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ABSTRACT

A study analyzed the number and types of contributions that girls and boys made to a science discussion in a sixth-grade class. A 48-minute, student-centered cross-discussion was videotaped and analyzed. The exceptionally long discussion and the complexity of the topic (involving moving shadows and frames of reference) make the lesson a rich source of information. Results indicated that girls in the class contributed far less than would be equitable given their representation in the class's population, but that boys and girls spent roughly the same percentage of turns they did take in giving explanations. Far more of the girls' remaining turns, however, were concerned with such interactional issues as allocating turns, while boys' remaining turns were more frequently concerned with seeking or conferring status. Findings suggest that valuing the type of interactional work usually done by girls, and helping boys overcome their focus on status would create an environment more conducive to science learning for both genders. (Two tables of data and five footnotes are included. Contains 30 references.) (Author/RS)

"The boys all scramble through": Some gender issues in sense-making conversations[1]

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Abstract

In this paper I analyze the number and types of contributions that girls and boys made to a science discussion in a sixth-grade class. I find that girls in this class contributed far less than would be equitable given their representation in the class's population, but that boys and girls spent roughly the same percentage of the turns they did take in giving explanations. Far more of the girls' remaining turns however were concerned with such interactional issues as allocating turns while boys' remaining turns were more frequently concerned with seeking or conferring status. I suggest that valuing the type of interactional work usually done by girls, and helping boys overcome their focus on status would create an environment more conducive to science learning for both genders.

Introduction: the importance of conversations for learning

Studies in various curriculum areas endorse cooperative conversations as important means for learning (for examples see Palinscar, 1986; Forman & Cazden, 1985; Palinscar & Brown, 1989). The central argument for the value of participating in conversations is that it allows sharing of the cognitive load (Palinscar and Brown, 1989). Extending Vygotsky's notion of teaching as the relationship between one adult and one child to include the notion of learning from a peer group (see Forman & Cazden, 1985; Brown & Palinscar, 1989; Tudge, 1990; Newman, Morrison & Crowder, in press; Newman, Crowder & Théberge, 1992), conversations are seen as the mechanism by which the interpersonal becomes intrapsychological. Based on their examination of a number of sixth grade lessons concerned with seasonal change, Newman, Crowder, & Morrison (forthcoming) claim that "cooperative conversation is an important condition for the development of scientific theorizing in the classroom."

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Simple participation is not enough. Whereas giving explanations to others and to oneself correlates positively with many measures of individual achievement and problem-solving success (Webb, 1989; Chi, de Leeuw, Chiu, & LaVancher, 1992; Chi, Bassok, Lewis, Reimann & Glaser, 1989; Pirolli & Bielaczyc, 1989; Brown & Palinscar, 1989; Ferguson-Hessler & de Jong, 1990; Russell & Kelley, 1991; Dole, Valencia, Greer & Wardrop, 1991), receiving explanations has few significant positive effects on achievement (Webb, 1989). If active participation during a science class is more conducive to learning science than simply listening: Who gets to participate? What is the nature of that participation? More specifically: to what extent do boys and girls have the same opportunity to give explanations and to engage in the cooperative conversations that are presumed to foster the development of scientific theorizing?

Gender Differences and Science

A serious imbalance in the participation of girls and boys during the particular lesson analyzed in this paper was readily apparent to independent observers (Cazden, Lemke, personal communications, April, 1993). Given the serious imbalance in science educational opportunites for girls and boys documented in the literature, this is not surprising. Numerous studies of science achievement have reported gender differences where, to varying degrees, boys do better in science than girls (see Fleming & Malone, 1983; Steinkamp & Maehr, 1983; Becker & Chang, 1986; Kulik & Kulik, 1989; Lynn & Hyde, 1989). The National Assessment of Educational Progress (Mullis & Jenkins, 1988) reported that gender differences in science achievment were largest for seventeen-year-olds, a situation which has not changed since 1978. Grandy (1987), for example, reported that elementary boys and girls are equally interested in science and mathematics, but by the end of high school twice as many boys as girls are interested in these fields. According to the *AAUW REPORT: How Schools Shortchange Girls* (Wellesley College Center for Research on Women, 1992) science and math curricula often ignore or stereotype females, teachers pay less attention to girls than to boys, and teachers are more likely to ignore black girls even when they make a greater effort than white classmates to catch the teacher's attention. In short, formal schooling in the United States effectively turns girls away from science.

Although some writers have related these findings to biological differences (see Hacker, 1992), most researchers agree that differences in science achievment and career choice are the result of cultural and social factors. In fact, it seems likely that girls' difficulties in math and science are less real than perceived—by their teachers (Jungwirth, 1991; Becker, 1976, cited in Walkerdine, 1989:10), their peers (Madhok, 1992), by standardized tests (Wellesley College Center for Research on Women, 1992), and on occasion by girls themselves (Parsons et al., 1976, also see Bar-Tai, 1978 and Madhok, 1992).

Cultural and social factors and perceptions do not simply exist somewhere "out there," established once and for all. Our everyday interactions reflect and—in reflecting—reproduce these factors. Less often, we use our everyday interactions to resist these cultural factors and perceptions. Focusing on everyday classroom interactions, this paper constitutes an effort to uncover how they reflect or create the cultural phenomena that hold girls in some sense less "scientific."

The Data

The data reported in this paper are derived from my analysis of one lesson, captured on videotape. Our research group has dubbed this the "relativity tape" because a great deal of the talk in this lesson depends on frames of reference. The unusually long student-centered cross-discussion (see Cazden, 1988, Lemke, 1990), together with the complexity of the topic, makes the lesson an exceptionally rich source of information.

A few days earlier one student had represented a shadow as moving all the way around a person throughout the course of the day. During this particular lesson students were trying to decide whether and where such a thing could happen. The first attempt to say where depended on a geocentric point of view. At the North Pole it could look like your shadow was going all around you. Another student soon disagreed because the shadow was always opposite the sun. Some students remained on one side or the other of this debate. Students generated data to prove their points with a stick, a globe, and the light of an overhead projector. A few students realized that what one saw depended on one's point of view and tried to explain this to their classmates. Towards the end of the tape two students got into an even subtler discussion of how and where a shadow might change planes. At the very end a student tried to synthesize the different arguments that have been made, and the teacher then recommended that everyone think more about this problem.

The tape stands as a good example of a sense-making conversation,[2] where students address one another, spontaneously offer to speak, refer to previous comments, take up old arguments, ask questions, answer each other's questions, and evaluate the quality of each other's arguments.

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[2] As set forth in Newman, Crowder & Morrison (forthcoming) and Morrison, Newman, Crowder & Théberge (1993), a sense-making conversation is an idealized, culturally-defined way of organizing talk. As in ordinary conversation, participants tacitly agree to cooperate, to maintain relevance (Grice, 1975), and to take turns (Sacks, Schegloff, & Jefferson, 1974). What distinguishes a sensemaking conversation is that the participants appear to be engaged in a collaborative task whose purpose is to construct a mutually acceptable explanation of a situation by coordinating, as separate constructs, theory and data. Additional tacit agreements are necessary to support this goal, especially that all explanations are tentative, inherently open to challenge, and accountable to, and only to, the available evidence.

Data Analysis

Forty-eight minutes twenty-seven seconds of a science lesson were transcribed in turns, from the point where the teacher introduces a question that arose from a student's representation of a shadow's movement through the day until the point where the teacher and a student summarize what has been said and the teacher initiates another activity.

Because of the importance of student-generated explanations (cited in the literature), I coded turns that functioned as explanations or partial explanations. Additionally, because of my concern with access to the conversation, I coded turns that functioned (1) to allocate turns, (2) to indicate a person's value and worth to the group, and thereby as a contributor to the conversation, and (3) to show or elicit attentive listening, all under a category idealistically named "social equity." I also coded for a category called facilitation, which helped me look at who gave and received various kinds of help or support in making their points.

Naturally turns can contain several utterances, all of which might have different functions. Moreover, a carefully constructed utterance can perform more than one function. Thus there is not a one-to-one correspondence between codes and turns. Relationships between the codes do exist and these are pointed out in the descriptions of the three coding schemes.

Giving explanations

Turns in which students gave explanations. Explanation was considered broadly to include any attempt by students to answer questions, to make logical connections, to generate theories, or to provide evidence. The actual types of explanations given by students during this particular lesson are irrelevant to the question of this paper. Working from the claim that giving explanations is valuable in itself, it is more interesting to see how many of whose turns served as explanations, regardless of the specific nature of those explanations.

Social equity

By social equity, I refer to conversational moves affecting turn allocation, participants' face, and the negotiation of attentive listening. These kinds of moves ration the time available for turns in granting or disallowing the right to speak, say that a contributor is or is not worthy of esteem, or show that a contribution merits careful attention.

Allocating Turns Coding for turn allocation included moves where speakers protected, provided and termintated turns. Instances where speakers verbally protect turns at talk include such occasions as when the teaching assistant protected Emmeline's turn, by saying "let her get through her idea." Rick has mastered what is arguably another kind of turn protection (I have coded it as such): the turn that consists entirely of placeholders or what might be seen in

other contexts as hesitations. It's like he is just saying something, anything, to keep the floor until he manages to put out some substantial, meaningful words.

I have also coded instances where speakers provide turns. These include situations that Lemke (1990) would call "nominations," or simply calling on someone else to talk.

In the following exchange Kevin ostensibly tries to account for a frame-of-reference problem that arose in the discussion of whether a shadow could go all the way around a person during the course of a day. After five intervening turns by other speakers, he cedes the floor, giving up his own turn, and calls on Lumina, providing a turn for her. Incidentally, this is the only time during the entire lesson that a boy calls on a girl.

Kevin:	Yes, that - that would appear to those little puny earthlings out there [Aaron pats Kevin on the back three times then steps away from the globe with his hands in his pockets] - um - right on the North Pole - see - um - let' s say you were looking this way [gestures southeast, relative to the globe] - let' s see the sun is shining on you and the earth is moving around you - you're moving with it but not as much as it xxx - but - um - it would appear to you since these are moving by very, very slowly - since - um - you're moving along - that - that your shadow would move.
Aaron:	[moves between classmates and globe] Why would it appear to you that?
Brad:	Aaron, Aaron-can't see.
Deanna:	Aaron. [her hand pulls him back, from blocking the view, by his sleeve]
Teacher:	can you move back a little bit because you're blocking, NO [maybe referring to pulling Aaron's sleeve] not off, just back.
Aaron:	Aaah!
Kevin:	Well, because like - I think someone else can probably explain it <better> [?] Lumina [his whole arm pointing to her].

Similarly I have coded instances where speakers explicitly terminate turns. These do not include interruptions. Interruptions are subjective; one student may feel interrupted in a situation where another does not (Greenwood, 1993). An example of explicit turn termination occurs when the class tells some boys to "Sit down," since standing at the front of the class signifies holding some part of the floor.

Indicating Worth I have also coded a class of turns that seem to say whether a contributor is or is not worthy of esteem. Such a class of turns is important for classroom science discussions for two reasons: it can provide a basis for deciding who gets turns, and it can serve as an informal, student-generated evaluation of the quality (sometimes "correctness") of a contributor's explanation. In calling these codes *paying face, threatening face* and *saving face,* I am following Brown and Levinson (1987: 61) in making use of the English folk term, which connects face with notions of being embarrassed or humiliated. Brown and Levinson (1987: 61)

argue that as something that is emotionally invested and can be lost, maintained or enhanced, face must be constantly attended to in interaction.

I am not however, using Brown and Levinson's fully elaborated theory. I am taking for granted that face is maintained in the classroom and marking mainly occasions when it is explicitly attended to in words, either in ways designed to enhance or to threaten it. I have coded acts designed to maintain—or more accurately repair—face after the speaker has suffered a face threat as "saving face." This decision is in fact consistent with Brown and Levinson's argument: "Given that face consists in a set of wants satisfiable only by the actions (including expressions of wants) of others, it will in general be to the mutual interest of two MPs [Model Persons, a tongue in cheek construction representing a wilful fluent speaker of a natural languge endowed with the properties of rationality and face] to maintain each other's face." (B&L, 1987: 60).

Brown and Levinson (1987: 61) describe face as "the public self-image that every member wants to claim for him[sic]self, consisting in two related aspects: (a) negative face: the basic claim to territories, personal preserves, rights to non-distraction—i.e. to freedom of action and freedom from imposition [and] (b) positive face: the positive consistent self-image or 'personality' (crucially including the desire that this self-image be appreciated and approved of) claimed by interactants."

I have called instances where face is enhanced *paying face*. Though there is one clear instance where the teacher pays a boy negative face, I have only coded for paying positive face. One reason for this depends on the nature of a classroom, where adults are authority figures over students. Upon entering a classroom many students lay aside large parts of their negative face, including freedom of action and freedom from imposition. One reason for this laying aside is to allow the teacher to protect other aspects of all class members' negative face, including rights to non-distraction, personal preserves and territories. Yet, there is also a more general reason for not coding payments of negative face. Since negative politeness—attention to a person's negative face—involves avoidance, coding for it would be time-consuming and speculative. It would require, for example, finding occasions where it would be impolite to say something and then finding that nothing in fact was said.

Here we see the teacher paying face to Lumina, and providing a turn for Aaron:

Teacher: [as Lumina walks away from front] Thank you, Lumina - you did a good job - um - Aaron, uh - you said something about having no shadow - where do you have no shadow?

In this case it may look as though the teacher is not simply paying face to Lumina, but also evaluating the quality of her explanation. Evaluation needn't always be a reason to pay face. In this example a student pays face to the

teaching assistant, Nina. Aaron has been having trouble finding a suitable prop to represent the world and allow him to make his point. Nina, who had gone into the adjoining room, appears in the front of the room with a smallish ball on which a globemap is drawn. And Deanna declares, "Nina thinks of everything."

As for face threats, I have coded only for certain types of threats to positive face. This means taking for granted threats to negative face, because they can be so frequent in classrooms and are in fact expected there. For example a teacher may rebuke a student's behavior, thereby threatening that student's negative face (impeding his or her freedom of action), and is in fact, expected to do so in many circumstances to prevent disruptions of the class. At the beginnning of the lesson, we see a student suffer the closest thing to a reprimand that happens in the whole lesson. Aaron, the very same student who saves face most often during the rest of the discussion is rebuked (i.e., suffers a negative face threat) by the teacher and complies without any protest. In fact, he cooperates almost cheerfully with the teacher's infringement of his negative face.

Teacher:	Uh - There is a - uh - Ah no we're going to work a little bit on the proximoscope. We're not going to work real long on it so be as efficient as possible in regards to your labors. There's a lot to do this afternoon and we're going to give this about a half an hour, of work. Now, some of the issues that came up the other day when Denis was here was which way the shadows were going - uh - he commented - uh - that uh- I'll take that [a stick].
Aaron:	sure. [handing it over]
Teacher:	- he commented that one of the shadows went 360 degrees - found it interesting and then commented is there a place on the planet earth where that can happen?

Teaching and learning entail many acts which Brown and Levinson (1987: 65-66) categorize as intrinsically threatening to negative face. These include orders and requests, suggestions and advice, and remindings. In fact, it makes sense to code many types of suggestions and advice as facilitation, because they are designed to help the speaker think through or more clearly communicate her or his idea.

It is tempting to find mitigation of face threats not in the learning goals of a classroom but in the power differential between teachers and classmates. However these particular teachers' classroom management style involves using very few threats to negative face, and, on the other hand, frequently paying face to their students. It is the students who perpetrate the most face threats on one another, and these mainly to one another's positive face. These students do not threaten the teachers' face, but also rarely pay face to teachers (though once, as seen above, to the teaching assistant). In sum the teachers, not taking advantage of their greater social power, are most polite to students. Students, still aware of this power differential, are less impolite to teachers than they are to each other.

In the following bit of transcript, Emmeline is wondering about the motion of a shadow on the North Pole. We see several kinds of social equity moves here. I would like to draw attention to the threat James makes to Aaron's face, to Aaron's face-saving response, which is somewhat supported by Emmeline, and finally, to underlined phrases that explicitly aim to show and elicit attentive listening, which I will talk about soon.

Emmeline:	it would go from one side to another- Would that happen in a whole year for the North Pole?
Aaron:	oh I see what you're saying. No. That wouldn't that it would happen kind of see the reason why there's +/.
Deanna:	sshh.
James:	she didn't ask you.
Aaron:	yes she did.
Emmeline:	I asked anybody.
Aaron:	yes so she asked me [Emmeline blows air through her teeth] so what I'm saying is the reason why there's even day and night is um is because there's a tilt +/.

Another set of acts whose intrinsic face threat is mitigated and legitimized—but certainly not minimized—in the particular classroom I am studying consists of contradictions, disagreements and challenges. Such acts can also be useful for learning. These however, threaten positive face, a participant's positive consistent self-image. The teachers in this classroom try to create safety for students to make sense with and for each other, and therefore to disagree with each other's arguments, but it seems clear by the varied responses that students perceive such disagreement as more or less face-threatening. Aaron for example makes several face-saving moves after students indicate disagreement with his argument. Lumina on the other hand makes no such face-saving moves when a classmate disagrees with her. I might guess then that some students have their self-image more tied up with being "right" than do others. If so, those certain students were all boys in this discussion, for as Table 2 shows, boys made all the face-saving moves and girls made none.

I have coded instances where speakers explicitly indicate some concern with *attentive listening*. This includes the use of such phrases as "what I was trying to say was," where they clarify in the interest of being heard (and presumably understood) by others, as well as phrases like "let me see if I can explain what you're saying" or simply, "so what you're saying is," where they check their own understanding of someone else's point.

Though in some situations such phrases could be seen as ways to pay face, or to maintain the other's face while at the same time adding to or critiquing her or his idea, I have not coded any of these as attending to face. This is because I think that the teachers model and explicitly value engaging in attentive listening, perhaps as a means towards mutual understanding. One of the teachers from this

particular classroom talked to the researchers about her goal of "get[ting] the kids to listen to each other." In at least one lesson (1/15/93), she pointed out to the students that because they hadn't yet done any experiments or *heard what other kids were saying*, they shouldn't come up with an answer yet. As a near native or emic concept (Geertz, 1974), it merits a code of its own.

In fact hearing what other kids are saying seems so important that not doing it could cost a student his or her rights to the floor:

*EMM: Aaron, understand what she's saying - why don't you go sit down -

Facilitation

While social equity codes apply mostly to utterances which help to regulate and assign value to interactions, facilitation codes apply mainly to utterances which help to further the main speaker's purpose. Such utterances generally accompany actions which help another, the "main" speaker, convey his or her meaning (or the utterance in and of itself may serve as such an action). If giving explanations is important to achieving in science, then it seems important to ask who gives and receives help when explaining. Receiving such help is necessary not only for learning science, but for learning how to explain. The question remains about the value giving such help has for learning science (though clearly it has other value at least). I'd like to point out here that because much of the help is in the service of conveying the speaker's meaning, the person giving that help needn't know a whole lot more about the domain than the speaker does, but need only see the speaker's difficulty or be confused or recognize that others may be confused by the speaker's current efforts.

Change of Mode I coded as facilitating utterances where a class member suggested that a speaker use a different mode of communication. Examples might include asking a student to draw or to act out what she or he is trying to describe in words. Such a suggestion could conceivably fall into two of the social equity categories: negotiating attentive listening or threatening face. The reason I have *not* considered it as "attentive listening" is that it has a different, generally more active impact: the main speaker usually changes tactics. Rather than simply trying to show attentive listening, suggestions for change of mode seem designed to help the main speaker convey her or his meaning more effectively. Probably because this is a learning environment, and because the suggestion to better explain indicates the audience's faith that the speaker actually does have something worth explaining, most such suggestions don't seem to be taken as face threats.

Using Props I coded as facilitating utterances where class members (teachers and students) provided props for one another, or helped each other to use

props.[3] On the most basic level, students used props to illustrate what they were saying or asking: for example in talking about the earth's rotation, students might spin a globe (the prop). On a different level, students might let props represent the real thing, and use them in order to formulate a question or to generate data that would answer such a question. For example, Marc contributed to the debate over whether or not a shadow at the north pole would rotate 360 degrees over the course of a day by setting up a stick at the north pole of a globe and turning that globe around in front of a projector light. In some cases of prop use, other students helped the main speaker handle the props, sometimes drawing attention to this action verbally. For example, when Rick was trying to keep his finger on one spot on the globe as he spun it, Deanna said "Here Rick," she and Annie got up to hold the globe for him, while Deanna said "There."

Offering Help Aside from helping with props, students sometimes did such things as suggest a word for an idea that the speaker seemed to be struggling with. Such instances I have coded as "offering help." Around those instances I sometimes found (1) cases where students called for or otherwise indicated the need for help, and (2) acknowledgments or thanks for help given. Calls for help may indicate that these students recognized the goal of their conversations as one of collaboratively constructing a theory. In one such case, Kevin tried briefly to communicate an idea, but relinquished his turn, saying "Maybe somebody else can explain it better." Coding for acknowledgement or thanks for help given seems less important for purposes of looking at who gets help in making explanations, but in most cases it indicates that the help was not received as a threat to face.

Allowing Think -time. The final type of facilitation I called "allowing think-time." Such a name is of course an inference. I used this code basically to indicate long pauses in the main speaker's talk where her or his turn could have suffered termination, but in fact did not. It would probably be fruitful to take a close, qualitative look at what might make the difference between terminating a turn and waiting the pause out. Unlike the other facilitation codes, this cannot be attributed to any one person. This does not enhance the answer to "Who facilitates?" But clearly one person, the main speaker, receives such facilitation, and that does partly answer "Who gets help?"

Findings

Normally the class is comprised of 9 boys and 7 girls,[4] but one girl was absent the day this discussion took place. So the ratio of male students to female students in

[3] Thanks to Elaine Crowder for first drawing my attention to props.

[4] This is a small class. I am not sure yet how the size of a group affects its ability to conduct a sense-making conversation. I have seen sense-making conversations in a class of 12 girls and 13

the discussion analyzed was 1.5: 1. As a group, the boys had 449 turns and the girls, collectively, had 223 turns. The ratio then of boys' turns to girls' turns is 2.01: 1, 34% greater than we would expect it to be if distribution of turns were equitable by gender. Because the average length of turns for boys collectively and for girls collectively were roughly equal—10.49 and 9.93 words per turn, respectively—the ratio of words spoken by boys to words spoken by girls is 2.03:1, also roughly 35.3% greater than we would expect it to be if members of each gender contributed equitably to the classroom conversation.

This brings up the question of what we should expect. A number of studies have established that males talk more in a variety of private and public contexts: the bedroom (DeFrancisco, 1989; P. Fishman, 1977), the boardroom (Case, 1988), and finally, the classroom (Spender, 1989b), where boys generally seek to be more visible.[5] Spender puts a number on it; she claims the 30% is the upper limit of what women can contribute before men feel that women have contributed more than their share. That implies men expect to contribute at least 70% of the talk in a given context, far more than would be equitable. So these schoolboys are not quite as overbearing as other men in the world might be. Not that this excuses them. In fact, it is their very close approximation to the problem that helps reproduce it.

Boys tended to vary less in the length of their turns, most of their individual averages being very close to their collective average of 10.49 words per turn. While the girls' collective average of 9.93 words per turn differs only slightly from that of the boys, individually girls varied from their collective average far more than the boys did. One might wonder whether this points to there existing two distinct styles of talking, and if it does ask whether girls might be more bi-dialectal than boys, which could account for greater variation.

If giving explanations is conducive to learning, then who gives explanations? In Table 1, we can see that 122, or 54.70%, of the girls' 223 turns were coded as explanatory whereas 263, or 58.57% of the boys' 449 turns were so coded. It seems then that girls are about as likely as boys to use the turns they do have for the purpose of giving explanations. We might conclude that if girls had equitable

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boys. Still I have not looked at access and participation, which may be more sensitive to size of the group, in that classroom.

[5] Because of their "narrow bandwidth" that transmits only words and not physical information such as sex, age, race, etc., many people thought computer-mediated communications would provide more equitable opportunities for interaction. But, even as the Internet becomes an increasingly important tool of science, math and engineering work, women typically participate in electronic networks and computer- mediated communications far less than men do. Sutton (1993) gives the male-female ratio on CompuServe and America OnLine as 9:1. Herring (to appear) found that women contributed only 20% of the postings on the Linguist list (an academic distribution list). Herring, Johnson, and DiBenedetto (1992), monitoring another "friendly" and "supportive" list in a "feminist" field for five months, found that women's contributions averaged between 20% and 30%.

access to sense-making conversations they would have equitable opportunity to give explanations.

TABLE 1: TURN TYPES IN BBN20

	explanation	social equity	facilitation
GIRLS			
ANNIE	24	5	4
EMMELINE	19	19	5
LARA	10	2	1
DEANNA	20	18	6
LUMINA	48	7	2
SAMANTHA	1	1	0
GIRLS' TOTAL	*122*	*52*	*18*
% OF GIRLS' TURNS	*54.70*	*23.32*	*8.07*
BOYS			
AARON	77	35	3
BRAD	37	4	3
RICK	66	13	2
DARRYL	0	0	0
KEVIN	5	4	2
SVEN	7	1	1
JAMES	39	8	1
MARC	29	7	2
PORADA	3	3	0
BOYS' TOTAL	*263*	*75*	*14*
% OF BOYS' TURNS	*58.57*	*16.70*	*3.12*

Fifty-two, or 23.32%, of the girls' 223 turns were coded for social equity, whereas 75, or 16.70%, of the boys' 449 turns were. Utterances coded for social equity included those apparently aimed at saving face, threatening face and terminating turns, as well as on the more positive side, paying face, providing turns, protecting turns. It is interesting to note that a greater number of boys' social equity moves sought status (face), and therefore the name social equity is slightly ironic. Boys perpetrated far more face threats than girls did, and made all the face-saving moves. Girls paid more attention than boys did to the allocation of turns and spent less of their turns in status-oriented face moves.

Both genders marked a good deal of their turns with comments that showed they were negotiating attentive listening. As explained earlier in the beginning of the data analysis section, attentive listening could either be shown or elicited. If broken down this way, 12 of the boys' 28 explicit attempts to negotiate attentive listening served to elicit such listening—e.g. to clarify their own point—rather than to indicate that they had heard or were trying to understand somebody else's. Only 4 of the girls' 12 explicit attempts to negotiate attentive listening

served their own points. One of the teachers in this classroom has identified "getting the kids to listen to each other" as a prerequisite for establishing a sense-making culture in their classroom. During this lesson, the teacher modelled exclusively references to hearing somebody else's point. It is interesting to speculate whether the need to guide listening to one's own point arises because one considers one's thought so important or because one fears that one articulates with inadequate clarity. Testing these possible explanations would require attention to other markers such as qualifiers, hedges or, especially for this kind of thing, intensifiers.

TABLE 2: NUMBER OF TYPES OF SOCIAL EQUITY MOVES BY GENDER

	Girls (n = 6)	Boys (n = 9)	Teacher (male)	Teaching Assistant (female)
protecting a female other's turn	2	0	4	3
protecting a male other's turn	5	0	5	0
protecting own turn	8	11	0	0
providing a turn for a female other	2	1	6	0
providing a turn for a male other	4	7	6	0
providing a turn for the teacher	0	1	not coded	0
terminating a turn of a female other	0	0	2	0
terminating a turn of a male other	14	1	3	1
terminating one's own turn	1	1	0	0
paying face to a female other	1	3	3	0
paying face to a male other	2	2	1	0
threatening a female other's face	0	2	0	0
threatening a male other's face	1	5	0	0
saving one's own face	0	13	0	0
explicitly engaging in attentive listening	12	28	17	1
Total	52	75	47	5

Eighteen, or 8.07%, of the girls' turns were coded as facilitation whereas 14, or 3.12% of the boys' turns were coded as such. Recall that turns coded under facilitation included such as things as providing props or help with props, offering help, accepting help, or suggesting a different mode of explanation (only the teacher did this last one).

TABLE 3: NUMBER OF TYPES OF FACILITATION MOVES BY GENDER

	Girls (n = 6)	Boys (n = 9)	Teacher (male)	Teaching Assistant (female)
suggesting a different mode to a female	0	0	0	0
suggesting a different mode to a male	0	0	2	0
providing props or help with props to a female	1	3	3	0
providing props or help with props to a male	12	4	10	2
providing props or help with props to a group	0	0	0	2
offering help to a female	1	1	2	0
offering help to a male	0	1	3	0
call for help for oneself	4	5	0	0
call for help for a female other	0	0	0	0
call for help for a male other	0	0	1	0
Total	18	14	21	4

Really only one category of facilitation moves offers striking differences, and that is "providing props or help with props." Twenty-eight such moves are provided *to* boys, whereas only 7 are provided to girls. It would be interesting to see what cumulative effect such a difference might have on a class if it persisted over the course of an academic year. On the basis of this lesson, though, several factors could be seen as reducing the importance of this difference. One is that once props were set up and students were using them to run their models and make their points, subsequent speakers would just use the same materials. Boys were not only the most frequent speakers, but spoke at the beginning of the lesson. Twenty-four minutes, twenty-six seconds into the talk, the teacher becomes more directive than he has been up until that point, providing turns for four girls. You will notice that Deanna offers an excuse for why the girls have not been able to secure turns up until now:

Teacher: okay, this is the order it's gonna we're gonna go +/.
Marc: I have some more to say though.
Teacher: fine, but you're gonna have to +/.
Marc: yeah.
Teacher: get back at the end of the line because a lot of people are in front of you # We got Annie and Deana and Emmeline and then Lumina # Okay?
Deanna: okay Annie.
Teacher: Almost all the girls represented here # Annie, go ahead, you go first.
Deanna: well the boys all scramble through.

By th time the girls have real opportunities to make their explanations, many props are already in place. Moreover, though girls *make* 13 such moves, as opposed to the boys who make 7, it is just one girl who provides half of the girls' total help with props to boys. Though possibly due to her gender, this is idiosyncratic.

If one collapses the categories of facilitation and social equity into one, it could be called something like support. These are the kinds of activities that keep the conversation running, rationing turns (in a classroom they are scarce), affirming or denying contributor's rights and worth to speak, helping speakers get their points across. It is interesting that girls provide so much more support (roughly one-third of their turns) than do boys (nearly one-fifth of their turns). This is not so different from Fishman's (1980) findings that the female partners did the interactional work in conversations between married couples. Again, one must see a connection between everyday practices of the classroom and larger social patterns. The causality is not as interesting as the possible direction from which to initiate change in these patterns.

Implications

This study did not assess the students' science knowledge, nor therefore its growth, in any standardized, formal way. But it will be important to point out here that the least vocal student during this particular lesson was perceived by the teachers as somewhat average or pedestrian in her science abilities. And it is true that she did not talk a whole lot during the year. But she stood out in my mind for the nature of her contributions. One day two boys were arguing over whether shadows in different areas of the playground would be the same or different lengths. This girl did not attempt to explain anything to them; she suggested a plan for testing their ideas. Listening carefully to both of their views, she designed an experiment. And as skillfully as either of the teachers in this classroom, she used the domain—the discourse of science—to manage what could have become an unpleasant social exchange.

It seems that if educators and educational researchers are moving towards conversations as modes of learning, we need to value far more than just the opportunity to give explanations, to show off knowledge of or to struggle with *content*. Some students—Aaron stands out as an exemplar from this lesson—invest being right with their positive face. A preoccupation with saving one's face renders difficult the possibility of changing one's mind and thus of learning. At the very least such a preoccupation makes it necessary to disguise the ways in which one changes one's position. In order to make learning comfortable, it seems necessary to discourage status seeking moves as inhibitory to the learning process. On the other hand, recall Lumina as a representative of the girls. Collectively, the girls made no face-saving moves, even when other students disagreed with them. Girls' greater attention to issues of turn allocation, to showing understanding of others' points, and to helping others get those points across, all served to foster the kind of exchange necessary for a truly collaborative, sense-making conversation. We need to value the work that students, especially girls, do in managing the *process* of conversing, and therefore of learning. In these ways, we can help create a friendlier environment more conducive to science learning for both genders.

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