effectiveness focused on *the dialogic quality of student thinking*. Thus, when evaluating group performance, CR researchers analyzed the distribution of participation, the divergence of questions, the quality of student arguments, and the acquisition of the rhetorical moves useful in facilitating argument construction. Similarly, individual student performance was assessed by evaluating written argumentative discourse in terms of the presence of reasons supporting the chosen position, the consideration of alternative perspectives, and the incorporation of relevant information acquired from others.

In future studies, we plan to further expand and refine our methodological strategies. For example, so far the scoring of reflective essays was based on the number of supporting and opposing reasons. While it is reasonable to assign a higher value to an argument with more supporting and opposing reasons, weighting reasons in terms of their quality can result in a more accurate measure of student performance. In their study of children’s arguments, Means and Voss (1996) proposed a hierarchy of reasons, suggesting, for example, that appealing to direct consequences of a given action is better than appealing to authority or to personal experience. In our most recent studies (e.g., Reznitskaya, Sequeira, Rogers, & Glina, 2009), we are exploring other measures of individual student performance, including an interview focused on discussing an open-ended question and a recall of an argumentative text that contains multiple perspectives on an issue.

In terms of substantive results, CR studies demonstrated that genuine dialogic interactions could occur in an elementary school classroom through the use of theoretically-sound pedagogy. Dialogic interactions appeared to not only influence student learning within the social context, but also helped students to internalize argumentative skills and to successfully transfer them to new contexts, tasks, and communicative modes (i.e., from oral group discussion to a written task performed individually). Our findings support the position that elementary school children are developmentally ready to become acquainted with argumentation (see also Crowhurst, 1988; Stein & Trabasso, 1982) and that the teaching of argumentative discourse ought not to be delayed until later grades. In the future, we hope to extend the use of dialogue-based pedagogy to other subject areas, such as science and math. Considering that rational argument underlies the knowledge construction in academic fields, engagement in dialogic interaction should help students acquire a better understanding of deep epistemological structures of school disciplines.

We also plan to further probe the generalizability of our findings by closely examining the impact of CR pedagogy on children with different cognitive, social, and personality characteristics. For example, how does CR work for children with limited verbal skills, lower self-confidence, or poor motivation? Alternatively, what are the individual characteristics that help students learn argument skills at higher rates? Miller *et al.* (2008) recently took a step in this direction in a qualitative study

that examines participation patterns of quiet children, showing that these children become more active during CR discussions. Further, it was found that quiet students who participated in CR wrote better reflective essays than comparable quiet students who did not participate in CR.

Another interesting direction for future research is to examine the challenges faced by practicing teachers as they move from traditional to the CR pedagogy, with its emphasis on equal participation and collaborative knowledge construction. In a qualitative study, Nguyen-Jahiel and colleagues (2007) took an in-depth look at the struggles and successes of a veteran elementary school teacher who had to reconsider and adjust her discourse practices as she was learning to implement the CR model in her classroom. The authors conclude that, while the transformation was ‘anything but smooth’, the teacher and her students were able to acquire new ways of interaction, which provided with opportunities for all classroom members to participate in the process of reflective judgment. We need more research that investigates teacher adaptation to dialogue-based pedagogies and identifies related professional support services.

To conclude, as a civil society where citizens can play an active role in resolving political, social, and professional controversies, we will only benefit from helping our students develop an ability to think dialogically:

... to recognize that they indeed have a point of view, that they live inferentially, that they do not have a direct pipeline to reality, that it is perfectly possible to have an overwhelming inner sense of the correctness of one's views and still be wrong. (Paul, 1986, p. 30)

We suggest that the skillful use of classroom dialogue can help to externalize the rational processes, socializing students into the new ways of thinking.

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Notes

1. Two of the four studies had additional treatment conditions, where CR was supplemented with explicit instruction and group monitoring activities. For more discussion of these additional conditions, please see Kim (2001) and Reznitskaya *et al.* (2007).
2. Using a more conservative Cohen *d* measure with pooled variance estimates, the treatment effects range from medium to large ($0.45 < d < 0.68$).

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