The Snowball Phenomenon: Spread of Ways of Talking and Ways of Thinking Across Groups of Children

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Social influences on the reasoning and rhetorical strategies of 104 fourth graders were examined during 48 small-group discussions. A total of 14,942 lines of discussion transcript were sifted to determine patterns of occurrence of 13 argument stratagems serving several rhetorical functions. The major finding was that the use of argument stratagems snowballs. That is, once a useful stratagem has been used by a child during a discussion, it tends to spread to other children and occur with increasing frequency. After the first appearance of a stratagem, the probability that it will appear again usually rises and remains high. In general, there are fewer and fewer lines of discussion between successive appearances of a stratagem. The snowball phenomenon was more pronounced during discussions with open participation than during discussions with teacher-controlled participation.

This article is about social influences on the development of reasoning. Theoretical accounts of how people learn to reason from social interaction are often traced to Vygotsky’s (1981) notion of internalization, which he expressed as follows: “The higher functions of child thought first appear in the collective life of children in the form of argumentation and only then develop into reflection for the individual child” (p. 157). A contemporary formulation of Vygotskian ideas has been proposed by Rogoff (1995), who prefers the concept of participatory appropriation to internalization. Participatory appropriation refers to “the process by which indivi-
uals transform their understanding of and responsibility for activities through their own participation … . Participation is itself the process of appropriation” (Rogoff, 1995, pp. 150–151). Participatory appropriation “is ongoing development as people participate in events and thus handle subsequent events in ways based on their involvement in previous events” (Rogoff, 1995, p. 156).

A succession of reviewers, generally sympathetic to the ideas of internalization and participatory appropriation, have complained that the ideas lack specificity (A. L. Brown & Palincsar, 1989; Hatano, 1993; Kucan & Beck, 1997). What gets internalized or appropriated and under what circumstances? How does the process work? One searches in vain for precise, data-based answers to these questions. According to Webb and Palincsar (1996), “Group processes in the classroom remain somewhat enigmatic … . Although the literature is rich with speculation … there is a need for rigorous studies that systematically investigate the variables that are hypothesized to mediate learning in groups” (p. 867).

In this article, we present an empirical evaluation of a specific model of the appropriation of reasoning strategies during group discussions. Following Billig (1987) and Kuhn (1992, 1993), we treat reasoning as a process of argumentation. In this view, reasoning inside one’s mind consists of a flow of propositions within a discourse of reasoned argumentation. This formulation enables us to specify reasoning strategies as particular forms of argument.

We assume that reasoning is fundamentally dialogical—an idea that can be traced to Bakhtin (1981, 1986; Wertsch, 1991), the provocative Russian literary theorist. Thinkers must hear several voices within their own heads representing contrasting perspectives on an issue. The ability and disposition to take more than one perspective arises from participating in discussions with others who hold different perspectives. We further assume that reasoning is inherently metacognitive (Hofer & Pintrich, 1997). Thinkers must be able to make their own thought the object of reflection. Hearing critiques of one’s own and others’ thought promotes metacognition, as does participating in the formulation of critiques.

Our key structural assumption is that extended arguments can be broken down into recurrent patterns that we call argument stratagems. A complete argument stratagem is comprised of information about (a) the purpose or function of the stratagem, (b) the conditions in which the stratagem is used, (c) the form the stratagem takes, (d) consequences of using the stratagem, and (e) the possible objections to this type of stratagem. As an example, consider an argument stratagem that we identified in children’s discussions in previous studies (Anderson, Chinn, Waggoner, & Nguyen, 1998, pp. 175–176). Suppose a group of children are discussing the question, “Should wolves be reintroduced into northern forests?” A child makes the following contribution: “Yeah, but what if you were a rancher? Wouldn’t you be really upset if a wolf came and ate some of your cows?” We have labeled the argument stratagem that underlies this type of contribution, “Places classmate in [SCENARIO].” The capitalized, bracketed term is a place holder for
variable, context-specific information with which the child instantiates an argument. The purpose or function of the stratagem is to get others in the discussion to consider the situation from a different perspective. This stratagem is used when one believes that the arguments of others are not taking into account all points of view. Possible objections to this argument are that you cannot be sure of the views of others (e.g., maybe ranchers accept loss from predators as a routine part of doing business) and that the worrisome scenario may be unlikely to happen (e.g., it may be rare for wolves to eat cattle).

The concept of an argument stratagem couples the notions of language form and language function. The coupling cannot be rigid, however. By way of analogy, hammers afford pounding and shovels afford digging, but it is possible to dig with a claw hammer or pound with a garden spade. Likewise, expressions in a language conventionally afford certain uses. However, people use language in marvelously inventive and flexible ways, therefore language users are necessarily and habitually alert for unconventional uses. In this study, for instance, the question, “What do you think, [NAME]?” would be addressed to a certain child during a classroom discussion to invite the child to contribute something to the discussion. However, we found instances in which children used the expression to taunt another child, as well as many instances in which they used the expression conventionally.

In previous analyses of children’s argumentation, we focused on the logical core of individual arguments (Anderson, Chinn, Chang, Waggoner, & Yi, 1997). However, in this article, we employ a broader, social definition of argument—an expansion that we consider to be legitimate in the light of the goals of this investigation. For instance, among the argument stratagems that are examined are ones for inviting classmates into a discussion, such as “What do you think, [NAME]?” Social facilitation of this kind contributes to a lively and equitable discussion. Moreover, one might justifiably contend that stratagems of this kind relate to individual reasoning narrowly conceived. Asking others to join in a discussion is an indication of openness to alternative ideas, which is often considered to be a hallmark of critical and reflective thinking (Ennis, 1987).

According to our theory, argument stratagems are the building blocks of an argument schema (Reznitskaya & Anderson, in press). By an argument schema, we mean a structure that represents extended stretches of argumentative discourse. To crystallize the concept of an argument schema, we draw on our own previous work (Anderson et al., 1997; Chinn & Anderson, 1998), theories of argument formulated by philosophers and rhetoricians (Govier, 1987; Perelman & Olbrechts-Tyteca, 1969; Toulmin, 1958; van Eemeren & Grootendorst, 1992), and the research of social scientists studying argumentation (Chambliss, 1995; Kuhn, 1992; Pontecorvo & Girardet, 1993; Resnick, Salmon, Zeitz, Wathen, & Holowchak, 1993; Stein & Miller, 1993; Voss, Fincher-Kiefer, Wiley, & Silfies, 1993; Wiley & Voss, 1999). Generalizing from research on other types of schemas or discourse structures (Anderson & Pearson, 1984; Goldman & Rakestraw,
2000), we hypothesize that an argument schema (a) enables discussion participants to organize argument-relevant information, (b) enables retrieval of argument-relevant information from memory, (c) facilitates argument invention and argument repair, (d) provides the basis for anticipating objections, and (e) provides the basis for finding flaws in one’s own arguments and the arguments of others. An important feature of an argument schema is that it is abstract and, therefore, enables transfer or generalization among situations. Operationally, indications that people possess an abstract schema include (a) appropriate use; (b) variation in surface form while preserving deep structure; (c) repeated use, especially use over an extended period of time; and (d) use in varied contexts.

Presenting a satisfactory taxonomy of argument stratagems is beyond our reach right now. As the basis for an initial empirical investigation, what we have tried to do, instead, is broadly represent the kinds of social and intellectual functions that must be served in successful argumentative discourse. Children’s uses of 13 argument stratagems are examined. These stratagems may be roughly grouped in terms of the following functions: (a) managing the participation of classmates, (b) positioning in relation to a classmate’s argument, (c) acknowledging uncertainty, (d) extending the story world, (e) making arguments explicit, and (f) supporting arguments with evidence.

A central tenant of our theory postulates a process by which argument stratagems are internalized or appropriated. According to the snowball hypothesis, once a useful argument stratagem has been employed by a child in a discussion, it will spread to other children participating in the discussion and occur with increasing frequency. The idea is that children pick up and use argument stratagems they see other children using, provided the stratagems are seen as functional and are not too complicated. The process is neither one of simple mimicry, nor a matter of being fashionable, as in adopting a style of dress. We believe that children appropriate an argument stratagem when they judge that the stratagem is a useful tool for advancing understanding or adding to the persuasive force of an argument. If we are correct, children who adopt a stratagem cannot simply be copycats. They have to understand what the stratagem is good for, when to use it, and how to use it.

The snowball hypothesis is an adaptation on an intimate scale of models of diffusion, or contagion, that have been used successfully in the investigation of large-scale social phenomena. The range of previous application includes studies of the diffusion of technological innovations through social networks, such as in Ryan and Gross’s (1943) classic study of the adoption of hybrid seed corn by Iowa farmers, studies of disease epidemiology (Morris, 1994), studies of the spread of feeding and nesting innovations among species of birds (Lefebvre, Whittle, Lascaris, & Finkelstein, 1997), and studies of the escalation and spread of riots (Bohstedt, 1994; Myers, 1997). The only previous study of classroom instruction based on the concept of diffusion of which we are aware was one by Roth (1996), which is reviewed in the next section. We use the term snowball because it connotes a child-friendly meta-
phor, as opposed to the terms diffusion (a chemical metaphor), contagion (an epidemiological metaphor), or escalation (a civil disturbance metaphor).

The likelihood that an argument stratagem will snowball probably depends on a number of factors. It stands to reason that an argument stratagem will be more likely to snowball if it involves a new assembly of known or easily acquired concepts. An example is “I think [POSITION] because [REASON].” In discussions, children often use “I think [POSITION],” and they sometimes use “Because [REASON]” (Anderson et al., 1997). Simply hearing the complete stratagem used by other students should be sufficient to lead children to combine these known, or at least not difficult, parts. Additional use in varied contexts should lead to fluent, flexible mastery.

A limiting factor is that a stratagem must first occur to be emulated. Elementary school discussions conventionally take the form of a recitation in which students are quizzed about information they have read (Cazden, 1988). Few, if any, student contributions to a recitation can be construed as arguments (Anderson et al., 1998), and, thus, the likelihood of social propagation of argument stratagems is slight. To have a chance of discovering anything about social influences on the acquisition of argument stratagems, one has to look at forms of discussion in which children have extended opportunities to argue. In the study described in this article, discussions took place in a format called collaborative reasoning (Waggoner, Chinn, Yi, & Anderson, 1995). In a collaborative reasoning discussion, children take public positions on an issue and then offer reasons and supporting evidence. They are expected to listen carefully and evaluate each others’ arguments. When they disagree, they are supposed to challenge with counterarguments. Previous research has established that during collaborative reasoning discussions, most utterances do express arguments, challenge the arguments of others, or respond to challenges with elaboration and supporting information (Anderson et al., 1998; Chinn & Anderson, 1998).

Various features of social networks probably influence how susceptible people are to social influence. Possibly important in classroom discussions are norms for participation. The study described in this article contrasts discussions with teacher-controlled participation and discussions with open participation. Teacher-controlled participation is the usual arrangement in which children bid for turns by raising their hands and gaining the floor when nominated by the teacher. Open participation is an arrangement in which children speak freely without raising their hands. We believe that children are likely to be more susceptible to influence from their peers during open, rather than teacher-controlled, participation. This is because they are primarily oriented toward each other during open participation rather than toward the teacher (Anderson et al., 1998). Another conjecture about susceptibility to social influence that we evaluate in this study is that children are more likely to pick up stratagems directed to them personally as opposed to being directed to others or broadcast to an entire group. The idea is that children are more keenly aware of the persuasive force of personally directed stratagems.
BACKGROUND

From among the many strands of scholarship relevant to the investigation of social influences on the development of thinking, we briefly and selectively comment on the history of the idea that there is a connection between argument and thought, summarize evidence about social influences on thinking, review the literature on peer modeling and on the effects of norms for participation during discussions, and describe specific antecedents to this investigation.

The idea that private thinking resembles public argument did not originate with Vygotsky. In his delightful book, *Arguing and Thinking*, Billig (1987) traces the idea to Protagoras, Isocrates, and other Greek and Roman philosophers. The Eleatic Stranger in Plato’s (1942, as cited in Billig, 1987, p. 110) dialogue, *Sophist*, said, “Thought and speech are the same; only the former, which is a silent inner conversation of the soul with itself, has been given the special name of thought.” Similarly, Francis Bacon (1605/1858, p. 243, as cited in Billig, 1987, p. 110) maintained that we use the same processes “in argumentation, where we are disputing with another” as “in meditations, when we are considering and resolving anything with ourselves.” Among the somewhat more modern figures to whom Billig ascribes the same or a related view are William James, George Herbert Mead, and Jean Piaget. Considering the prominence of Lev Vygotsky in theorizing about the relation of arguing to thinking in the field of children’s cognitive development, it is interesting that Vygotsky is not cited by Billig.

The preoccupation of the last 25 years of research addressing social influences on children’s thinking has attempted to assess whether Vygotsky or Piaget is more nearly right about the process. Vygotsky (1978) emphasized a social learning process in which the child is guided by a “more knowledgeable other.” Piaget (1932; Perret-Clermont, 1980) was impressed with “sociocognitive conflict” among child peers as a goad to cognitive growth. Inevitably, perhaps, research has not permitted a decisive choice between the theories of Vygotsky and Piaget (Azmitia & Perlmutter, 1989; Webb & Palincsar, 1996). Children can and do learn from more knowledgeable others. At the same time, peer-to-peer influences are strong—stronger in many circumstances than adult-to-child influences (A. L. Brown & Palincsar, 1989)—and under many conditions, sociocognitive conflict facilitates learning (Johnson & Johnson, 1985; Webb & Palincsar, 1996, p. 853).

Throughout the last quarter century, modeling and imitation have been the unloved stepchildren of cognitive development. According to Webb and Palincsar (1996), “Developmental researchers have taken great pains to show that cognitive gains made during collaboration are not due only to imitation of a model,” although they add that “few would dispute that students can learn by observing others” (p. 847). In fact, the research on learning from a model is notable for the strength and consistency of effects (Bandura, 1986; Schunk, 1987, 1998).
The disinclination of developmentalists to be interested in modeling and imitation may stem from the historical identification of these topics with behaviorism, as in Miller and Dollard’s (1941) classic, *Social Learning and Imitation*. Bandura (1986), the giant in research on modeling during the modern era, began as a behaviorist, but it is noteworthy that his penultimate book on modeling deserves its title, *Social Foundations of Thought and Action: A Social Cognitive Theory*. Some may feel that research on modeling is irrelevant to cognitive development because a large proportion of the studies have been done on social and emotional change in exceptional children. For example, studies featuring modeling have examined means for helping children to cope with such problems as shyness (Strain, Kerr, & Ragland, 1981), fear of dogs (Bandura & Menlove, 1968), fear of snakes (Kornhaber & Schroeder, 1975), or anxiety about medical procedures (Klorman, Hilpert, Michael, LaGana, & Sveen, 1980).

However, Schunk (1998) summarized a substantial body of evidence showing that the benefits of modeling extend to cognitive skills and strategies. A number of factors that mediate the influence of modeling have been investigated. Two of the most important factors are that the model is perceived as being competent and that the use of the skill or strategy produces a functional result. Peer models are especially helpful when students harbor doubts about their competence or social appropriateness is at issue (Schunk, 1987, p. 170). Highly relevant to the snowball hypothesis is the finding that multiple peer models are better than a single model (Bandura & Menlove, 1968; Schunk, Hanson, & Cox, 1987). A fault of much of the research on peer modeling is that it has used trained child accomplices, and often the model has been videotaped rather than live. Little of the research has been done in natural classroom settings.

A pioneering study comparing discussions with open and teacher-controlled participation was completed by Au & Mason (1981). They found that under open participation, Native Hawaiian children performed better on several measures of quantity and quality of discussion contributions. They concluded that the results supported the “balance of rights hypothesis,” according to which, “higher levels of productive student behavior are probable if there is a balance between the interactional rights of the teacher and children” (p. 150). Au and Mason emphasized the congruence of the open-discussion format with the “talk story” pattern of interaction in Hawaiian homes. However, Almasi (1995) reported comparable results with children from a suburban public school on the east coast of the United States. Similarly, Chinn, Anderson, and Waggoner (in press) compared open and teacher-controlled discussions in a rural public school and an urban parochial school in the midwestern United States and found large differences favoring open participation in amount and quality of discourse.

A fault of previous research is that norms for participation have been confounded with the approach to discussion. The teacher-controlled format has always entailed recitation about story facts, whereas the open format has allowed...
children the expressive latitude to adopt an aesthetic or critical stance toward the topic of discussion (see Chinn et al., in press). In the study reported here, teacher-controlled and open participation were compared within the collaborative reasoning approach to discussion. This meant that aesthetic and critical stances were enabled under both formats for participation.

Research by ethnographers and sociolinguists suggests that participation structures are dynamic and vary within, as well as across, social activities (Erickson & Shultz, 1981; Shultz, Florio, & Erickson, 1982). Thus, it is reasonable to suppose that the norms for participation endorsed by the teacher will affect, but not completely determine, actual participation structures. One would expect participation structure to be more fluid and to see more than one structure in play during open participation when teacher control is relaxed, than during teacher-controlled participation. Although this investigation is not primarily about participation structure, we report some analyses that bear directly on rights and obligations for speaking (see the section entitled Conditions and Consequences of Stratagem Use), as well as impressions that arise from many hours spent looking at videotapes and reading transcripts. For instance, children arguing one side of a question seem to form temporary coalitions. Our impression is that members of coalitions gain the right to overlap the speech of other members of the coalition, completing or extending one another’s thoughts (see the analysis of three girls discussing The Paper Bag Princess; Munsch, 1990).

Turning now to the specific antecedents of this study, Roth (1996) studied diffusion* in a classroom (Grades 4–5) in western Canada during a 13-week civil engineering unit.1 A practice that spread widely throughout the room was the use of glue guns to make joints in the towers and bridges the children were building. One boy, and then another, brought a glue gun from home. From then on, the use of glue guns spread quickly, and the number brought to the classroom rose to four, six, and finally seven. Children who already knew how to use the guns taught others employing modeling, explanation, and fading. Expertise developed in stages rather than being acquired all at once from a single observation of a model. Novice glue gun users had to learn from more expert users how to troubleshoot problems, such as blown fuses and burns from hot glue. The two electrical outlets in the room, where the glue guns were used, became sites for collaboration and transfer of practices.

Echoing the research on peer modeling reviewed earlier, Roth (1996) concluded that glue gun technology spread because it enabled a variety of functional results: “Because of its flexibility, the glue gun satisfied Ron’s need for strong joints, Maggie’s demand for a neater assembly, Tom’s desire to produce miniature joints, and Stan’s requirement for a pin that could not slip” (p. 213). Another prac-

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1 Roth (1996) marked diffusion with an asterisk (*) to indicate that he was reserving judgment about whether it is an appropriate term.
tice that diffused throughout the room was the use of the Canadian flag as a decora-
tion. To the disappointment of Roth and the teachers, a practice that did not diffuse
was the use of triangular braces to stabilize constructions. Roth surmised that one
reason this practice did not spread is that many of the children’s structures were
stable without triangular braces. Reservations one might have about the Roth study
are that it took place in a single classroom and that use of triangular braces, the one
practice examined that had significant conceptual content, did not diffuse through-
out the room.

The immediate antecedent to this study was our discovery in previous research
of an elaborate argument stratagem that apparently spread from child to child
within a discussion group (Anderson et al., 1998, pp. 175–176). This argument
stratagem has the form, “Places classmate in [SCENARIO]” illustrated earlier
with the question of whether wolves should be reintroduced into northern forests.
Twenty-eight instances of this pattern were identified in a set of transcripts of 20
collaborative reasoning discussions (2 discussions by each of 10 groups of fourth
graders). Fifteen of the 28 instances appeared in one discussion group, and three of
the four children who displayed the pattern two or more times were from this
group. It seemed to us that the stratagem originated with one girl and then spread to
other children within the group. There was a probable influence of the teacher,
who was good at issuing challenges of this type.

To recapitulate, building on previous research, our goal in this study was to sys-
tematically evaluate a hypothesized mechanism that could account for a significant
aspect of the learning that happens within groups of children. The proposed mecha-
nism is the diffusion of recurrent patterns or stratagems. According to the snowball
hypotheses, once one child has displayed a useful stratagem during a discussion, the
stratagem is likely to spread to other children and occur with increasing frequency.
The snowball hypothesis was evaluated by performing detailed analyses of a series
of 48 discussions that took place in four fourth-grade classrooms.

**METHOD**

**Participants**

The participants were 4 teachers, 58 boys, and 46 girls enrolled in four fourth-grade
classrooms from two socioeconomically and ethnically diverse public schools in a
small Midwestern city in the United States. At one school, 39% of the students
qualified for free or reduced-price lunch; 58% of the students were European
Americans, 37% were African Americans, and 5% were from other ethnic groups.
At the other school, 40% of the students qualified for free or reduced-price lunch;
41% of the students were European Americans, 55% were African Americans, and
4% were from other ethnic groups.
The teachers volunteered to participate in the project after hearing a description of the collaborative reasoning approach to discussion, as well as a description of the requirements of the study. Two of the teachers had collaborated with us in a previous study. The other two were nominated for the study by their building principal. All four were judged by their principals to be accomplished teachers, and all could be described as conventional in their approach to instruction.

Ms. Carr had 15 years of teaching experience at the time of the study.2 She held discussions at a rectangular table in an area set off from the rest of the room by a divider. During discussions with teacher-controlled participation, she had a minimalist approach to allocating turns for speaking. She simply glanced at a student and the student would begin talking. Students uncertain whether they had been granted turns would say, “Me?” Ms. Carr’s mood was variable. On days when she was preoccupied, discussions in her room were brief.

Ms. Day was a former physical education teacher with 20 years of teaching experience. Discussions took place in a semicircle off to the side of the room. In this classroom, unlike the other rooms, students operated the video camera. Sometimes these students could not refrain from joining the discussion. Ms. Day was more an observer than a participant during discussions with an open participation. She sat outside the group and seldom intervened. Perhaps because of this, the open discussions in her room were animated to the point of being raucous.

Ms. Kuhlman had 7 years of teaching experience. A petite woman, smaller than some of her fourth graders, she almost always dressed in jeans and a sweat shirt. She held discussions on a circular piece of carpet in one corner of the room. The children sat in a circle on the carpet and Ms. Kuhlman sat in the corner on a chair facing out toward the class. A laconic person who seldom smiled or displayed overt enthusiasm, Ms. Kuhlman nonetheless conveyed by the inflection of her voice that she was interested in what students had to say.

A veteran of 27 years as a teacher, Ms. Lester was formal in demeanor and traditional in approach. Students were usually quiet and attentive. Their desks were arranged in rows facing the chalkboard. Ms. Lester discharged the students row by row when it was time for recess or a restroom break. Discussions were held at an oval table in the back of the room. During discussions with an open format, Ms. Lester stressed the importance of not interrupting others, but she did allow students to speak freely and control the topic.

Design

Children took part in a series of discussions with conventional, teacher-controlled participation in which they bid for turns by raising their hands and waiting to be

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2The teachers and children were given pseudonyms.
nominated by the teacher. They also took part in a series of discussions with open 
participation in which they spoke freely without teacher nomination. The order of 
open and controlled discussions was counterbalanced, as shown in Table 1.

At the beginning of the school year, all four teachers had organized their classes 
into three ability groups for reading–language arts instruction: a high group, middle 
group, and low group. These groups, which ranged in size from 6 to 10 children \((Mdn = 8)\), served as discussion groups in this study. The groups within each classroom engaged in five collaborative reasoning discussions over a period of 2½ weeks to become adapted to the first format for participation to which the class was assigned, followed by two test discussions, using the same format for participation and involving one of two counterbalanced sets of stories, as indicated in Table 1. Then, the format for participation switched. The groups within the classroom engaged in the second series of five collaborative reasoning discussions spread over 2½ weeks to become familiar with the second format for participation to which the class was assigned, followed by two more test discussions involving the other set of stories.

Materials

Four stories were used for test discussions. To balance the interest of the stories to boys and girls, two had a female protagonist and two had a male protagonist. *Amy’s Goose* (Holmes, 1977) is about a lonely farm girl who befriends a goose that has been injured by a fox. She wants to keep the goose as a pet instead of letting it fly south with the rest of the flock. The discussion question was, “Should Amy let the goose go?” In *The Paper Bag Princess* (Munsch, 1990), a princess outsmarts a dragon and rescues a prince. The dragon has burned her castle and with it all her clothes, so the princess has nothing to wear but a paper bag. When the prince sees her, he says she should go away and come back when she is dressed like a real princess. The discussion question was, “Should the princess marry the prince?” *Thin Ice* (W. R. Brown & Anderson, 1983) is based on a true story of two boys whose parents have repeatedly warned them to stay away from the frozen river near their

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homes. One of the boys ventures out onto the ice anyway. The ice gives way and the other boy, Joel, pulls him out of the river. The question was, “Is Joel a hero?” *Ronald Morgan Goes to Bat* (Giff, 1990) features a boy who makes frequent mistakes when playing baseball and can neither catch nor hit the ball. The question was, “Should the teacher let Ronald play?”

*Amy’s Goose* and *Thin Ice* were paired to form Story Set A. Story Set B consisted of *The Paper Bag Princess* and *Ronald Morgan Goes to Bat*. As shown in Table 1, the sets of stories were counterbalanced to make the stories and associated discussion questions orthogonal to norms for participation.

### Procedure

Teachers attended a half-day workshop to learn about collaborative reasoning and to receive a further briefing on the design, procedure, and schedule for the study. During the workshop, we presented the goals and explained the steps in collaborative reasoning. Teachers learned about strategies for promoting reasoning and collaboration among their students (see Nguyen et al., in press; Waggoner et al., 1995). They saw video clips of exemplary discussions conducted by other teachers. They also engaged in role playing to practice being a facilitator of collaborative reasoning discussions.

Discussions took place twice a week in the morning during the period allocated for reading-language arts instruction. Typically, students read the story silently at their seats before gathering for the discussion. When the teacher judged that a story might be too difficult for some students, the story was read aloud to the class or it was read with partners. All the groups within a room read and discussed the same story on a given day. The order in which groups met for discussion varied from day to day, so that the nominal ability level of groups was roughly orthogonal to the order in which stories were discussed.

A research team member served as a participant observer in each classroom, assisting the teacher, offering suggestions, taking field notes, and videotaping discussions. Discussions were videotaped with an S-VHS camcorder. The camcorder was mounted on a tripod and positioned to get a view of all of the children’s faces. To make the speech as intelligible as possible, sound was recorded with a PZM microphone on a table in the middle of the discussion group. Videotapes were viewed weekly by the entire research team, who then suggested improvements and ways to solve problems.

Students completed a wide range checklist vocabulary test (Anderson & Freebody, 1983) and the reading comprehension subtest from the Metropolitan Achievement Tests (Farr, Prescott, Balow, & Hogan, 1986). At the end of the study, students were individually interviewed to examine their concepts about discussion and their preferences for open or teacher-controlled participation (see Kim et al., 2000).
Data Analysis

The data for this analysis consists of the transcripts of the test discussions held at the end of the series of open discussions and again at the end of the series of teacher-controlled discussions. Altogether, there were 48 test discussions (four classrooms, three groups within classrooms, and four discussions by each group).

Initial transcriptions of the videotapes were done in the manner that suited the transcribers. Some transcribers worked at a computer terminal, operating the VCR with a custom foot pedal. Other transcribers wrote transcripts out in longhand and then keyed a word processing file. In either case, once an initial transcript had been made, it was checked by a second transcriber. The goal was a complete, verbatim transcription of the discussion with accurate identification of the speaker and a record of interjections and overlapping speech. Some discussions had to be checked several times before this goal could be approached.

Analyses were completed using QSR NUD*IST 4 (1997) for qualitative research. This software was used to organize, search, and code the corpus of 48 discussion transcripts. The corpus contains 14,942 lines of up to 60 characters of text. A total of 7,947 turns for speaking are identified in the corpus, of which 5,748 are student turns and 2,199 are teacher turns. These counts include full turns, simultaneous turns, group turns, and fragmentary turns (for details of coding turns, see Chinn et al., in press).

The discussion corpus was analyzed in two stages. First, all student turns were systematically searched using the QSR NUD*IST 4 (1997) String Search, Pattern Search, and Index Search functions for language forms indicative of 13 argument stratagems described and illustrated in the next section. Once alternative wordings that could express the stratagem had been specified, this step was more or less mechanical. A turn was provisionally considered to display a stratagem if it contained a word string that conventionally expressed the stratagem, including word strings that conventionally would be taken to have the same, or nearly the same, meaning as the most typical expression of the stratagem. We probably did not find every variation in wording to express a stratagem, although we tried to cast a wide net by thinking of different ways to express ideas ourselves and by remaining alert to children’s modes of expression. Because of the NUD*IST software, when another wording variation was discovered, rerunning a search to make it more inclusive was not burdensome. The pattern of results proved to be robust to changes in the range of wording variations counted as expressing a stratagem.

At the second stage, every use of a stratagem provisionally identified in the first stage was evaluated by two raters working independently. The raters marked hard copies, using the QSR NUD*IST 4 (1997) document browser (in particular, the Locate Text Unit command) to examine utterances in the context of occurrence. The raters’ task was to evaluate the meaning or discourse function of an utterance, judging whether or not it expressed a certain stratagem. The raters were supposed
to apply an ordinary conversational standard in interpreting utterances. Fragmentary utterances (e.g., “What if//” or “But I think//”) were not counted as expressing stratagems because the meaning of such utterances is undetermined. Results more strongly favor the snowball hypothesis when fragments are included, but this may be an artifact. We noticed that fragments often precede a full use of a form by one or two turns, possibly because in open discussions children interject fragments such as “What if//” or “But I think//” as a tool for gaining speaking rights.

The raters agreed on the classification of 97% of the student speaking turns identified in the first stage of analysis. The remaining 3% include clerical errors and oversights as well as differences of interpretation. There were quite a number of oversights in which one of the raters failed to score a turn—usually when the turn ran together with the previous turn without spacing in the printout. Differences in classification of turns were resolved in conference. In the end, a total of 1,631 instances of the 13 argument stratagems were jointly confirmed by the two raters.

RESULTS AND DISCUSSION

To evaluate the snowball hypothesis, we completed qualitative and quantitative analyses bearing on the social propagation of 13 argument stratagems that serve various rhetorical functions. We evaluated several rivals to the snowball hypothesis. We tried to ascertain the strength and consistency of trends, the percentage of children in a group who display a stratagem, whether children have deep understanding or are simply parroting surface forms, whether stratagems are used under appropriate conditions and get expected results, whether children who are personally targeted with stratagems are more susceptible to social influence, whether norms for participation influence the use of stratagems, and whether stratagems spread from group to group within classrooms.

Managing Participation of Classmates

The first two argument stratagems we examined were speech acts to gain the floor for a classmate. One of these was most frequently expressed as, “What do you think, [NAME]?” All of the instances of this rhetorical form involving one girl during a discussion of *Ronald Morgan Goes to Bat* (Giff, 1990) follow:

Tyrone: What do you think, Jalisha?
Jalisha: Um, I think they should let him play. What do you think, Tyrone?
Jalisha: Harriet, Harriet, what do you think?
Jalisha: Harriet, what do you think?
Jalisha: Harriet, what do you think?
Jalisha: What do you think, Brice?
Jalisha: What do you think, um … Trent?

When Tyrone asks Jalisha what she thinks, she promptly returns the favor and then, in later turns, directs the request to several other children. The request directed to Tyrone was Jalisha’s first use of “What do you think, [NAME]?” during a videotaped discussion. The transactions involving Jalisha nicely illustrate the ancillary hypothesis that children pick up forms directed at them personally. During a later discussion of *The Paper Bag Princess* (Munsch, 1990), Jalisha twice asks classmates if they have anything to contribute to the discussion:

Jalisha: Would you like to share anything, Trent?
Jalisha: Brice! Would you like to share?

What is interesting here is that, although the surface form has changed, the meaning and discourse function of the utterance is the same as “What do you think, [NAME]?” This suggests that Jalisha has internalized the deep structure of an invitation to participate rather than memorizing a string of words.

Altogether, there were 45 instances of “What do you think [NAME]?” in the corpus of 48 discussions. Table 2 summarizes the quantitative analysis designed to evaluate the snowball hypothesis. The first row in the table gives the transition probability, which is the probability that the event will happen again given that it has occurred a certain number of times already. For instance, the fourth figure in the row indicates that the probability of “What do you think, [NAME]?” is .83, given that this event has already happened three times during the discussion. The probability figures show that as soon as the stratagem has occurred once, the likelihood that it will occur one or more additional times increases. The second row in Table 2 contains the median number of lines in discussion transcripts before a given event, counting from the previous event or, in the case of the first event, starting from the beginning of the discussion. The figures show that there were more lines before the first occurrence of “What do you think, [NAME]?” than before the second, and more lines before the second than before later occurrences.

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*SNOWBALL PHENOMENON*
A second type of speech act used for gaining the floor for classmates during boisterous discussions is to proclaim, “Let [NAME] talk!” The following are all of the occurrences of this utterance in a discussion of *The Paper Bag Princess* (Munsch, 1990). Utterances that do not contain the form have been omitted:

Martin:  Ssshhh! Be quiet! Let Zeke talk!
Mary Ann:  // You guys, let Shirley talk.
Martin:  Let James talk.
Terri:  Shirl just talk over ’em.
Martin:  Everybody be quiet and let James talk!
Martin:  Let James talk, everybody be quiet, and let James talk.
Zeke:  Let Cassy talk!
Martin:  Let Seth talk.

Table 3 shows the analysis of the 18 instances of “Let [NAME] talk!” that occurred during the 48 discussions. After 1 occurrence, the probability of additional occurrences jumps and remains fairly high. After the first occurrence, the number of lines before the next occurrence drops and remains low.

Despite some variation from occurrence to occurrence, it is clear that the two speech acts for managing participation considered in this section behave according to the snowball hypothesis.

Positioning in Relation to a Classmate’s Argument

Three argument stratagems involve a student’s support of or opposition to a classmate’s argument. The first of these is simply “I agree (or disagree) with [NAME].” The following are examples of the stratagem in consecutive turns from a discussion of *The Paper Bag Princess* (Munsch, 1990):

Andre:  *I agree with Kordell* because um, uh, he, he look, he is he seems that he don’t like her and she sure got no clothes to wear them to get marry, and she could have died trying to go and (throw herself) to rescue him he still he still saying go get your cl-, go get some

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<td>6</td>
<td>10</td>
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clothes on you look like a bum she should have clothes on the princess suppose to have clothes on.

Angel: *I agree with both of you guys* because, it’s not what you see on the outside it’s what you see on the inside that counts in someone … but, I think that he shouldn’t, she shouldn’t marry him because the way he um, told her you need to go get some dress and get dressed up like a princess, :I didn’t://

Table 4 presents the summary analysis of the 160 occurrences of “I agree (or disagree) with [NAME]” during the 48 discussions. The figures for both the transition probability and the lines-before measure are consistent with the snowball hypothesis.

A distinctive way of addressing a classmate’s argument is to say, “I got something for you, [NAME].” This stratagem appeared six times in only one discussion, the following discussion of *Amy’s Goose* (Holmes, 1977). Two fragmentary uses are also displayed, whereas utterances not containing the form have been omitted:

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<td>63</td>
<td>21</td>
<td>11</td>
<td>10</td>
<td>8</td>
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Auretha: I got challenge for you, Kyle, um, if, he wouldn’t able to feed himself, how come he was getting food, um, before he were there?

Kevin: // I got something for you, Auretha, [Timothy sighs], if, he, if the goose, was, still in the barn for a long time, then Amy let it go, then, it would not get its food, because it hasn’t been in a wild for a while.

Timothy: I got something for you, Sylvia, [Kevin giggles] but, he didn’t, he didn’t wanna go back there, they didn’t want him because of the group.

Auretha: I got something for //

Auretha: I got something for Cassius, I disagree with Cassius and Kevin, um, you said if, if, he get, he might get sick, if (he get it all, that’s it,) every fall that, they’ll come back, and maybe, he can go then, and sometimes, maybe, if Amy let him go to the lake in, lake in, and he could get water and he won’t get sick.

Timothy: :: Well, I got something for you [looks at Auretha]
Auretha: I got a challenge for you, Tom, because, um, [teacher says something to Marcel who was talking with Cassius] if, if animal dies, she’s gonna be upset with herself, but it, because, she didn’t let him go, but if she let him go, she could find another pet somewhere, or ask her mother or father to go and get her one, another pet.

Timothy: I, I got something for, I disagree with Ms. Lester, because then it won’t know how, eat.

Table 5 presents the analysis of “I got something for you, [NAME].” The probability figures confirm the snowball hypothesis and so do the lines-before figures, except for the last one.

The third argument stratagem for taking a position in relation to a classmate’s argument is “But [COUNTERARGUMENT],” meaning the use of but to initiate an opposing argument. “But [COUNTERARGUMENT]” includes phrases such as “Yeah, but” and “No, but,” however, does not include instances in which an elaborated concession or point of agreement preceded the word “but.” The following excerpt consists of 18 consecutive lines from a discussion of Amy’s Goose (Holmes, 1977) in which there are six occurrences of “But [COUNTERARGUMENT],” including several instances in which the child did not hold the floor long enough to express an opposing argument:

Auretha: But the/
Kevin: Yeah, but the bar-, barn door’s closed.
Timothy: // Yeah, but if they knock it down.
Sylvia: What kind of fox : could do that?
Auretha: : How, how could the fox knock out the door? [children giggle]
Timothy: Jump on it?
Kevin: : Yeah, right.
Sylvia: : No, he’s not strong enough.
Marcel: I don’t :: that’s gonna ???
Auretha: :: Okay, jump down the door, knock out the door, if, the door’s rusty, and wiggly.
Timothy: ::: Yeah, but if it won’t,
Kevin: ::: And if it is very old, too.
Timothy: *But* people open the door, to get in there, the fox can sneak in, so while they’re gone:/// 
Sylvia: //Yeah, *but* they could see the fox sneak in.

The foregoing excerpt is full of interesting features. Notice, for instance, the series of questions that conform to the snowball hypothesis. Sylvia initiates with, “What kind of fox could do that?” The form is immediately echoed by Auretha, who asks, “How, how could the fox knock out the door?” Timothy’s answer to Auretha continues the question form with, “Jump on it?” Another thing to notice is the collaborative development of the theme of breaking into the barn. At first, Auretha joins Sylvia in doubting that a fox could break through the door. However, midway through the excerpt, after Timothy has suggested the fox could jump on it and other children have interjected comments, Auretha swings around to Timothy’s perspective and says, “Okay, jump down the door, knock out the door, if, the door’s rusty, and wiggly.” After a fragmentary utterance by Timothy, Kevin expands Auretha’s idea, adding, “And if it is very old, too.”

Table 6 contains statistics for the 152 instances of “But [COUNTERARGUMENT].” The transition probability for the third and fourth occurrences declines, which is not fully consistent with the snowball hypothesis. However, results from the lines-before measure are consistent with the hypothesis.

The data from three stratagems for positioning oneself in relation to another’s argument are generally consistent with the snowball hypothesis. Results with the lines-before measure support the hypothesis in every case. Results with the transition probability measure were also consistent with the hypothesis, except in the case of “But [COUNTERARGUMENT].”

Acknowledging Uncertainty

Two types of speech acts acknowledging uncertainty were investigated. The first type consisted of hedges such as *probably, might,* and *maybe,* used to qualify some proposition and hence termed “Hedge [PROPOSITION].” The following is an ex-

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excerpt from a discussion of *Thin Ice* (W. R. Brown & Anderson, 1983) that illustrates the use of hedges:

Jaqueline: But, I disagree with Janelle, um, because, *if* he had, uh, tried to crack all the ice, it *might* take a long time to crack all the ice, and, uh, Jeff, he got on there, he about 100 uh, pounds, so the ice was able to hold him, so he will *probably* have to like jump really hard, and, try to crack it, [Deborah says, “um”] so it *might* take a long time.

Deborah: I agree with Jaqueline, because, he *could* jump and try to break it, and, he, *might*, *if* he jumps too hard, he *might*, and he fell, actually break the ice, *he might* fall into the river, too, and then how could they, then, they would be both stuck in there, and, *if*, they’re were howling, they’re far away, and no one’s around, [Teacher says, “ok”] and um// [children look at the teacher]

Teacher: //I thought, I thought you’re finished.

Deborah: And um … I’m done. That’s what I was gonna say. [children giggle]

Burk: Um, I think, I disagree with Janelle, because *if* you go ’n the lake, uh, *if* you just go, and break the ice, they *could’ve* caught of, pneumonia or something like that, and um, I think, um, he should go um, trying to help him out, instead of, trying to, go in and break the ice because, they can both catch something.

The excerpt illustrates that a major use of hedges is to express tentativeness about what will happen if the characters choose a certain course of action and the story world is extended. The excerpt also illustrates that children often use more than one hedge word within the same utterance. For example, Jaqueline uses “might” and “probably,” and Deborah uses “could” and “might.” This indicates that these children have control of the underlying meaning of the terms and not merely the surface forms.

Table 7 shows the statistical analysis of the 481 utterances containing “Hedge [PROPOSITION]” that appeared during the 48 discussions. It is important to emphasize that the unit of analysis was the turn or complete utterance; therefore, for instance, Jaqueline’s utterance is counted once in the analysis even though she used “might” twice, “probably” once, and “if” once. The probability figures are near 1.00, but the lines-before figures clearly support the snowball hypothesis.

A second speech act that expresses uncertainty is typified by “I am confused.” The following utterances appeared in a discussion of *The Paper Bag Princess* (Munsch, 1990). Utterances that do not contain “I am confused” or a comparable form have been omitted:
Dario: Well I am confused because [he stops upset and looks to the teacher because Edith continues to talk]

Dario: I am confused because she shouldn’t marry him because all he wants is her beauty and wealthy, but she should marry him because she needs a prince to marry and she can’t just be a princess without a prince or

Jasmine: I am kind of confused now because when Edith said um, maybe she doesn’t want to be a queen, (I li-) like kind in the beginning she said, that they were going to get marry and she was really happy about it until the dragon came.

Adam: I am confused

Tad: I don’t know …

Jasmine: Well, I don’t know but, I don’t know but I will still try to help him …

Jasmine: Maybe he didn’t, I am not sure but maybe he didn’t know because of his age

“I am confused” and related forms are self-reports of mental states that reflect metacognitive awareness. One of the discourse functions of this type of rhetorical move seems to be to keep the discussion focused on the issues that the speaker says he or she is confused about. It is interesting that the manner of expressing uncertainty shifts between Adam, who is the last to say, “I am confused,” and Tad, who says, “I don’t know.” Jasmine echoes, “I don’t know” in her next contribution and later shifts to still another variant, “I am not sure.” Table 8 shows that the probability and spacing figures of the 57 instances of “I am confused” are in close agreement with the snowball hypothesis. In summary, the data on expressions voicing uncertainty are generally consistent with the snowball hypothesis.

Extending the Story World

We examined three rhetorical moves in which the speaker envisions the story world when it is extended or personalized in some way. The first move we examined in-
volves the construction, “What if [SCENARIO]?” and related forms. The following are selected utterances from a discussion of *Amy’s Goose* (Holmes, 1977). Utterances not containing the “What if [SCENARIO]?” are omitted:

Nadeen: No. Because, because *what if* it, because she needs to take it to, um, to the animal, ah, thing (whatever they call it ???).

Kambria: *What if* the goose, she-, she//

Kambria: If she, if she keeps, tries to keep it, take care of it, *what if* it keeps lost somethin’, she worries about, and she starts lookin,’ for it and then um, and then, and then//

Kambria: It was just like um, Nadeen said, that um, she she she, um, shoulda take it to the, the pet shop, I think she said, to keep it, but I think, *what if* they had um, like two, two people at the um, vetr-, veginarian?

Kambria: Yeah, and, and it was a lot of pet things to take care of, and they couldn’t um, everybody, the grownups couldn’t take of all them at the same time, and *what if* some the, some of the um, some of them got um, got sick, and they couldn’t, and then um, the people woulda got upset, because they didn’t have time to get um, the other pets um, the pets somethin’. At the ??? //

The “What if [SCENARIO]?” is a classic lead into hypothetical reasoning. The excerpt shows Kambria repeatedly using and starting to gain control over this type of reasoning. Table 9 shows that the statistics for the 56 utterances containing the “What if [SCENARIO]?” are congruent with the snowball hypothesis.

Discussion participants often place themselves in the story world, imagining how they would feel, and visualizing how they would act if faced with a character’s predicament or expressing how they felt or acted in a situation that resembles the character’s predicament. The following are examples of “Places self in [SCENARIO]” from a discussion of *Ronald Morgan Goes to Bat* (Giff, 1990):

Tijara: I would still be playin’ because, if I’m not, I’m not even good at baseball, but if I keep on practicing I could get better . . .

Calvin: If I were the coach, I would ah, ah, Ronald, ?? the pitcher . . .
Calvin: Um, If I were the coach I would make em, I would make ’em come back, I mean, I mean I would um, make him call his mom, and ah, tell him that, call his mom that he ah, (???) ex-, extra, can he like stay and practice … .

Table 10 presents the transition probability and lines-before values for the 67 instances of “Places self in [SCENARIO].” The data fit the snowball hypothesis. Instead of placing themselves in the story world, students may urge classmates to step into the story world, identify with characters, and imagine how they would feel and act. The stratagem for this type of speech act is “Places classmate in [SCENARIO].” The following are consecutive turns from a discussion of Thin Ice (W. R. Brown & Anderson, 1983). Several participants, including the teacher, collaborate in constructing an envisionment. Notice the chaining of “What if” questions:

Jack: Allen, what if you fell in the ice, and Trent said, I don’t want to save you.
Allen: Simple. When I get out, I’d just punch him in the nose.
Tyrone: Well, how would you get out?
Bethany: But what about if you don’t get out?
Jack: Yeah!
Harriet: Yeah. What if you couldn’t swim? What if the water was, what if //
Allen: // Hey, I know how to swim. I took swimming lessons last year.
Harriet: What if there is ice?
Teacher: But when you took swimming lessons, did you have boots on and two, two pairs of pants (and a coat)?
Allen: No.
Bethany: Uh, wha-, what about if you were in the pond and, um, the ice was frozen and you had like heavy boots on, two pairs of jeans, two sweaters, and stuff. and two pairs of socks and everything. What abou-, and you couldn’t swim at all? And you had, a heavy, heavy coat on //

Table 11 summarizes the statistics for the 51 instances of “Places classmate in [SCENARIO].” Again, the results are in accord with the snowball hypothesis.

### Making Arguments Explicit

Children’s naturally occurring arguments are seldom fully explicit, in the sense that they tend to be missing, at least in the surface realization, one or more of the premises required by a valid inference pattern (Anderson et al., 1997). Therefore, it is interesting to know whether, if one child makes an explicit argument, the tendency to be explicit will spread across a group of children.

We examine two types of explicit argument. The first has the typical form, “I think [POSITION] because [REASON].” The following examples are from a discussion of *Ronald Morgan Goes to Bat* (Giff, 1990). Utterances without “I think [POSITION] because [REASON]” have been omitted:

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[Several lines omitted]

Bethany: Uh, wha-, what about if you were in the pond and, um, the ice was frozen and you had like heavy boots on, two pairs of jeans, two sweaters, and stuff. and two pairs of socks and everything. What abou-, and you couldn’t swim at all? And you had, a heavy, heavy coat on //

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Ramiro: I think he should, ’cause he, well I think he should and he shouldn’t. I think, he shouldn’t because he can’t, hit or anything. And I think he should ’cause he, um, he could be the like, mascot and stuff, and like, little mascot in the suit or somethin’.

Nadeen: I think he should because, um, because there’s some people that, like, what-, like what we said before, everybody’s different, and, um, he (can’t) be scared of the ball, but I think he should stay on the, on the team, I think the question let him stay because at least he’s trying.

Jerry: I think shouldn’t play because, I don’t think he was tryin’ because in, in the um, story, I think this is what I heard, they said, um, a kid said, um, “hit the ball before it goes past the plate.”
Although these are not models of clear communication, these arguments do contain a position, “I think he should (be allowed to play)” or “I think he shouldn’t (be allowed to play).” They do contain the logical connective “because.” And, they do incorporate reasons.

Table 12 contains the analysis of the 268 occurrences of “I think [POSITION] because [REASON]” that appeared in the 48 discussions. The probability values start high and drop, which is inconsistent with the snowball hypothesis. The lines-before values can be called weakly consistent with the hypothesis.

The second argument form we examined is based on, or resembles, the classic pattern of valid inference, modus tollens, which has the form (a) if a proposition \( p \) is true, then a second proposition \( q \) is true; (b) however, \( q \) is not true; (c) therefore, \( p \) is not true. An argument form that parallels modus tollens is seen in story discussions about whether a character should undertake a certain course of action. The arguer predicts a bad consequence if the character acts in a certain way and concludes, therefore, that the character should not act in this way. We examined children’s arguments that pivot on “If [ACTION], then [BAD CONSEQUENCE], so [NOT ACTION].” The following are all of the instances from a discussion of The Paper Bag Princess (Munsch, 1990):

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</table>

Mary Ann: I think it shouldn’t be allowed, because if he got to be king, who knows what he would do to the kingdom // …

Zeke: :::: I don’t think they should, I don’t think that they should get married, because, um, if, um, he got married, he would be king, when, um, her Dad died, or whoever’s Dad it was, so then he could like, order all the people in a whole village, or kingdom and everything, to just stay in the kitchen, and make him all this stuff, because, at the end he’s a big fat slob of a person, that she shouldn’t get married to, and he’s a bum! …

Cassy: I don’t think, uh, that they should get married. [voices taper off] I don’t think that they should get married, because if, um, they did, they don’t really make a good couple and she’d probably kick him out … the first hour. [kids talk] And, and he’d be banging on the door (???) …
Cassy: Ok, well, I do-, I still don’t think that they should get married, because if they did, they’d have to go live in his castle, and the dragon would probably come back and smash that, and then they just (???), and go back in the cave … .

Mary Ann: I also think that they should get married: because she saved his life, because if she hadn’t gone there he would have been eaten :: by the horrible (???) …

Zeke: [other voices taper off] I don’t think he should get married, because, um, if they got married, um, they wouldn’t be happy, so uh, I wouldn’t even get married in the first place.

Table 13 presents the quantitative analysis of the 82 occurrences of “If [ACTION], then [BAD CONSEQUENCE], so [NOT ACTION]” in the corpus of discussions. There were a rather large number of arguments containing this type of structure. This is surprising, because our previous research with collaborative reasoning has suggested that modus tollens is infrequent in children’s arguments, and that even less frequent is modus tollens with an explicit if–then premise (Anderson et al., 1997). The items in Table 13 trend toward being consistent with the snowball hypothesis.

Using Story Evidence

The 13th and final rhetorical move that we examine is using information from the story to bolster an argument (see Anderson et al., 1998). A typical form for this move is “In the story, it said [EVIDENCE].” The following are illustrations from a discussion of Amy’s Goose (Holmes, 1977):

Cassy: [lowers hand] Um, I think she should let him go, because that goose belongs in the wild, and in the story she said, come on, she said to the goose, I’m going to shut you up, you’re, not strong enough for flying, yet. But later on in the story, she says, it says that she thinks that, um, he goose really is strong enough, that he can go. She just doesn’t want to let him go, because she likes him … .

Mary Ann: But in the story it said that he was well enough to go and fly … .

<table>
<thead>
<tr>
<th>Measure</th>
<th>First</th>
<th>Second</th>
<th>Third</th>
<th>Fourth</th>
<th>Fifth</th>
</tr>
</thead>
<tbody>
<tr>
<td>P(E + 1</td>
<td>E)</td>
<td>0.63</td>
<td>0.60</td>
<td>0.50</td>
<td>0.89</td>
</tr>
<tr>
<td>Lines before</td>
<td>38</td>
<td>33</td>
<td>11</td>
<td>22</td>
<td>23</td>
</tr>
</tbody>
</table>
James: [lowers hand] ’Cause, it, um, the gander would probably die too, because, um, in the story it says, when they were flying away, all, when they were all far away, all of a sudden (alone) the goose (pulled) back and (sees) the gander, and it was like, and um, the gander had come back many times to the, um, barn uh, calling for his mate.

Table 14 contains the transition probability and lines-before figures covering the 188 instances of “In the story, it said [EVIDENCE].” With the exception of the third and fourth probability figures, these data are congruent with the snowball hypothesis.

To give an overall accounting, the foregoing analyses establish a prima facie case for the snowball hypothesis. Ignoring some variability, we judge that the items for 11 of the 13 argument stratagems are consistent with the hypothesis. Once a stratagem has occurred in a discussion, the likelihood that it will occur again jumps and remains high. There are fewer and fewer lines of discussion between successive uses of a stratagem. The one stratagem that is inconsistent with the hypothesis is “I think [POSITION] because [REASON].” Also not entirely consistent is “Hedge [PROPOSITION].” In this case, the lines-before measure drops sharply between occurrences, in accord with the hypothesis. However, the transition probability measure starts very high and then declines slightly, which according to the hypothesis, it should not.

Rivals to the Snowball Hypothesis

This section examines rivals to the snowball hypothesis and possible sources of bias in the analyses reported so far that seem to support the hypothesis. First, the lines-before measure prior to the first occurrence of a form may be inflated because of preliminary talk before a discussion really gets underway. A teacher may call children to attention, settle disputes over seating, and reiterate norms for collaborative reasoning discussions. Children may make suggestions or ask questions about procedure. Every discussion begins with a statement of the discussion question and a poll of the children about their positions on the question.

TABLE 14
Likelihood and Spacing of “In the story, it said [EVIDENCE]”

<table>
<thead>
<tr>
<th>Measure</th>
<th>First</th>
<th>Second</th>
<th>Third</th>
<th>Fourth</th>
<th>Fifth</th>
</tr>
</thead>
<tbody>
<tr>
<td>$P(E + 1</td>
<td>E)$</td>
<td>0.79</td>
<td>0.87</td>
<td>0.76</td>
<td>0.64</td>
</tr>
<tr>
<td>Lines before</td>
<td>47</td>
<td>33</td>
<td>19</td>
<td>19</td>
<td>14</td>
</tr>
</tbody>
</table>
Table 15 presents a summary of data in which the discussion introduction, defined as all of the lines of talk before the first student utterance addressing the discussion question, has been subtracted from the first lines-before value from each discussion. The \( P(E + 1|E) \) values are the means of the 13 argument stratagems. The lines-before values are the medians of the 13 stratagems. Every stratagem gets equal weight in this analysis, regardless of the number of occurrences.

The data presented in Table 15 are fully consistent with the snowball hypothesis. There are more lines of discussion before the first event than before the second and later events, even after the number of lines-before first event has been corrected to remove the discussion introduction. Aggregating the forms stabilizes and smooths the transition probability function, and especially the lines-before function, suggesting that the variability seen in the use of many of the individual stratagems is unsystematic and due to small numbers.

One rival to the snowball hypothesis says that the occurrence of rhetorical forms is random and independent. What determines the spacing between forms is the number of times a form happens to occur during a discussion. According to this rival, the behavior of the lines-before measures is an artifact that arises because event strings of different lengths have been pooled. For instance, if a form appears once, the expected lines-before value is midway through the discussion, whereas if a form appears six times in a discussion of the same length, the typical distance between appearances would have to be much smaller.

One way to evaluate the random effects model is to stratify the lines-before measure according to the length of the event string. This has been done in Table 16, which contains the lines-before data for all 13 stratagems. Each row in the table pools event chains of a given length and longer. For instance, the row labeled “3” combines all the instances in which there were three or more uses of any of the stratagems. The figures are weighted according to the number of uses of a given stratagem, meaning, for instance, that frequent stratagems such as “Hedge [PROPOSITION]” receive much more weight than infrequent stratagems such as “I am confused.”

Reading from top to bottom in Table 16, it can be seen that density does matter: The more times a form appears in a discussion the smaller the space between appearances. Nonetheless, reading from left to right, it can be seen that the snowball hy-

<table>
<thead>
<tr>
<th>Measure</th>
<th>First*</th>
<th>Second</th>
<th>Third</th>
<th>Fourth</th>
<th>Fifth</th>
</tr>
</thead>
<tbody>
<tr>
<td>( P(E + 1</td>
<td>E) )</td>
<td>0.50</td>
<td>0.82</td>
<td>0.75</td>
<td>0.75</td>
</tr>
<tr>
<td>Lines before</td>
<td>46</td>
<td>23</td>
<td>11</td>
<td>14</td>
<td>12</td>
</tr>
</tbody>
</table>

*Discussion introduction subtracted from the first lines-before value.
The frequency distribution of independent, random events is represented by the Poisson distribution. According to the snowball hypothesis, however, uses of argument stratagems are not independent; instead, it is supposed that a use of a stratagem increases the likelihood of later uses. For this reason, the snowball hypothesis predicts that uses of argument stratagems will fit the contagious Poisson distribution (Coleman, 1964), which is modeled with a parameter representing the extent to which prior events change the likelihood of subsequent events. The value of the contagion parameter was positive for each of the 13 argument stratagems, whereas the expected value is zero when later events are independent of earlier events.

Table 17 contains observed and expected frequencies, pooling over the 13 stratagems. As can be seen, the overall fit of the observed frequencies with the frequencies expected from the contagious Poisson distribution was good, \( \chi^2(33) = 9.78, p > .5 \), whereas the fit with the frequencies expected from the independent Poisson distribution was poor, \( \chi^2(34) = 2.91E + 16, p < .01 \).

Another plausible rival to the snowball hypothesis is that the appearance of argument stratagems is governed by appropriateness to the phase or stage of a discussion. Certain stratagems may be more felicitous early in a discussion. Other stratagems may be more appropriate at a later stage. Hence, it could be that stratagems such as “I think [POSITION] because [REASON]” and “If [ACTION], then [BAD CONSEQUENCE], so [NOT ACTION]” are most suitable for initial presentation of an argument, which may explain why the data for
these stratagems were only minimally consistent with the snowball hypothesis. On the other hand, a stratagem such as the “What if [SCENARIO]?” may be most appropriate later in a discussion, which could explain why the data for this stratagem appear to strongly confirm the snowball hypothesis. If the 13 stratagems are predominantly ones suitable later in a discussion, the data could be a pervasive bias in favor of the snowball hypothesis. The difficulty we have with the stage notion is that it is ad hoc and ill defined, and we do not know how to systematically evaluate it.

<table>
<thead>
<tr>
<th>Number</th>
<th>Observed Frequency</th>
<th>Contagious Poisson</th>
<th>Independent</th>
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<tbody>
<tr>
<td>0</td>
<td>311</td>
<td>263.6</td>
<td>46.5</td>
</tr>
<tr>
<td>1</td>
<td>55</td>
<td>101.3</td>
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<td>135.7</td>
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<td>4</td>
<td>19</td>
<td>32.0</td>
<td>88.1</td>
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<td>5</td>
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<td>2.4</td>
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<tr>
<td>9</td>
<td>7</td>
<td>9.4</td>
<td>0.7</td>
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<tr>
<td>10</td>
<td>11</td>
<td>7.6</td>
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<tr>
<td>11</td>
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<td>6.1</td>
<td>0.0</td>
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<tr>
<td>12</td>
<td>4</td>
<td>5.0</td>
<td>0.0</td>
</tr>
<tr>
<td>13</td>
<td>9</td>
<td>4.1</td>
<td>0.0</td>
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<td>3.3</td>
<td>0.0</td>
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<tr>
<td>15</td>
<td>4</td>
<td>2.7</td>
<td>0.0</td>
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<tr>
<td>16</td>
<td>3</td>
<td>2.2</td>
<td>0.0</td>
</tr>
<tr>
<td>17</td>
<td>3</td>
<td>1.9</td>
<td>0.0</td>
</tr>
<tr>
<td>18</td>
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<td>1.5</td>
<td>0.0</td>
</tr>
<tr>
<td>19</td>
<td>1</td>
<td>1.3</td>
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<td>20</td>
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<td>1.0</td>
<td>0.0</td>
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<tr>
<td>21</td>
<td>1</td>
<td>0.9</td>
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<td>22</td>
<td>0</td>
<td>0.7</td>
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<td>23</td>
<td>0</td>
<td>0.6</td>
<td>0.0</td>
</tr>
<tr>
<td>24</td>
<td>1</td>
<td>0.5</td>
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</tr>
<tr>
<td>25</td>
<td>0</td>
<td>0.4</td>
<td>0.0</td>
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<tr>
<td>26</td>
<td>0</td>
<td>0.3</td>
<td>0.0</td>
</tr>
<tr>
<td>27</td>
<td>1</td>
<td>0.3</td>
<td>0.0</td>
</tr>
<tr>
<td>28</td>
<td>0</td>
<td>0.2</td>
<td>0.0</td>
</tr>
<tr>
<td>29</td>
<td>1</td>
<td>0.2</td>
<td>0.0</td>
</tr>
<tr>
<td>$\chi^2$</td>
<td>9.78</td>
<td>2.91E + 16</td>
<td></td>
</tr>
</tbody>
</table>

TABLE 17
Observed and Expected Frequency of Argument Stratagems
Spread of Stratagems to Other Children

None of the foregoing analyses distinguish between repetitions of a stratagem by the same child and the spread of the stratagem to other children. It is not remarkable when a child who has used a stratagem once uses it again. Such a child demonstrably has the competence and the disposition to use the stratagem. What is more interesting is whether other children begin to use the stratagem.

Table 18 presents an analysis of the number of children in a discussion who use an argument stratagem. This is a pooled analysis involving all 13 stratagems. The data are stratified according to the number of instances of a given stratagem that occur during a discussion. Obviously, if there is just one instance of a stratagem, only one child could display it; if there are two instances, then as many as two children could display it; and so on. The table contains two measures of breadth of use of a stratagem, which behave somewhat differently depending on the size of the discussion group.

Table 18 reveals that there is a progressive increase in the number and percentage of children who use an argument stratagem in a discussion as a function of the number of instances of the stratagem. The results indicate that the repeated use of a stratagem is not attributable merely to persistent use by one or a few children. Instead, the data are consistent with the idea that the use of stratagems spreads from child to child.

An alternative explanation of the data in Table 18 is that popular stratagems, which perhaps are known by most children, tend to be used by many children in any particular discussion, whereas unpopular stratagems, perhaps known by only a few children, are used by smaller numbers of children. To evaluate this alternative, we ran a regression analysis predicting the number of different children in a discussion who use a given stratagem. Entered first was an index of stratagem popularity; namely, the total frequency of each stratagem across all discussions, $t(575) = 19.37, p < .01, R^2 = .395$. Entered next was the number of instances of a strata-

<table>
<thead>
<tr>
<th>Instances</th>
<th>Number of Children</th>
<th>Percentage of Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.0</td>
<td>14.1</td>
</tr>
<tr>
<td>2</td>
<td>1.8</td>
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<td>3</td>
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<td>31.6</td>
</tr>
<tr>
<td>4</td>
<td>2.7</td>
<td>34.0</td>
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<tr>
<td>5</td>
<td>3.4</td>
<td>45.5</td>
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<tr>
<td>6</td>
<td>3.8</td>
<td>47.1</td>
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<tr>
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<td>4.2</td>
<td>59.3</td>
</tr>
<tr>
<td>8+</td>
<td>5.2</td>
<td>67.4</td>
</tr>
</tbody>
</table>
gem in a given discussion, which still had a powerful influence on the number of children in the discussion group who used the stratagem, \( t(574) = 36.78, p < .01, R^2 = .425 \). Comparable results were obtained in a regression analysis predicting the percentage of children in a group who use a stratagem. Thus, the data on the number and percentage of children in a group using stratagems cannot be explained in terms of overall stratagem popularity. We conclude that the hypothesis that the use of stratagems spreads from child to child remains very attractive.

Cooccurrence of Related Forms

If children understand the meaning and functional significance of the argument stratagems they use, then, according to the snowball hypothesis, when a certain form occurs in a discussion, closely related forms should also become more frequent. Therefore, one way to test whether children understand the deep structure of a form is to calculate the conditional probability of a related form. For example, if “I disagree with [NAME]” is more likely in discussions in which “I agree with [NAME]” occurs, this suggests an ability to transform an underlying structure.

In fact, “I disagree with [NAME]” occurs one or more times in 48% (23) of the total discussions. However, “I disagree with [NAME]” occurs in 75% (21 out of 28) of the discussions in which “I agree with [NAME]” also occurs, but in only 10% (2 out of 20) in which “I agree with [NAME]” does not occur.

“Might not” occurred in 33% (16 out of 48) of the discussions. It occurred in 37% (15 out of 41) of discussions in which “might” also occurred, but in only 14% (1 out of 7), in which “might” did not occur.

The phrase “I’m not sure” occurred in 13% (6 out of 48) of the discussions. It occurred in 27% (3 out of 11) of the discussions in which the related phrase “I am confused” occurred, but in only 8% (3 out of 37) of the cases in which “I am confused” did not occur.

The unusual form “I got a challenge for you, [NAME]” occurred only twice. Both occurrences were during the one discussion in which the structurally and semantically related form “I got something for you, [NAME]” also occurred.

An invitation to speak expressed as “Do you have anything to say, [NAME]?” appeared in just three discussions. In all three, an invitation to speak expressed as “What do you think, [NAME]?” also appeared.

Compared, finally, was the likelihood of “probably” as a function of whether or not “maybe” occurred in the same discussion. “Probably” occurred in 88% (42 out of 48) of the discussions. When “maybe” also occurred, the likelihood of “probably” was 93% (39 out of 42). When “maybe” did not occur, the likelihood of “probably” was 50% (3 out of 6).

Overall, these results provide strong confirmation that students were picking up deep structures rather than parroting surface forms.
Conditions and Consequences of Stratagem Use

An aspect of our theory of the social propagation of argument stratagems is that children generally will learn to use a stratagem under appropriate circumstances to achieve certain commonly understood purposes. In this section, we evaluate whether this aspect of the theory is tenable. Many of the stratagems have conditions and consequences that are not transparent. Therefore, the evaluation is limited to three stratagems that do have at least some straightforward and observable conditions and effects.

Conditions for the well-socialized use of “What do you think, [NAME]?” include that the nominated classmate (a) has not spoken recently or (b) has tried to speak but has not been able to get or hold the floor. Of the 44 occurrences of “What do you think, [NAME]?” the addressee could not be determined in 3 cases. Among the remaining 41 occurrences, in 33 cases the nominated classmate had not spoken within the previous 15 lines of discussion, whereas in 6 cases, the nominated classmate had uttered a sentence fragment (marking a failed attempt to take the floor) within the previous 15 lines of discussion. In the remaining 2 cases, the nominated classmate held the floor for a full turn within the previous 15 lines. Overall, 95% of the uses of the stratagem can be considered to have been employed under appropriate conditions.

The ostensible purpose for a normal, good faith use of “What do you think, [NAME]?” is to get the nominated classmate to say what he or she thinks. In 61% (25 out of 41) of the cases in which the nominated child could be determined, the nominated child did, in fact, speak—usually immediately after the invitation to speak had been issued and usually holding the floor for a full turn. This is impressive because “What do you think, [NAME]?” is usually addressed to children who do not have much to say. In 2 out of the 16 cases in which the nominated child did not speak, the children indicated they did not wish to speak. The remaining 14 cases in which the nominated child did not speak within 15 lines all occurred in one discussion group. Without these cases (illustrated in the following) that involved taunting rather than genuine invitations to speak, the percentage of instances in which “What do you think, [NAME]?” got normal results rose to 93%:

Someone: :: Seth, what do you think, Seth?
James: Yeah, what do you think, Seth?
Zeke: What do you think, Seth?
Mark: What do you think, Seth? [Kids all talk at once, calling out Seth! Seth! Talk! Talk!]

Conditions for a normal use of “Let [NAME] talk!” resemble the conditions for the use of “What do you think, [NAME]?” except that one would expect more cases in which the nominated child wants to speak but has not been able to get the
floor. Among the 18 instances of this stratagem, in 7 instances, the nominated child had not spoken within the previous 15 lines of discussion; in 8 instances, the nominated child had uttered a sentence fragment revealing a failed attempt to get the floor; and in 3 instances, the nominated child had spoken within 15 lines. Altogether, in 83% (15 out of 18) of the instances, normal conditions of use were satisfied. As anticipated, preceding sentence fragments, indicating a wish to speak, were more frequent with “Let [NAME] talk!” (44%) than with “What do you think, [NAME]?” (15%).

The usual purpose for “Let [NAME] talk!” is to gain the floor for the nominated child. In 61% (11) of the cases, the nominated child did get the floor and completed a full turn, typically immediately after being nominated. Among the 7 cases in which the nominated child did not get the floor, in 1 case the child who said “Let [NAME] talk!” ceded the floor to another child who began to talk. A second case involved one of the two boys who had been pestered with faux invitations to speak. In the third case, the teacher intervened and changed the subject. If these 3 cases are discounted, the percentage of cases in which the normal purpose of “Let [NAME] talk!” was realized rose to 73%.

Somewhat more complicated is “Places classmate in [SCENARIO].” Typically, this form is employed to challenge another child, for example, “If you were Ronald, wouldn’t you want to have a chance to play?” When used in this way, the position expressed should contrast with the position expressed by the immediately preceding speaker or, if not the immediately preceding speaker, a child identified by name who has spoken earlier. A challenge that takes the form “Places classmate in [SCENARIO]” has the ostensible purpose of causing the classmate to reconsider his or her position. A rhetorical move of this form would seem to put the classmate under a compulsion to respond, either agreeing or rebutting the challenge. It is to be expected that the response would usually be delivered immediately.

Of the 51 instances of “Places classmate in [SCENARIO],” 38 involved challenging and permitted an unambiguous analysis. As anticipated, in 95% (36 out of 38) of the instances, the targeted child did respond to the challenge. The teacher intervened and changed the subject in the only 2 instances in which the child did not respond.

Only 6 uses of “Places classmate in [SCENARIO]” identified the targeted child by name. The remainder used “you,” which, contrary to expectation, frequently did not refer to the immediately preceding speaker. Also contrary to expectation, the targeted child responded immediately in only 42% (16 out of 38) of the cases. Both failed expectations can be traced to the fact that often the scenario was elaborated by other children before the targeted child got an opportunity to respond. Those amplifying the initial challenge continued to say “you,” and the amplifications took discussion space, preventing the targeted child from responding immediately.

These points are illustrated in the following episode from a discussion of The Paper Bag Princess (Munsch, 1990) in which two girls, Kelley and Edith, are try-
ing to persuade a third girl, Jasmine, that the Princess should not marry the Prince because he was mean and ungrateful. Over the course of the discussion, an elaborate analogy has been developed comparing the Princess and Prince with “you” and a little lost boy who refuses help because “you” are wet and dirty due to circumstances beyond “your” control. In the third utterance, Kelley reinstates the analogy and then Edith adds an elaboration before Jasmine gets a chance to respond. Near the end of the episode, Kelley again issues a “Places classmate in [SCENARIO].” This time the teacher breaks in before Jasmine can respond and directs a different question to Edith.

Jasmine: Well I wouldn’t have to have dirty clothes just because I would be out in the rain
Lamar: Or maybe he//
Kelley: //[/ Kelley puts her hand on her head looking desperate] What if you were going to that really fancy restaurant and you had a raincoat on someone grabbed your raincoat and you were wearing really nice clothes and they got all wet and gross and a car splashed you with mud in a mud paddle
Edith: and then you had to help the little boy cross the street
Jasmine: Had to?
Edith: You wanted to
Kelley: :So you can help him
Jasmine: :But if he didn’t want my advise I will just go home
Edith: Maybe he didn’t want yo’ help because you were//
Teacher: //Adam//
Edith: //Yuh muddy and yuk
Kelley: Your hair was a mess because of the rain. How that make you feel?
Jasmine: Uhm/
Teacher: //Edith, do you think that the prince meant what he said?

The foregoing exchange illustrates an interesting point about participation structure. Children like Kelley and Edith coconstructing an argument seem to us to acquire equal and comingled speaking rights. They are able to overlap each other’s contributions and finish one another’s thoughts without being seen as interrupting.

In sum, conditions for the good faith use of stratagems generally were satisfied. Normal purposes for stratagems usually were achieved. Most deviations from expectation are readily understandable with the benefit of hindsight.

Forms Targeted at Individual Children

A corollary of the snowball hypothesis is that children have an increased likelihood of picking up rhetorical forms directed to them personally. Just about any form may
be directed to one or a few individual children, rather than being broadcast to the entire group, but to make the analysis clear-cut, we decided to investigate three forms that are usually directed to individuals.

For “What do you think, [NAME]?” and “I agree (or disagree) with [NAME],” the method of analysis was to classify instances of use during a discussion according to whether the child to whom the form was directed had previously been targeted with the form or not. Pooling over all discussions, the probability that a targeted child would subsequently use a form was the number of targeted children who displayed the form divided by the total number of children targeted. The probability that a nontargeted child would subsequently use a form was the number of nontargeted children who displayed the form divided by the total number of children never targeted. The probability that a repeating child would subsequently display a form was the number of children who display the form two or more times divided by the total number of children who display the form at least once.

Table 19 shows that targeted children were less likely than children not targeted to use “What do you think, [NAME]?” and “I agree (or disagree) with [NAME].” One reason for this nonconfirming result is that there is a bias in the measure. There is generally less space in a discussion for targeted children to display a form. Consider that a child targeted late in a discussion has little opportunity remaining to use a form, whereas a nontargeted child has had the whole discussion. To date, we have not succeeded in inventing a workable measure that removes the bias.

A pairwise measure was used with “But [COUNTERARGUMENT].” The method was to classify the second “but” in each consecutive pair of preposed “but”s in a discussion according to whether it was displayed by the child who initiated the first “but” in the pair, the child to whom the first “but” was targeted, or a different child. Table 19 shows that the targeted child was far more likely to be the next one to use “but” than any given nontargeted child. In fact, the targeted child was somewhat more likely to be the next to use “but” than the child who had most recently used the stratagem. The apparent strong support for the hypothesis in this case may not generalize to other argument stratagems. A child who has been addressed with “But [COUNTERARGUMENT]” probably gains speaking rights, increasing his or her opportunity to be the next to use the stratagem.

<table>
<thead>
<tr>
<th>Argument Stratagem</th>
<th>Repeating Child</th>
<th>Target Child</th>
<th>Nontarget Child</th>
</tr>
</thead>
<tbody>
<tr>
<td>“What do you think, [NAME]?”</td>
<td>0.30</td>
<td>0.13</td>
<td>0.15</td>
</tr>
<tr>
<td>“I agree/disagree with [NAME]”</td>
<td>0.40</td>
<td>0.38</td>
<td>0.53</td>
</tr>
<tr>
<td>“But [COUNTERARGUMENT]”</td>
<td>0.30</td>
<td>0.33</td>
<td>0.06</td>
</tr>
</tbody>
</table>
In sum, our attempts to evaluate the idea that children might be more likely to pick up stratagems directed at them personally yielded inconsistent results.

Influence of Norms for Participation on Use of Argument Stratagems

Our theory is that children are more susceptible, or permeable, to social influence during open rather than teacher-controlled discussions. During discussions with an open-participation format, there were, on average, 40 occurrences of the various argument stratagems. During discussions with a teacher-controlled participation format there were, on average, 31 occurrences. Children were much more likely to use the forms “What do you think, [NAME]?” and “Let [NAME] talk!” during open discussions. The greater prevalence of these forms during open discussions is only to be expected: The teacher relinquished the role of discussion moderator, which the children then assumed.

Less obvious is the finding that children were twice as likely to use “But [COUNTERARGUMENT]” during open rather than teacher-controlled discussions. This form is appropriate when a child is able to take the floor immediately after the classmate with whom he or she disagrees, which may be easier in an open discussion. The child who disagrees with a classmate in a controlled discussion may not be called on by the teacher right away. When the child does take the floor after an interval, a preposed “but” is no longer appropriate for expressing disagreement. Instead, a form such as “I disagree with [NAME]” should be used. Therefore, if the likelihood of disagreement in open and controlled discussions is the same, but there is simply a lower likelihood of getting the floor immediately during a controlled discussion, one might expect “I disagree with [NAME]” to be used more often in controlled discussions. In fact, however, “I disagree with [NAME]” was slightly more likely to be used in open rather than teacher-controlled discussions.

Alternatively, if a child in a controlled discussion wishes to express disagreement with a classmate and gains the floor after an interval, he or she might first name the classmate and reinstate the point and then introduce a rejoinder with “but,” as in, “Janelle, a little while ago you said … but I think …” In fact, “buts” in internal positions within utterances were twice as likely in open than in controlled discussions. Therefore, the conclusion that emerges is that issues are far more likely to be publicly contested in open discussions than in teacher-controlled discussions.

Consistent with the foregoing conclusion is the additional fact that children were twice as likely to use “In the story, it says [EVIDENCE]” in open rather than controlled discussions. This form is almost always used to rebut challenges. The rare form “I got something for [NAME],” which is used to challenge another’s argument, occurred in only one discussion (an open discussion). Also, somewhat more frequent in open discussions was “If [ACTION], then [BAD CONSEQUENCE], so [NOT ACTION],” which is often, but not always, used in counterarguments. On the
other hand, “I think [POSITION] because [REASON],” which is seldom used in counterarguments, was slightly more likely during teacher-controlled discussions. Again, it seems that children were more concerned with addressing the arguments of others during open discussions, but perhaps more concerned with expressing their own positions during teacher-controlled discussions.

A direct measure of permeability to social influence is afforded by the contagion parameter in the contagious Poisson distribution (Coleman, 1964). “Let [NAME] talk!” and “I got something for [NAME]” did not occur during any teacher-controlled discussions. Of the remaining 11 argument stratagems, in 8 instances parameter values were higher for open than for controlled discussions. The average value of the contagion parameter was 1.38 for open discussions and 1.15 for controlled discussions. Hence, the results seem to support the conclusion that an early occurrence of a stratagem has a greater influence on the likelihood of later occurrences during open rather than teacher-controlled discussions.

We had supposed that children would be more likely to internalize and persistently use stratagems during open discussions than during discussions in which teachers controlled participation. One test of this conjecture is to examine the likelihood of a group of children using an argument stratagem, given that the stratagem was used at least once by the same group in a discussion of another story a few days earlier. Pooling over the 13 stratagems, the likelihood of continued use of a stratagem from one open discussion to the next open discussion was .80, whereas the likelihood of continued use from one teacher-controlled discussion to the next was .73. For comparison, the likelihood that a stratagem would be used in the second of two open discussions or the second of two teacher-controlled discussions, given that it had not been used in the preceding discussion, was .25 in each case. We may conclude that the data modestly favor the conjecture.

In sum, children used more forms for turn management and more forms suitable for contesting the arguments of others during open rather than teacher-controlled discussions. Early occurrences of an argument stratagem had a greater influence on the likelihood of later occurrences during open rather than teacher-controlled discussions. Children were slightly more likely to persist in using a stratagem from one open discussion to the next open discussion than they were from one teacher-controlled discussion to the next.

Spread of Argument Stratagems From Group to Group

Up to this point, we have focused on the snowballing of argument stratagems within discussion groups. In this section, we take up the question of whether there is diffusion of stratagems between groups in the same classrooms. We look at the possible influence of the nominal ability level of the discussion group and the order in which groups discuss the same story on a given school day.
Research on diffusion of scientific and technological innovations establishes that early adopters are resourceful and competent people who subscribe to a progressive ideology (Strang & Soule, 1998). Even riots have a “natural leadership” composed of the better educated, more resourceful, and more committed people from among the crowd (Bohstedt, 1994). If a classroom has a natural leadership, one would suppose that it is normally comprised of the children whom the teacher has assigned to the high group. Therefore, it is a credible hypothesis that, as a matter of predominant direction of influence, rhetorical innovations originating in the high group diffuse to the other groups within a classroom.

To evaluate this hypothesis, we calculated the likelihood that a stratagem would appear at least once in the average or low group in a classroom on the day a certain story was discussed given that the stratagem appeared one or more times in the high group. The analysis involved 10 of the 13 stratagems. “But [COUNTERARGUMENT]” and “Hedge [PROPOSITION]” were not included in the analysis because these stratagems appeared in almost every discussion. The form “I got something for [NAME]” was not included because it appeared in only one discussion. Pooling over the 10 remaining stratagems, the unconditional probability of a form appearing in the high, middle, and low discussion groups was .49, .42, and .33, respectively. The high group differed from the middle group and, particularly, the low group mainly in the use of the argument forms “I think [POSITION] because [REASON]” and “If [ACTION], then [BAD CONSEQUENCE], so [NOT ACTION].”

The average likelihood that a stratagem would appear in the discussion of the low or middle group, given that it appeared in the discussion of the high group the same day, was .52, whereas the average likelihood that the stratagem would appear in the low or middle group, given that it did not appear in the high group, was .23. On the surface, these results seem consistent with the high-group leadership hypothesis. However, the conditional likelihood of a stratagem appearing in a certain discussion group was much higher if it appeared in any of the other groups in the classroom. For instance, the likelihood that a stratagem would appear in the high group, given that it appeared in the low group, was .63. Therefore, although the analysis establishes that there are social influences circulating in classrooms, the hypothesis that the predominant direction of influence is from the high group to other groups is not supported.

Another reasonable hypothesis is that prior discussions influence later discussions on the same day, especially because in this study, contrary to typical practice, all of the groups read and discussed the same story on the same day. We have noticed children listening to the discussions of other groups. We think we have seen rhetorical innovations in early discussions picked up and used by participants in discussions that follow on the same day. This study permits a systematic evaluation of the order hypothesis because the order in which groups discussed a story varied, making order roughly orthogonal to other factors, such as the nominal ability level of the group.
Pooling over the 10 argument stratagems considered in this section, the average probability of a form appearing at least once in the first, second, and third discussion in a classroom on a certain day was .44, .46, and .34, respectively. The low figure for the third discussion is surprising and on its face inconsistent with the notion that rhetorical innovations are accumulating and being passed from group to group. Perhaps the children were tired and hungry by the time of the third discussion, which was usually late in the morning, or maybe the third discussion sometimes had to be cut off early to get the children to lunch on time. The later possibility can be ruled out, because the third discussion was as long, on average, as the first and second.

The average likelihood of an argument stratagem appearing in the second discussion in a classroom, given that it had appeared in the first discussion of the day in that room, was .65. A suitable benchmark is the likelihood of a form appearing in the first discussion, given that it appeared in the second, which was .62, or almost as high. Of course, the second discussion cannot have a causal influence on the first, so the fact that the conditional probability was almost as high indicates that factors other than order were responsible for the high values. Similar results were obtained comparing the first and third and second and third discussions. This analysis indicates, again, that there are social influences in classrooms that have a pervasive influence on the rhetorical forms that children employ but does not support the specific idea that there is an immediate influence of a prior discussion on later discussions the same day.

The upshot of the analyses described in this section is that the uses of argument stratagems tend to cooccur in the various discussions group within a classroom. If one group uses a stratagem, then other groups within the room probably will as well. A classroom contains a dense web of social relationships that could influence the uptake and maintenance of stratagems. However, a couple of specific conjectures about the source and direction of influence could not be confirmed. It will remain for subsequent research to try to answer such intriguing questions as the following: Are some children innovators who lead in the introduction of new stratagems? Do children vary in their disposition to follow the example of others? Are the examples provided by popular children or personal friends more likely to be emulated (see Azmitia & Perlmutter, 1989, pp. 119–120)?

Teachers and the Larger Social System

This article foregrounds child-to-child influences on the diffusion of argument stratagems. Undoubtedly, teachers play an important role as well in introducing, ratifying, and sustaining the use of certain stratagems (see Gavelek & Raphael, 1996). A detailed analysis of teacher influences would have to be as intricate as the analysis of child-to-child influences and is beyond the scope of this article. However, we describe one case to illustrate teacher influence and to make the point that teachers and students are actors in a larger social system.
Earlier, we identified Tyrone saying, “What do you think, Jalisha?” as the proximate cause of Jalisha’s prompt response, “What do you think, Tyrone?” and her later queries directed to other children. The full story of why Jalisha began asking others what they think begins considerably earlier. Tyrone’s and Jalisha’s questions were just 2 out of 45 instances of “What do you think, [NAME]?” in this corpus of 48 discussions. In contrast, there were no instances of the form in an earlier corpus involving 20 collaborative reasoning discussions and 20 story recitations (cf. Anderson et al., 1998).

The first time we saw “What do you think, [NAME]?” was in a discussion led by a teacher whom we have given the pseudonym, Shirley Rogers (Nguyen-Jahiel et al., in press). She eventually became an outstanding collaborative reasoning teacher, but collaborative reasoning was difficult for her and her students at first. Mrs. Rogers was a directive teacher who had a powerful presence in her classroom and commanded extraordinary respect from her students. The entrenched roles in her room based on traditional notions of teacher as the giver of knowledge and students as receivers made it difficult, at first, for Mrs. Rogers to relinquish the mantel of authority and for her students to assume responsibility for their own thinking.

During the first several collaborative reasoning discussions, Mrs. Rogers wrote the reasons students gave for their positions on the chalkboard (see Nguyen-Jahiel et al., in press). While she was writing, the children would sit quietly waiting for her to finish, instead of going on with the discussion. Several times she urged the children to continue talking. One day, as the children finally began tentative, whispered conversations, Mrs. Rogers turned from the board to overhear a child ask another child what she thought. Mrs. Rogers exclaimed that asking others what they thought was exactly what she wanted them to do. This turned out to be a pivotal moment. Subsequently, “What do you think, [NAME]?” and “Why do you think [POSITION]?” became common forms in Mrs. Rogers’s room.

The members of the research team were charmed by these new-found discussion skills. A videotape of a discussion from Mrs. Rogers’s classroom that featured several skillful uses of “What do you think, [NAME]?” was incorporated into subsequent workshops to introduce teachers to collaborative reasoning. Therefore, the complete story of why Jalisha said, “What do you think, Tyrone?” begins in another classroom in a different school a few years earlier. A rhetorical innovation by a child is ratified by her teacher; university personnel pick up, endorse, and transmit the innovation to other teachers who, in turn, transmit it to children in their classrooms; the children then propagate it among one another.

SUMMARY AND CONCLUSIONS

Overall, this study strongly confirms the snowball hypothesis: Once an argument stratagem emerges in a discussion, it tends to spread to other children and occur with increasing frequency. The hypothesis holds true for stratagems serving vari-
ous rhetorical functions: managing the participation of classmates, positioning in relation to a classmate’s argument, acknowledging uncertainty, extending and personalizing the story world, making arguments explicit, and bolstering arguments with evidence. Snowballing is found for both frequent and infrequent stratagems. It is found in different classrooms, among discussion groups of varying ability. It is evident on two different measures: After the first appearance of a stratagem, the probability that it will appear again usually rises and remains high; in most cases, there are fewer and fewer lines of discussion between successive appearances of a stratagem. In short, the findings make the case—one we believe is compelling—that social propagation could be a fundamental process in children’s development of language and thought.

Several rivals to the snowball hypothesis were considered. A rival hypothesis that assumes that occurrences of stratagems are independent, random events gives an inadequate account of the data. Another rival to the snowball hypothesis is that the likelihood of argument stratagems is governed by their appropriateness to the phase or stage of a discussion. This rival is ill-defined and could not be systematically evaluated.

As anticipated, children generally seem to understand the meaning, function, and conditions of use of argument stratagems that they pick up during discussions. One kind of evidence for understanding is the cooccurrence of forms related in meaning or deep structure, such as “I agree–I disagree,” “might–probably,” and “I am confused–I am not sure.” Another kind of evidence is that children almost always use stratagems in appropriate circumstances to achieve commonly understood purposes. For instance, “What do you think, [NAME]?” was almost always addressed to children who had not spoken recently or who had tried to speak but had been unable to get the floor. The children addressed with “What do you think, [NAME]?” usually took the floor or at least acknowledged the question.

We expected children to be more permeable to social influence during open discussions than during discussions in which teachers controlled participation. Results were consistent with this hypothesis. Early occurrences of argument stratagem had a greater influence on the likelihood of later occurrences during open rather than teacher-controlled discussions. We also expected children would be more likely to internalize and persistently use stratagems during open rather than teacher-controlled discussions. Results weakly favored this hypothesis. The likelihood of continued use of a stratagem from one open discussion to the next open discussion a few days later was slightly higher than the likelihood of continued use of a stratagem from one teacher-controlled discussion to the next.

According to a corollary of the snowball hypothesis, children are more likely to appropriate argument stratagems directed to them personally. This hypothesis proved difficult to evaluate, and results were inconsistent.

The terms appropriation and internalization have been used interchangeably throughout this article. Of the two terms, appropriation, as conceptualized by
Rogoff (1995), more gracefully accommodates our findings. An implication of the concept of appropriation is that, to some extent at least, the argument stratagems that a group of children are able to use are the possessions of the group rather than the possessions of individuals. The stratagems embody ways they have of talking and thinking with one another.

However, we are not opposed to the concept of internalization within the minds and hearts of individuals, and, unlike Rogoff (1995), we are not trying to replace internalization with appropriation. It is just that a definitive showing of internalization is beyond the reach of the methods of this study. For that showing, individual assessment and a baseline or controls would be required. We have demonstrated internalization of aspects of argumentation in another study. Reznitskaya et al. (in press) showed that, as compared to children from matched control classrooms, children from classrooms that participated in collaborative reasoning discussions wrote persuasive essays that contained significantly greater total numbers of satisfactory arguments, counterarguments, rebuttals, formal argument devices, and uses of textual information as evidence.

Argument stratagems, as defined in this article, comprise just one level of analysis of argumentation. We are gratified that this has proved to be a tractable level for an empirical demonstration of social influences. Nevertheless, there is every reason to suppose that there are social influences at other levels of argumentation as well. These levels probably range from “mutualities” in physical and emotional expression (Wallbrot, 1995), to strategies for constructing and evaluating extended arguments (Chinn & Anderson, 1998), to emergent understandings of the purposes of argumentation.

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