The ISI Classroom Observation System: Examining the Literacy Instruction Provided to Individual Students

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The Individualizing Student Instruction (ISI) classroom observation and coding system is designed to provide a detailed picture of the classroom environment at the level of the individual student. Using a multidimensional conceptualization of the classroom environment, foundational elements (teacher warmth and responsiveness to students, classroom management) and instructional elements (teacher-child interactions, context, and content) are described. The authors have used the ISI system to document that children who share the same classroom have very different learning opportunities, that instruction occurs through interactions among teachers and students, and that the effect of this instruction depends on children's language and literacy skills. This means that what is effective for one child may be ineffective for another with different skills. With improving classroom observation systems, the dynamics of the complex classroom environment as it affects student learning can be better understood.

Keywords: classroom management; classroom research; literacy; reading; school/teacher effectiveness

Capturing the dynamics of what happens in the classroom is the centerpiece of many studies in education research. These studies have provided important insights into elements that are common among effective schools and classrooms, but rare in ineffective schools and classrooms (e.g., National Institute of Child Health and Human Development Early Child Care Research Network [NICHD ECCRN], 2002; Pressley et al., 2001; Taylor, Pearson, Clark, & Walpole, 2000; Wharton-McDonald, Pressley, & Hampston, 1998). By examining what happens in classrooms and assessing students' learning, researchers strive to understand how key elements of the classroom environment influence students' learning. Central goals are to support teachers' efforts to provide effective instruction and to design classroom environments that promote student development cognitively, socially, and emotionally (NICHD ECCRN, 2002). In our studies, we focus principally on literacy instruction and classroom management. Understanding how teachers help students learn to read is important because fully 30% of U.S. students fail to read proficiently by fourth grade, and this percentage is even higher in schools serving children who live in poverty (National Assessment of Educational Progress, 2007).

The purpose of this article is to describe a video observation and coding (i.e., transcription) system that has been useful in describing a range of classroom environments as they predict students' literacy growth. In 1979, Elinor Ochs observed that "transcription [or coding] is a selective process reflecting theoretical goals and definitions" (p. 44) The observation and coding system we describe here is best understood in the context of the evolving theoretical frameworks that guided development and the research questions the system is designed to answer.

Theoretical Framework for the ISI Observation System

Although our observation and coding systems have changed over time to meet our evolving research aims (Ochs, 1979), our research has consistently focused on elucidating the multiple sources of influence on children's development using an ecological model and the interactions within and among ecologies and child characteristics (Bronfenbrenner, 1986). The ecological model purports that children's development is affected by both proximal (e.g., the home and school) and more distal sources of influence (e.g., the community and local, state, and national policies), and that these influences and their associations with development may change over time (Morrison, Bachman, & Connor, 2005). Thus we have observed children and parents interacting in their homes (Hindman, Connor, Jewkes, & Morrison, in press) and teachers and students in the classroom (Connor, Morrison, & Katch, 2004), following children through their early school careers.

Our work has also benefited from a perspective of learning and development as proceeding in transactions among children and other people, objects, and symbols (Sameroff, 1995). Bronfenbrenner and Morris (2006) note the importance of proximal processes, or the sustained interactions children have with these elements over time. Moreover, the same processes do not always lead to the same outcomes (homotypic discontinuity), and different processes may produce similar outcomes (heterotypic continuity). Our operationalization of the literacy instruction to which children are exposed thus assumes (a) that the overall classroom milieu (e.g., management of the classroom) and other, distal, settings such as home environments contribute to

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literacy learning; (b) that to understand literacy development, among the most important contributors are the proximal processes—including the interactions, experiences, and activities related to literacy—in which children engage in the classroom; and (c) that there are interactions between child factors and experiential ones (Child × Environment interactions), and thus the effect of instruction, for example, will depend on the characteristics and skills children bring to the classroom.

Like any translation of theory into a usable method and observation system, we also need constraints on these three assumptions. Regarding the first, our work has thus focused largely on the classroom setting, but we control for the contributions of other sources of influence in analyses (such as home literacy environment). Second, to capture the learning process, we constrain our variables to the amount of time an individual child spends in a particular literacy activity described across multiple dimensions. We measure what the child experiences, but we also control for whether the child is actually engaged by measuring the time spent off-task, for example. This enables us to identify something measurable (time in a given activity) but account for the fact that the child is an active participant whose engagement, or disengagement, in the process will influence the activity's efficacy. Third, guided by research on early literacy, we have identified specific child factors—including literacy skill, vocabulary, and self-regulation upon classroom entry—that interact with children's classroom experiences to affect learning.

The classroom observation system we describe here translates these theories and constraints into a tool that allows us to address our driving research questions, including: (a) What is the nature and variability in the amounts and types of instruction and noninstruction children experience in the classroom? (b) How does instruction and classroom management affect students' development, particularly with regard to literacy and self-regulation? (c) Are there Child × Classroom Environment interactions? That is, does the effect of particular types of instruction depend on students' language and literacy skills? (d) Are certain classroom management strategies more important for children with weaker or stronger self-regulation?

We are currently conducting a series of cluster-randomized control field trials (RCTs) to answer these research questions by examining the implementation and effect of the Individualizing Student Instruction (ISI) intervention on students' literacy and self-regulation outcomes in first grade (Connor, Morrison, Fishman, Schatschneider, & Underwood, 2007). Most recently we have followed children from first to second and (this year, 2008–2009) into third grade. The evolving design of our observation system has been driven by this ISI intervention research.

In the ISI intervention research, teachers were provided software that computed amounts and types of instruction (Connor, Piasta, et al., 2009) using models from our previous research. Utilizing an earlier version of the observation and coding system described in this article (Connor, Morrison, & Katch, 2004), we found correlational evidence for Child × Instruction interactions and the effect of timing of instructional activities over the school year. That is, children in classrooms where their teacher spent substantial amounts of time with his or her students explicitly teaching decoding skills made greater gains in word reading skills, but only if they began the year with fairly weak word reading skills. Children who had stronger reading skills in the fall generally demonstrated less growth in these classrooms. For them, more time spent reading and writing independently was associated with stronger reading skill gains. At the same time, for children with weaker reading skills in the fall, greater time spent in these activities was associated with less reading skill growth, unless smaller amounts of time were provided in the fall with increasing amounts over the school year. Using these Child × Instruction interactions, we designed algorithms that use children's assessed language and literacy skills to recommend amounts and types of instruction (Connor, Piasta, et al., 2009). Thus, in the RCTs, teachers in the intervention group provided the recommended amounts of instruction, whereas the teachers in the control group conducted literacy instruction following district guidelines. In two separate studies with first graders, we found significant effects of individualizing instruction using the ISI protocol (Connor, Morrison, Fishman, & Schatschneider, 2008; Connor et al., 2007).

We and others have found Child × Instruction interactions from preschool through third grade across samples and for different outcomes (Al Otaiba et al., 2008; Connor, Morrison, & Petrella, 2004; Connor, Morrison, & Slominski, 2006; Foorman, Francis, Fletcher, Schatschneider, & Mehta, 1998; Juel & Minden-Cupp, 2000). These studies have relied on a variety of classroom observation systems. Still, in every study, there were quantifiable descriptors of the classroom environment, typically with duration of the activity as the metric. In addition, these observations were subsequently linked to student outcomes.

The ISI classroom observation system explicitly codes salient dimensions of teaching (Connor, Morrison, & Katch, 2004; Connor et al., 2006; Morrison et al., 2005). With its roots in ecological (Bronfenbrenner, 1986) and transactional (Sameroff & MacKenzie, 2003) views of child development, this multidimensional conceptualization of the classroom is the guiding framework for how we design our observation and coding systems.

Our model of the learning environment is provided in Figure 1. Resembling a crystal, this model starts from the bottom, where children bring many individual characteristics and skills with them to the classroom. For example, children differ in the language and learning environments they experience at home (Connor, Son, Hindman, & Morrison, 2005; Hart & Risley, 1995; Huttenlocher, Vasilyeva, Cymerman, & Levine, 2002), which influences their language and emergent literacy skill development. Children differ in their ability to pay attention, change tasks, follow rules, and interact with peers (Hamre & Pianta, 2005), which is frequently referred to as *self-regulation* (Blair, 2002; McClelland et al., 2007). These differences potentially influence their interactions with their teacher and peers, and their learning in the classroom.

There are also foundational dimensions of the classroom environment—teacher warmth and responsiveness to students, classroom management and organization, discipline, and the social and emotional climate (Connor et al., 2005; Hamre & Pianta, 2005; NICHD ECCRN, 2002). There are characteristics that teachers bring to the classroom. For example, teachers' knowledge of the subject area (Moats, 1994; Piasta, Connor,

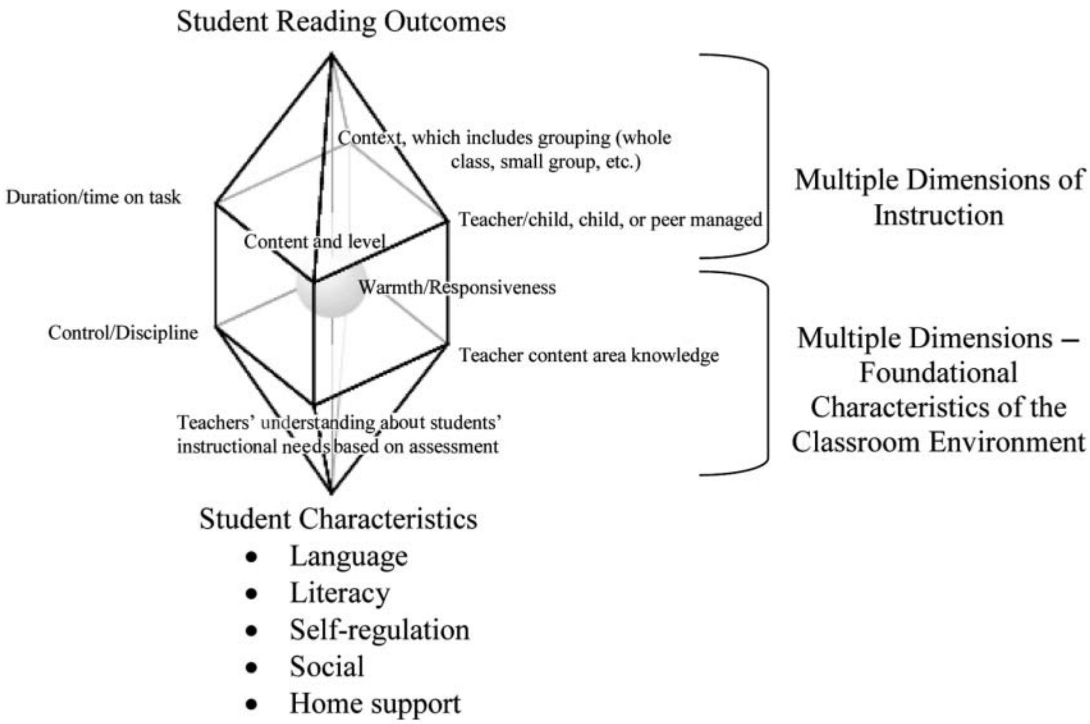

FIGURE 1. *Multiple dimensions of the classroom environment model.*

Fishman, & Morrison, in press) and other qualifications, including credentials and experiences (Darling-Hammond, 2000; Goldhaber & Anthony, 2003). Another teacher characteristic that appears to affect student learning is teachers' facility with interpreting assessment results for each student in order to inform instruction (Connor, Morrison, Fishman, & Schatschneider, in 2008). All of these are considered foundational skills in this model because they appear to contribute to student outcomes, although indirectly. Theoretically and practically, they are necessary but not sufficient to promote student learning (Cohen, Raudenbush, & Ball, 2003). We conjecture that teachers who use their knowledge of the content area, of the curriculum or instructional regime, and of their students' skills and instructional needs more automatically (i.e., strong foundational characteristics) will be able to interact with students in learning activities more responsively and flexibly (S. W. Raudenbush, personal communication, July 2008), which will in turn contribute to stronger student learning and hence outcomes.

Moving up the model, the dimensions of instruction include who is focusing the child's attention on the learning activity at hand (i.e., *management*, which includes teacher, teacher/child, peer, and child self-management); the *context* of the instruction (whole class, larger group, small group, individual); the *content* of the activity, including academic activities (literacy, science, mathematics) and subactivities (e.g., for literacy, encoding, decoding, comprehension), and classroom management activities (organization, transitions, disruptions, etc.); and the *duration* of these activities. These dimensions operate simultaneously to define specific literacy (in our case) activities. Thus the teacher working with a small group of students discussing a writing project and working on revisions would be considered a teacher/child-managed small-group writing activity that includes encoding and discussion. We can go further and describe activities as explicitly or implicitly focused on a particular outcome. For example, the described activity is explicitly focused on helping children extract and construct meaning from text (Snow, 2001) and implicitly or indirectly focused on decoding (see Table 1). Using these and other dimensions of instruction, we can describe the complexities and dynamic nature of instruction and yet still be able to use the variables in analytic models, such as hierarchical linear modeling (Raudenbush & Bryk, 2002).

The multiple foundational and instructional dimensions of the classroom environment may, according to our model, operate globally at the classroom level or more specifically at the individual-child level (the model in Figure 1 is for one child, but one can imagine many crystals together to describe the classroom more globally). For example, a teacher might be generally warm and responsive to his or her students (a global classroom characteristic) but at the same time interact differently with certain students, such as students with behavior problems. In the same way, instruction can operate more globally (e.g., whole-class instruction) and at the individual-student level (e.g., small-group instruction). The ISI observation system makes the implicit assumption that more fully understanding the multiple dimensions of instruction will better explicate key elements of effective teaching than will focusing solely on the more foundational dimensions of instruction. Thus the dimensions of instruction (e.g., content, context, management, etc.) are more fully

Table 1
Dimensions of Instruction: Management (TCM and CM), Context (Whole Class, Small Group, etc.), and Content (Code- and Meaning-Focused)

	Teacher/Child-Managed (TCM)		Peer- and Child-Managed (CM)	
Context	**Code-Focused (CF)**	**Meaning-Focused (MF)**	**Code-Focused (CF)**	**Meaning-Focused (MF)**
Whole Class	(TCM-CF) The teacher writes *cat* on the board and asks students to find other words from the same word family (e.g., *hit, hat, bat,* where *hat* and *bat* are correct).	(TCM-MF) The teacher reads a book aloud to the class. When he finishes the book, he asks the children to retell the story in their own words.	(CM-CF) All students complete a worksheet on blending phonemes into words while the teacher sits at her desk and reviews assessment results.	(CM-MF) All students write a story about their summer while the teacher writes about his summer.
Small Group and Pair	(TCM-CF) The teacher reads a list of words aloud, and the small group or pair of students put their thumbs up if they hear the long *a* sound and thumbs down if they do not hear the sound.	(TCM-MF) While reading a book to a small group of children (or pair), the teacher asks students to compare how this story is similar to the one they read yesterday.	(CM-CF) Two students take turns reading a book together.	(CM-MF) A group of students work together at a center, using letter-rime flash cards to make nonsense and real words. They then read the word and say whether it is a real word or not.
Individual	(TCM-CF) The teacher works with an individual student and is timing how long it takes him to read a list of nonsense words. She then provides feedback on word attack strategies.	(TCM-MF) During a shared reading activity, the teacher listens to a student individually as the child retells the story. They then discuss comprehension monitoring strategies.	(CM-CF) A student completes a worksheet where he must color the pictures for which each name includes the long *e* sound.	(CM-MF) After listening to a book on tape, a student answers questions about the story on a worksheet.

Note. Code-focused combines all literacy content codes that are related to code-related literacy instruction, such as phonological awareness, phonics, letter and word fluency, and so on. Meaning-focused combines all literacy content codes that focus on the active extraction and construction of meaning from text, including oral language, vocabulary, comprehension, text fluency, writing, and so on.

explicated than are the foundational dimensions (e.g., teacher warmth and responsiveness), for which we use more global classroom-level rubrics such as CLASS (Pianta, 2006).

The History of the ISI Classroom Observation System

The roots of the ISI observation and coding system can be traced back to Durkin's (1979) observation technique, which was aligned with the goals of developing a broad but explicit observation system. In her study, Durkin observed kindergarten classrooms, recorded the time an activity began and ended (with 1 minute as the minimum interval), and labeled the activity (from a list of activities that was prepared before observations ensued), who was involved in the activity (the whole class, a small group of students, etc.), and what materials were used for the activity. What was important about Durkin's methods was the focus on what was happening in the classroom and for how long. This was in contrast to making a priori judgments about what constituted effective instruction and then evaluating teachers' behaviors. Still, Durkin made a priori judgments about the activities she expected to observe in classrooms. Thus we adapted Durkin's technique in 1995 and began to design an observation system, the Early Schooling and Child Study (ESCS) observation system, which, to the extent possible, moved away from a priori judgments.

The ESCS observation system utilized in the mid-1990s was developed to investigate the nature of and variability in classroom instruction across the content areas from kindergarten through third grade. Researchers produced a written record of the entire school day (Cameron, Connor, & Morrison, 2005; Connor, Morrison, & Katch, 2004; Connor, Morrison, & Petrella, 2004). The narrative included the time (starting and ending), the activity, the teacher behavior, the student behavior, and the materials used. Pilot testing revealed that it was easier to record a near-verbatim narrative of what the teacher and/or students were saying and doing. Attempting to assign codes or check specific labels while observing appeared to hinder the observation process, resulting in the loss of potentially valuable information. This system provided a classroom-level view of the instruction received. Individual students were not coded. By quantifying the observed instruction using time as a metric, we were able to use our instruction variables in multilevel models. It was these models that provided correlational evidence of Child × Instruction interactions at the classroom level (e.g., Connor, Morrison, & Petrella, 2004).

The ESCS system was limited because it did not allow us to examine whether students who shared the same classroom might receive different amounts and types of instruction—observation was at the classroom level. To better understand the dynamics of classroom instruction at the individual-student level, we incorporated features of a video-coding system that was originally designed in 1999 to examine the verbal interactions between the teacher and specific children in preschool classrooms (Connor, 2002). Informed by discourse analysis methods (Gee, 1999) and developmental psycholinguistic methods (Ochs & Schieffelin, 1979), this observation system created verbatim transcripts of teachers and students interacting from videotapes and audiotapes, which were then coded. Rather than duration, the frequency with which specific types of interactions were observed to occur during teacher–child discussions was recorded. The frequencies were then incorporated into multilevel statistical models (Raudenbush & Bryk, 2002). The results of this study suggested that teachers interacted with their students differentially in ways that systematically affected students' emergent literacy development and that this depended to some extent on students' sociocultural language characteristics (Connor, 2002).

Combining features of each observation system (recording time spent in activities with video recording and focus on individual students), in 2001 the Pathways observation system was designed to utilize classroom videotapes and behavioral coding software. Designed to capture instruction from preschool through first grade, this protocol allowed us to examine the amount and types of literacy instruction each child received and whether the instruction was at the classroom level (e.g., whole class) or at the student level (e.g., small group or individual; Connor et al., 2006). The system also permitted us to more closely examine classroom organization and management (e.g., length of transitions) as they affected students' outcomes (Cameron, 2007; Ponitz & Morrison, 2008). Using time (minutes:seconds) as the metric, these studies revealed that children who shared the same classroom spent quite different amounts of time in specific literacy activities (Connor et al., 2006), with implications for their literacy outcomes. This system directly informed the development of the observation system we present here.

The ISI Observation and Coding System

Again, the observation system used in the ISI studies was designed to explicitly examine whether children in ISI intervention classrooms were receiving recommended amounts of instruction, based on their language and literacy skills, and whether receiving these recommended amounts and types of instruction contributed to greater literacy growth, compared to children receiving instruction that was not specifically individualized (i.e., business as usual). We computed the recommended amounts of instruction using findings from our prior correlational research on Child × Instruction interactions, including results from the Pathways observation system.

The ISI system shares many of the observation protocols, codes, and definitions used in the Pathways system. However, the ISI system is designed to capture literacy instruction following children from kindergarten through third grade and to examine whether teachers are matching the content of the literacy instruction to students' assessed skill levels. Thus the codes capturing the content of the literacy instruction are more detailed than those found in the Pathways system and include additional constructs, such as morphological awareness and comprehension strategies.

In the ISI coding system, any event lasting 15 seconds or longer is captured across specific multiple dimensions. Our current system focuses on the instructional dimensions that capture who is focusing students' attention on the learning activity at hand (e.g., teacher/child, child managed, etc.; see Figure 1), content of instruction, and context of instruction, specifically grouping (e.g., whole class, small group, etc.) and duration. We also specifically code the dimensions of classroom organization and management (which might be considered a foundational dimension), because part of the ISI intervention includes professional development on organizing and managing small-group instruction. These dimensions include organization, planning, management, transitions (e.g., waiting in line, moving from one activity to another), disruptions, and others. We discuss these in more detail later in the article. In the appendix, we have included the section on Literacy >> Comprehension from our coding manual. The full manual is available upon request from the first author.

Observation Methods

Because we wished to examine the learning experiences of individual children, we decided to videotape classrooms while completing detailed field notes. With video, we did not need to make as many a priori coding decisions. For example, we recently found that students' decoding skill gains depended on their teachers' assessed level of content knowledge about decoding (e.g., how many phonemes in the word *box*) and the amount of explicit decoding instruction students received (Piasta et al., in press). When their teachers had higher scores on the knowledge survey, more time spent in decoding instruction was associated with students' greater decoding skill growth. However, for students whose teachers had low scores on the survey, the more time they spent in decoding instruction, the less was their decoding skill growth. By going back to the videotape, we were able to observe that the teachers who had low scores on the knowledge survey frequently taught basic phonics and phonological skills incorrectly. For example, one teacher with a low score on the knowledge survey told the students that the *a* in *above* (schwa) made the short *a* sound (as in *cat*), which is incorrect for the region in which the teacher and student lived.

How We Captured and Prepared the Videotape for Coding

Videotaped classroom observations were scheduled at each teacher's convenience and conducted during the entire literacy block in the fall and spring, which lasted a fairly consistent 120 minutes for all classrooms. We videotaped all day during the winter to record a typical day. Research using data from multiple observations per year (4–8) suggests that the middle of the school year is a reasonable time to capture a representative snapshot of the classroom environment; moreover, correlations among observed classroom variables are moderately to highly stable, at .65 or above (Hamre, Pianta, Downer, & Mashburn, 2007; NICHD ECCRN, 2002).

Research assistants used two digital (mini-DV) video cameras with wide-angle lenses for each observation so that we would be better able to capture as much of the classroom activity as possible. In addition, detailed field notes were completed throughout the observation period. We recorded specific information that might not be evident from the videotape alone, for example, activities that children were accomplishing in groups or at their desks. We noted the precise times when children entered and left the classroom, described events or activities that took place outside the camera's view, and gathered samples of worksheets and other activities and detailed descriptions of these (e.g., from field notes, "Students are completing a comprehension worksheet

Table 2
Transcript of Six and a Half Minutes of Video (Time in Seconds)

0.00 Child A,Individual,TCM
0.00 Child B,Individual,TCM
0.00 Child D,Individual,TCM
0.00 Child E,Individual,TCM
0.00 Child F,Individual,TCM
0.00 Child G,Individual,TCM
0.00 Child H,Individual,TCM
0.00 Child K,Individual,TCM
0.00 Child L,Individual,TCM
0.00 Child A,Print Vocabulary,Vocab/Use,WrkBk/WrkSht
0.00 Child B,Print Vocabulary,Vocab/Use,WrkBk/WrkSht
0.00 Child D,Print Vocabulary,Vocab/Use,WrkBk/WrkSht
0.00 Child E,Print Vocabulary,Vocab/Use,WrkBk/WrkSht
0.00 Child F,Print Vocabulary,Vocab/Use,WrkBk/WrkSht
0.00 Child G,Print Vocabulary,Vocab/Use,WrkBk/WrkSht
0.00 Child H,Print Vocabulary,Vocab/Use,WrkBk/WrkSht
0.00 Child K,Print Vocabulary,Vocab/Use,WrkBk/WrkSht
0.00 Child L,Print Vocabulary,Vocab/Use,WrkBk/WrkSht
22.30 Child A,Noninstructional,OrientActivity
22.30 Child B,Noninstructional,OrientActivity
22.30 Child D,Noninstructional,OrientActivity
22.30 Child E,Noninstructional,OrientActivity
22.30 Child F,Noninstructional,OrientActivity
22.30 Child G,Noninstructional,OrientActivity
22.30 Child H,Noninstructional,OrientActivity
22.30 Child K,Noninstructional,OrientActivity
22.30 Child L,Noninstructional,OrientActivity
75.03 Child A,Text reading,TReadAloud,WrkBk/WrkSht
75.03 Child B,Text reading,TReadAloud,WrkBk/WrkSht
75.03 Child D,Text reading,TReadAloud,WrkBk/WrkSht
75.03 Child E,Text reading,TReadAloud,WrkBk/WrkSht
75.03 Child F,Text reading,TReadAloud,WrkBk/WrkSht
75.03 Child G,Text reading,TReadAloud,WrkBk/WrkSht
75.03 Child H,Text reading,TReadAloud,WrkBk/WrkSht
75.03 Child K,Text reading,TReadAloud,WrkBk/WrkSht
75.03 Child L,Text reading,TReadAloud,WrkBk/WrkSht
102.80 Child A,Comprehension,Highlighting,WrkBk/WrkSht
102.80 Child B,Comprehension,Highlighting,WrkBk/WrkSht
102.80 Child D,Comprehension,Highlighting,WrkBk/WrkSht
102.80 Child E,Comprehension,Highlighting,WrkBk/WrkSht
102.80 Child F,Comprehension,Highlighting,WrkBk/WrkSht
102.80 Child G,Comprehension,Highlighting,WrkBk/WrkSht
102.80 Child H,Comprehension,Highlighting,WrkBk/WrkSht
102.80 Child K,Comprehension,Highlighting,WrkBk/WrkSht
102.80 Child L,Comprehension,Highlighting,WrkBk/WrkSht
177.46 Child I,Individual,CM
180.43 Child I,Noninstructional,Transition/Act
212.50 Child I,Individual,TCM
212.50 Child I,Comprehension,Highlighting,WrkBk/WrkSht
266.20 Child A,Text reading,TReadAloud,WrkBk/WrkSht
266.20 Child B,Text reading,TReadAloud,WrkBk/WrkSht
266.20 Child D,Text reading,TReadAloud,WrkBk/WrkSht
266.20 Child E,Text reading,TReadAloud,WrkBk/WrkSht
266.20 Child F,Text reading,TReadAloud,WrkBk/WrkSht
266.20 Child G,Text reading,TReadAloud,WrkBk/WrkSht
266.20 Child H,Text reading,TReadAloud,WrkBk/WrkSht
266.20 Child I,Text reading,TReadAloud,WrkBk/WrkSht
266.20 Child K,Text reading,TReadAloud,WrkBk/WrkSht
266.20 Child L,Text reading,TReadAloud,WrkBk/WrkSht
284.80 Child A,Comprehension,Highlighting,WrkBk/WrkSht
284.80 Child B,Comprehension,Highlighting,WrkBk/WrkSht
284.80 Child D,Comprehension,Highlighting,WrkBk/WrkSht
284.80 Child E,Comprehension,Highlighting,WrkBk/WrkSht
284.80 Child F,Comprehension,Highlighting,WrkBk/WrkSht
284.80 Child G,Comprehension,Highlighting,WrkBk/WrkSht
284.80 Child H,Comprehension,Highlighting,WrkBk/WrkSht
284.80 Child I,Comprehension,Highlighting,WrkBk/WrkSht
284.80 Child K,Comprehension,Highlighting,WrkBk/WrkSht
284.80 Child L,Comprehension,Highlighting,WrkBk/WrkSht
399.43 Child A,Noninstructional,OrientActivity
399.43 Child B,Noninstructional,OrientActivity
399.43 Child D,Noninstructional,OrientActivity
399.43 Child E,Noninstructional,OrientActivity
399.43 Child F,Noninstructional,OrientActivity
399.43 Child G,Noninstructional,OrientActivity
399.43 Child H,Noninstructional,OrientActivity
399.43 Child I,Noninstructional,OrientActivity
399.43 Child K,Noninstructional,OrientActivity

where they must answer questions about the book the class just finished reading together"). Activities that took place outside the classroom were not recorded; nor did we record activities for students who left the classroom during the observation.

We coded the classroom video in the laboratory using the Noldus Observer Pro version 5.0 software package (Noldus Information Technology, 2001b). Coders were trained research assistants, some of whom also conducted the video observations. To the extent possible, for the ISI studies, coders were blind to whether teachers were in the treatment or control condition.

The Coding System

Our current coding system was specifically designed to explicate the dimensions of instruction that were relevant to our research on Child × Instruction interactions. As discussed, we have focused on several salient dimensions of instruction, including (a) management of students' attention; (b) context of the activity, including whether it was classroom level (children were doing essentially the same thing at the same time, i.e., whole class) or student level (children were doing substantially different activities at the same time, i.e., group or individual); (c) content of the activity (instruction or noninstruction); and (d) duration of the activity. These dimensions operate simultaneously so that an activity with a duration may be defined using these dimensions (see Table 1). We found that below a threshold of 15 seconds, we were unable to establish adequate intercoder reliability. Thus a recorded activity was any event that lasted 15 seconds or longer. An activity that lasted fewer than 15 seconds was not coded—for example, the teacher says, "Listen to the story" (organization) and then begins reading (text reading); the brief organization activity in this example would not be coded). A partial transcript of a coded classroom is provided in Table 2.

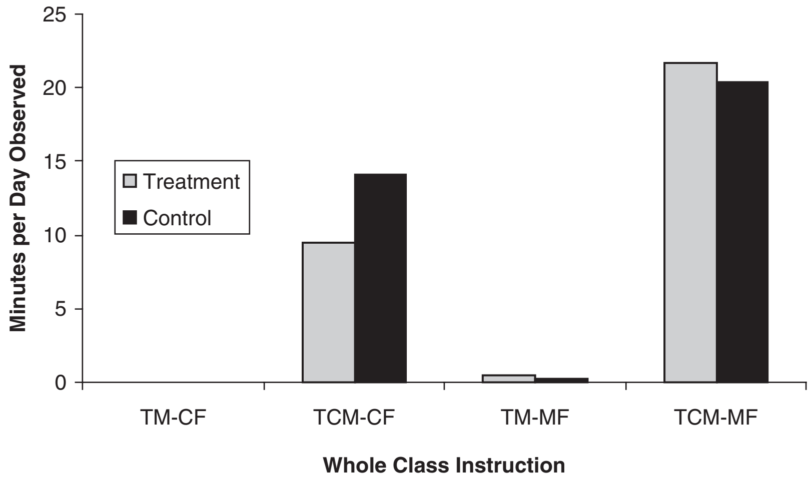

FIGURE 2. *A comparison of time spent in more interactive (teacher/child-managed [TCM]) and less interactive (teacher-managed [TM] code-focused [CF]) instruction by group.*

The *management* dimension (see Table 1) considers who is focusing the child's attention on the learning opportunity: the child (CM), peers (PM), or the teacher and child together (TCM). Activities are coded as TCM when the teacher is actively interacting with students. CM activities are coded when the child participates in activities without the support of the teacher independently. Activities in which students are interacting without the supervision of the teacher are coded as PM. Activities include sustained independent silent reading (CM), buddy reading (PM), and completing worksheets at his or her desk (CM). We tested a teacher-managed (TM) code, which was defined as when teachers talked for at least 3 minutes without inviting the children to participate. However, we observed less than a minute of this kind of interaction across our participating first-grade classrooms (see Figure 2). As the study moves to second and third grade, more TM instruction (e.g., lectures) may be observed. We also code the activities of aides, volunteers, and other professionals. This dimension originates in the time-on-task and engagement literatures (Arlin, 1979; Karweit & Slavin, 1980; Meece, Blumenfeld, Hoyle, & Blumenfeld, 1988; Pressley et al., 2001; Ryan & Patrick, 2001; Skinner, Wellborn, & Connell, 1990), as well as the developmental and educational psychology literatures (Deci & Ryan, 1994; Grolnick & Farkas, 2002; Wachs, Gurkas, & Kontos , 2004), highlighting the importance of active engagement with appropriate, external supports for predicting learning outcomes.

The second coding dimension, *context*, considers whether students and the teacher are working together as an entire class (whole class), in smaller groups, or individually (either the child alone or one-on-one with the teacher). Specifically, activities in which the entire class participates are designated as Whole Class. Small Group (3 or more children working together) and Pair activities are coded when students worked together in smaller units to complete worksheets, read texts, write and edit stories, and so on. When children are working one-on-one with their teacher (e.g., tutoring) or independently, including individual seatwork such as completing worksheets, journal writing, and silent reading, these activities are coded as Individual.

The third dimension of the coding scheme, *content*, captures the intended purpose of the classroom activities (see Table 1). Thus if the purpose of the activity is to teach children how to blend letter sounds to make words, then the activity is coded as a literacy activity, and specifically, phoneme awareness >> blending. Other academic (e.g., science) and nonacademic (e.g., transition) activities are coded generally, although our focus on literacy led to more detailed codes for these activities. We first define literacy activities with respect to the broad content area targeted by instruction (i.e., Phoneme Awareness, Syllable Awareness, Morpheme Awareness, Onset/Rime Awareness, Word Identification/Decoding, Word Identification/Encoding, Grapheme–Phoneme Correspondence, Fluency, Print and Text Concepts, Oral Language, Print Vocabulary, Comprehension, Text Reading, and Writing). The mean amounts observed across 46 first-grade classroom for fall, winter, and spring are shown in Figure 3. We then define subcategories within each of the broad content areas more specifically. For example, a comprehension activity may have focused on a particular comprehension strategy, such as monitoring understanding or making inferences (see the appendix). We provide more detail on nonacademic or noninstruction activities in the last part of this article.

The coding scheme allows all four dimensions (focusing of attention, grouping unit, content, duration) to be coded for each activity for each individual child (see Tables 1 and 2). In Table 2 we provide a sample transcript from the 2005–2006 study. At the start of the literacy block, children were working on a vocabulary worksheet individually at their desks as the teacher walked around the room guiding them through the activity and stopping frequently to help children with specific items. Coding each of the target children in turn, the coder selected the code Individual, TCM. The code CM (Individual, CM) would have been selected if children had been working without the support of the teacher (e.g., while he or she was working with another group of children). The activity is coded Individual rather than Whole Class because the children are working individually at their desks with intermittent support from the teacher. This is in contrast to the teacher reading and discussing a book with the class, where children are gathered in a group and learning together, which would have been coded Whole Class. Then content was coded Print Vocabulary, Vocab/Use, WrkBk/WrkSht, which indicates that the

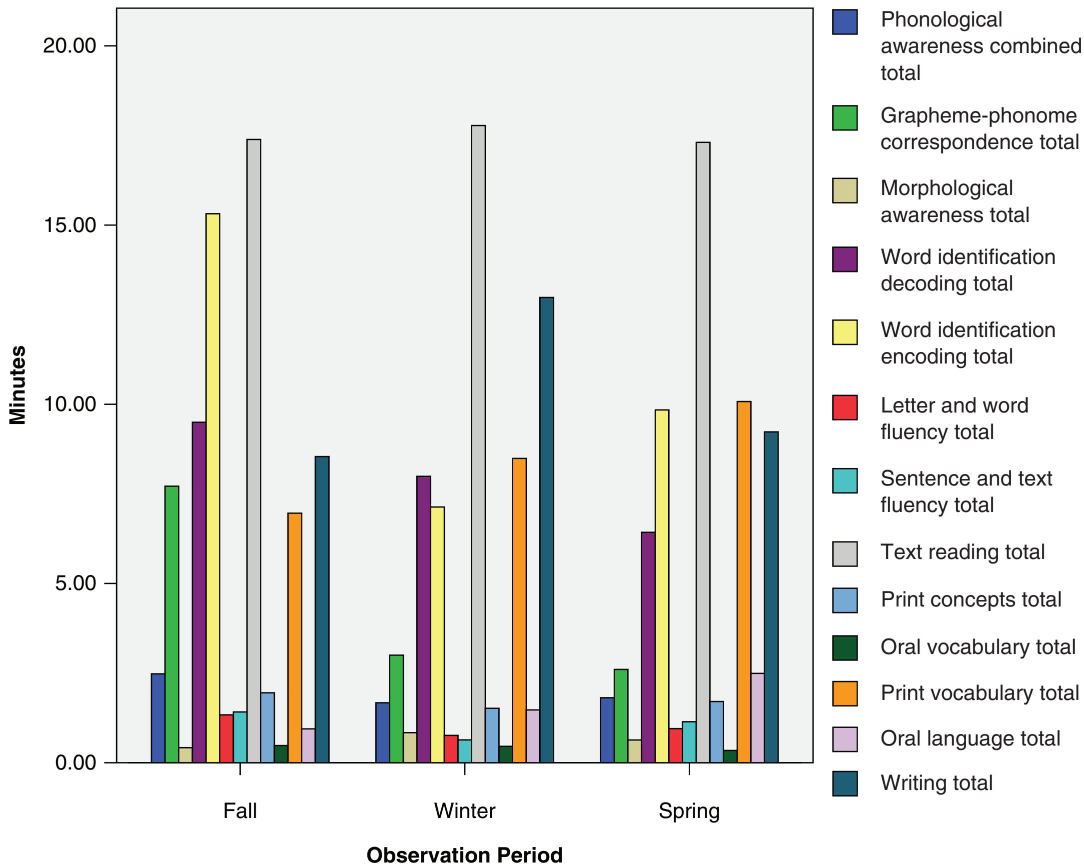

FIGURE 3. *Mean amounts of the major literacy content codes for first-grade classrooms in the fall, winter, and spring.*

category was vocabulary, the first modifier was *vocabulary use*, and the second modifier was the material—children were working in their *workbooks* (in this case the core curriculum workbook).

Coding Software

We use Observer Pro software (Noldus Information Technology, 2001a), which is one of several commercially available software systems designed to capture behavioral observational data. A screen shot is shown in Figure 4. Other published systems include Studiocode (Studiocode, 2009), NVivo (QSR International, 2007), and CHILDES (MacWhinney, 1994). Features common to these programs include specifying a subject to be coded (e.g., a mouse, a student, or an entire classroom) and identifying what that subject is doing and for how long a certain behavior occurs. Several programs use transcripts. These programs also compile and conduct simple statistical analyses with the captured data, including reliability analyses. The published software programs listed above are relatively versatile. With one program, researchers may design multiple coding systems (such as one for coding literacy instruction and another for social interactions).

We decided to use Observer Pro software in 2001 and continue to use this software in our research. Thus our coding system has been adapted to accommodate the organization of the software. Any commercially available software package will have advantages and disadvantages, which should be considered before making the considerable investment of time and resources. For example, until the most recent version of Observer Pro was released, the number of student participants (i.e., subjects), the behaviors that could be coded (i.e., behavioral classes), and the specific qualifying descriptions that could be attached to a behavior (i.e., modifiers) were limited (www.noldus.com).

Because our goal was to code the activities in which individual children were participating, we wanted to include as many child participants per classroom as could be accommodated by the software. However, that meant that if we coded 12 students, we could use only two behavioral classes. Thus the dimensions of attention management (teacher/child, peer, etc.) and grouping (whole class, small group, etc.) were coded using one behavioral class and one of the two modifiers available. Content of instruction (literacy, mathematics, noninstruction, etc.) constituted the other behavioral class, and details were coded using the modifiers. For example, one activity might be coded literacy >> comprehension >> monitoring, where the behavioral code is *literacy/comprehension* and *monitoring* is the modifier. The other modifier captured the materials used (e.g., narrative text, worksheets, expository text).

In subsequent coding schemes, we reduced the number of students to 10 and separated the management and grouping dimensions. Although this improved coding reliability, downloading data with the software became much more difficult. The newer version of Observer makes the extraction of data simpler but still highly complex. There is also more flexibility in developing coding systems. In previous versions, all codes had to be set a priori. Adding or changing codes made previous transcripts incompatible

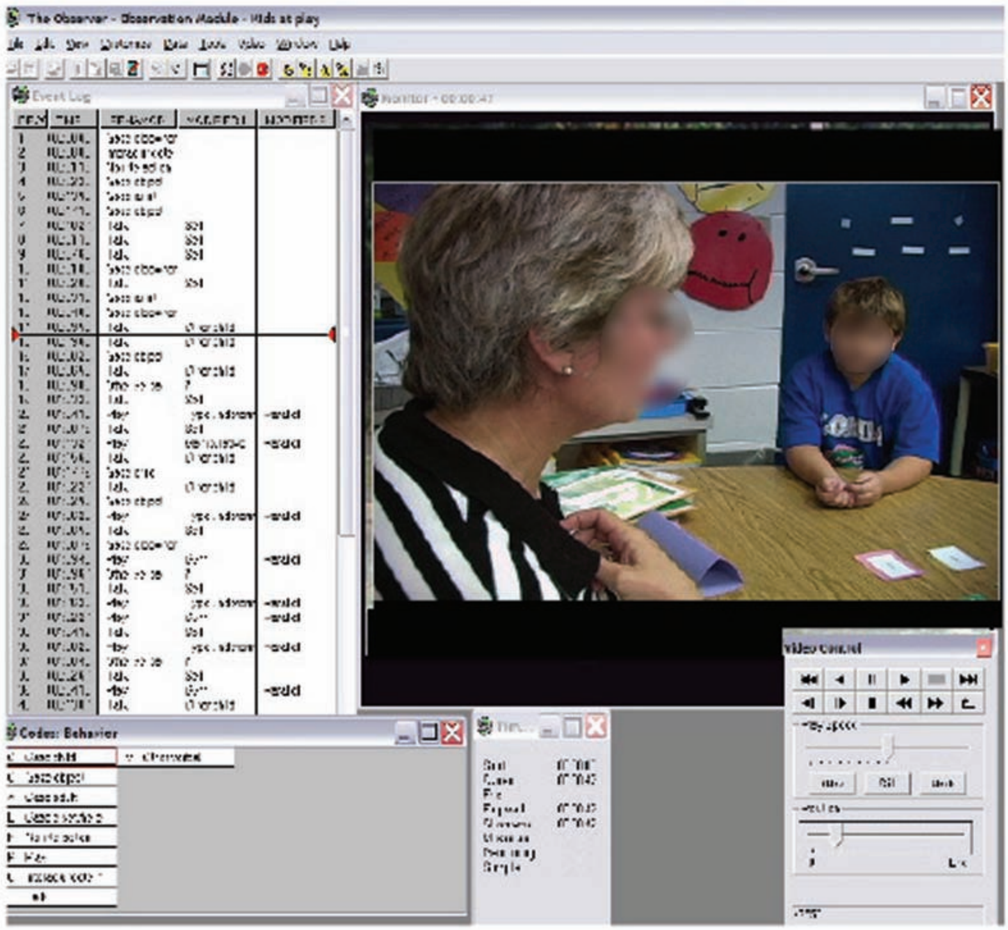

FIGURE 4. *Screen shot of Observer Pro. Coded activity would be individual (context), teacher/child managed (management), phoneme awareness >> analogy/word family (content).*

with the new system. In the newest versions of Observer (which we have not yet adopted), codes reportedly can be added and deleted without jeopardizing previously coded video (www.noldus.com).

Reliability and Validity

The Observer software can be used to compute intercoder reliability for many different types of variables, including agreement on the activity code, a match on the time spent in that code, and agreement on the order in which codes have been assigned, or a combination. We require coders to attain a Kappa of .70 (Landis & Koch, 1977) for the activity code and the time spent in that activity, with agreement within 15 seconds.

The reliability feature of the software is used frequently to bring coders to acceptable levels of reliability as well as for reliability checks during coding. We require at least 5% of tapes from our study to be dual coded, and we report these reliability ranges in our write-ups. For our most recent article (Connor, Piasta, et al., 2009), we achieved good interrater agreement (Kappa = .80) among all coders before formal coding commenced. When 5% of the completed observations were randomly selected and 30 minutes were recoded by another research assistant, reliability among coders was moderate to almost perfect, with a Cohen's kappa mean of .76 and a range from .50 (moderate) to .92 (high; Landis & Koch, 1977).

Another key indicator as to whether an observation system is valid and reliable is how well the results allow one to answer the research questions for which the system was designed. This argument is implicit in Ochs's 1979 essay, and we apply that benchmark here. Our classroom coding system reveals that children who share the same classroom participate in very different learning activities that systematically predict their literacy skill gains (Connor et al., 2006; Connor, Piasta, et al., 2009). For example, one child might be involved in a discipline activity while another is reading a book in the library corner with a peer. In Figure 5, we show the amount of small-group, teacher/child-managed (TCM) code-focused instruction observed in the winter of 2006 for approximately 460 students. Code-focused instruction is the sum of all literacy activities that are explicitly focused on teaching children how to decode and encode at the word level. Specific content areas include phonological and morphological awareness, phonics, letter and word fluency, and word-level encoding. Each bar represents the duration of the activities (in seconds) observed for one child.

When we zoom in on one classroom, we see that even within classrooms the amount of instruction varies for each child during

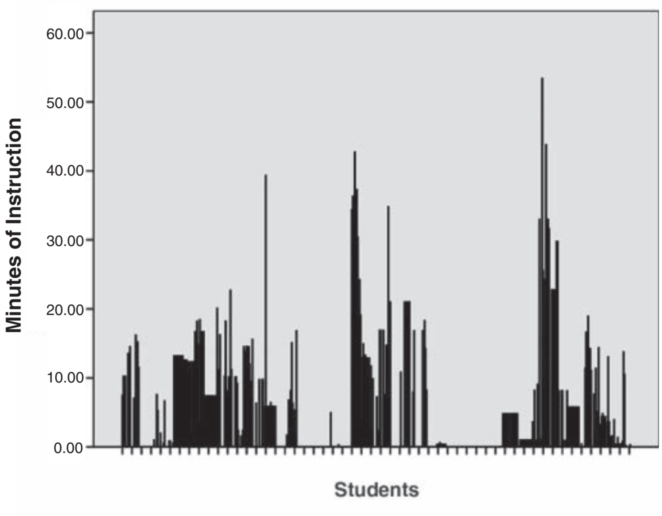

FIGURE 5. *Total amounts of small-group, teacher/child-managed, code-focused instruction, where each bar represents one child in the classroom.*

the 2-hour literacy block (Figure 6). In this figure, the solid black bars represent the amount of small-group, TCM-code-focused instruction observed for the target children in this classroom. Note that Child D participated in more than 40 minutes of small-group, TCM-code-focused instruction (e.g., working in a small group with the teacher on blending and segmenting single syllable words), whereas Child C, during the same literacy block, participated in fewer than 25 minutes.

The gray bars represent the amount of time that it was estimated each child would require per day to reach grade level or attain a year's worth of reading skill growth by the end of the school year. These estimates were computed using algorithms based on Child × Instruction interaction research findings (Connor, Piasta, et al., 2009). Child A had strong letter–word reading skills at the beginning of first grade, and so the algorithms recommended relatively little time for small-group TCM-code-focused instruction. In contrast, Child C and Child G had skills well below grade expectations, and so the algorithms recommended substantial amounts of time in TCM-code-focused instruction. By comparing the gray and black bars, we see that Child G and Child E are receiving instruction that is fairly close to the recommended amount, whereas Child A and Child D are receiving more than the recommended amount, and Child C is receiving less. The absolute value of the difference between the observed and recommended amounts is the *distance from recommendation* (DFR).

Students' DFRs strongly predicted their end-of-the-year literacy outcomes, whereas the total amount of TCM-code-focused instruction they received did not (Connor, Piasta, et al., 2009). That means that children who received instruction closer to the recommended amounts made significantly greater gains in reading than did children who received instruction that was farther from the recommended amounts. Children in ISI intervention classrooms were significantly more likely to have smaller DFRs than were children in control classrooms. The finding that DFR for TCM-code-focused and CM/PM-meaning-focused instruction provided in small groups or individually, as opposed to total amount of instruction, predicted students' gains—coupled with a significant treatment effect for the ISI intervention (Connor et al., 2007)—provides good evidence that Child × Instruction interactions are causally implicated in the substantial variation in children's literacy learning observed both between and within classrooms.

Observing Classroom Management and Children's Self-Regulation

Much of our research has focused on better understanding the role of children's social behavior and self-regulation (specifically, behavioral regulation) and the effects of interactions among these skills and the classroom environment on literacy and self-regulation growth. Our measure of behavioral regulation, the head-toes-knees-shoulders task, was designed to assess children's ability to remember rules for behavior while responding (working memory), to pay attention and switch tasks, and to inhibit automatic responses while responding unnaturally (Matthews, Ponitz, & Morrison, in press; Ponitz et al., 2008). These are theoretically important skills for successfully negotiating the classroom environment. Teachers in our studies tended to report that children with higher scores on the task had stronger social skills and fewer behavior problems compared to children with lower scores on the task (Connor, Ponitz, et al., 2009). Performance on the task was positively associated with students' gains on a number of skills, including reading (McClelland et al., 2007). We hypothesized that certain aspects of the classroom environment, specifically those related to classroom organization and management, might affect students' behavioral regulation and literacy skill growth. This is the reason that we carefully recorded the amount of time students

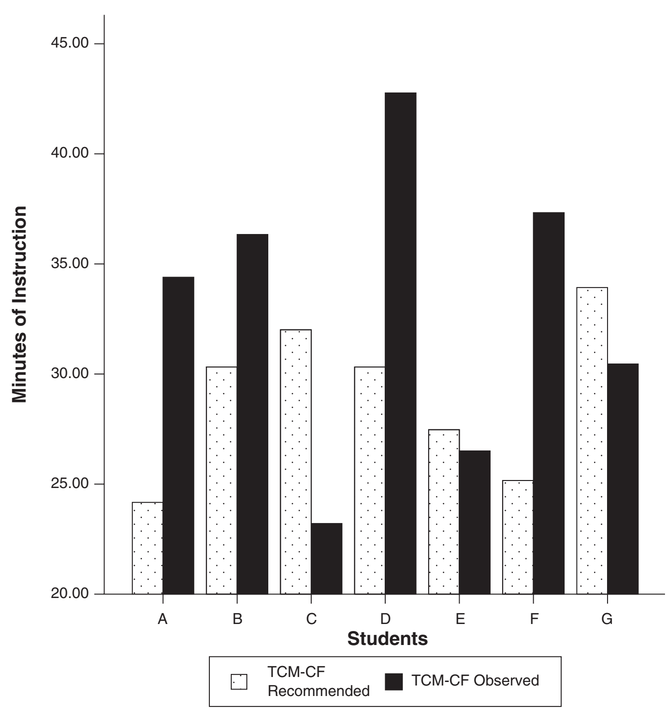

FIGURE 6. *Comparing observed and recommended amounts of small-group, teacher/child-managed (TCM), code-focused (CF) instruction in one classroom.*

spend in activities associated with classroom management. These included organization and noninstruction. The latter includes transitions, discipline, disruption, and blatant student off-task behavior.

Organization codes capture the amount of time the teacher spends explaining how to do an activity, explaining classroom routines, using devices to manage transitions (e.g., singing a cleanup song when it is time to clean up and change activities), anticipating activities to be accomplished during the school day or the next school day, and so on. Our research shows that such activities, when considered more globally at the classroom level, have generally positive associations with students' reading skill gains (Cameron et al., 2005; Cameron, Connor, Morrison, & Jewkes, 2008; Connor, Cameron, et al., 2008).

Disruption codes capture the amount of time during which the work of the class is interrupted by events inside or outside the classroom, such as loudspeaker announcements or other adults or students entering the classroom with a message for the teacher. Interestingly, we have found that these kinds of events are associated with smaller literacy gains for children with weaker behavioral regulation skills but appear to have no effect for students with stronger skills (Bell, Connor, Glasney, & Morrison, 2008). We are currently reviewing video to examine why such disruptions appear to interrupt the learning of children with weaker behavioral regulation.

Off-task behavior is child specific, and the child must be overtly off-task for this behavior to be coded. That is, we focus on children's behavior and code children off-task only when their behavior blatantly does not match the demands of the situation. We hesitate to infer, based on our research and general observations, that children are not learning when they appear to be either engaged or not engaged in a particular activity (Connor, Jakobsons, Crowe, & Meadows, 2009). Especially as children develop, levels of emotional and cognitive engagement in activities are increasingly difficult to measure with observational systems (Fredricks, Blumenfeld, & Paris, 2004). However, being emotionally involved (e.g., liking school or reading, enjoying the classroom) and cognitively engaged (e.g., willing to work hard to figure a problem out) are likely equally or more powerful predictors of achievement, as compared to fairly simple behaviors such as being off-task (Fredricks et al., 2004). In line with the notion that classroom engagement is multidimensional, our preliminary analyses indicate that off-task behavior is generally not predictive of student outcomes unless children demonstrate generally weak behavioral regulation skills (Glasney et al., 2008).

Summary and Implications

In this article we presented an overview of the ISI classroom observation and coding system, which was designed to provide a detailed picture of the classroom environment, focusing on instruction, at the level of the individual student. Foundational to our system is a theoretical framework that describes the classroom environment and instruction across multiple dimensions. Our findings have led us to utilize a transactional view of the classroom environment (Morrison & Connor, in press; Sameroff & MacKenzie, 2003), where the students and teachers contribute reciprocally to learning opportunities.

Using the ISI classroom observation system, we have begun to answer key research questions. We have found that effective patterns of instruction and classroom environments depend on the language, literacy, and self-regulation skills children bring to the classroom and so differ for each student across a continuum. This complexity appears to consist of fairly predictable functions when the child's skill level and the classroom instructional environment are known (i.e., Child × Environment interactions). For example, a seemingly chaotic classroom where children are working on many child- and peer-managed projects and are expected to manage their own learning (a variety of child-managed learning opportunities) might be a highly stimulating and effective learning environment for a student who brings stronger language and behavioral regulation skills to the classroom. At the same time, our research suggests that such an environment would not provide an effective learning environment for a student with weaker language and behavioral regulation skills. It may be that a solution to successfully explaining the workings of the classroom environment is to identify and describe (using classroom observation systems) these predictable functions and how they work together to influence students' achievement and development more broadly. Thus instead of concluding that child-managed learning opportunities should be banned from classrooms completely, an effective teacher would know which children are most likely to learn well in a child-managed activity and which children probably would need more supports to remain engaged in productive learning time (Rimm-Kaufman, Paro, Downer, & Pianta, 2005). Instruction could then be designed using small groups and centers so that more effective types of instruction (child managed vs. teacher/child managed) would be implemented for each student.

The ISI classroom observation system has been designed to incorporate multidimensional, transactional, and dynamical systems frameworks to describe the classroom environment (Connor, Piasta, et al., 2009; Ford & Lerner, 1992; Op't Eynde & Turner, 2006; Sameroff & MacKenzie, 2003). Using data from the classroom observations, the results of our classroom-based research suggest that we can begin to describe how effective classrooms function to ensure the achievement of their members. For example, we have found that instruction that (a) is intentionally planned to accommodate the individual differences among children within the classroom, (b) relies on careful assessment of students skills, and (c) is responsive to each student's changing status (cognitive, behavioral, social-emotional) is generally more effective than instruction that treats the classroom environment more globally, less diagnostically, more intuitively, and less dynamically. Observation systems that can describe the internal student-level functioning of classrooms will better elucidate the important elements of the classroom environment that affect student learning and development. With this understanding, we can design more effective instructional environments for all children.

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APPENDIX
Excerpt from the ISI Classroom Observation System Coding Manual

6.1.3. Comprehension (Behavior) cmp
Comprehension should be coded for activities intended to increase students' comprehension of written or oral text. This includes instruction and practice in using comprehension strategies and demonstration of comprehension abilities. Comprehension activities generally follow or are incorporated into reading or listening to connected text (e.g., silent sustained reading followed by a comprehension worksheet, comprehension strategy instruction using a particular example of connected text, an interactive teacher read aloud during which the teacher models various comprehension strategies). Event codes should also be coded when comprehension strategy instruction takes place (see section 7).

6.1.3.1. Missing (Modifier)
This is a default modifier automatically created by Noldus. It will not be used for our coding purposes.

6.1.3.2. Previewing (Modifier) prv
Comprehension>Previewing should be coded for activities which involve thinking about what might occur in a story based on the illustrations (including taking a "picture walk" through a book), cover, title, etc. Previewing activities always *precede* reading and involve predictions about the general content of a text, which helps to distinguish it from Comprehension>Predicting. Previewing often leads into activating prior knowledge related to the story (Comprehension>Prior Knowledge).

6.1.3.3. Predicting/Inferencing (Modifier) prd
Comprehension>Predicting/Inferencing should be coded for activities which involve predicting future events or information not yet presented based on information already conveyed by the text (e.g., making predictions from foreshadowing). Predicting occurs while reading a story and involves specific details or events, as opposed to Comprehension>Previewing, which involves a general prediction of what the text will be about.

6.1.3.4. Questioning (Modifier) q
Comprehension>Questioning should be coded for activities which involve generating or answering questions regarding facts from the text (e.g., What did Ira miss when he went to the sleepover? What was the name of _______?), provided that these activities are not better coded by Comprehension>Prior Knowledge (e.g., when the teacher uses a question to scaffold children in activating personal knowledge related to the text: "When you go to an amusement park, what do you expect to see?"), Comprehension>Monitoring (e.g., when the teacher uses a question aimed at stimulating students' metacognitive assessment of whether they comprehended the text: "Did I understand what happened there?"), or Comprehension>Predicting (e.g., when the teacher asks students to predict what will happen next: "What do you think the lost boy will do now?").

6.1.3.5. Monitoring (Modifier) mon
Comprehension>Monitoring should be coded for activities which involve stimulating students' metacognitive awareness regarding their comprehension of text or sharing strategies to provoke students to think about whether they are fully understanding. Generally, these activities involve thinking about one's own understanding of a particular text and whether the text is making sense (e.g., the teacher pauses and says "Did that make sense to you? If not, how can we fix it?" or "Wait, did I understand that?" or "That didn't make sense to me. Let's go back and reread"). These may include identifying areas of difficulty while reading, using think-aloud procedures to pinpoint difficulties, looking back in the text, restating or rephrasing text, or looking forward to solve a problem (last sentence from Pathways Code).

6.1.3.6. Highlighting (Modifier) hlt
Comprehension>Highlighting should be coded for activities which involve picking out the important details conveyed through a text. Examples include verbally listing, underlining, highlighting, or otherwise noting major points. Comprehension>Highlighting differs from Comprehension>Summarizing because it explicitly involves identifying the important details within text.

6.1.3.7. Summarizing (Modifier) sum
Comprehension>Summarizing should be coded for activities which involve generating an overall statement regarding the content of text, condensing which is different from retelling. Identifying main ideas would be coded in this category.

6.1.3.8. Context Cues (Modifier) con
Comprehension>Context Cues should be coded for activities in which students are using pictures, the title, or previous parts of the text to understand a new event or new information presented in the text. For example, a teacher might advise a child to look at pictures to identify the setting of a story.

6.1.3.9. Graphic/Semantic Organizers (Modifier) org
Comprehension>Graphic/Semantic Organizers should be coded for activities in which students are using graphic or semantic

(continued)

organizers (e.g., Venn diagrams, story webs) in order to aid their comprehension. Graphic/semantic organizers used to plan writing instruction should be coded under Writing>Prewriting/Organizers.

6.1.3.10. Prior Knowledge (Modifier) prk
Comprehension>Prior Knowledge should be coded for activities which involve activating students' personal knowledge as it relates to the content of text in order to facilitate comprehension. An example would be asking "Have you ever slept over at a friend's house?" when reading *Ira Sleeps Over*.

6.1.3.11. Retelling (Modifier) ret
Comprehension>Retelling should be coded when students are asked to retell a story using their own words. This differs from Comprehension>Summarizing because a retell should mimic the text structure and include **as many details of a text as possible**.

6.1.3.12. Sequencing (Modifier) seq
Comprehension>Sequencing should be coded for activities involving putting events from a text into the correct order. *If the activity involves graphic organizers, this should be noted in the comment field*.

6.1.3.13. Comparing/Contrasting (Modifier) cmp
Comprehension>Comparing/Contrasting should be coded for activities involving comparisons across or within texts. If the Comparing/Contrasting activity involves use of a graphic organizer (e.g., Venn diagram), this should be coded under Comprehension>Graphic/Semantic Organizers with "compare/contrast" noted in the comment field.

6.1.3.14. MF-TBD mft
The Comprehension>MF-TBD code should be used only when (a) none of the other Comprehension modifier codes are appropriate for a given activity and (b) the activity fits the Comprehension description. *A brief description of the activity should be noted in the comment field*. Note that, by definition, these activities should be meaning-focused.