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Playful Talk: Negotiating Opportunities to Learn in Collaborative Groups

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This case study examines the role of playful talk in negotiating the "how" of collaborative group work in a 6th-grade science classroom. Here we develop and test a Vygotsky-derived hypothesis that postulates playful talk as a mechanism for identity exploration and group status negotiation. Our findings indicate that students utilized the playful talk genre as a means to (a) position themselves and others as more or less competent within the group in order to create or foreclose opportunities to learn, (b) maintain and strengthen bonds that were developing within the group toward the goal of achieving higher levels of coordination and opportunities to learn, and (c) pivot toward a self-selected identity aimed sometimes at affecting one's status within the group. Taken together, these 3 playful talk functions allowed the group to manage tensions that arose as a result of periods of low coordination and to open opportunities to learn for lower status group members. This study contributes to researchers' understanding of affective aspects of collaborative learning, which are theorized as foundational to success in such endeavors.

This study examines the role of playful talk in negotiating the "how" of collaborative group work in a sixth-grade science classroom. We investigate a focal group of students' use of various types of playful talk to (a) position themselves within the group's participation structure vis-à-vis status and (b) dynamically shift the

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group's shared relational space to create or foreclose opportunities for engagement and learning. Building on Vygotsky's (1978) theory of play and mental development, we conceive of playful talk as performing a pivot function that allows adolescents to negotiate aspects of their socially constructed identities in order to affect the coordination of collaborative group work. Our study contributes to the field's understanding of social aspects of collaboration, which are theorized as foundational to success in small-group work (Barron, 2000, 2003; Cohen, 1994; Dekker, Elshout-Mohr, & Wood, 2006; Esmonde, 2009).

COORDINATION AND COLLABORATIVE GROUP LEARNING

In order to construct the joint problem space needed for successful small-group collaboration (Roschelle & Teasley, 1995), students must coordinate "a *content space* (consisting of the problem to be solved) and a *relational space* (consisting of the interactional challenges and opportunities)" (Barron, 2003, p. 310). Barron (2000) argued that this coordination could be accomplished through a complex array of cognitive and social tasks that may be compartmentalized into three elements of collaborative interaction: shared task alignment, joint attention, and mutuality. Groups of students may evidence varying degrees of these elements, indicating higher and lower levels of coordination. Subsequently, the level of coordination achieved has an impact on learning outcomes for the group.

For example, previous research indicates that collaborative groups that are competitive in nature have poorer learning outcomes—in terms of higher level discourse—than do groups that are based on cooperation (Cohen, 1994; Mercer, 1996). Anderson, Thomas, and Nashon (2009), however, argued that groups can overemphasize cooperation (or "social harmony") at the expense of "discursive argumentation, critique, consideration of multiple perspectives, [and] offering alternative ideas, all of which are recognized as precursors and/or pathways to meaningful science learning" (p. 531). Indeed, higher level discourse patterns account for student learning in collaborative group work (Cohen, 1994; Mercer, 1996; Webb, Nemer, Chizick, & Sugrue, 1998). These findings suggest that achieving coordination is based on the group's ability to modify competitive behavior and maintain a productive level of social harmony. Hence, *how* the group coordinates its work plays an important role in determining learning opportunities for the members of the group (Esmonde, 2009).

Coordination, Status, and Opportunities to Learn

Deciding who will do what in a small-group context is influenced by the relative status of group members to one another (Cohen, 1994). This status may be determined by a number of social and cultural factors, including gender,

existing friendships, and academic achievement level (Anderson et al., 2009; Strough, Berg, & Meegan, 2001; Webb et al., 1998). For example, students who have high academic achievement levels may feel confident and therefore assert their competence in a bid to direct group activity. Such behavior may result in foreclosing opportunities to learn for other less confident or less competent students in the group (Esmonde, 2009).

Status within a group may also be affected by the nature of the work the group is undertaking. For example, specific domains, such as science and technology, are perceived by many to be male domains (American Association of University Women, 2010; Nosek et al., 2009), which may affect girls' participation in computer-based activities (Underwood & Underwood, 1990). For instance, research into mixed-gender collaborative groups working in computer contexts has revealed the dominance of boys in controlling the computer (Underwood, Underwood & Wood, 2000). This dominant behavior results in part from boys' gender *identification* with the technology domain, and it has a negative impact on girls' opportunities to learn (Margolis, 2008).

Although the relative status of group members influences coordination, it is important to note that status is situational; dynamic interactions within the group, as well as the social contexts in which interactions unfold, also influence coordination and collaboration. For example, Esmonde (2009) has shown that prior knowledge, experience, and *alignment with the social discourses* of the classroom serve to position students within collaborative groups as knowledgeable or competent (or lacking both qualities), which in turn influences the interactions between differently positioned students and their "access to valued forms of participation" (p. 1017). Because of this, argued Esmonde, a group's level of coordination, in terms of shared task alignment and mutuality (characterized, respectively, by the "co-construction of solutions and references to others' ideas" and the "potential for all members to meaningfully contribute," Barron, 2000, p. 429), is influenced by individuals' social positions within the context.

It is therefore important for our investigation into the relational space of group activity to understand how students' positional identities are situationally constructed and how this influences participation within the context of group work. We postulate that one avenue for students to negotiate their positional identities is through playful talk. We base our view on Vygotsky's theory of the role of play in mental development.

THE VYGOTSKIAN VIEW OF PLAY AND MENTAL DEVELOPMENT

Vygotsky (1978) argued that play arises in young children as a response to desires that cannot be immediately gratified. To cope, children invent imaginary situations

in which those desires can be satisfied. In creating an imaginary situation, children begin to become free of the perceptual constraints that had previously limited their actions. In other words, once children begin to imagine other scenarios, they move beyond the bounds of visual perception toward mental representation. They do so in an effort to fulfill their unrealizable wishes. This behavior is what Vygotsky considered the foundation of play. He argued, however, that such imaginative play is mediated by rule-based behavior. For example, when children engage in pretend play that includes the adoption of roles, the children participating in the game conform to the rules associated with that role, such as when playing "Mommy." To achieve this state of imaginary role-play, a child needs to be able to abstract the meaning of a behavior (e.g., a mother cradling a baby) and then transfer that meaning into behavior within the imagined scenario (e.g., the child pretending to play the role of mother by cradling a doll). Vygotsky argued that such abstraction requires the use of a *pivot*—an action or object that can facilitate the process of severing meaning from real things and projecting it onto others. Through the use of pivots, young children begin to exert self-control by conforming their own behavior to the rules of the imaginary game.

Play, then, performs two important developmental roles in young children: It assists in the development of mental representation as well as the development of self-regulation. We argue that playful talk has an analogous role vis-à-vis the negotiation of youth identities and group coordination.

Playful Talk, Identity Negotiation, and Group Coordination

Playful talk refers to verbal interactions that include humor, puns, teasing, music making, and other word play (Lytra, 2009). Wegerif (2007) considered playful talk an aspect of student creativity that has both social and academic salience. Playful talk is a ubiquitous mode of communication among youthful peers (Carter, 1999, 2002) that contributes to the creation of their social identities (Lytra, 2009). We subscribe to a postmodern, narrative view of identity as multiple, shifting, and situational (Gee, 2001; Holland, Lachicotte, Skinner, & Cain, 1998). Holland et al. (1998) argued that it is the "person-in-practice" (p. 40) that is the operative element of identity construction. In taking action (including speech acts), the person draws on past experiences yet responds to the current situation using the materials and resources available in the immediate environment. Although in this way individuals may author their own identities, the construction of these identities always occurs within a social and cultural context (Holland et al., 1998). Thus, the construction of an identity is always constrained by the sociocultural environment—that is, rules of behavior, available tools, signs and symbols, and so on (Bakhtin, 1981). Furthermore, one's position within a specific community may be prefigured by the physical qualities of one's being (e.g., ethnicity, sex; Holland et al., 1998) or imposed upon one by institutional forces (Gee, 2001). In this sense,

although individuals have agency in how they position themselves in relation to others within a social setting, the identity one constructs is also constrained by forces that regulate social interaction within that setting.

In this article, we argue that playful talk serves a *transitional* function in the negotiation of one's identity. Playful talk creates an imaginary space where the institutional strictures of one's positional identity may be loosened. Just as play frees young children from the perceptual constraints of the visual field, so might playful talk allow students to go beyond the situational constraints of their institutional identities. We theorize that playful talk among peers in a classroom may liberate children from the role of student and allow them to experiment with different roles—roles they select for themselves. In this way, children are able to imagine and play at possible selves. In this conceptualization, playful talk serves as a pivot toward the development of new, self-determined identities for youth. And in the context of collaborative group work, the playful talk pivot may serve as a tool for affecting one's status in the group.

Moreover, we argue that inasmuch as playful talk may be considered a game that the students engage in, playful talk participants will conform to the rules of the game. Following Vygotsky (1978), we reason that in conforming to the rules of the playful talk game, the members of the collaborative group regulate the coordination of the group. Therefore, in this article we also investigate the role of playful talk in regulating the "how" of group work through observed levels of coordination. Understanding how playful talk is used as a mechanism for affecting one's own status and for regulating group coordination is important, because, as noted previously, one's own status and negotiations related to the coordination of group work have implications for opportunities to learn within the group.

Our primary research question in this study then is this: What is the role of playful talk in creating or foreclosing opportunities to learn within the collaborative group? In order to investigate this question, we developed two subquestions as follows: (a) What types of playful talk do students engage in while solving robotics challenges? and (b) How does each student participate in the group's playful talk practice as regards status and group coordination? This research sheds light on relational aspects of collaborative learning and specifically the moment-to-moment formation of group participation structures and the creation and foreclosure of opportunities to learn in collaborative groups.

Robotics Context for the Study

Developers of educational robotics construction kits envisioned play and creativity as a primary means of study and learning with robotics technology (Resnick, 2009). Indeed, research suggests that an important pedagogical approach to take with robotics is to allow students to play around with the technology (Lindh & Holgersson, 2007). In our own research we have demonstrated the ways in which

students engage in play and creativity to reason about and solve robotics challenges (Sullivan, 2011). We grounded this study of student playful talk in the context of an inquiry-based physics/robotics curriculum unit precisely because of the attendant playful aspect. We reasoned that an open-ended curriculum that enabled play and creativity would also engender playful talk among collaborative group members.

METHODS

Research Design and Participants

The participants in this case study were members of a sixth-grade science classroom at a public school in Holyoke, Massachusetts. A total of 78% of the students in the Holyoke Public School District are Latino, and 79% are eligible for free lunch (Massachusetts Department of Education, 2012). Massachusetts Comprehensive Assessment System scores for all of the sixth-grade students at the focal school during the year of the study showed that more than half of the students were in the Needs Improvement or the Warning/Failing category in English language arts and fully 80% of students were in the Needs Improvement or Warning/Failing category for math.

The participants in the study included a class of 23 students (11 girls and 12 boys). Among the 23 student participants, three 12-year old Latina/o students, two girls and a boy, were selected as the focal group. The classroom teacher chose the focal group based on his belief in their ability to successfully complete the physics/robotics curriculum. In an interview, the teacher indicated that the students in this group were not, to his knowledge, friends outside of class.

The teacher, Mr. Smith, was a 25-year-old White man who was in his third year of teaching middle school science. Mr. Smith had received a bachelor's of science degree in plant and soil science and was in the process of obtaining teacher certification in secondary science. Informed consent was received from all participants. Pseudonyms are used throughout.

Data Collection Methods

The focal group of three students was video- and audiotaped over an 11-day period as they engaged in a physics-based robotics curriculum. All of the whole-class discussions, teacher–focal group, and student community–focal group interactions were video- and audiotaped. We also conducted semistructured interviews with the teacher at the end of the first week and at the end of the unit in order to gather more contextual information about the classroom setting. The curriculum consisted of seven activities. The activities were progressively sequenced first to introduce students to the use and function of the Lego Mindstorms robotics kit

(see Sullivan, 2008, for a description of this kit) and then to focus on light and heat energy topics that could be explored using the robotic devices. Two video cameras were used to record student activity. We acted primarily as silent observers in the classroom; however, on occasion we answered questions about the robotics technology. We took field notes of the class each day. At the end of each class session, we discussed our observations and wrote a set of general notes based on our discussions.

Data Analysis

Data analysis occurred in stages. First we analyzed the video- and audiotaped data using a modified form of interaction analysis (Jordan & Henderson, 1995) in order to establish the overall trajectory of group activity. Rough content logs of these data were recorded at the actual time of taping, and a finer grained log was created in subsequent viewings of the videotapes. This finer grained content log was chunked into 5-min segments. We did this in order to create a timeline of microevents over each of the 90-min class periods. The segmented timeline provided a manageable framework for closely analyzing 990 min of video- and audiotaped interactions.

Next we reviewed the content logs and wrote descriptions of the quality of group interactions for each 5-min segment of the 11-day period. We utilized Barron's (2000) markers of high and low levels of coordination to guide our description (see Table 1). For example, in any 5-min period we noted whether or not students were demonstrating the positive or negative aspects of shared task alignment, joint attention, or mutuality as described by Barron.

TABLE 1
Forms and Markers of Coordination

Form of Coordination and Definition	Markers of Coordination	
	High	*Low*
Shared task alignment: Establishment of a collaborative orientation toward problem solving	Coconstruction of solutions Reference to other's ideas	Independent solution paths Reference to own ideas
Joint attention: The degree to which attention is jointly focused during solution-critical moments	Workbook (materials) as center of coordination Joint monitoring of solution	Workbook (materials) as territory Individual monitoring
Mutuality: Reciprocity with the potential for all members to meaningfully contribute	Productive conflicts Transactional responses Turn-taking norms respected	Conflicts of insistence No response to contributions Turn-taking norms violated

Source. Barron (2000).

Our descriptive analysis of coordination was qualitative in nature and did not lend itself to quantitative reduction. Therefore, the unit of analysis remained the 5-min chunking segment. We used this microanalysis of student interaction to allow us to develop a dynamic, narrative characterization of group coordination on each day, which, taken as a whole, provided an overall chronology of group cohesion over the 11-day unit.

Playful Talk Frames.   The next stage of data analysis consisted of analyzing how and when the group shifted the group interaction mode from a small-group learning mode to a playful talk mode. To accomplish this, we turned to Goffman's (1974) work on frame analysis. Goffman identified the sociocultural and contextual factors of human communication that make possible an accurate interpretation of the intent of another's utterances or actions in a given situation; social frameworks are activated and anchored in specific activities. Such anchoring activities are temporally and spatially bracketed by *well-understood markers* that help to guide social interaction. Goffman provided an example of the dimming of the lights in a theater as a frame marker that signals "the show is about to begin." This dimming of the lights is understood by the theater goers who share an "attending the theater" social framework.

In a classroom setting, there are at least two interactional contexts within which it is possible to recognize specific social frameworks: the instructional context and the recreational context (Lytra, 2009). The instructional context may include an instructional frame that is signified by specific markers enacted by the teacher, including attention-getting verbal commands. It may also include a whole-class activity frame, a small-group learning frame, or an individual seatwork frame. In the recreational context, it is possible to discern a play frame among peers, signaled by a number of mechanisms as discussed below. It is important to note that a frame may be shifted at any given moment either through an action (such as a bell ringing) or through talk (Lytra, 2009; Tannen, 1993). Shifting a frame through talk is accomplished through the use of contextualization cues.

Contextualization cues.   From Gumperz's (1982) definition of contextualization cues we are able to derive a method for understanding how a frame may be shifted through talk:

> Constellations of surface features of message form are the means by which speakers signal and listeners interpret what the activity is, how semantic content is to be understood and how each sentence relates to what precedes or follows. These features are referred to as *contextualization cues.* (p. 131, emphasis in the original)

Contextualization cues help individuals determine the interactional meaning of an utterance (Tracy, 2002). According to Gumperz, contextualization cues

include prosody, formulaic expressions, and code switching. For the purposes of this study, we are most interested in the contextualization cue of prosody. *Prosody* refers to paralinguistic elements of speech, including intonation (pitch levels), changes in loudness (volume levels), stress (changes in pitch, volume, and duration), variations in vowel length, and phrasing (chunking, pausing, accelerating, and decelerating).

Therefore, to establish *how* students shifted the frame, we identified and examined the prosodic contextualization cues that signaled the shift to a play frame. During this analysis we realized that some episodes of playful talk were not signaled solely by prosodic elements but, as Coates (2007) noted, were identifiable based on the responses of participants in the playful talk episode, for example, laughing or smiling. Therefore, we also used these interactional elements to aid our analysis. This analysis deepened our understanding of when and how playful talk was used in the group.

Playful Talk Coding.   Once we had identified the instances of playful talk in the data set, we developed a coding scheme to look more deeply at the phenomenon of playful talk at both the individual and the group levels. This coding scheme consisted of theoretically derived codes from the work of Lytra (2009) and data-driven codes. All codes are reported in the Results section. We used these codes to help us quantify the *types* of playful talk that were engaged in by participants. For the purposes of this analysis, each instance of playful talk was coded according to all of the applicable codes. For example, if a student was singing a song to tease another student, the episode was coded as both singing and teasing. We provide an overall count of the discrete instances of playful talk engaged in as well as counts of the types of talk this consisted of—therefore, there are more instances of types of talk than actual episodes of playful talk. This allows us to more accurately portray the form and the function of student playful talk.

In the final stage of data analysis, we took together the coordination and playful talk analysis for each student individually and for the group as a whole. In so doing, we were able to interpret observed, individual identity pivots in terms of status negotiations, coordination, and opportunities to learn. In this way, we were able to build a characterization of individual student participation in negotiating the "how" of group work.

Transcription.   In preparing to present the results of the study, we selected representative examples of playful talk types and episodes. These data were then professionally transcribed utilizing Jeffersonian notation (Jefferson, 1984). Jeffersonian notation is designed to graphically depict prosodic elements. The use of Jeffersonian notation is meant to aid the reader in the interpretation of the transcribed utterances. The Appendix provides a key for understanding Jeffersonian notation symbols.

Reliability. Our research study was based fully on qualitative methods. We conducted microgenetic analysis of approximately 990 min of video- and audiotaped collaborative group work. The use of coding schemes in examining student talk followed a process of analytic collaboration (Hogan, Nastasi, & Pressley, 1999). The first author served as the expert judge in the coding and analysis of the data, with the second author serving as the analytic audience and collaborator in discussing and revising codes. This process recognizes the "necessity for deep contextual knowledge in making reliable and valid interpretations of the data" (Hogan et al., 1999, p. 398). We developed this deep contextual knowledge through our presence in the classroom and our close and iterative viewing of the full video- and audiotaped corpus. Our collaborative process included the utilization of theory-derived codes (Lytra, 2009) and data-driven codes. Data-driven codes were developed through an iterative process of discussion and revision. Tallied data are provided for purely descriptive ends—providing these data allows us to present the reader with a sense of the ubiquitous nature of the students' playful talk activity over the study period.

To aid in the interpretation of the results presented in the Results section, we first provide a description of the classroom context as derived from our interviews with the teacher. In so doing, we aim to provide the reader with a general sense of the classroom culture within which our focal students' interactions unfolded.

Classroom Context

Pedagogical Approach. Mr. Smith used a project-based, inquiry-learning pedagogy, featuring frequent collaborative group work, to teach the sixth-grade science curriculum. He also engaged in whole-class discussion and lecture. According to Mr. Smith,

> I challenge the kids with a question or problem, and then they have to attack it by some sort of process that they devise based on what we're learning . . . There has to be an investigation that they do. Inside that investigation they'll notice things. The teacher has to prompt them, to share or explain those things, which is kind of what I'm trying to do. Hopefully in that process they might connect two and two together.

Mr. Smith indicated that he randomly assigns the students to a different collaborative group for every project. He does this because he views part of his work as helping students to develop skills needed for group work. He stated, "Most of my assignments are group work. I firmly believe that if they don't know how to work in a group after sixth grade, they're going to have a major problem."

Finally, Mr. Smith revisited the idea of the scientific process in each unit in order to reinforce central aspects of empiricism. His goal for the year was to connect each project to the next in order to create continuity and interest for the students:

The way that the curriculum is written, it's very easy to teach it for two weeks and never review it, never come back to it ever. I realized that that is wrong to do. I think it's okay if you switch topics. I think it would be wrong if those topics are not interconnected somehow. If nothing, I want to teach them the scientific process.

Physical Structure of the Classroom.   The students' desks were arranged in clusters of four throughout the classroom. The classroom space was adorned with the outcomes of student collaborative group project work. Just prior to the physics/robotics unit, the students had worked on a properties of matter design project focused on boat construction. The students' finished boats were displayed on a table near the classroom door. The wall above the table display was full of posters on the topics of mass, volume, and density as they related to the boat construction project.

Activity Structure of the Classroom.   Mr. Smith provided a reliable structure for the class through a posted agenda of class activities each day. The agenda generally included the "Do Now" assignment (which usually required reflective writing related to the work the class had done the day before), quiet reading time, group project work, and time for whole-class review at the end of the period. During group project work time, students were allowed freedom of movement and association within the classroom to retrieve needed materials, to test their designs/programs, and/or to confer with other students. The classroom context then was one of open-ended, project-based science inquiry that was supported through reflection, reading, brief lectures, whole-class discussion, review, and teacher supervision. In our observation of the classroom dynamics, Mr. Smith had a positive relationship with his students. The students were well aware of class routines and expectations, and they followed the structure that Mr. Smith provided for them. We observed no serious disciplinary incidents while present in Mr. Smith's class. Furthermore, we observed a high level of student participation during whole-class discussions, and these discussions, despite the overall low achievement level of the class, occurred at a high level. Mr. Smith indicated that he had high expectations for the students, which is why he conducted high-level discussions of the science content.

RESULTS

In our review of the research literature, we found that individual status in the group affects coordination and in turn opportunities to learn. Furthermore, we hypothesized that playful talk plays a role in how students negotiate their status within a group, thereby affecting coordination and opportunities to learn. In presenting our

results, then, we first provide our descriptive analysis of the types of playful talk students engaged in, and we then present data related to students' playful talk participation in terms of status negotiations and group coordination. With these points established, we address our central research question: What is the role of playful talk in creating or foreclosing opportunities to learn within the collaborative group?

Playful Talk Types

We observed the students utilize 14 specific types of playful talk over the 11-day period. We subsumed these 14 types of playful talk under seven superordinate categories. Three of these superordinate categories were drawn from the work of Lytra (2009): humor, music making, and teasing. Four of the superordinate categories were derived from the data analysis: pop culture references, playful talk positioning, technology-mediated playful talk, and word play. Table 2 presents the 14 distinct subcategories of playful talk that we observed over the 11-day unit, the seven superordinate categories they were classified into, examples of each specific type of talk, and the contextualization cue that signaled to us that this was an instance of playful talk.

As can be seen in Table 2, three of the superordinate categories are the same as the subcategory: playful talk positioning, pop culture references, and word play. These three superordinate categories of playful talk are distinct yet irreducible to subcategories (in the context of this study). The four other superordinate categories—humor, music making, teasing and technology-mediated playful talk—all subsume two or more subcategories of playful talk. Moreover, the definitions of humor, music making, pop culture references, teasing, and word play are self-evident. However, our definitions of playful talk positioning and technology-mediated playful talk require further explanation. Here we define these two superordinate categories and the specific playful talk types subsumed under them.

Playful talk positioning refers to instances of playful talk that position a given student as either more or less capable as regards the robotics activity. Students used playful talk to assert their competence with robotics toward the goal of attaining a more active role in the work of the group. They also used it to position other students as less competent for the same purpose. In the example provided in Table 2, Javier suggests to Ilana that she is always very pessimistic about the work of the group and the efficacy of their designs. In so doing, he positions Ilana as a negative influence in the group and undercuts what may well be legitimate criticism of the current group effort.

The superordinate category of technology-mediated playful talk subsumes four specific types of playful talk: analogy, child's play, gendered filial humanization (GFH), and simulation of the functioning of the robot. Each of these specific types of talk were classified as technology mediated because the robotic device and/or

TABLE 2
Observed Playful Talk Types

Playful Talk Type	Superordinate Category	Example From Data	Contextualization Cue
Joking	Humor	J: ↑↑Zi::ng >zing zing zing< [zi:::::ng] S: [°Is it going to] ↑do it?° J: E::r, yeah >looka looka looka looka looka < (0.8) yeah look it (0.6) look i:t look i:t (0.4) S: ↑O::h J: [Sharpen my pencil] S: [Ha ha ha ha ha] huh huh J: O::h yeah (.) oh ↑↑no it's ↑↑stu:::ck,	Nonsense words Elongation Laughter Pitch movement (very high pitched)

Joking about conflict	Humor	J: [You] ↑can't draw oreos co:z my go:::d just cos it's
		   food (.) o↑kay (0.4) how >would you like< if
		   (.) oreos were (people) on your food e::h, they
		   don't ↑dra:w you;
		I: >Huh huh< ha ha .hhh
		J: Then you'd understa:::nd
			Laughter
			Pitch movement
			Elongation (speeded-up talk)
			
			Sarcasm

Chanting	Music making	J: Il sa ja (.) il sa (ja) (sti::ll) it made up its own ↑na::me, (.) and I was like	Rhythmic repetition of a word or phrase
Funny sounds	Music making	J: [It's gonna go::zz↑]::.(.) ↑A:::gh	Nonsense words Pitch movement
Singing	Music making	*Singing (song)* J: Ay bee see dee ↑ee ef gee ↓haitch ai [jay kay]= *Singing (melody)* J: ↑Dew::n dewn dewn de:wn [dewn dewn] S: [(?)(right)] (.) right now J: Dum ↑dum dum du::m (.) [dum dum dum] dewn dewn dewn (.) dewn	Pitch movement Rhythm

(Continued)

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TABLE 2
(*Continued*)

Playful Talk Type	Superordinate Category		Example From Data	Contextualization Cue
Pop culture references	Pop culture	J:	You heard it's like °un gum° (.) transformers of something we'll have to transfo:rm from the (1.0) ↑come o::n (1.0) akchu:n oh (0.6) °co:me o::n° (0.6) ye:::s (0.4) I'll do the alphabet when it's loading	Reference to popular or peer culture phenomenon Nonsense words
Playful talk positioning	Positioning	J:	↑Why you always denying things ↑huh?	Pitch movement
		I:	Coz this one didn't work=	Vocal loudness
		J:	=She's like miss downer (.) over here (0.8)	Laughter
		J:	You >wanna ↑be< the downer from (.) downerville	
		S:	Downy huh huh huh (0.4)	
		J:	She gro:ws up (.) <this is never gonna wo:rk> (0.4) why you even doing this	
Mimicking	Teasing	J:	I'm going to (.) oh my Go:d, I'm going to get so mad at this gi:rl [she's] like ↑I I told you the (thi:ng's) not going to=	Pitch movement
		S:	[.hhhh]	Vocal loudness
		J:	= wo:rk,	
Teasing	Teasing	J:	[Where's my pe]ncil? (.)	Pitch movement Laughter
		S:	O:::::H (.) I didn't gave it to you:::,	
		J:	You didn't ga::ve it to me::? (0.4)	
		J:	↑Nice vo↑ca:bulary, huh huh hu::h (.) I didn't $ga:ve it to you:,$	

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Analogy	Technology-mediated playful talk	S: It lo:oks like an airplane ha ha	Pitch emphasis Laughter Physically moving the device around
Child's play	Technology-mediated playful talk	J: Oh my (0.8) this goe:s, (4.4) tch tch	Wordless vocalizations
		S: ↑No:: like in the ↑middl::e	Physically moving a piece around while joking
		J: °Yeah (.) coz I'm going be like like that°	
		S: ↑No:t in the ↑co::rner, (0.8)	
		J: Yes in the corner	
		S: ↑Not in the corner	
		J: >So it goes< sch↑wi (.) schwu schwu [schwu schwu]	
		S: [On the other] side	
		J: Schwu schwu schwu what?	
Gendered filial humanization	Technology-mediated playful talk	S: ↑It has $(problems)$ (0.4)	Pitch movement (smile voice)
		J: COME BA::CK HERE NO::W	Vocal loudness (shouting)
		S: >Huh huh huh huh< .hhh hu::h >huh huh huh huh<	Laughter
Simulating the function of the robot	Technology-mediated playful talk	J: I'm going to give you a powpow::	Pitch movement
		J: Ultra[sonic ↑o:h] my go::d	Vocal loudness (whisper)
		I: [(Studless ↑beam)]	
		I: This is a (studless beam)	
		S: Um ↑yeah	
		J: °It's watching you::°	
Word play	Word play	S: Sh::eck	Elongation Purposeful mispronunciation

Note. J = Javier; S = Sara; I = Ilana.

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the Lego pieces were integral to the playful talk utterance. With the exception of child's play, these forms of talk had some type of meaning-making or role-playing focus. For example, as regards analogy, all three of the focal students (Ilana, Javier, and Sara) engaged in playful talk aimed at exploring what the robotic device was or could be. In the example in Table 2, Sara picks up the robotic device and waves it through the air, saying, "It looks like an airplane."

The child's play subcategory refers to instances in which wordless vocalizations were made to accompany the motorized or physically manipulated movement of the robot. The example in Table 2 refers to an instance in which Javier and Sara are discussing where to take a light reading. While they are doing this, Javier picks up the robot, moves it through the air, and makes an accompanying nonsensical sound. In these instances, it appears that the students are interacting with the robotic device as if it were a toy, hence the term *child's play*.

Two of the students in our focal group, Javier and Ilana, engaged in a type of playful talk that anthropomorphized the robotic device; they humorously related to the device as if it were a human child. For example, we observed Javier take a mock disciplinarian role with the device when it failed to perform in the way he wanted ("Come back here now, I'm going to give you a pow pow") and we observed Ilana cradle the device as if it were an infant child, asking the others, "What should we name it?" Here the students engaged in a form of gendered role-play with the robotic device. This activity also points to the students viewing the robot as a toy.

Finally, students simulated the function of the robotic device through physical gesturing and vocalizations. In our earlier work, we identified simulating the function of the robotic device as a strong problem-solving strategy for reasoning about robotics challenges (Sullivan, 2008). In the example in Table 2, Javier thinks about the functioning of the ultrasonic sensor by moving it through the air and playing with the idea that the ultrasonic sensor "watches" people.

Total Instances of Playful Talk.   Our results indicate that students engaged in a total of 233 playful talk interactions over the 11-day period. As previously noted, some instances of playful talk were classified into more than one category. For this reason, the total number of categorized playful talk instances presented here exceeds the total number of playful talk interactions. Also, we have included in this count the playful talk initiations that were not picked up by other students. There were a total of 409 playful talk instances observed over the 11-day period. Figure 1 provides a representation of the categorical breakdown of these instances.

Playful Talk Practice, Positional Status, and Group Coordination

Having identified the playful talk types used by students, we now present a narrative analysis of the students' playful talk participation in terms of group status
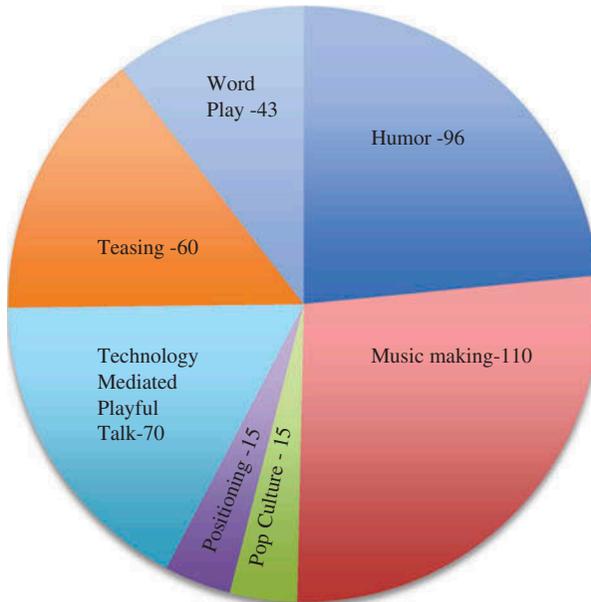
FIGURE 1   Playful talk totals by category (color figure available online).

and group coordination. In order to meaningfully discuss students' contributions to group coordination, we provide a brief overview of the group's relational trajectory over the 11-day unit. This overview is instrumental to our interpretation of the meaning of specific playful talk interactions in relation to opportunities to learn in the group.

Group Coordination.   Utilizing Barron's (2000) markers of coordination, we identified three distinct periods in the group's relational trajectory over the 11-day period. The first period lasted 4.5 days and was characterized by consistently higher levels of coordination, group success with the curriculum activities, and several instances of playful talk. The second period lasted 2 days and was characterized by consistently lower levels of coordination, group failure with the curriculum activity, and fewer instances of playful talk. The third period lasted 4.5 days and consisted of relatively higher levels of coordination, some group success with the curriculum activity, and more instances of playful talk. Table 3 presents the enacted curriculum activities, the group's success with these activities as measured by time to completion, the observed accuracy of the solution, and the overall character of coordination on each day.

Our analysis of the group's varying levels of coordination over the 11-day unit indicated that the group experienced both higher and lower levels of coordination

TABLE 3
Enacted Curriculum Activities, Group Success, and Group Coordination

Curriculum Activity	Curricular Goal	Chronology	Group Success	Overall Character of Group Coordination
Identify, label, and draw robotics pieces and parts.	Build vocabulary. Develop familiarity with the kit.	Day 1	Completed activity accurately and on time.	*Shared Task Alignment* (+) Discussed identity of pieces (coconstruction of solutions) *Joint Attention* (+) Joint focus on finding pieces (materials as center of coordination) Agreement on when a specific piece had been identified (joint monitoring of solution) *Mutuality* (+) Took turns reading the instruction sheet aloud (turn-taking norms respected)
Build a robotic vehicle and program it to move forward one foot and then backward one foot and stop.	Learn to build using the blueprints book. Learn to write a simple program.	Day 2	Completed activity accurately and on time. Received extension activity from the teacher.	*Shared Task Alignment* (+) Discussed the task and how to accomplish it; jointly constructed answer to reflection question (coconstruction of solutions) *Joint Attention* (+) Found the Lego pieces for one another in order to build (materials as center of coordination) Discussed which was the correct piece to use (joint monitoring of solution) *Mutuality* (+) Helped one another if having trouble fitting two pieces together (transactional responses) Took turns reading the instructions aloud; took turns building the robot, step by step (turn-taking norms respected)

Build a support for the touch sensor; add the touch sensor to the robotic vehicle; and program it to move forward until it touches an object, then back up for one foot and stop.	Learn to write a program with a dichotomous interactive element. Understand how the touch sensor functions.	Day 3	Javier absent on this day. Sara and Ilana completed activity accurately and on time. Received extension activity from the teacher.	*Shared Task Alignment* (+) Discussed the task and how to accomplish it; jointly constructed answer to reflection question (coconstruction of solutions) *Joint Attention* (+) Found the Lego pieces for one another in order to build (materials as center of coordination) Jointly (physically) held the robot as they built it; discussed how to program the robot (joint monitoring of solution) *Mutuality* (+) Took turns reading the instructions aloud; took turns building the robot, step by step (turn-taking norms respected)
Build a support for the light sensor; add the light sensor to the robotic vehicle; and program it to move forward until it senses a darker object, then make a 90° turn, back up for one foot, and stop.	Learn to write a program with a continuous interactive element. Understand how the light sensor functions.	Day 4	Completed activity accurately and on time. Received extension activity from the teacher.	*Shared Task Alignment* (+) Discussed the task and how to accomplish it; jointly constructed answer to reflection question (coconstruction of solutions) Ilana referred to Javier's idea to convince Sara (reference to other's ideas) *Joint Attention* (+) Joint focus on the robot, the laptop, and the test field (materials as center of coordination) Joint focus on the task from beginning to end (joint monitoring of solution) *Mutuality* (+) Sara disagreed with Javier and Ilana as to one programming element, Javier and Ilana used reasoning to convince Sara of their idea, Sara accepted idea (productive conflicts, transactional responses) Took turns reading the instructions aloud; took turns building the robot, step by step (turn-taking norms respected)

(Continued)

TABLE 3
(*Continued*)

Curriculum Activity	Curricular Goal	Chronology	Group Success	Overall Character of Group Coordination
Light and Dark Scavenger Hunt Challenge: With light and touch sensor affixed to the robotic device, write a program to collect and store 10 light readings. Find the five brightest and five darkest areas of the classroom to record. Note on a map of the classroom where the light reflection readings were taken. Collect and compare two sets of data recorded at different times in the same locations. What may account for any observed differences in light readings?	Learn to write a program that utilizes multiple sensors and one that is designed to collect and store data. Learn to upload stored data to a graphing program. Learn to interpret graphed data. Learn about the concept of variability and the importance of controlling variables in scientific investigations.	Days 5–8	Did not complete activity on time. Finished 1 day late on Day 8 without the help of Javier. Final work was accurate.	*Shared Task Alignment* (−) Ilana began building the device on her own without consulting others; Javier began collecting light readings over Sara's objections that the program was incorrect (independent solution paths) Javier ignored ideas of Ilana and Sara (reference to own ideas) *Joint Attention* (−) Javier controlled the robotic device and would not share it (materials as territory) *Mutuality* (−) Javier insisted that his approach was correct, even though it was not and even though Sara pointed out the correct approach (conflicts of insistence) Javier ignored Ilana and Sara's suggestions for how to solve the problem (no response to contributions) Group did not read the instructions aloud together, Ilana began building the attachment to the robot on her own, Javier did not allow Ilana or Sara to hold robotic device and collect light readings (turn-taking norms violated)

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Stir-It-Up Challenge: Build a stirring device to be powered by one of the robot's motors. Place the stirring device and a temperature sensor in a beaker of hot water. Place a second temperature sensor in a second beaker of hot water. Write a program that will turn the stirring device and that will collect 100 data points at 5-s intervals from each beaker using the temperature sensors. Upload and compare the results of this experiment. Did stirring the water help to cool it faster?	Learn to build without blueprints. Learn about the temperature sensor. Learn about controlled experiments. Practice interpreting graphs.	Days 7–9	Completed activity accurately and on time. Received extension activity from the teacher.	*Shared Task Alignment* (+) Ilana and Sara worked together on solution to the Light and Dark Scavenger Hunt; the group worked together to construct the device for the Stir-It-Up challenge; jointly constructed answer to reflection question (coconstruction of solutions) *Joint Attention* (+) Ilana and Sara shared the robotic device and the laptop to correctly complete the Light and Dark Scavenger Hunt; Group shared Lego pieces, robotic device, and laptop to jointly work on the Stir-It-Up challenge (materials as center of coordination) Ilana and Sara focused together on interpreting and comparing the graphs for the Light and Dark Scavenger Hunt; group worked together to develop a solution for the Stir-It-Up challenge (joint monitoring of solution) *Mutuality* (+) Sara and Javier worked respectfully to discuss how to program the robot for the Stir-It-Up challenge (transactional responses) Ilana and Sara took turns reading the instructions aloud; group took turns building robotic devices (turn-taking norms respected)

(*Continued*)

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TABLE 3
(*Continued*)

Curriculum Activity	Curricular Goal	Chronology	Group Success	Overall Character of Group Coordination
Cave Explorer Challenge: Build a robotic vehicle and affix a light sensor, a touch sensor, and a temperature sensor to it. Write a program that will allow you to maneuver the robotic vehicle into one of three constructed "caves." Collect 100 data points at 5-s intervals related to the temperature and brightness in each of the three caves. Compare these data and decide which cave would be the most comfortable one in which a team of field-based scientists could sleep.	Apply the robotics and science literacy skills and concepts learned over the previous 2 weeks.	Days 9–11	Partially completed the activity. Collected two of the three data sets and made a decision based on data collected.	*Shared Task Alignment* (+) Discussed the task and how to accomplish it; jointly constructed answer to reflection question (coconstruction of solutions) *Joint Attention* (+) Joint focus on the robot, the laptop, and the test field (materials as center of coordination) Joint focus on the task from beginning to end (joint monitoring of solution) *Mutuality* (+) Group worked respectfully together in discussing how to program the robot for the Cave Explorer challenge (transactional responses) Took turns reading the instructions aloud; took turns building the robot, step by step (turn-taking norms respected)

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on each day but experienced a very difficult period of persistent low coordination in the middle of the unit (Days 5–7). The main rupture in the group during this time cleaved the group in two, with Javier on one side and Sara and Ilana on the other. Eventually the group was able to recover a semblance of coordinated group effort. With the group's relational trajectory as a contextual backdrop, we now provide an analysis and specific examples of each student's playful talk practice as it was related to status negotiations and group coordination.

Ilana.   Ilana was a Latina girl. She participated in the school's Robotics for Girls program, which made use of the PicoCricket Kit. This kit was specifically created to interest girls in robotics (Rusk, Berg, & Resnick, 2005). Although presumably this experience would have cast Ilana as a knowledgeable member of the group in regards to robotics activities, because of the differences in the robotics construction kits, she did not occupy this position. Indeed, Ilana often positioned herself as "less competent" during several programming tasks, often exclaiming in frustration "this is hard" when presented with a difficult roadblock. Although she seemed to grow in her willingness and motivation to undertake more building and programming tasks, Ilana often adopted the role of critical observer during group activities, which was manifested in comments aimed at keeping the group focused on the task. She also frequently referred to authoritative texts (e.g., instruction worksheets, the teacher, or Javier's claimed "expertise") to advance the group toward problem solutions. Ilana carried the instruction sheet in her hand and she also took charge of the ruler in order to measure the distance the robotic device travelled.

Playful talk.   Ilana engaged in the least amount of playful talk over the study period. Table 4 enumerates her playful talk contributions by category. As can be seen in Table 4, Ilana's playful talk practice spanned the major playful talk categories. Here we provide an analytic description of her practice in terms of status negotiation and group coordination.

TABLE 4
Ilana's Playful Talk Contributions by Category

Playful Talk Category	Number of Instances
Humor	12
Music making	8
Pop culture	3
Positioning	3
Teasing	10
Technology-mediated playful talk	9
Word play	6

Status negotiations.   As mentioned, Ilana at times presented herself as less competent. Perhaps because of this, she appeared to have the least amount of status vis-à-vis the robotics activity. However, we did observe Ilana independently attempt to negotiate her status in the group on three separate occasions. She did this work primarily through playful talk positioning in which she took opportunities to cast herself as competent as regards the task. For example, on one such occasion, Ilana negotiated taking turns building the robot with Javier. He offered that she build Steps 2, 3, 4, and 5 in the Lego manual; positioning herself as a competent builder, she playfully suggested that she also build Steps 6, 7, 8, 9, 10, 11, 12, 13, and 14. In other words, she offered to build the entire device. We view this playful talk episode as an identity pivot for Ilana. Here, by playfully suggesting that she would build the entire device, she pivoted toward the identity of competent builder.

Ilana also performed identity pivots during moments of technology-mediated playful talk. On multiple occasions, Ilana pretended to "mother" various pieces of the robotics equipment and other classroom artifacts, such as a pencil. In these moments, as she either cradled the artifact, pretended to hug and/or kiss it like it was a baby, or scolded the artifact as if it were a petulant child (e.g., slapping the robot while saying, "Bad! Bad!"), Ilana pivoted toward the identity of mother or parent. Our codes describe this behavior as *gendered filial humanization* (GFH), which we define as the anthropomorphizing of an object in a way that suggests the pretense of a parent–child or guardian–child relationship (see Table 2). For Ilana, we did not observe these solo acts of play accompany any forms of positioning or claims to competency; rather, they stood out as moments in which she was not directly involved in the construction of solutions to a task.

However, all of Ilana's GFH acts garnered the attention of her group members, particularly Javier. Javier picked up on each instance of GFH that Ilana initiated and reacted with either teasing comments (e.g., "Its name is gonna be ppfftt") or positioning statements (e.g., "Girl, what are you doing?"). Thus, we identified both Ilana's GFH actions and the reactions they provoked as contributing to Ilana's weak status in the group.

Group coordination.   As noted previously, the group went through three distinct periods in terms of coordination. The playful talk practice of the group rose and fell with these periods. Specifically, during periods of low coordination, the group engaged in significantly fewer instances of playful talk. Given the relatively sparse engagement in playful talk during the low coordination period, we examine each student's playful talk practice in relationship to the social harmony of the group that characterized periods of higher levels of coordination.

Whereas Ilana, Sara, and Javier only functioned as a group during periods of high coordination, Ilana and Sara functioned as a group for the entire 11-day unit. These alliances were telegraphed through playful talk interactions. For example,

singing was a playful talk activity that clearly bonded Ilana and Sara during certain interactions; the girls often sang brief (sometimes only two-word) phrases of songs but did so in sync with one another and while doing the same activity. Hence, singing represented a form of playful talk that contributed to the girls' social harmony and emerged as a way of communicating their consonance with each other. Indeed, the sheer number of singing occasions we observed during this study suggests that singing was an overwhelmingly influential aspect of the group's playful talk practice.

Word play at times forged a semblance of social harmony between all of the group members. For instance, when Ilana told Javier on Day 5 that she and Sara had invented the playful name "IlSaJa" (composed of the first two letters of each of their names) for the robot, the group began chanting the name, demonstrating some of the inclusion and social harmony we observed among the group's members during the first 4 days of the study—a time when they were progressing through the challenges successfully and working well together. In addition, Ilana took up and elaborated on three different jokes initiated by Javier during the last 2 days of the study (Days 10 and 11), during the group's rebound to more highly coordinated activity. We regard these instances of humorous playful talk as contributions by Ilana to the group's social harmony.

Javier.   Javier was a Latino boy. Just prior to the beginning of the study, Javier became a participant in the after-school activity club Robotics for Boys. The club utilized the same NXT equipment and Robolab software to build and program their robots that were used in the science classroom, which gave Javier a leg up in the robotics curriculum unit as a slightly more experienced user and programmer. This leg up was publicly validated on the first day of class when Mr. Smith announced that students in the robotics after-school club for boys already knew what to do. Indeed, Javier frequently used his after-school robotics experience to justify a position of "most competent" within the group. We often observed Javier display a dominant position in the group as he tried to assert control of the robotics equipment (especially the robotic device) and frequently attempted to direct the group's progress and troubleshooting tasks. His (sometimes) aggressive tone was balanced, however, by his playfulness in the group. Javier offered the most attempts at initiating playful talk throughout the study.

In terms of his assertions to control objects, the privileged intellectual status given to him already by Mr. Smith (because of his familiarity of the NXT units through the Robotics for Boys program) appeared to allow Javier to emerge as the group leader in terms of group activity on Day 1. Despite occasional claims to a lack of knowledge, Javier continued to behave in a way that leveraged his status to forward his own ideas and playfully reject others' throughout the 11-day period. It is important to note that we did not observe Javier use his knowledge or status within the group to create opportunities for learning among his group

TABLE 5
Javier's Playful Talk Contributions by Category

Playful Talk Category	Number of Instances
Humor	74
Music making	83
Pop culture	8
Positioning	10
Teasing	40
Technology-mediated playful talk	53
Word play	22

mates. Rather, his claims to competency and assertions of control appeared to focus on the creation of opportunities for himself to control the direction of activity or opportunities to control one of the valued objects within an activity (e.g., the NXT). In terms of participation, these behaviors, in combination with his advantaged status at the beginning of the study, suggest that Javier attempted to leverage his and others' social position to negotiate opportunities for his own participation and learning in the activity.

Playful talk.   Javier engaged in the most playful talk of all of the group members. Table 5 enumerates Javier's playful talk contributions by category. As can be seen in Table 5, Javier's playful talk practice spanned the major playful talk categories. Here we provide an analytic description of his practice in terms of status negotiation and group coordination.

Status negotiations.   Perhaps because of Javier's elevated status within the group, he did not engage in playful talk positioning of himself as competent; rather, he engaged in playful talk to position others as less competent or less capable in order to maintain his status. For example, Javier playfully positioned Ilana as incompetent on at least two occasions on Day 9, making light of her skepticism that his proposed solution path would work. In response to her outward questioning, he called her "Debby Downer" and later again in a playful voice said, "My gawd, I'm gonna get so mad at this girl." Sara picked up on this utterance and voiced her appreciation of its humor and playfulness, saying, "Oh my gawd that's funny." Here, Javier's playful form of positioning enabled him to maintain control over an activity and reject the ideas of others, but through playful talk he did this in a socially acceptable way. Thus, he maintained his elevated status.

Javier also used teasing to achieve his status goals. His teasing, which appeared playful in its delivery (i.e., intonation, pitch, etc.), set a tone early on in the

study that, in combination with his privileged experience with the NXT in the Robotics for Boys club, served to both put the girls down verbally and elevate his intellectual status in the group, thereby increasing opportunities for his own learning during group activities. As we define teasing, this type of behavior signifies a playful way of invoking status differentials between parties. Hence, by his frequent teasing, Javier effectively elevated his status momentarily while lowering the status of the target of his teasing (predominantly Ilana). On many occasions on which he teased Ilana we observed her withdraw from direct conversation or relinquish control of an object. We did not observe her challenge his teasing comments or return them with teasing comments of her own, thereby granting him an elevated status over her.

In line with his teasing, Javier also used a joking style that referenced imaginary conflicts or tensions, often between him and his group members. For instance, Javier often joked sarcastically about pretend catastrophes, such as a broken robot or lost program. However, comments such as "Oh, so now you're calling me a computer?" and "What have Oreos done to you?" positioned Javier as a victim and defender of the moral higher ground within these made-up conflicts. Thus, we refer to this style of joking as *joking about conflict.* Whereas Javier made some joking-about-conflict statements seemingly to play a quick prank on his group mates, other statements closely resembled teasing. Joking-about-conflict statements differed from teasing statements, however, in that they only implied (sarcastically) that one had been teased (Javier, Oreos) and another had done the teasing (Sara or Ilana). Yet a result of this style of joking, as with teasing, was the sarcastic implication of a status differential between the pretend teaser (Sara or Ilana) and the pretend tease-ee (Javier, Oreos), such that the pretend teaser was gifted an elevated status as a result of the (sarcastic) teasing. In these instances, Javier used playful talk to make a pivot toward the identity of victim. Javier used the highest number of joking-about-conflict statements on Days 8 and 10, arguably as he vied to regain some social status within the group after the period of low coordination in which Ilana and Sara distanced themselves from him. Hence, we identified joking-about-conflict as an emergent method to communicate status within the group. The technique represented a countertease in which Javier was able to flip his status from teaser to one being teased, perhaps as a means of eliciting sympathy.

Javier's identity pivots also included a pivot toward parent. Similar to Ilana, Javier often adopted a parental tone toward the robot. During these moments with the robot, Javier behaved as a disciplinarian father, scolding the robot for behaving "badly." These statements sometimes provoked laughter from Sara and Ilana, but not consistently. This identity pivot toward parent did not appear to affect Javier's status within the group, but it did align with his expression of self as dominant in group activity.

Group coordination.   Perhaps Javier's most significant contribution to the group's playful talk practice was his joking nature. Sara and Ilana laughed frequently throughout the study, mostly in response to Javier's jokes. Sara and Ilana both picked up this style of interaction at various times, indicating that the group shared a common understanding of joking as a legitimate way of communicating various things. Hence, joking often indicated social harmony between group members.

In addition, at least two of Javier's technology-mediated playful talk utterances were picked up by the group, becoming a part of their playful talk practice. These utterances are evidenced in the data as "Jing/Ying/Zing" and "Wait for it." The Jing/Ying/Zing utterances all refer to the sound one particular robotic device made on Day 8 as part of the Stir-It-Up challenge. We observed Javier use word play on 22 occasions throughout the study. Nine of these playful utterances involved plays on the word *Zing/Ying/Jing* and often took place during moments of solitary play. Other episodes of word play Javier participated in included the use of the word *scheck* when troubleshooting and checking results with Sara and the partial taking up of Sara and Ilana's plays on the term *thingy devicey* to describe the apparatus they were working on during the Stir-It-Up activity. We consider the take-up of other group members' word play to evidence some of Javier's awareness of social mores and his desire to work with his peers.

Sara.   Sara was a Latina girl. Sara was also a member of the Robotics for Girls after-school club, which utilized the PicoCricket Kits. Sara was a frequent contributor to group discussions and a willing troubleshooter, as demonstrated by her assertiveness when reviewing troublesome programs and problematic equipment. Sara was also consistently engaged in whole-class discussions. Sara demonstrated a great deal of self-confidence throughout the study and appeared un-intimidated by Javier's attempts to dominate group activities. Indeed, whereas Ilana seemed willing, at setbacks, to defer to Javier's authority as the experienced robotics student, we observed Sara remaining steadfast in her attempts to find solutions to numerous problems, sometimes deflecting Javier's aggressive behavior in an effort to forward her ideas.

Playful talk.   Perhaps in keeping with her confident but not dominant role in the group, Sara's playful talk contributions occupied the middle ground. Table 6 enumerates Sara's playful talk contributions by category. As can be seen in Table 6, Sara's playful talk practice spanned the major playful talk categories. Here we provide an analytic description of her practice in terms of status negotiation and group coordination.

Status negotiations.   Toward the end of the period of low coordination, Sara used word play as a means of positioning herself and Ilana as a subgroup separate from Javier. While Sara and Ilana were engaged in an episode of word play with

TABLE 6
Sara's Playful Talk Contributions by Category

Playful Talk Category	Number of Instances
Humor	10
Music making	19
Pop culture	4
Positioning	2
Teasing	10
Technology-mediated playful talk	8
Word play	15

the term *thingy devicey* and building a support apparatus for the Stir-It-Up challenge, Javier attempted to draw their attention to himself and the task he was doing. When his attempt to focus their attention on him failed, he, somewhat passive-aggressively, chided, "Fine. Ignore me." Sara responded with the statement, "You're doing that, we do this, you know?" clearly indicating to Javier that his participation in their building activity was not welcome. The girls continued with the word play. Jaded, Javier then replied that their game of "thingy devicey" word play was "getting old." Sara rejected this claim and responded, saying, "No, this is a new thing," and then continued the game of word play with Ilana. In this way, Sara used a game of word play to challenge Javier's dominance in the group and position him as an "outsider" to the girls' subgroup. Hence, Sara and Ilana carved out a separate task and relational space for themselves. Sara's status negotiations, then, appeared similar to Javier's, which was to effectively use playful talk to position others.

Another interesting aspect of Sara's playful talk related to status occurred on Day 5 when she picked up one of the Lego figurines and mused, "I found this little guy. We should put him somewhere." Javier joined the play and the two tussled over where to put the figurine. At one point, Sara said in reference to the toy, "Let's make it a girl." Javier immediately objected to this, while Ilana jumped in to the play for the first time and agreed that the figurine should be thought of as a girl. Javier then said, "Let's make it something better than a girl." To which Sara responded, "A tomboy?" By initially positioning the figurine as a "he" and then switching it to be a girl, Sara was, arguably, creating space for girls within the robotics activity. Although we cannot view this as an identity-based, playful talk pivot for Sara in the same way as Ilana and Javier experimented with such pivots, it is possible that by suggesting that the Lego figurine be a girl, Sara was projecting herself into the world of Lego and Lego robotics. She may well have been playfully responding to the positive positioning of boys at the beginning of the unit by Mr. Smith. We discuss this possibility in greater detail in the Discussion section.

Group coordination.   Sara engaged in the teasing of both of her group partners. When teasing Ilana on Day 6, for instance, Sara seemed to lightheartedly poke fun at Ilana's struggles with the robotic device. Similarly, Sara lightheartedly teased Javier on Day 8, when he was trying to reestablish himself as a participating group member through a victim identity pivot. Sara picked up on Javier's initiation of playful talk ("Oh, so now you're calling me a computer screen? Okay, call me a computer screen.") and teased him, saying, "You want me to call you a computer screen? Computer screen! Computer screen!" This type of teasing appeared to reinforce group cohesion after their period of low coordination.

Sara's most noticeable contributions to the group's playful talk were the plays on words she invented throughout the study. Sara initiated several word play themes that the group took up (*sheck, IlSaJa, thingy devicey,* and *ATTDTTA*) and referenced during moments of play, solution construction, and positioning. For example, at various moments during Days 3, 4, and 5, Sara used the word *sheck* during troubleshooting activities. This mispronunciation of the word *check* became a frequently referenced word to describe future activities related to troubleshooting and trial and error. Indeed, Javier adopted this pronunciation over the course of those days to talk about related activities (e.g., "Let's go sheck"). When picked up by other group members, these new words and phrases represented heuristics or practices of playful talk that different members of the group came to understand collectively. Hence, plays on words such as *sheck* and *thingy* are examples of the group finding situational means to communicate ideas related to roles and proposed solutions.

In sum, the students' playful talk practice was reflective of the ways in which they attended to one another's talk and one another's attempts to direct the attention of the group or set the tone of the group. In taking up one another's ways of playing with words or with the physical materials themselves, the students demonstrated a sense of groupness—a desire and a tendency to play together in a way that was specific to these three students. Indeed, playful talk served as a mechanism for establishing and maintaining group cohesion. In addition, the students engaged in playful talk as a means of role and status negotiation within the group. The students teased one another as a means of playfully negotiating who would do what within the group. And, as we know from the literature, such negotiations are directly related to students' opportunities to learn. To further investigate the relationship of playful talk to opportunities to learn, we now address our primary research question.

The Role of Playful Talk in Creating or Foreclosing Opportunities to Learn Within the Collaborative Group

As demonstrated here, the students used playful talk to position themselves as both socially and academically competent within the group. We view this playful talk

positioning as a form of role and status negotiation within the group. Here we analyze two illustrative examples of academic playful talk positioning (accomplished through teasing), and we discuss how these episodes functioned to influence opportunities to learn within the group.

The first episode occurred on Day 1 of the session and it involved Javier, Ilana, and, indirectly, Mr. Smith. During his introduction of the 11-day physics/robotics unit to the students, Mr. Smith introduced his robotic device as "Schneider" and referred to it as "he." Mr. Smith also remarked during the introduction that the students who were taking part in the after-school Robotics for Boys club would be familiar with what they were going to do in class that day, because they had already done it in the after-school club. With these comments, Mr. Smith committed two acts of positioning—first, he positioned the robotic device as male; and second, he positioned the participants in the after-school Robotics for Boys club as knowledgeable. The first act of positioning reinforced societally held beliefs that science and technology are male domains (as discussed in the literature review). The second act of positioning allowed the students participating in boys' robotics to lay claim to a leading role in the work of the group—because they already knew how to do it.

Once Mr. Smith had completed the introduction and the students were working in their groups, Ilana initiated a playful talk episode that addressed the positioning acts committed by Mr. Smith. Javier took up Ilana's teasing. The transcript of this playful talk episode and our analysis of it are provided in Table 7.

In this playful talk episode Ilana was attempting to negotiate roles within the group as regards opportunities to learn. She began this negotiation by claiming that Mr. Smith did not build the robot but rather purchased it already built. She extended this teasing claim to the boys' robotics group and then, finally, to Javier himself. In the meantime, she made the claim that she knew how to build the robot (pivoting toward the identity of competent builder) before admitting that she did not. This may be seen as an attempt to level the playing field in terms of positioning within the group. In other words, Ilana was attempting here to rebut Mr. Smith's positioning of the students who take part in boys' robotics (including Javier) as more knowledgeable in order to maintain some sort of equal status in the group. She was doing this because, earlier, Javier was asserting, through claims to knowledge, his right to build the robot. In making this claim, Javier was foreclosing Ilana's and Sara's respective opportunities to learn with the first activity. To combat this situation, Ilana began teasing Javier. However, once Ilana admitted that she did not know how to build the robot, despite her involvement in the girls' robotics after-school club, the teasing switched from offensive to defensive for Ilana. As Javier established his knowledge and Ilana's lack of knowledge, Ilana turned to making jokes about girls' robotics and what they learn there. This joke was also aimed at positioning in the sense that she was claiming that robotics can be a girl's activity that has to do with girl topics like doing one's

TABLE 7
Playful Talk Positioning, Example 1

Line		Utterance	Interpretation
1	I:	=You ↑built that Mister?	Ilana, in a quiet voice, asks Mr. Smith if the built Schneider (the robotic device) in the after-school club for boys.
2	J:	Ye::s	Javier replies affirmatively for Mr. Smith, who did not hear the question.
3	I:	Yeah right (.) I bet you he got it from the store [he probably bought it]	Ilana teases Javier that Mr. Smith did not make it but bought it, positioning Mr. Smith as a consumer, not a builder.
4	J:	[He] bou::ght a:ll tha:t and made it [that's easy to make]	Javier defends Mr. Smith.
5	I:	[he bought that, nah] he bought that [he bought the robot]	Ilana continues to tease.
6	J:	[That's easy to make]	Javier continues to defend.
7	I:	But he bought the robo::t	Ilana continues to tease.
8	S:	Ha ha ha::h .hh	Sara laughs at Ilana's teasing of Javier.
9	I:	you know he di:d	Ilana continues to tease.
10	J:	He ↑didn' [t]	Javier defends.
11	I:	[I] bet you that he::, (.) I bet you guys buy a bo:x with the robot already in their and say you built i:t (0.8)	Ilana turns the teasing object from Mr. Smith to the boys' robotics group, positioning them as consumers, not builders.
12	S:	Yea::h (0.4)	Sara joins in the teasing.
13	J:	↑You're ↑gonna do that for↑get ↑you:: (1.8)	Javier brushes off the teasing.
14	J:	Bent [(stud) (less)]	Javier looks for a piece in the box and verbalizes the name of the piece.
15	I:	[Coz you don't know] how to build a robo:t [I know] how	Ilana makes Javier the object of her teasing and positions herself as competent to build the robot.
16	J:	[↑Me?] Of course I do	Javier replies that he knows how to build the robot.
17	I:	Yeah right	Ilana continues to tease.
18	J:	I have ro[botics how do] I not know how to build a robo:t	Javier defends.
19	I:	[How come you] (0.4) I have robotics too,	Ilana begins to question how Javier knows how to build while she does not, as she has robotics, too.
20	J:	There we go	Javier indicates that she should also know how to build the robot

21	I:	And I >don't know how to build the robot	Ilana admits that she does not know how to build the robot.
22	J:	Well then (.) that's just ↑you,	Javier positions Ilana as someone who is not a learner and not a builder.
23	I:	No:: because they don't ↑teach us about ro:bots they teach us about gi::rl's stuff they [teach us about (nails)]	Ilana rebuts this positioning with a joke about the after-school girls' robotics club.
24	J:	[They teach us about gir]ls stuff (.)	Javier repeats Ilana's comment in a mimicking voice.
25	J:	↑Nails? (0.4) ↑↑What? (.)	Javier questions Ilana about girls' robotics.
26	I:	Yeah >well just about your roboti:cs< (0.6)	Ilana clarifies.
27	J:	[Yeah]	Javier concurs.
28	I:	[And] ↑they teach us about nai::ls and [everything]	Ilana persists in her joke about girls' robotics.
29	J:	[I kno:w]	Javier goes along with the joke.
30	S:	[She does]	Sara concurs with Ilana, also participating in the joke.
31	J:	[What's a] (bushing) show me the: [(.) picture show me the ↑picture (?)]	Javier turns his attention to the task.
32	I:	[(See) (what they say) okay your nails] has a ro↑botic (0.4) cover (under your nail)	Ilana elaborates on the joke to position the girls' robotics class as being both about "girl stuff" and about robotics.
33	J:	A ro↑botic cover under your [nail o↑ka:y]	Javier repeats Ilana's comment, encouraging her to continue.
34	I:	[.hh ↑hu::h]	Ilana vocally affirms Javier's comment.
35	J:	Ju::s- ju:st okay >forget it< forget I even ↑a::sked that question (.) .hhh no but ↑we ma:ke the real robo:ts we're not	Javier withdraws his question to end the joke but positions the work they do in boys' robotics as the "real robotics" work and, in so doing, positions girls' robotics as inferior.
36	I:	Yeah right	Ilana replies.
37	J:	Nai::[ls]	Javier begins to ridicule Ilana.
38	I:	[Wh]atever (.) you >I [don't see (anyone)<]	Ilana deflects his ridicule.
39	J:	[°What are you talkin]g about° =	Javier dismisses Ilana.
40	I:	=Whatever	Ilana acquiesces.
41	J:	[↑A:sk him I] da:re you	Javier suggests that Ilana verify with Mr. Smith that they build the robots in the boys' robotics club.

Note. I = Ilana; J = Javier; S = Sara.

nails. Ilana reached out to include Sara in the joke, and Sara willingly played along.

Ilana's attempt to claim robotics as a girls' activity is very important, we argue, because we view it as a response to Mr. Smith's initial positioning of his robotic device as a male and of robotics in general as a male activity. In attempting to reframe robotics as a girls' activity, Ilana performed what we might consider an *identification* pivot. She identified robotics as a girls' activity, one in which girls have the right to equally participate. In this pivot, Ilana worked toward making space for herself and Sara to have opportunities to learn (through identification with girls' robotics) within the group.

The second example of playful talk positioning occurred on Day 7. At this point in the 11-day unit, the students were still experiencing low levels of coordination. The group had moved on from the Light and Dark Scavenger Hunt challenge (which, to this point, they had failed to complete) to the Stir-It-Up challenge. At the beginning of this challenge, the students needed to build a stirring device and a support for the stirring device. Javier proclaimed that he would create the support and that Ilana and Sara should build the stirring device. While the students were working, Sara initiated an episode of playful talk featuring word play that became an opportunity both to tease Javier and to verbally and emotionally exclude him from the subgroup that was Sara and Ilana. Table 8 presents the transcript of this episode and our interpretation of the utterances.

By the end of this episode, Sara and Ilana had playfully positioned Javier outside their inner circle. This exclusion accomplished three tasks. It positioned Sara and Ilana as competent in the building of the "steering wheel." In other words, it allowed them to pivot toward the identity of competent builders within the group. Also, it emphasized the cohesiveness of Sara and Ilana as a subgroup and positioned Javier as being not knowledgeable—directly challenging his authority within the group and thereby foreclosing his opportunities to learn while opening their own. Here, playful talk was used as a strategy by Sara and Ilana not only to pivot toward a different identity but to attend to their own social relations and indicate to Javier that he did not have standing within the subgroup to "know" what the subgroup was talking about. In this way, playful talk served as a means to cue social status within the group and to recalibrate claims to knowledge and authority therein.

Though there were clearly moments of high tension during this episode on Day 7, it did not result in complete rupture. Rather, Javier was able to both express his desire to have the joke end and also participate in the extension of the word play over the length of the episode. In this way, the playful talk episode served to help Ilana and Sara provide feedback to Javier on his group status, but it also provided Javier a way to continue interacting with them. For example, when he added the term "around" to the string "a temperature thingy devicey that turns," it

TABLE 8
Playful Talk Positioning, Example 2

Line		Utterance	Interpretation
1	S:	I made >a little< (.) I made a little thingy devicey	Sara discusses the steering wheel she and Ilana have been making with the Lego pieces as a part of the Stir-It-Up challenge as a "thingy-devicey."
2	J:	A little thJingy devicey?	Javier repeats the phrase in a questioning way.
3	S:	Yeah ↑>huh huh< hu::h (0.4) .hhh you know I'm gonna call it from now on you know.	Sara replies in the affirmative about the name she has given to the steering wheel.
4	J:	She made a thingy devicey	Javier joins in the word play.
5	S:	[$Yea::h$]	Sara replies in the affirmative.
6	J:	[Did you] know tha::t (0.4)	Javier continues to play.
7	S:	Oh wait	Sara looks for a piece in the parts box.
8	J:	She ↑made a ↑↑thingy devicey(0.6)	Javier continues the game.
9	S:	You wanna try it ↑ou::t? (1.0)	Sara invites Javier to try out her "thingy devicey."
10	J:	°What are you ta:lking about° (1.0)	Javier asks for clarification.
11	S:	hhhhh do you want to (jump) on my thingy devicey thingy?	Sara jokingly invites Javier to jump onto her "thingy devicey thingy."
12	J:	°Shut u::p°	Javier does not like the insinuation of the joke and quietly tells Sara to be quiet, indicating the tension that exists in the group because of the period of low coordination.
13	S:	No (.) you: shut up (.) ↑you, (.) you, (1.0)	Sara escalates the conflict.
14	S:	You can have my little thingy devicey thingy,	Sara begins to tease Javier.
15	I:	A:h	Ilana vocalizes.
16	J:	Can you sto:p it please	Javier asks Sara to stop teasing.
17	S:	No	Sara continues to escalate.
18	I:	Today you (inaudible)	Ilana is speaking with Sara about her device.

(*Continued*)

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TABLE 8
(*Continued*)

Line		Utterance	Interpretation
19	S:	Yeah (0.4) you know you put your feet right he::re	Sara continues with the joke about how to mount the "thingy devicey."
20	I:	Yea::h	Ilana joins in the joke with Sara.
21	S:	And then you an- the- and then you put your ↑arms in here	Sara continues with the joke.
22	J:	[We can use] this to stir i::**t**	Javier attempts to move the focus back to the task of building a stirring device.
23	I:	↑↑Hu::h ha ha	Ilana laughs at Sara's joke.
24	J:	And [>then the water goes<]	Javier discusses the problem they need to solve.
25	I:	[It's steering] on the bottom	Ilana continues to discuss Sara's "thingy devicey" with Sara.
26	S:	Yeah	Sara concurs with Ilana.
27	J:	[Fi:ne (.) ignore] me (.) oka::y	Javier expresses frustration with being ignored by Sara and Ilana.
28	I:	[hu::h ha ha]	Ilana laughs.
29	S:	You're doing ↑that we do this you know	Sara indicates that they will not help Javier with the problem because it is his to solve; Ilana and Sara are working on their own problems (building the "thingy devicey"). Here, Sara is clearly rejecting Javier as a group member—she is positioning him outside the group of two that is Sara and Ilana.
30	J:	You know what	Javier begins to reply.
31	S:	You know my little thingy devicey thingy [to turn]	Sara returns to the joke as word play.
32	J:	[Okay alright] ALRI:G**HT**	Javier expresses frustration by raising his voice.
33	S:	This is the turn the turning thingy	Sara continues with the word play.
34	J:	O::::h my [no (.) it's getting (old)]	Javier asks in another way for the girls to stop joking.
35	I:	[↑Lee::::::::: lee:::::::]	Ilana vocalizes.
36	S:	No	Sara rebuts Javier's comment.
37	I:	E::::r	Ilana vocalizes.

#	S:	Utterance	Description
38	S:	No it's a new thing	Sara continues to exclude Javier.
39	J:	It's getting (o[:d]) [A] turning devicey thingy,	Javier continues to express his dissatisfaction.
40	I:	Hee [hee:::::::]	Ilana laughs.
41	J:	[It's getting] old	Javier complains more about the joke.
42	I:	.hhhh you don't know what we talking a[bout] (so)	Ilana also positions Javier as not knowledgeable and, therefore, outside of the group of two (Ilana and Sara).
43	S:	[Yeah]	Sara concurs with the positioning.
44	J:	Su::re you're talking about a thingy devicey [that]	Javier rebuts Ilana's claim to his lack of knowledge.
45	S:	[Ha ha]	Sara laughs at the conflict.
46	I:	No we're not talking about a thingy devicey we're talking about [a thingy]	Ilana replies to Javier.
47	J:	[HA WHATEVER just WHATEVER]	Javier raises his voice in an attempt to drown Ilana out.
48	S:	[No we're talking about a thingy]	Sara replies to Javier simultaneously with Ilana.
49	I:	[We're >not talking about< a: thingy] devicey we're talking about a thingy dev[icey] okay	Ilana continues with her explanation of why Javier does not understand (she emphasizes the last syllable to the word *devicey* to distinguish their knowledge from his).
50	S:	[Yeah]	Sara concurs with Ilana.
51	J:	No just	Javier attempts to rebut Ilana.
52	I:	You said (it was wro:ng)	Ilana provides more evidence of Javier's lack of knowledge.
53	J:	[Just no no::::]	Javier again attempts to end the teasing.
54	S:	It's called (.) a temperature thingy devicey that [turns]	Sara continues the word play.
55	I:	[O:::h] when it spi::ns it goes in the water like [↑this]	Ilana discusses the functionality of the "thingy devicey" as it relates to the Stir-It-Up challenge.
56	J:	[A tem]perature thingy devicey that tu:rns	Javier repeats the word play phrase—joining in the joke again.
57	S:	↑Yeah (0.6) that's what it's named now	Sara concurs.
58	J:	You ↑gotta be be kidding me::	Javier makes fun of the term.
59	S:	.hh ↑hu:h	Sara laughs.
60	I:	Eh	Ilana vocalizes.
61	J:	<A temperature thingy devicey that tu::rns>	Javier repeats the word play phrase.
62	S:	Yeah	Sara concurs.
63	I:	A::h ah ah ah a::h	Ilana vocalizes.

(*Continued*)

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TABLE 8
(*Continued*)

Line		Utterance	Interpretation
64	J:	Call me when I'm (.) [done throwing up]	Javier expresses his continued discomfort with the word play in a graphic way.
65	S:	[Wait, Ilana a thingy devic]ey that tu:rns no a temperature thingy devicey that turns (0.4)	Sara expands on the word play.
66	J:	Around	Javier joins in the word play.
67	I:	Ye:: [ah]	Ilana concurs.
68	S:	[Ye]ah	Sara concurs.
69	J:	That's next	Javier continues with the word play.
70	I:	Around (0.4) say a↑round next a thingy devicey that turns around	Ilana continues with the word play.
71	S:	A temperature thingy devicey that turns around, [hhhh, h::uh]	Sara continues with the word play and laughs.
72	I:	A temperature thingy device that turns arou::nd	Ilana continues with the word play.
73	J:	I didn't tell you to get used to it	Javier asks again for a halt to the word play.
74	S:	Oh well (.) you will	Sara rebuts Javier.
75	I:	A tempera↑ture	Ilana continues the word play.
76	S:	Thingy	Sara continues the word play.
77	I:	A temperatu::re	Ilana continues the word play.
78	S:	Thingy [devicey] (.) that tur:ns around	Sara continues the word play.
79	I:	[Devicey] (1.0) z::::: zm:: (.) a::::: temperature thingy devicey that (.) tu[rns]	Ilana continues the word play and starts to write the words down.

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80	S:	[Oh tee] we could put tee (0.4) ay tee tee dee tee::. (.) ai ay (.)Ay [dee tee dee tee]	Sara introduces a new element to the word play, turning the phrase into an acronym.
81	I:	[dee tee ai ay] Ay (.) [ay tee tee dee tee ai ay]	Ilana joins in this new aspect of the word play as she writes each word down.
82	S:	[Ay tee tee dee tee ai a:y]	Sara continues with the acronym development.
83	I:	[.hh ay] tee tee dee [tee tee]	Ilana works on the acronym development, speaking in unison with Sara.
84	S:	[Tee tee] (0.4) That looks like an ay	Sara continues acronym development, seeking clarification.
85	I:	Ay it is ay	Ilana confirms that she has written an A.
86	S:	Oh ay (.) oh look loo:k it, (.) a form ay ↑tee tee (.) dee (.) ay tee tee (.) ↑dee ay tee tee a dee and then write it ↑backwa:rds (.) ay tee ↑tee	Sara recognizes a pattern in the acronym as a palindrome (the acronym may be read the same way forward as backward).
87	I:	Dee:	Ilana continues to help with acronym development.
88	S:	Tee tee ay; ay tee tee dee tee tee ay	Sara arrives at the final acronym AITTDTTA.

Note. S = Sara; J = Javier; I = Ilana.

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was picked up by Sara and Ilana—so he successfully took part in the word play game. And because word play was part of the group's shared playful talk practice, it may have reopened the possibility of cohesive group work. In essence, Sara and Ilana used playful talk to readjust the group dynamic by asserting themselves and their right to actively participate in the group's activities (and hence to learn about robotics). It also provided Javier an opportunity to take part in shared group practices in order to maintain a sense of the group as a whole.

DISCUSSION

Our analysis of the data in this study indicates that students utilized the playful talk genre as a means to (a) position themselves and others as more or less competent within the group in order to create or foreclose opportunities to learn, (b) maintain and strengthen bonds that were developing within the group (particularly between Sara and Ilana) toward the goal of achieving higher levels of coordination and opportunities to learn, and (c) pivot toward a self-selected identity aimed sometimes at affecting one's status within the group. From a broader perspective, we argue that playful talk performed an important affective function in the group's interactions. Playful talk, as engaged in by this group, appears to be a method for the students to explore and work out group power dynamics in a *socially acceptable* way. In other words, playful talk may be used to avoid direct confrontation or competition but still allow students to meaningfully negotiate the "how" of group work vis-à-vis status, coordination, and opportunities to learn.

Based on our review of the literature, we know that status differentials among individuals may affect opportunities to learn within a small collaborative group. Furthermore, we know that science and technology are viewed, societally, as male disciplines. In our study, we observed gender as a salient variable as regards status differences among the three students, and this was reflected in many of the positioning acts engaged in by the students. In our view, Mr. Smith unwittingly accentuated gender-based status differences on the first day of the unit when he referred to his robotic device using a male pronoun and positioned the Robotics for Boys club participants as more knowledgeable about the unit than other students. In so doing, he privileged the male members of the class. This may have introduced heightened levels of gender-based competition within our focal group. Javier may well have sought to dominate the group's activities regardless of these positioning comments, but the fact that Ilana directly took up Mr. Smith's positioning in her playful talk on Day 1 indicates that she was keenly aware of the privileging of Javier. Moreover, both Ilana and Sara sought to reframe robotics as a girls' activity over the course of the 11-day unit. We discuss this reframing in greater detail later.

As noted, prior research has also shown that competition in collaborative groups often has negative repercussions on learning within the group. Once our focal group began to experience lower levels of coordination, a within-group competitive element was introduced. The within-group competition we observed revolved around control of the laptop, the Lego pieces, and the robotic device itself. The robotics construction kits were designed from a constructionist perspective (Resnick, Martin, Sargent, & Silverman, 1996; Resnick & Ocko, 1991), which views hands-on manipulation and construction of materials into entities as a primary means of knowledge construction (Papert, 1993). In this particular context, because of the nature of the robotics activities and their emphasis on hands-on exploration of robotics concepts, direct control of the devices led to greater opportunities to learn.

On Day 7 of the 11-day unit, as a means of recovering from the downward relational trajectory of the group experienced on Days 5–7, Sara and Ilana engaged in a word play playful talk interaction that served to express their solidarity with each other and their desire to take a leading role in the direction of group activity. They did this by creating their own Lego device without the help of or consultation with Javier. Through direct manipulation of the robotics materials and the "ATTDTTA" playful talk word play exchange, Sara and Ilana positioned Javier outside of the group and reestablished themselves as active agents in creating opportunities for themselves to learn within the group. In so doing, they were able to regain a successful trajectory for the group, typified by high levels of coordination between Sara and Ilana and higher levels of coordination across the entire group. In effect, they regulated the group's activity through playful talk and an identity pivot toward that of competent builder.

Strough et al. (2001) argued that girls are more concerned with interpersonal relationships, including mutual participation, in collaborative group work than boys, girls engage in high-affinity talk while working collaboratively. Therefore, whether the formation of this all-female subgroup was a result of Mr. Smith's positioning or simply a predictable outcome of girls working together collaboratively it is not possible to tell. But it is clear that there was a gender dynamic at work in this group and that *all* of the participants of the group used playful talk positioning as a mode of negotiating their group status.

Our results also indicate that, as postulated, students used playful talk to pivot toward self-selected identities that went beyond their institutional identities as sixth-grade science students. These pivots were sometimes performed toward the goal of shifting one's status within the group. For example, Ilana and Sara performed playful talk identity pivots toward competent builder of the robotic devices. Meanwhile, Javier performed elaborate identity pivots toward the role of victim, arguably to combat his positioning outside of the Sara/Ilana subgroup on Day 7. Indeed, although Javier used the joking-about-conflict playful talk mode

prior to this positioning, he made most of these moves (18 of 22) after being excluded on Day 7. So, although the joking-about-conflict mode of playful talk was in his repertoire to begin with, it appeared more frequently once he had in effect been socially excluded. As we noted, this pivot appeared to work for him as Sara picked up on the joke and played it out in friendly ways with him, thereby making space for him again in the group.

In addition to the individual identity pivots, Ilana also used playful talk to attempt to reframe robotics as a girls' activity. In so doing, she was performing an *identification* pivot through her playful talk. In reframing robotics as a girls' activity, she sought to create a psychological space for herself and Sara to identify with the robotics activity. As noted earlier, Sara also performed this identification pivot but in a more indirect fashion. In play with the nondescript Lego figurine, Sara decided, after initially referring to it as "a little guy" and "he," that it should be considered female. It seems then that playful talk creates an imaginary space where alternate realities may be entertained. And these alternate realities revolve around playing with identity.

We also observed both Ilana and Javier perform identity pivots toward the role of parent. In thinking about these pivots, we turn to the work of Sfard and Prusak (2005), who have formulated a discourse view of identity that includes an actual identity and a designated identity. In their formulation, one's actual identity is composed of the things that can be currently, accurately said about the person (e.g., she is a professor). In contrast, a designated identity is what might be expected to happen in the future or what one may aspire to in the future (e.g., he will be a chef). We find these concepts to be useful in thinking about Ilana and Javier's identity pivots toward the role of parent. Each of these students at various times interacted with the robot from a stereotypically gendered, parental perspective. Ilana performed the designated identity of nurturing mother, and Javier performed the designated identity of disciplinarian father. One might argue that this behavior is indicative of the importance of gender identity for these students in general, regardless of group negotiations. And Ilana and Javier's stereotypic stance toward gender may have added to the competitive activity in the group, particularly once Mr. Smith cued gender as a salient variable for group interactions. Furthermore, because technology is viewed societally as a male discipline, Ilana's relatively weak status within the group may have been accentuated by her strong identification with a distinctly female role: mother.

Future Research

In this study, we have found evidence of students pivoting toward noninstitutional identities through playful talk. Further research into the relationship of playful talk to identity exploration is warranted to help researchers understand the breadth and depth of the association and its role in youth development. Specifically, a focus on

investigating the circumstances under which specific types of identity exploration occur and for what purpose will assist experts in creating learning environments that facilitate positive identity exploration for youth.

Lytra (2009) and Carter (1999, 2002) have argued that playful talk is a ubiquitous mode of youthful communication, and this study bolsters that claim. One question for us as researchers relates to the variability of the types of playful talk in which students may engage. For example, two categories that we developed for this study that had not been previously identified in the literature were technology-mediated playful talk and playful talk positioning. Clearly, the robotics content of the unit influenced the development of the former category. Meanwhile, the competitive nature of some of the group interactions may have contributed to the development of the latter category. For example, if a collaborative student group is working well together and not involved in competition for control of materials and activities, then there may be no need to position oneself, playfully or otherwise. Further research into the playful talk practices of various types of collaborative groups (competitive or cooperative) would help experts understand this practice with greater specificity.

Implications

Here we have begun to demonstrate the role of playful talk in the projection and expression of situated and designated identities in the pursuit of opportunities to learn in small-group collaborations. The implications of our research include possibilities for creating curriculum and/or pedagogical approaches that create a space for identity exploration through playful talk. It is important to consider how meaningful playful talk interactions may be enabled through skillful teaching, curriculum, or software development, especially as a means of engendering playful talk that encourages identity pivots toward competency in science, technology, engineering, and mathematics topics. The use of collaborative, open-ended inquiry with constructionist materials, as in this study, is one means of creating these spaces.

Furthermore, in this study Mr. Smith unintentionally created a situation in which one's gender identity was relevant to group work. His behavior is indicative of the persistence of gendered identification and gender bias within the fields of science and technology. This persistence has most recently been empirically verified by the work of Moss-Racusin, Dovidio, Brescoll, Graham, and Handelsman (2012), who found that the 127 science faculty who participated in their study consistently discriminated against young female scientists in hypothetical employment situations. It is important then for experts to also consider ways to address these persistent and, we argue, implicit biases. Mr. Smith created an inquiry classroom and was very dedicated to facilitating learning for *all* students. In our view, his focus on the robots as male was unconscious, yet it was somewhat harmful

because it put Ilana and Sara in the position of having to reimagine robotics as a girls' activity. As educators and designers, we need to think seriously about how to address these unconscious biases beyond preservice teacher education programs and find ways to combat them everywhere (including in teaching, curriculum development, and software design).

CONCLUSION

In this article, we have furthered understanding of the relational aspects of collaborative group learning through examining the affective role of playful talk in such settings. Playful talk is an important and complicated means by which students in a group negotiate their identities, relationships, and group coordination. It is a powerful mechanism by which students engage with one another to construct themselves as competent, as competitive, as fun loving, as socially valued, and as members of a group. It is also a place where underlying beliefs derived from the larger society are expressed and come to light in indirect and safe ways. Playful talk may serve to create tension, and it also may serve to alleviate tensions in a group. Students who are engaged in playful talk during collaborative group work are not just messing around; they are coordinating group work, negotiating identities, and working toward developing selves in a safer peer space.

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APPENDIX

The Jefferson Transcription System

Taken and adapted from http://www-staff.lboro.ac.uk/~ssjap/transcription/transcription.htm

This transcription system uses standard punctuation marks (comma, stop, question mark); however, in the system they mark intonation rather than syntax. Arrows are used for more extreme intonational contours and should be used sparingly. The system marks noticeable emphasis, volume shifts, and so on. A generally loud speaker should not be rendered in capitals throughout.

[]	Square brackets mark the start and end of overlapping speech. They are aligned to mark the precise position of overlap.
↑↓	Vertical arrows precede marked pitch movement over and above normal rhythms of speech. They are used for notable changes in pitch beyond those represented by stops, commas, and question marks.
→	Side arrows are used to draw attention to features of talk that are relevant to the current analysis.
Under<u>lin</u>ing	Underlining indicates emphasis; the extent of underlining within individual words locates emphasis and also indicates how heavy it is.
CAPITALS	Capitals mark speech that is hearably louder than surrounding speech. This is beyond the increase in volume that comes as a byproduct of emphasis.
°↑<u>I</u> know it,°	Degree signs enclose hearably quieter speech.
that's r*ight.	Asterisks precede a "squeaky" vocal delivery.
(0.4)	Numbers in round brackets measure pauses in seconds (in this case, 4 tenths of a second). If they are not part of a particular speaker's talk they should be on a new line. If in doubt use a new line.
(.)	A micropause, hearable but too short to measure.
((stoccato))	Additional comments from the transcriber (e.g., about features of context or delivery).
she wa::nted	Colons show degrees of elongation of the prior sound; the more colons, the more elongation.
hhh	Aspiration (out-breaths); proportionally as for colons.
.hhh	Inspiration (in-breaths); proportionally as for colons.
Yeh,	"Continuation" marker, speaker has not finished; marked by fall-rise or weak rising intonation, as when delivering a list.
y'know?	Question marks signal stronger, "questioning" intonation irrespective of grammar.
Yeh.	Full stops mark falling, stopping intonation ("final contour") irrespective of grammar and not necessarily followed by a pause.
bu-u-	Hyphens mark a cutoff of the preceding sound.
>he said<	Greater than and less than signs enclose speeded-up talk. Occasionally they are used the other way around for slower talk.
solid.= =We had	Equals signs mark the immediate "latching" of successive talk, whether of one or more speakers, with no interval.
heh heh	Voiced laughter. Can have other symbols added, such as underlinings, pitch movement, extra aspiration, etc.
sto(h)p i(h)t	Laughter within speech is signaled by *h*'s in round brackets.

Additional Notation for Crying and Similar "Emotional Expression" (Hepburn, 2004)

°°help°°	Whispering—enclosed by double degree signs.
.shih	Wet sniff.
.skuh	Snorty sniff.
~grandson~	Wobbly voice—enclosed by tildes.
↑↑Sorry	Very high pitch—represented by one or more upward arrows.
k(hh)ay	*Aspiration in speech*—an *h* represents aspiration: in parentheses indicates a sharper, more plosive sound
hhhelp	outside parentheses indicates a softer, more breathy sound.
Huhh .hhih	*Sobbing*—combinations of *hh*'s, some with full stops before them to indicate inhaled rather than exhaled
	*Sobbing*many have voiced vowels,
Hhuyuhh	some also have voiced consonants.
>hhuh<	If sharply inhaled or exhaled enclosed in greater than/less than symbols (> <).
↑Mm:. hh (3.5)	*Silence*—numbers in parentheses represent silence in tenths of a second.

Additional Notation Used

$funny$	Smile voice—laughing/chuckling between markers.
#sad#	Talk between markers is croaky.
t, d,	Boldface consonant represent a hardened sound.

Note. Taken and adapted from Hepburn & Potter (2009).