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Comprehension Instruction**

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Mikyung Kim Wolf, Amy C. Crosson, and Lauren B. Resnick
Learning and Research Development Center,
University of Pittsburgh

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Center for the Study of Evaluation
National Center for Research on Evaluation,
Standards, and Student Testing
Graduate School of Education & Information Studies
University of California, Los Angeles
GSE&IS Building, Box 951522
Los Angeles, CA 90095-1522
(310) 206-1532

Project 2.3: Indicators of Classroom Practice and Alignment
Brian Junker, Lauren B. Resnick, and Lindsay Clare, Learning and Research Development Center,
University of Pittsburgh

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ACCOUNTABLE TALK IN READING COMPREHENSION INSTRUCTION

Mikyung Kim Wolf, Amy C. Crosson, and Lauren B. Resnick
Learning and Research Development Center, University of Pittsburgh

Abstract

This study examined the relationship between the quality of classroom talk and academic rigor in reading comprehension lessons. In addition, the study aimed to characterize effective questions to support rigorous reading comprehension lessons. The data were collected as a part of the Instructional Quality Assessment (IQA) pilot. The IQA is a tool-kit being developed to evaluate the quality of instruction. As for the indicators of instructional quality, IQA included a set of rubrics to measure the extent to which the classroom talk is accountable (Accountable Talk rubrics), the lesson is rigorous (Academic Rigor rubrics), and the teacher's expectations are communicated to the students (Clear Expectations rubrics). Specifically, Accountable Talk rubrics consist of seven dimensions in classroom talk: (1) *participation*, (2) *teacher's linking ideas*, (3) *students' linking ideas*, (4) *asking for knowledge*, (5) *providing knowledge*, (6) *asking for rigorous thinking*, (7) *providing rigorous thinking*. The data for this study included 21 reading comprehension lessons in several elementary and middle schools from three urban school districts. Quantitative analyses showed that the ratings on students' *providing knowledge* and *providing thinking* rubrics had strong, positive relationships with the rating of academic rigor. These results suggest that students' participation in classroom talk allows for a rigorous lesson. Qualitatively, the lesson transcripts were closely examined to find characteristics of teachers' questions that engage students in high-level thinking. This study also discussed implications for effective questioning in classroom and effective indicators for instructional quality.

Classroom talk has drawn an increasing interest among educators and researchers as it has come to be viewed as a rich lens for analyzing the role of student-teacher interaction in teaching and learning. Not only is talk a primary medium of instruction, but it plays a key role in socializing intelligence (Edwards & Westgate, 1994; Resnick & Nelson-LeGall, 1999). In light of this, many researchers have attempted to characterize patterns of classroom talk (Cazden, 2001; Edwards & Westgate, 1994; Heyman, 1983; Lemke, 1990; O'Connor & Michaels, 1993; 1996; Tharp & Gallimore; 1991).

Given the assumption that social interaction supports and increases cognitive development in students' learning, it follows that discourse-based instructional approaches facilitate effective reading comprehension instruction. These

instructional approaches acknowledge that reading comprehension is a collaborative process where the teacher and students co-construct meaning from the text (Palincsar, 2003). This process-oriented rather than product-oriented approach is reflected in collaborative approaches to text comprehension during a discussion such as Reciprocal Teaching (Palincsar & Brown, 1984), Questioning the Author (Beck, McKeown, Hamilton, & Kucan, 1997), and Collaborative Reasoning (Chinn & Anderson, 1998). The common feature of these approaches is that teacher and students engage in a dialogue where the teacher models an interaction, focusing on supporting students to deepen their understanding of text. Ultimately, the students take responsibility to lead the dialogue as they develop into increasingly independent readers.

In traditional lessons, the discussion is typically characterized with a sequence of teacher initiation, student response, and teacher evaluation (IRE). The criticism of the IRE is that the nature of the question is one that the teacher already knows the answer to, so is simply testing the students' knowledge (Cazden 2001). Hence, it constrains the participants of the discussion from collaboratively building meaning from the text. In contrast, discourse-based lessons focus on the quality of the teacher's questions and talk moves to generate effective reading comprehension lessons.

The importance of discussion for comprehending the text has been emphasized in a number of studies (Applebee, Langer, Nystrand, & Gamoran, 2003; Beck et al., 1997; Brown et al., 1993; Goldenberg, 1992; Hiebert & Wearne, 1993; Rosenshine & Meister, 1994). Beck et al. (1997) have developed a series of queries that the teacher can use in assisting students with understanding text in their instructional approach called Questioning the Author. The queries were specifically designed to investigate the text, grapple with ideas, and clarify ideas in the text. For example, the teacher can initiate a discussion by using an open-ended query, "What's going on here?," and extends the discussion by asking a follow-up query, "That is what the author said, but what did the author mean?" Beck et al. claim that these sets of queries reinforce students' comprehension of the text rigorously. These queries also aim to teach students to actively self-monitor meaning, including "interrogating" the text, and to assist students in making text-based inferences and connecting important ideas within the text to build a coherent version of the text.

Brown et al.'s (1993) study reported that the use of collaborative dialogue during the reading comprehension lessons was positively associated with the

students' gains in building knowledge and comprehension. On the basis of framework of Reciprocal Teaching, this study suggests that the use of dialogic strategies such as question generating, summarizing, clarifying, and predicting facilitates students' knowledge building and comprehension of the text. Applebee et al. (2003) also provided empirical evidence that discussion-based activities coupled with academically challenging tasks are positively related to develop students' literacy skills. In this study, the researchers specifically focused on the role of dialogic instruction where the teacher uses authentic and open-ended questions rather than questions for which the teacher has pre-specified answers.

The effect of specific types of classroom talk has also been studied in some research. Hiebert and Wearne (1993) examined the particular types of discourse in relation to students' responses in length. They found that classrooms with ample use of describing and explaining question types (e.g., "Tell how you solved the problem." "Explain why a procedure is chosen or why it works.") had a significant effect on the gains of academic growth over a school year. Heymen (1983) closely examined a specific teacher's utterance, "What do you mean?" and the students' diverse responses to it. Based on a thorough discourse analysis, he suggested that teachers should make explicit use of this utterance to provide a common stock of knowledge for all participants in the classroom. Similarly, O'Connor and Michaels (1993, 1996) focused on the value of a particular teacher's strategy, "revoicing." They argued that the teacher's revoicing efforts provided an opportunity for students, themselves to share reformulations. These reformulations became the basis on which students then built arguments in classroom discussion. The revoicing strategy thus provided a framework for a social interaction to promote classroom learning.

As discussed, there is considerable theoretical support on the links between classroom discourse and learning as well as some research on the effects of specific conversational strategies. However, empirical research concerned with analyzing the coordination of a variety of classroom talk moves and their effects on the lesson is scant.

The present study investigated the relationship between the nature of the classroom talk and the degree of the rigor of the lesson task. In particular, this study examined both the quality of the teacher's talk and students' talk, and their relationship between the two. Further, this study aimed to closely look at the teacher-student interaction to distill the characteristics of the teacher's talk moves

that facilitate a rigorous discussion which reinforces students' understanding of a challenging text or concept and critical thinking.

Method

Sample

Data for this study were collected at two different times. The research team visited a number of elementary and middle schools in three urban school districts to recruit teachers to volunteer for participation in the study. For the first data collection in Spring 2002, we recruited seven teachers in one district, and at the second time in Spring 2003, 14 teachers in two school districts agreed to participate. In total, 21 teachers from ten schools agreed to allow the research team to observe their reading comprehension lessons. Participating teachers were offered a bookstore gift certificate as compensation for their time. The range of grade levels was from Grade 1 to Grade 8. Parental consent from all students in participating teachers' classes was also collected. The total number of students for this study was 441 of which 45% were male and 55% were female. The participating students were diverse in ethnicity, representing 27% African-American, 7% Asian, 48% Latino, 13% White, and 5% other. Teachers identified 20% of these students as English language learners.

Instruments

The data were collected using the Instructional Quality Assessment (IQA) tool developed at Learning and Research Development Center (LRDC) of the University of Pittsburgh. The IQA tool was designed to assess the quality of classroom instruction in K-12 settings, focusing on four major aspects to promote students' learning: (1) accountable talk in the classroom, (2) academic rigor of the lesson, (3) clear expectations, and (4) the students' self-management of learning. These aspects are empirically and theoretically driven from a great body of research in cognitive and social psychology that have been translated by Resnick and her colleagues into a set of principles of effective teaching and learning called the Principles of Learning (Resnick, Junker, Magruder, Mconachie, & Crosson, 2001; Resnick & Hall, 1998). The IQA toolkit consists of 16 rubrics for rating observed lessons, as well as six rubrics for rating the quality of assignments that teacher gives to the students in the class. All the rubrics except one (*level of the text*) are on a 4-point scale (with 1=poor and 4=excellent). The rubric which measures *the rigor of the text level* has a 3-point scale

(with 1=poor and 3=excellent). The tool also included student and teacher interview protocols and an intensive rater training program.

This study only dealt with the data from Accountable Talk and Academic Rigor rubrics because the purpose was to examine the relationship between classroom talk and the rigor of the lesson. A set of Accountable Talk rubrics of the IQA assesses the teacher and students' skills for participating in whole group discussions to promote learning. Specifically, the Accountable Talk rubrics consist of seven dimensions of classroom talk: (1) *participation rate*, (2) *teacher's linking ideas*, (3) *students' linking ideas*, (4) *asking for knowledge*, (5) *providing knowledge*, (6) *asking for rigorous thinking*, (7) *providing rigorous thinking*. The definitions of these subscales are explained in coding of classroom talk section below. Among these, the ratings on '*participation rate*' were not used for the analysis because this rubric intends to measure only the quantity of the classroom talk. With respect to assessing the academic rigor of the lesson, three dimensions were rated; (1) *rigor of the text*, (2) *active use of knowledge: analyzing and interpreting the text during the whole-group discussion*, and (3) *active use of knowledge during the small group or individual tasks*. Since the ratings on classroom talk were based upon the whole-group discussion, only the ratings on Academic Rigor during the whole-group discussion (i.e., the second rubric of Academic Rigor) were used as data for this study.

Classroom Observation

Two trained raters visited one reading comprehension lesson for each teacher participating in the study. The lesson time was about 45-50 minutes. The teachers were told to demonstrate a reading comprehension lesson that was as typical as possible while including the following components: (1) a text was read aloud to, with, or by the students; (2) the teacher lead a whole-group discussion for about 20 minutes; and (3) the teacher assigned group-work or individual tasks for small-group or independent work. By specifying the structure of the lesson for each teacher, we attempted to reduce the variability across the lessons due to differences in diverse lesson structures. In our conversations with teachers before and after lesson observations, most teachers indicated that the observed lesson was typical of their daily practice. Those who commented that they had to alter their lesson to accommodate the IQA research team said that most of their reading comprehension work was with smaller groups of students, but that the lesson observed—although with a larger group than normal—still represented typical teaching. Teachers completed a pre-visit questionnaire, including information about the observed

lesson in advance of the observation in order to provide background information for the raters.

The raters rated the quality of classroom talk based only on the whole-group discussion. This is because it was not feasible for raters to capture the teacher and students' interaction during the small group or individual activities. However, the academic rigor of the lesson was rated holistically based on the entire lesson observation.

All the lessons were audiotaped and transcribed. Additionally, the raters made detailed notes during their observation, which they used as evidence to justify their scores. They transcribed the class interaction during the whole group discussion. The raters assigned a score for each rubric right after the lesson observation, and the raters then debriefed their scores. When disagreement between scores occurred, raters compared evidence to reach a consensus score.

Coding of Classroom Talk

Accountable Talk rubrics have been developed with consideration of three dimensions that are important for learning: (1) accountability to learning community (ALC), (2) accountability to accurate knowledge (AAK), and (3) accountability to rigorous thinking (ART).

The purpose of ALC is to measure the degree to which teachers and students make consistent efforts to ensure that all participants understand the ideas and positions shared during the whole-group discussion. Additionally, this dimension measures the extent to which teachers and students make efforts to link contributions to one another so that the discussion builds on ideas within the learning community. To receive a high score on the rubrics for this dimension, whole-group discussion would have to evidence that teachers/students are listening attentively, paraphrasing, and building ideas upon one another's contributions.

The purpose of AAK is to measure the degree to which teachers and students ensure that participants provide specific and accurate knowledge as evidence to back up their contributions. In other words, this dimension captures the extent to which there is a "commitment to getting the facts right" in the lesson discussion. To receive a high score on rubrics for this dimension, whole-group discussion would have to evidence that teachers press for accurate knowledge by asking participants to support their contributions, and that students, in turn, support their contributions with specific, appropriate, and accurate evidence.

The purpose of ART is to measure the degree to which speakers are asked to explain their thinking by using rational strategies to present arguments and by drawing logical conclusions. This dimension also measures the degree to which contributors explain their thinking. To receive a high score on rubrics for this dimension, classroom talk would have to evidence that students are pressed to explain thinking for their claims, and students would have to explicate their reasoning in ways appropriate to the discipline.

Table 1 illustrates specific rubrics under these three dimensions and a few examples of talk moves that the raters are trained to code during the lesson observation.

During the rater training program, the raters studied numerous video clips to become familiar with accountable talk moves and to be able to identify them appropriately.

Analyses

Since this paper is primarily concerned with the type of classroom talk moves and the level of rigor during the whole group discussion, only the scores on the accountable talk moves and the academic rigor of the lesson during the whole group discussion were used in the analyses. In order to examine the reliability of the raters' scores, the percentage of agreement on the exact scale point was first calculated. In addition, Cronbach's alpha coefficients and Spearman's correlation coefficients were computed to examine the internal consistency of the ratings and relationship between the two raters' scores.

Consensus scores were used to investigate the relationships between scores on the accountable talk and academic rigor rubrics. Correlations analyses were conducted in order to investigate the relationships among each rubric. Stepwise regression was also performed to discover which rubric had the most predictability of scores for the academic rigor rubric. All statistical analyses were conducted using SPSS 11.0 (2001).

As for qualitative analyses, the transcripts and the raters' notes were closely examined in order to characterize the patterns of the interaction and the teacher's "talk moves." Specifically, a comparison was made between a weak and a strong quality of particular kinds of talk moves made by teacher and students.

Table 1
Category of Accountable Talk

Category (Rubric)	Description	Talk moves*
Accountability to Learning Community (ALC)		
Teacher's linking (T: L)	To what extent does the teacher explicitly link different people's ideas?	<ul style="list-style-type: none"> • John, did you hear what Ann just said? Can you repeat that in your own words? • Who agrees / disagrees with what Ann just said? • Who wants to add on to what Ann just said?
Student's linking (S: L)	To what extent does the student explicitly link different people's ideas?	<ul style="list-style-type: none"> • I want to add on to what Ann said.... • I agree with you because...
Accountability to Accurate Knowledge (AAK)		
Asking for knowledge (T: K)	To what extent does the teacher press the students to support their ideas with evidence based on the text?	<ul style="list-style-type: none"> • How do you know that? • Can you give me some examples? • Where did you find that information? • Can you show me which part of the text tells you that information? • What do you mean?
Providing with knowledge (S: K)	To what extent do the students support their ideas with evidence based on the text?	<ul style="list-style-type: none"> • I know that because it says here...
Accountability to Rigorous Thinking (ART)		
Asking for rigorous thinking (T: Th)	To what extent does the teacher press the students to explain their thinking?	<ul style="list-style-type: none"> • Why do you think that? • Can you explain that more? • Say more about that.
Providing with rigorous thinking (S: Th)	To what extent do the students explain their thinking?	<ul style="list-style-type: none"> • I think because...

*Accountable Talk and Talk moves are well-described in the Accountable TalkSM CD (2002) produced by the Institute for Learning (IFL) / LRDC.

Results

Interrater Reliability

Regarding accountable talk scores, 64% of exact agreement was obtained between the two raters. Cronbach's alpha coefficient was .89, indicating high internal consistency of the scores. In addition, the Spearman's correlation coefficient was .80 ($p < .00$ at $\alpha = .05$), suggesting that there was a moderate level of the rating tendency between the two raters' scores. Slightly higher rater reliability was found in academic rigor scores. The exact agreement between the two raters was 76%. Cronbach's coefficient alpha was .93, and the Spearman's correlation coefficient was .88 ($p < .00$ at $\alpha = .05$).

IQA Scores on Accountable Talk and Academic Rigor

Table 2 presents the means and standard deviations of the scores of the rubrics on academic rigor and accountable talk. According to the scales of the IQA tool, a score of 3 generally reflects a higher level of cognitive demands and rigor. The means of the scores on the academic rigor during the whole group discussion indicates that the observed lessons, on average, are slightly beyond the level of comprehending the storyline of the text itself and close to the level of analyzing and interpreting the text.

Means of the scores on the accountable talk rubrics ranged from 2.00 to 3.38. *Linking* talk moves had a lowest mean among the accountable talk rubrics. Particularly, students' *linking* talk moves were rarely observed. On the other hand, the teachers' efforts to ask students to elaborate their thinking were the most frequently observed talk moves. Interestingly, the means on the teacher's accountable talk rubrics were higher than their counterparts of the students' talk.

Relationships Among Accountable Talk and Academic Rigor Scores

Table 3 provides the results of the correlation analysis among the scores on each rubric. Overall, all the accountable talk moves had a significant relationship with the rigor of the lesson. In particular, students' talk moves on *knowledge* and *thinking* had the highest correlations with the ratings on the academic rigor (.84 for *students' knowledge* and .80 for *student's thinking*). It is also notable that the teacher's *asking for knowledge* and the *students' providing knowledge* was highly intercorrelated,

as was true for the relationship between *teacher's asking for rigorous thinking* and the *students' providing rigorous thinking* (.90 for *knowledge* and .88 for *rigorous thinking*).

Table 2
Mean and SD for the Scores on Each Rubric (N = 21 lessons)

Rubric	M	SD
<u>Academic Rigor</u>		
Active use of knowledge	2.67	.966
<u>Accountable Talk</u>		
Teacher's linking	2.14	.910
Student's linking	2.00	1.183
Asking knowledge	3.14	.854
Providing knowledge	3.10	1.091
Asking rigorous thinking	3.38	.921
Providing rigorous thinking	3.14	1.108

Table 3
Correlations Among the Scores on the Rubrics of AR and AT (N = 21)

	AR	T:L	S:L	T:K	S:K	T:Th	S:Th
AR	-	.57**	.61**	.79**	.84**	.60**	.80**
T:L		-	.42	.42	.49*	.17	.33
S:L			-	.45*	.47*	.32	.50*
T:K				-	.90**	.56**	.72**
S:K					-	.36	.65**
T:Th						-	.88**
S:Th							-

* significant at $\alpha = .05$, ** significant at $\alpha = .01$.

In order to investigate which talk move has the highest predictability of the ratings on the academic rigor of the lesson, stepwise regression analyses were conducted. Although all six accountable talk rubrics were entered as predictors, only two rubrics were found to be significant predictors of the scores on the academic rigor during the lesson. As shown in Table 4, the *students' providing knowledge* and *providing rigorous thinking* were the only significant predictors. Particularly, the *students' providing knowledge* was the highest predictor of the holistic scores, with a

standardized regression weight of .84. The R^2 indicated that 81% of the variance of the academic rigor scores was accounted for by the combination of these two talk moves.

Table 4
Summary of Stepwise Regression Results Predicting AR Scores ($N = 21$)

	Variable	R^2	Adjusted R^2	R^2 Change	Sig	B	$SE B$	β
Step 1	S: K	.70	.69	.70	.00	0.74	.11	.84*
Step 2	S: K	.81	.79	.11	.00	0.49	.12	.56*
	S: Th					0.38	.12	.43*

* $p < .05$

Comparison of Weak and Strong Accountable Talk Moves

Qualitatively, we examined the characteristics of the talk moves that the raters had coded from their field notes. The following selected examples describe “weak” and “strong” quality of talk moves for the three dimensions of accountable talk. Italics in the following excerpts indicate the talk moves that overtly corresponded to each dimension.

Accountability to Learning Community: Linking. As seen in Table 2, linking talk moves were the least frequently observed. It appears that most linking talk moves stayed at the superficial or formulaic level. Examples (1) and (2) display weak teacher’s linking moves.

(1) Example of weak linking (Grade 2)

T: Question Two. Why did he want so badly to change back to himself?

S: Big Anthony had this wish because he wanted the ladies to stop chasing him.

T: OK. *Do you guys agree with him?* Yes, he wanted the ladies to stop chasing him and I, I’m not sure he’s quite happy about this thing anymore.

(2) Example of weak linking (Grade 5)

[One student makes prediction.]

T: Right. Okay, so by the title he’s making a prediction. He’s thinking that it’s about a shipwreck. Good prediction. Let’s have one more prediction made, because we want to get to the story. Louis, what do you think?

S3: I think it’s gonna be [unintelligible] about people that [unintelligible] look for whales.

T: So, you think it’s about people that are gonna look for whales. So how many people think—*how many people agree with Marco or what Louis says?* It’s either about people who are gonna look for whales, or about a shipwreck. Kay, *so do we agree with one of them?* Those are two totally different predictions, aren’t they?

Let’s find out. Let’s see what the story’s about. And I like Chris Van Allsburg; he’s one of my favorites.

[Teacher reads.]

In both examples, the teachers used an explicit linking talk moves such as “Do you guys agree with him?,” “How many people agree with Marco?,” and “Do we agree with one of them?” However, the teachers gave little or no wait time for students to respond. Instead, the teachers answered their own questions. Additionally, the questions themselves were limited to yes-no questions, and did not require a response from a specific student.

On the other hand, in example (3), not only did the teacher provide an opportunity for students to build on each other’s ideas (“Do you wanna add...?”), but also she reformulated what the student had said (“So what I hear you saying is...”). Note that once one student (S2) added his own thought to the other’s (S1), the teacher summarized what the student said by starting her utterance, “So.” This example of linking illustrates a discussion that supports the development of a learning community where students are able to follow each other’s ideas.

(3) Example of strong linking (Grade 4)

- S1: I talked about Larry Brown (unintelligible) I said that I made text to text connection with Larry Dunn and Rufus because he felt like he wanted to cry but was tough—Rufus was too. And because he [Rufus] doesn’t have money to buy sandwiches, Rufus’s best friend was laughing at him.
- T: So *what I hear you saying is* that you’re making a character trait connection. Both characters have that trait of pride they don’t want to show their true feelings that they’re hurt and I agree with you. Someone on the other side of the room want to share with me? *Do you wanna add something new?*
- S2: *I’d like to add* to David because they both have ripped clothes, and pride. Now they’re both getting beat up. Larry and Rufus are alike.
- T: So they both shared similar experiences.

A similar example is found in (4). In this excerpt, the students seemed familiar with accountable talk moves. In contrast to examples (1) and (2), examples (3) and (4) describe cases where the teacher explicitly designated the next speaker.

(4) Example of strong linking (Grade 5)

- S1: He broke his leg.
- T: He broke his leg. So Victor’s actually doing a smart thing. He’s inferring information from the text. *How many others thought that?* Because it said he has a limp. *What were you going to say, Derek?*
- S2: Umm, *I was gonna say that I agree with Victor, because* when he was a little boy he wanted to sail, um, [unintelligible].
- T: You know, when he was telling the tale, he said, “The little boy always wanted to sail, even in the high winds.” Ashley?
- S3: Um, *I disagree with Angela and Carl, because* when Carl said the boy was gonna fly, [unintelligible], and the [unintelligible] started come down. But he hit a tree, and Angela said that he, he wasn’t, uh, caught in a, um, storm, but he didn’t. And she said that he wasn’t, um, the guy was gonna go [unintelligible]...

Accountability to Accurate Knowledge (AAK). The raters coded talk moves as accountability to accurate knowledge when the teacher and students engaged in describing factual information based on the text or supporting one's claim with evidence based on the text. The weak AAK examples are as follows in (5)-(7).

(5) Example of weak AAK (Grade 4)

[Teacher reads.]

T: Did he travel the whole world over?

S: No. He just went around the yard of his house.

T: And he went to the barn. Is that traveling the whole world over?

Ss: No.

T: So we have a problem already right?

Ss: Yeah.

In this example, after the teacher read a paragraph, he was checking the students' comprehension by asking what exactly happened in the story. Noticeably, the students' answers were limited to yes or no, except the first student's response. Seemingly, all the teacher's utterances already included the information that the students could have inferred from the story. Thus, the teacher provided little room for students to make sense of the poem and select appropriate evidence from the text to back up their thoughts.

Example (6) demonstrates a situation where the teacher's utterances contained questions that elicited isolated, surface-level facts from the story. As a result, the students' utterances merely included one-word responses.

(6) Example of weak AAK (Grade 6)

T: I'm gonna go over the workbook while you're working. Number one. What animal was at the bottom of the pile?

S1: The huge dog.

T: The huge dog. Anybody remember the name of that huge dog? What kind of dog it was?

S1: Greyhound?

T: No, it wasn't greyhound. What kind of dog was it? Remember I told you guys yesterday?

S2: [inaudible]

T: No. Saint...

S3: Saint Bernard.

T: Saint Bernard. Good. What dog stood over the huge dog's back legs?

S4: Spotted dog.

T: Spotted dog. And S4, how about over his front legs?

S4: The black dog.

T: The black dog. How many cats were in the pyramid?

S5: Four cats?

T: Four cats. S5, what animals did the cats stand on?

S5: The dogs?

T: Right. Well, not just the dogs but the smaller—I took the dogs, but you really should have said the smaller dogs. S1, how many squirrels were in the pyramid?

S1: Eight?
T: Eight.

Another weak example of AAK interaction was found when the teacher overscaffolded by providing too much information. In example (7), the teacher's second utterance aimed to eliciting the student's ideas on the character, Macduff. However, the teacher framed the question in such a way that the student just finished the teacher's incomplete sentence.

(7) Example of weak AAK (Grade 8)

T: Right, exactly. He's gone to England to get Malcolm. Malcolm is...
S: Duncan's son.
T: Duncan's son who ran off to England. So he's going to convince Malcolm and Edward in England that they need to raise an army to overthrow Macduff—Macbeth. So therefore, in Macbeth's eyes, Macduff is a...
S: Traitor.
T: Traitor. And therefore he's not only going to try and go after him, but kill his family. OK? So...just like in Spiderman. When the Green Goblin says he's going after Spiderman's girlfriend. So, the 3 prophecies that the apparitions come up with. One, beware Macduff. Two, no man born of woman can vanquish Macbeth. What does that mean? No man born of woman?

It was found that the teacher's pressing strategy was critical to encourage the students' elaboration of their ideas. Example (8) demonstrates that the teacher effectively utilized the AAK talk move, "how did you know that?" This question extended the student's initial one-word answer (i.e., "No") to a fuller articulation of the idea, including citing evidence from the text. In other words, instead of confirming the student's response, "The old man is the boy," the teacher provided an opportunity for the student to support his idea by repeating the question, "So how did you know that?"

(8) Example of strong AAK (Grade 3)

T: What are you thinking, Victor?
S: The old man is the boy.
T: *How did you know that?* Did Chris Van Allsburg tell us, in the print, the old man is really the boy?
S: No.
T: *So how did you know that, Victor?* How did you know that?
S: Because he said the, umm, that the winds are getting harder, and you have some sailors too, and he, he picked up his cane and he started to...
T: So Victor is inferring information from the text. Remember, we talked about that? Making inferences? He's taking—Chris Van Allsburg didn't tell us, "This old man is the boy." He's using his mind, and you know what? He's inferring information from the text, saying, "It says the man had a limp." So, because he has a limp, he's thinking it could, it's probably the boy, because what happened to the boy?

In the following example, the class engaged in an activity of text-to-world connections in which students interpreted the story and connected it to a real-life

situation. The teacher noted that the student did not provide the part of the story that was connected in the student's work. The teacher kept pressing the student to provide accurate knowledge from the text (e.g., "Who can retell this part?"). It took a number of teacher's attempts to get the students to provide evidence based on their knowledge from the text.

(9) Example of strong AAK (Grade 2)

S: This part of the story when the house burnt up this book reminds me of when my friend's house burnt because they left the light on with a blanket. Now my friend is with his Grandmother because his house burnt up. He was sad. He didn't like when his house got burnt because you can die he said.

T: Does that tell you what part of the book? It does? Does it?

S1: Yes.

T: Look, this book reminds me of. She did say that. She did tell what happened in the world. Did she talk about the part of the book? Did she explain this part?

Ss: No.

T: Who can retell that part?

S1: Tell what?

T: The part in the book that Amelie, she's making a connection, who can, can you tell that, Casey?

S2: Yeah. This story, this story, this part...

T: What's the part in the story? What's the part in the book, what's the part that she's talking about?

S2: About her, her friend's house burning down.

T: She's saying the book, the part in the book right? What's that part in the retell? I want you to retell me that part.

S2: Um, the part of the book that reminds me of when my friend's house burnt down.

T: Did he answer my question?

Ss: No.

T: No, what are you supposed to do? Yes, say about the part in the book. When house was burnt down. Who can tell the part in the book when the house burnt down? Felix.

S3: In the book.

T: Felix, can you take, the book is right there. Can you bring that to me? OK. OK. Does she talk about in, in, in her connection? Does she talk about this part?

S3: No.

T: Who can retell this part? Who can retell this part of the story?

S3: When um, when um, the little girl and her mom were walking home they saw the fire and they said um, the little girl said, I see fire and I see the um, yeah, smoke and I came over to mama and she said how is her grandma and then she said, the author said, that author said that it was hard to find the cat.

Accountability to Rigorous Thinking (ART). Accountability to rigorous thinking is concerned with the teacher's efforts to promote students' reasoning to support their ideas, and students' elaboration of their logic. Just as in AAK, weak ART moves lacked pressing or follow-up questions from the teacher. Examples (10a) – (10c) were selected from one second grade lesson. While the teacher read a book, she paused occasionally to ask students to explain their thinking. In (10a), even though the teacher asked the student to infer the meaning of the phrase, "a

long reverie," she never asked *how* the students figured that out. Similarly, (10b) displays the absence of the teacher's follow-up questions or attempts to elicit the student's thought.

(10a) Example of weak ART (Grade 2)

T: Aha! So you can't see the ball if it is too high and the sun is in your eyes! Okay, what do you think this means "a long reverie?" We have never had this word before.

S1: Dream.

S2: Daydream.

S3: Imagining.

S4: Dream the ball will come to him.

[Teacher continues to read the book.]

(10b) Example of weak ART

T: When I read "They never batted last," what does that make you think? Why does he say that?

S: The boy always bats last.

[Teacher continues to read the book.]

In (10c), the teacher assigned a task in which students were asked to interpret the underlying meaning of the story. The teacher did not follow up on any student contributions when the students presented their ideas.

(10c) Example of weak ART

[Teacher reads the book]

T: Let me read this again so you can discuss this with a partner. [Re-reads stanza and students discuss ideas with a partner.]

T: Okay, let's hear a few ideas.

S1: I was thinking they hit the ball...he is going to get it.

T: I think I heard something different from this group over here. Would you like to share your ideas with us?

S2: I think he is going to hit a homerun and the team starts to yell because they win the game.

S3: They were yelling because the ball was hit far and they were yelling for him to catch it.

T: So, you agree with Michele, that they were yelling to tell him to catch the ball.

S3: Yes, they were yelling at him to pay attention.

T: Well, let's find out...[Teacher continues to read the book.]

In contrast, examples (11) and (12) demonstrate the interaction where the teacher's utterances included a number of probing questions to press the students to explain their thinking. In (11), the teacher scaffolded students to put the main idea in their own words. Instead of moving forward after the first student's response, she had the students think what the author meant to say about the ocean by asking, "So what does that tell us...?" and "What can we say about the ocean?"

(11) Example of strong ART (Grade 3)

T: I want you to find the main ideas as we're reading. So far, are we correct about the main idea? Raise your hand if you can give me a sentence that would tell me the main idea of this article. It doesn't have to be a sentence from the article.

- S1: That over two-thirds of the world's surface is covered by vast ocean.
 T: So what does that tell us about the ocean? It's two-thirds. Is two-thirds a little bit of a whole? Or most of the whole?
 Ss: Most.
 T: Most of the whole. So what does that tell us about the ocean in general?
 S2: That it's big and gonna take almost half of the world.
 T: So if we say, The ocean is.....What can we say about the ocean?
 S2: The ocean is big and it takes almost half of the world.

Example (12) describes the situation where the teacher provoked the student's rigorous thinking by repeatedly asking "why" questions. At first, she gave an opportunity to the student to explain his idea in more detail by telling him, "tell me a little bit more." Upon listening to the student's explanation, the teacher further attempted to explore the student's thinking by asking "why the mistreatment," and "why?" In consequence, the interaction between the teacher and the student accomplished a rigorous and high level of discussion about the student's research.

(12) Example of strong ART (Grade 7)

- T: Okay, good. So we saw a lot of starvation, we saw assets, things the Jews owned being hidden so they wouldn't be taken away. What else?
 S1: How the Nazis treated the Jews. The inhumane activities that went on in the sauna and stuff, where they stripped them nude and shaved them, and made them wait in long lines in the cold.
 T: Excellent. Inhumanity. Tell me a little bit more about that.
 S1: About inhumanity in general?
 T: Well, in general or in context of the Holocaust or in context of your research.
 S1: My research is on concentration camps. They would import the Jews and, depending on what camp it was, they would take them someplace and shave them, strip them naked like I said. Then they would put them to work and sometimes if they were caught slacking off they would get shot or sent to a torture unit.
 T: So is inhumanity mistreatment? Yes. And we wrote poems about inhumanity, right? And how about the Holocaust? Why the mistreatment?
 S1: They were prejudiced against the Jews. They didn't like them. It was just jealousy. Anti-semitism.
 T: Why?
 S1: Because anti-semitism is basically jealousy. They didn't like them just because they supported a—they had a different kind of religion.
 T: Good.

Discussion

This study examined the characteristics of the dialogic interaction in the classroom and investigated how specific kinds of talk moves relate to the rigor of the reading comprehension lesson. The descriptive statistics show that the means of the teacher's talk moves were higher than those of the students' talk moves. This result suggests that the teachers, in general, lead the conversation, and used more talk moves to obtain student's responses. One interesting finding was that the talk moves

regarding knowledge or reasoning were relatively prevalent, but the talk moves of participants' linking ideas to each other was not a common practice. According to O'Connor and Michaels (1993), revoicing or reformulating each other's ideas is a critical means for promoting effective learning. Considering the diverse nature of the classroom population, building a learning community is of great importance to ensure all the students' learning, and thus raising a conscious awareness of the use of linking talk moves should be necessary.

The correlation and regression analyses indicate that good accountable talk moves had a positive and strong relationship with the level of rigor in the lessons. Specifically, the ratings of the academic rigor were highly predicted by the moves concerning students' accountability accurate knowledge (AAK) and rigorous thinking (ART) among other talk moves.

One possible explanation of this result may be found in the way that the academic rigor was defined in the IQA tool. That is, the IQA tool defined the rigorous lesson as one involving a thorough understanding of the text in addition to analyzing and interpreting the text. The task of analysis and interpretation of text should be accompanied by providing evidence from the text to achieve a high score in Academic Rigor on the IQA. Thus, when the discussion was involved in providing accurate knowledge, the raters might have considered the lesson as rigorous, focusing on a close reading of the text itself.

In addition, the result that the students' talk moves had more predictability of the rigor of the lesson suggests that the students' active participation is a key factor to determine the rigor of the lesson. Regardless of the nature of the IQA descriptors, the raters appeared to consider a rigorous lesson when they observed the students' talk moves rather than the teacher's.

However, it should be noted that the counterparts of the teacher's moves were highly associated with the students' talk moves as shown in the results of the correlation analyses. The correlation analyses show that the students' accountability to knowledge talk was highly intercorrelated with the teacher's counterpart. This was true with accountability to rigorous thinking talk. These results suggest that the teacher's talk moves play an important role in generating the interaction with the students. In other words, the students' responses often rely on the types of questions that the teacher phrased.

This finding was congruent with the results from the qualitative analyses of the teacher's and students' interaction. As illustrated in the talk move examples, the quality of the students' talk was commonly determined by the types of the teacher's talk. The qualitative analyses of the teacher and students' interaction revealed that the use of the teacher's strategy to keep probing the students' ideas were an effective way to encourage students' elaboration. When the teacher failed to reformulate or press students to elaborate on their ideas, exchanges tended to be brief and thus did not contribute to students' substantial understanding of text. Typically, yes-no questions, or one-word answer questions asking surface level facts from the story failed to lead students to elaborate their responses.

The results of this study provide a number of implications for classroom interaction for rigorous instruction. First, raising the awareness of explicit use of linking talk moves is necessary for building a learning community. A number of studies have proved that a discussion is an effective way of socializing intelligence for promoting learning (Applebee et al, 2003; Beck et al., 1997; Cazden, 2001; Erickson, 1996; Palinscar, 2003). As Palinscar (2003) emphasizes, teachers should make explicit the processes of constructing meaning from the text. One way of achieving this goal is the explicit use of effective talk moves. The effective use of linking talk moves can create a setting that invites more active interaction by ensuring that all the participants understand important concepts and procedures during the lesson. As Heyman (1983) emphasizes, common knowledge must be reformulated so that the participants can use the information to share in its meaning.

Second, in order to generate an opportunity for students to elaborate their knowledge and logic, teachers need to increase the use of the pressing strategy. As Cazden (2001) points out, the traditional IRE structure restrains the teacher and students from co-constructing the dialogue due to the nature of the teacher's questions. The pressing strategy will provide an opportunity for students to explore and reformulate their thinking rather than concluding the interaction.

Finally, even though it is necessary to be aware of the explicit use of the talk moves for accountable talk, there should be a distinction between the formulaic use and substantial use. As demonstrated in examples, it was often observed that the teacher explicitly used the talk moves (e.g., How many agree? Do you agree? Why?), but she failed to use them effectively. The common case of the formulaic or trivial use was found when the teacher answered her own question or gave no wait time to the students.

Although this study was undertaken to test our hypothesis that the discussion types have a significant influence on rigorous reading instruction, some limitations are evident. One may be concerned about the effect of the grade level on the quality of talk. Although the qualitative analyses presented that younger graders were capable of a rigorous discussion using good talk moves, whether some weak talk moves may have been due to limitation of the verbal capability of children in the younger grades. For a future study, it will be of interest to examine the characteristics of talk moves for each grade level. It should also be noted that statistical analyses were conducted with a small sample size. Thus, the scope of generalization of the results of this study is limited.

Despite the limitations, this study provided supportive evidence that a classroom discourse including listening to others, questioning other's knowledge, and exploring one's own thoughts has a positive relationship with the academic rigor of reading comprehension. Additionally, if one attempts to assess the quality of instruction such as in the IQA toolkit, the quality of classroom talk should be considered as a lens to look at the classroom culture.

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Appendix

Rubrics of Accountable Talk and Academic Rigor

Because the current IQA rubrics are still at the developmental stage, the score scale of 4 for each rubric is presented for example only.

Accountable Talk Rubrics

1. How effectively did the lesson-talk build Accountability to the Learning Community?

Rubric 2: Teacher's Linking Contributions: Does the teacher support the speaker's linking contributions?

4	At least 4 points during the discussion, the teacher explicitly connects speakers' contributions to each other and shows how ideas/positions shared during the discussion relate to each other by revoicing and recapping students' ideas.
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Rubric 3: Students' Linking Contributions: Do speakers' contributions link to and build on each other?

4	At least 4 points during the discussion the students, explicitly connect speakers' contributions to each other and show how ideas/positions shared during the discussion relate to each other.
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2. How effectively did the lesson-talk build Accountability to Knowledge?

Rubric 4: Asking knowledge: Were contributors pressed to support their contributions with evidence?

4	There are 4 or more efforts to ask students to provide evidence for their contributions, including questions that seemed academically relevant.
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Rubric 5: Providing knowledge: Did contributors support their contributions with evidence? (This evidence must be appropriate to the content area—i.e., evidence from the text; citing an example, referring to prior classroom experience.)

4	At least 4 points, speakers provide accurate and appropriate evidence for their claims, including frequent references to the text or prior classroom experience.
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3. How effectively did the lesson-talk build Accountability to Rigorous Thinking?

Rubric 6: Asking thinking: Were speakers pressed to explain their thinking during the lesson?

4	There are 4 or more efforts to ask students to explain their reasoning, including questions that seemed academically relevant.
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Rubric 7: Providing thinking: Did contributors explain their thinking during the lesson?

4	There are 4 or more examples of speakers explaining their thinking, using reasoning in ways appropriate to the discipline.
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Academic Rigor Rubric (only one rubric is presented)

Rubric 1: Active Use of Knowledge: Analyzing and Interpreting the text during Discussion

4	The teacher guides students to engage with the underlying meanings or literary characteristics of a text. Students interpret or analyze a text and use specific examples from the text and/or cite examples from the text to support their ideas or opinions.
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