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Improving Language-Focused Comprehension Instruction in Primary-Grade Classrooms: Impacts of the *Let's Know!* Experimental Curriculum

Language and Reading Research Consortium (LARRC)

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Abstract

This quasi-experimental study was designed to test the impacts of a curriculum supplement, *Let's Know!* on the quantity and quality of language-focused comprehension instruction in pre-Kindergarten to third grade classrooms. Sixty classrooms (12 per each of pre-K to grade 3) were enrolled in the study, with 40 teachers assigned to implement one of two versions of the experimental *Let's Know!* curriculum and 20 assigned to a control condition, in which they maintained their typical language-arts curriculum. Classroom observations, 90 minutes in duration, were collected near the end of the first unit's completion, about four to five weeks into the academic year. These observations were coded to examine impacts of *Let's Know!* instruction on two outcomes: (a) teachers' use of 18 language-focused comprehension supports, and (b) general classroom quality. Study results using quantile regression showed that *Let's Know!* teachers used a significantly higher number of language-focused comprehension supports during *Let's Know!* instruction compared to the control teachers during language-arts instruction; the same finding was also true for general classroom quality. Quantile regression results showed the greatest differentiation in instructional quality, when comparing experimental and control teachers, for teachers in the middle of the distribution of general classroom quality. Study findings highlight the value of language-focused curricula for heightening comprehension-specific supports in pre-K to grade 3 settings.

Improving Language-Focused Comprehension Instruction in Primary-Grade Classrooms: Impacts of the *Let's Know!* Experimental Curriculum

Many models of skilled reading theorize that reading comprehension is substantially influenced by one's language comprehension (Kintsch & Van Dijk, 1978; Perfetti, 2007). Particularly important to reading comprehension are one's vocabulary skills and those language skills that are deemed "higher-level," such as verbal reasoning, inferencing, comprehension monitoring, and analyzing text structures (Cain, Oakhill, & Bryant, 2004; Perfetti, 2007). Collectively, vocabulary skills and higher-level language processes enable readers to engage in higher-level comprehension of text, which involves creating a mental model of the text that integrates the text with one's prior knowledge and organizes its multiple propositions into an integrated whole (Kintsch & Van Dijk, 1978). Empirically, considerable work shows that these language skills contribute significant amounts of variability in children's reading comprehension, even when controlling for working memory and word-reading (Cain et al., 2004), and that difficulties with vocabulary ability and higher-level language skills serve to differentiate poor from good comprehenders (Garner & Reis, 1981; Nation, Clarke, Marshall, & Durand, 2004; Oakhill, Hartt, & Samols, 2005). For the purposes of this manuscript, we refer to classroom instruction that is focused on supporting children's growth in vocabulary and higher-level language skills as *language-focused comprehension instruction*. This type of instruction is targeted at developing language skills important to reading comprehension, and may be distinguished from text-focused comprehension instruction which emphasizes children's interactions with text (Clarke, Snowling, Truelove, & Hulme, 2010).

Several recent in-depth assessments of the nature of language-arts instruction have suggested that relatively little language-focused comprehension instruction occurs in the early primary grades (Connor, Morrison, & Petrella, 2004; Connor, Morrison, & Slominski, 2006). For our purposes, we refer to the early primary grades as spanning pre-kindergarten (pre-K) to third grade (PK-3), which reflects the importance of promoting continuity between pre-K and subsequent primary-grade instruction (Reynolds, Magnuson, & Ou, 2006). In pre-K settings, teachers are generally observed to provide very modest supports for children's language development in general (Justice, Mashburn, Hamre, & Pianta, 2008). An examination of the quality of language instruction occurring in 135 pre-K classrooms showed that the majority (54% of classrooms) were best characterized as providing very low levels of support to students, as measured by the extent to which teachers modeled for children complex vocabulary items, expanded children's utterances into more complex grammatical renderings, and engaged children in multi-turn conversations (Justice et al., 2008). In a separate study, Connor and colleagues (2006) examined the extent to which 34 pre-K teachers provided "meaning-focused instruction" in their classrooms, which is generally analogous to language-focused comprehension instruction. On average, teacher-led meaning-focused instruction occurred less than one minute per day, although there was some variability (0 to 7 minutes). Importantly, there was a positive and significant relation between the amount of meaning-focused instruction that children experienced and their language growth over the academic year (based on a measure of vocabulary). This finding suggests that teachers who provide a larger volume of language-focused instruction are offering important supports to their children's language development.

Studies of the later primary grades yield similar findings to those conducted in pre-K settings. For instance, Connor et al. (2004) examined the volume of "higher-order" instruction in

43 third-grade classrooms, and sought to capture the amount of time teachers spent targeting language-focused comprehension-related skills (e.g., improving children's vocabulary, engaging children in discussions of text). On average, there was considerable variability among teachers in the volume of higher-order instruction, which averaged about 20 minutes' duration of the 100-minute language-arts block. The amount of time teachers explicitly supported students' language-focused comprehension skills significantly predicted children's growth in reading comprehension over the academic year.

Given evidence suggesting that PK-3 teachers may provide a relatively low volume of language-focused comprehension instruction, an important process for advancing students' language skills, researchers are increasingly interested in identifying ways to enable teachers to increase the quantity and quality of language-focused comprehension instruction across these grades. Perhaps the greatest volume of effort has focused on enhancing teachers' practices with respect to vocabulary instruction (e.g., Beck & McKeown, 2007; Biemiller & Boote, 2006; Coyne et al., 2010; Justice, Meier, & Walpole, 2005). These efforts have generally focused on improving teachers' word-selection choices, such that vocabulary instruction includes targeted attention to academically relevant words, as well as improving the practices teachers use to promote students' learning of new words. Specifically, when teachers provide students with repeated and highly informative exposures to targeted words, as occurs when teachers provide explicit definitions of words to students in a variety of contexts, students' learning of new words improves (e.g., Beck & McKeown, 2007; Coyne et al., 2010).

Other efforts have concentrated on improving teachers' focus on text-structure knowledge, a higher-level language skill with a demonstrated effect on skilled comprehension (Cain et al., 2004). Williams and colleagues, for instance, examined the effects of an explicit

text-structure program as implemented by second grade teachers (Williams, Stafford, Lauer, Hall, & Pollini, 2009). The program featured reading, discussing, and analyzing expository texts as coupled with explicit teaching of how to navigate various text structures (e.g., cause/effect texts, compare/contrast texts) and how to understand clue or signal words important to navigating texts (e.g., *because, since* and *therefore* for cause-effect texts). Second graders whose teachers implemented the text-structure program showed significant improvements, relative to controls, on a number of measures of higher-level language skills (e.g., knowledge of clue words) and reading comprehension.

The literature to date provides a number of well-conceived efforts to increase the quantity and quality of language-focused comprehension instruction across the primary grades (Cain et al., 2004; Perfetti, 2007). However, there have been few efforts to affect the *full complement* of language skills known to be important to reading comprehension, including not only vocabulary skills but also higher-level abilities such as verbal reasoning, inferencing, comprehension monitoring, and analyzing text structures (Cain et al., 2004). An exception of note is the recent report of a randomized controlled trial conducted in the UK in which researchers tested a 20-week "oral language" (OL) intervention focused exclusively on facilitating lower- and higher-level language skills among 8- and 9-year-old poor comprehenders (Clarke et al., 2010). These students exhibited typical decoding skills but poor language- and reading-comprehension skills. Each 30-min OL intervention session, implemented over a 20-week period within the context of pull-out instruction, systematically targeted vocabulary, higher-level comprehension processes (e.g., verbally reasoning, comprehension monitoring), and narrative/story-structure analyses. Importantly, the OL intervention included only oral-language activities, with no focus on interactions with text (i.e., reading, writing). Compared to children receiving two intervention

alternatives and a wait-list control, children who received the OL intervention showed the greatest gains in reading comprehension and vocabulary skill immediately post-intervention and one year later, at which time those in the OL group had standardized reading comprehension scores 1.24 *SD* higher than those in the control group. While this controlled study provides causal evidence of the value of improving the full complement of language skills considered important to reading comprehension, the extent to which these results can generalize into everyday classroom settings is unclear, since the OL intervention described in this work was implemented by specially trained teaching assistants working in one-on-one sessions with students outside of the classroom.

The purpose of the present study was to examine pre-K to grade 3 teachers' implementation of a curricular supplement, *Let's Know!*, which was designed specifically to increase the quantity and quality of language-focused comprehension instruction across the primary grades. A salient feature of *Let's Know!* is that it was designed to improve the full complement of language skills considered important to reading comprehension. *Let's Know!* provides PK-3 teachers a 26-week scope and sequence of language-focused comprehension instruction organized into four topical units for each of five grades. As a curricular supplement, *Let's Know!* is *embedded* into the business-as-usual language-arts curriculum rather than supplanting it. Under separate cover, a thorough description of the two-year iterative process of *Let's Know!* development is presented (Authors, 2013), to include description of how its generation followed a logic model such that teachers' use of *Let's Know!* will result in improvements in the quantity and quality of language-focused comprehension instruction during language-arts instruction. In turn, these improvements will lead to elevated gains in students' lower- and higher-level language skills. Finally, these gains in language skills will contribute to

longer-term positive impacts on students' reading comprehension. As should be noted, the student-specific outcomes in this logic model are contingent upon achieving changes specific to classroom instruction, namely the quantity and quality of language-focused comprehension instruction.

The present study was designed to examine the first component of the logic model, specifically the extent to which pre-K to grade 3 teachers' implementation of *Let's Know!* during language-arts instruction results in significant improvements to the quantity and quality of language-focused comprehension instruction. *Quantity* of instruction is captured via an experimenter-designed tool that determines the extent to which teachers use 18 specific language-focused techniques, such as asking children to predict and infer; these techniques are closely aligned to the *Let's Know!* curriculum, and are prominently featured therein. Thus, the measure of quantity reflects a *proximal outcome* of intervention implementation. *Quality* of instruction is captured using a standardized observation tool often used to represent the overall quality of classroom instruction, namely the *Classroom Assessment Scoring System (CLASS; Pianta, Karen, Paro, & Hamre, 2008).* Students in classrooms characterized by overall high levels of quality, based on this tool, show elevated gains in language skill over time (Mashburn et al., 2008). This measure of quality reflects a *distal outcome* of intervention implement. We theorize that improvements in language-focused comprehension instruction should be observed on both proximal and distal outcome measures, reflecting indices of quantity and quality of intervention.

A rationale for focusing this study solely on classroom processes, independent of student outcomes, is suggested by the results of a number of studies showing that teachers may provide only limited supports to children with respect to development of lower- and higher-level

language skills, particularly within the pre-K setting (Jackson et al., 2006; Pence, Justice, & Wiggins, 2008; Pentimonti & Justice, 2010; Powell, Diamond, Burchinal, & Koehler, 2010). Pence and colleagues, for instance, studied the classroom instruction of pre-K teachers who were trained to implement specific language-facilitating techniques within the context of adopting a language-focused curriculum (Pence et al., 2008). Teachers showed only modest increases in their use of these seven techniques over the academic year. Importantly, the extent to which teachers used these techniques was associated with children's language growth during pre-K (Jackson et al., 2006; Pence et al., 2008; Pentimonti & Justice, 2010; Powell et al., 2010). More recently, Pianta and colleagues examined classroom quality in pre-K settings, based on the Language Modeling domain of the CLASS, as teachers implemented a language-focused curriculum (Pianta, Mashburn, Downer, Hamre, & Justice, 2008). Examination of CLASS scores at two-week intervals over the academic year showed that teachers implementing the language-focused curriculum in absence of coaching showed no changes in their provision of language-focused instruction over the academic year. In general, such findings show the importance of ensuring that teachers' implementation of language-focused intervention leads to improvements in both proximal and distal classroom processes.

To this end, this work was designed to address two research questions. First, to what extent is teachers' implementation of *Let's Know!* related to proximal measures of language-focused comprehension instruction in pre-K to grade 3 classrooms? Second, to what extent is teachers' implementation of *Let's Know!* related to distal measures of language-focused comprehension instruction in pre-K to grade 3 classrooms? In addressing these aims, we examined *between-group differences* in proximal and distal measures of classroom processes for teachers who embedded *Let's Know!* lessons into their language-arts instruction (experimental teachers)

relative to control teachers, who maintained their typical language-arts instruction. We hypothesized that teachers using *Let's Know!* would provide a greater volume of language-focused comprehension instruction than control teachers. Complementing the between-group approach, we also examined *within-group differences* for the proximal and distal measures for experimental teachers when implementing *Let's Know!* lessons versus when not implementing *Let's Know!* lessons, the latter during normal language-arts instruction. We hypothesized that *Let's Know!* teachers would provide a greater volume of language-focused comprehension instruction when using *Let's Know!* lessons relative to their typical language-arts instruction. In addressing this aim, we are able to determine whether the experimental lessons are what yields improved comprehension supports in primary-grade classrooms. Thus, this work provides a fairly stringent assessment of the impacts of *Let's Know!* on classroom processes.

Methods

Participants

Participants in this study were 60 lead teachers of pre-K to grade 3 classrooms in four states. The teachers were dispersed evenly across the grades, with 12 representing each of pre-K to third grade. Teachers were 95% percent female and the majority (95%) was non-Hispanic White/Caucasian. The teachers varied with respect to their experience serving as the lead/senior teacher in the classroom: 11 teachers (18%) were in the first year as lead teacher, six (10%) were in their second or third year as lead teacher, seven (12%) were in their fourth or fifth year, and the remainder (n = 19, 31%) had more than five years of experience; note that this information was unavailable for 18 teachers in the sample). All of the teachers had a Bachelor's degree, and 77% had additional post-graduate credentials (e.g., Master's degree).

The 60 teachers were recruited by four partnering universities (Arizona State University/ASU; Ohio State University/OSU; University of Kansas/KU; University of Nebraska-Lincoln/UNL), with each site enrolling either 14 (ASU, OSU) or 16 teachers (KU/UNL). For all procedures discussed in the remainder of this manuscript, activities were paralleled across all four sites. Teachers were drawn from educational organizations with which each site had established relations and sites were able to use their own preferred means for recruiting teachers into the study (e.g., offering information sessions, providing brochures). As this study was conducted in the second year of a five-year project featuring iterative development of language-comprehension interventions, some of the teachers had been previously involved in a minimal capacity with study activities (n = 20); for instance, some teachers had previously reviewed sample curriculum materials and others had piloted lessons.

Assignment to condition. Teachers were invited to participate in informational sessions presenting the goals of the study and the expectations of participants. Teachers self-selected to enroll in the study and provided informed written consent. Upon enrollment, teachers were assigned to implement one of two versions of *Let's Know!* (described in Methods), representing two experimental groups (n = 40), or to maintain their business-as-usual instructional practices, representing the control group (n = 20). Assignment of teachers was not wholly randomized, as the 20 teachers who had previously participated in study activities were randomly assigned to one of the two *Let's Know!* versions. The 41 teachers who were new to the study were randomly assigned to one of the three conditions. Therefore, the study is quasi-experimental in design and results should be interpreted accordingly. Examination of equivalence across the groups of teachers showed that that were no significant differences across groups for teachers' years of education, educational attainment, or age (all ps > .35).

Methods

The primary methods employed in this work were twofold. First, during their language-arts block, teachers embedded *Let's Know!* lessons into the block (experimental teachers) or maintained their business-as-usual instruction (control teachers), based on teachers' assignment to condition. Second, systematic classroom observations were conducted to document instructional practices during language-arts instruction. Each is described in turn.

Implementation of assigned instructional conditions. Teachers assigned to implement *Let's Know!* were asked to embed lessons into their typical language-arts instruction. *Let's Know!* implementation involved implementing structured lessons four times per week, each designed to be implemented in a whole-class format, and last approximately 30 minutes each (two hours per week). The *Let's Know!* lessons were organized into four units, the first three involving seven weeks of instruction and the last involving four weeks, for a total of 26 weeks of instruction. Language skills explicitly targeted within lessons, organized to follow a 26-week instructional sequence, included vocabulary, grammar, comprehension monitoring, inferencing and reasoning, and text structure. While the design of the *Let's Know!* supplement was identical across each of the five grades it spanned (pre-K to grade three), the objectives were developmentally ordered to span the five grades and the content differed in difficulty, accordingly. The units alternated between fictional themes and nonfictional themes. The fictional units (Fiction, Folktales) served as a vehicle for teaching oral-narrative skills, such as identifying the main character, setting, goals, and outcomes of a story, whereas the nonfictional themes (Animals, Earth Materials) strove to teach expository text-structures, such as cause/effect and compare/contrast.

Each unit began with a "Hook" lesson that served to orient students to the overall focus of a unit (e.g., Folk Tales) and to excite and motivate them, and culminated with a "Close" lesson, which provided a hands-on activity seeking to integrate the various skills developed during the unit (e.g., act out a folk tale created by students). Between the Hook and Close, teachers delivered five different lesson types, each of which was designed to develop specific language skills using various approaches. For instance, *Words to Know* lessons were designed to model the practice of rich-vocabulary instruction detailed in many research articles (e.g., Beck & McKeown, 2007). These lessons were soft-scripted to provide teachers explicit guidance in how to develop students' knowledge of a targeted set of academic vocabulary words through high-quality repeated exposures to these words, typically within the context of a read-aloud. That is, teachers were provided a script that organized the sequence of instruction within a given lesson, and were provided general suggestions for what she could say and examples she could use. *Text Mapping* lessons were designed to promote students' text-structure knowledge using techniques presented in Williams and colleagues' work in this area (Williams, 2005; Williams, Hall, & Lauer, 2004; Williams et al., 2005; Williams et al., 2009). These lessons were soft-scripted to provide teachers with guidance in how to promote students' attainment of clue words and to support their extraction of information from different types of texts (e.g., narrative, expository). Appendix A provides an overview of a typical unit's organizational scheme and Appendix B presents the specific lesson types.

Two *Let's Know!* versions of the supplement were created for each grade, one featuring fewer lesson types and more opportunities for practice. The first version included all lesson types shown in Appendix B, whereas the second version eliminated two of the lesson types (Text Mapping, Read to Know) and there were replaced with repetitions of Words to Know and

Integration lessons, so as to provide heightened opportunities to develop skills targeted in these lessons (e.g., vocabulary). The scope and sequence of instruction was, however, identical across both versions and, for the purposes of the present work, we do not examine differences between the two versions with respect to impacts on classroom processes specific to language-focused comprehension instruction. That is, on a lesson-to-lesson basis, we would expect *Let's Know!* teachers to look similarly when analyzing classroom processes. Thus, hereafter we will consider teachers assigned to either of the two versions of *Let's Know!* as comprising a single group.

To support teachers' implementation of *Let's Know!*, treatment teachers were invited to a one-hour orientation broadly describing the purpose of the intervention and what would be expected of them. Teachers were given access to online training modules providing a comprehensive array of supports. The first module outlined study activities, including a calendar of lessons, outline of lesson structure, overview of the components of the lessons, and explanation of study materials. Five subsequent modules were organized by lesson type and consisted of a narrated introduction to each lesson type, a definition of the instructional techniques featured in each lesson type and video examples of the technique in action. Two additional modules on grouping techniques and assessment were also included in the training. All modules ranged from 15-30 minutes in duration. Upon completion, teachers were asked to respond in writing to a series of close- and open-ended questions about the different teaching techniques, as explained by the modules. All training activities were completed individually and over 90% of teachers completed all written questions at the end of the modules. Teachers were also given the opportunity to request an additional one-on-one meeting with research personnel to discuss any aspects of implementation that may have been unclear (all teachers but one declined an additional meeting). On-going, informal communication between research personnel

and teachers was not uncommon; however, data was not collected as to the frequency of these interactions. To promote integrity of implementation, teachers completed logs aligned to each lesson on which they recorded lesson completion and any deviations from the lessons as designed. In addition, fidelity of implementation was observed three times per unit using a fidelity checklist; the checklist examined teachers' implementation of each component of the lesson. These fidelity assessments (teacher logs, fidelity checklists) looked at static features of curriculum implementation (e.g., whether teachers' implemented all components of the lesson) and did not look at specific processes (e.g., teachers' use of language-focused comprehension supports).

Teachers in the control condition implemented their business-as-usual language-arts program for the duration of the study. To control for Hawthorne effects, teachers in the control condition completed many activities similar to those in the experimental conditions, including completion of two online modules on various topics unrelated to the intervention (e.g., grouping techniques), and maintenance of instructional logs.

Systematic classroom observations. For the present purposes, a 90-minute videotaped observation was conducted in each classroom in the fall of the academic year, approximately four to five weeks into implementation of the experimental conditions. The observation was conducted during a period of classroom instruction that teachers indicated represented language-arts instruction. For the *Let's Know!* teachers, the observation included teachers' implementation of the day's *Let's Know!* lesson as well as language-arts instruction that preceded and followed the lesson. Trained research assistants conducted the observations during language-arts instruction using study-specific protocols that stipulated the classroom activities to be observed, the length of the observation, and the time of day. Subsequent to their collection, all videos were

uploaded via a secure server to the password-protected project website at OSU, where the observation coding and analyses relevant to this study were completed.

Measures

For the present study videotapes were coded and analyzed using two coding protocols, *Snippets* and the *Classroom Assessment Scoring System* (Pianta, Karen, et al., 2008) , the former developed specifically for the purposes of this study and the latter representing a commercially available, standardized measure of general classroom quality.

Snippets. Snippets is an observational tool designed to provide a proximal index of teachers' use of language-focused comprehension supports that are prominently featured within the *Let's Know!* lessons. The name of the tool derived from an interest in coding teachers' use of specific supports by examining brief "snippets" of language-arts instruction. Although there are observational protocols that feature intensive examination of moment-by-moment supports provided by teachers that span the duration of instruction (Connor et al., 2004), we sought to pursue a more parsimonious manner of observational coding, given planned larger-scale trials of *Let's Know!* that would involve hundreds of teachers.

The specific supports captured on the tool were identified using a combination of simultaneous top-down and bottom-up approaches. Regarding the former, lesson plans for all units and all grades of *Let's Know!* were reviewed by two members of research staff (who were not involved in developing curriculum materials) to develop a comprehensive list of all language-focused comprehension supports apparent in the lessons. For the latter, videos depicting teachers' implementation of *Let's Know!* lessons during design studies was watched by doctoral level research assistants in order to identify the presence of these specific supports as well as the likelihood of reliably observing specific behaviors. The process of identifying and

refining the final list of supports, presented in Appendix C, lasted approximately three months. The Snippets tool, in its final form, measures teachers' use of 18 distinct language-focused comprehension supports prominently featured in *Let's Know!* lessons.

For the purposes of this study, from each of the 90-minute videos collected from teachers in the fall of the year during language-arts instruction, two six-minute segments of language-arts instruction were randomly selected for coding with Snippets. For *Let's Know!* teachers, one six-minute segment was extracted from a *Let's Know!* lesson whereas the second segment was extracted from outside the lesson, with the latter representing teachers' normal language-arts instruction in which *Let's Know!* lessons were embedded. For control teachers, both segments were extracted from normal language-arts instruction. In total, 100 6-minute segments were coded for this study, representing classroom instruction provided by 50 teachers. Snippets was not coded for 10 video observations because the video captured in the classrooms did not reflect language-arts instruction or the video was of poor enough quality to impede coding. Coding was completed by trained research assistants (one doctoral level, one masters level) who had completed a comprehensive training program that involved study of the coding manual, discussion of specific codes, and practice opportunities to a reliability criterion of 90%.

The decision to code language-arts instruction based on two analysis of six-minute snippets per teacher was informed by prior work examining the nature of teacher-child conversations in preschool classrooms (Girolametto & Weitzman, 2002). Specifically, Girolametto and Weitzman transcribed teacher-child talk for a 10-minute segment pulled from a 15-minute classroom activity (e.g., storybook reading sessions). The information obtained from this segment length was sufficient to document individual differences in teachers' talk, children's talk, and to estimate relations between the two. For the present purposes, we examined about the

same overall duration of time (12-minute segment), but instead of examining a single continuous segment we elected to pull two smaller segments (the six-minute snippets) randomly from the overall 30-minute interaction to achieve potentially better representation of the entire session.

Coding of Snippets features an interval-based scheme, such that each six-minute segment is divided into 12 30-second intervals; within each interval, each support is coded for absence (0) or presence (1). Thus, in one 6-minute segment, scores for each support can range from 0 to 12, such that a score of 0 means that the support was not observed during any of the 12 intervals whereas a score of 12 means that the support was observed in each of the 12 intervals. Note that coding for a given support can transcend consecutive intervals; for instance, if a teacher is being observed to engage students in a discussion involving prediction (warranting coding of two supports – prediction and collaborative conversation), and that discussion spans across several intervals, each of the intervals in which this is observed would be coded accordingly. When coding of a segment is completed, a total score is derived by summing all supports observed across the 12 intervals within each segment, with a possible range in scores of 0 to 216 (based on documenting presence of18 supports in 12 intervals with scores of between 0 to 12 per support).

Reliability of the Snippets tool was assessed for 14 segments, representing 14% of the total segments coded. The segments were randomly selected from the entire corpus, and two coders separately and independently coded these segments during a one-week period. Overall exact agreement across the 14 segments was 98%; for the individual supports, agreement ranged from 75% to 100%. Kappa was also calculated, indicating adequate reliability when correcting for chance (.86). The coders subsequently conferenced on all disagreements to arrive at consensus for final Snippets scores used in analyses.

CLASS. The CLASS (Pianta et al., 2008) is a systematic observation tool designed to examine global classroom quality across three separate dimensions: instructional support (IS), emotional support (ES), and classroom management (CM). Each dimension represents the aggregate of multiple coded domains; for instance, the IS dimension represents the aggregate of three domains -- Concept Development, Quality of Feedback, and Language Modeling. For each domain, scores can range from 1 to 7, with scores of 1 and 2 representing low quality, 3 to 5 representing mid quality, and 6 and 7 representing high quality. Domain scores can be averaged to arrive at a Dimension score. In the present study, we focused exclusively on those domains comprising the IS dimension, as these most closely mapped to the intervention. Specifically, *Let's Know!* was designed to increase the quality and quantity of language-focused comprehension supports in the classroom, which are captured in the CLASS domains of Concept Development (extent to which classroom instruction promotes higher-order thinking and talking), Quality of Feedback (extent to which classroom instruction emphasizes the processes of learning), and Language Modeling (extent to which classroom instruction promotes high-quality language interactions).

To conduct CLASS coding, trained observers rated each of 10 separate domains during 15-minute segments randomly selected from the 90-minute larger observation video. Prior to the study, all coders completed a CLASS training course led by a CLASS-certified trainer. Coders were required to pass the standard benchmarks in order to be reliable, including 80% scoring agreement with five gold-standard, master coded observations (calculated as total agreement across all ten scales of the CLASS across five observations). A score within 1 point of the master code counted as agreement.

For the present study, CLASS was coded in 56 classrooms comprising 36 treatment classrooms and 20 control classrooms. For four classrooms, CLASS was not coded because the video was of poor enough quality to impede coding. For each *Let's Know!* classroom, four 15-minute segments were coded, two from within a *Let's Know!* lesson and two outside of a *Let's Know!* lesson, but within language-arts instruction, totaling one hour of instruction coded for each teacher in the treatment condition. For analyses purposes, CLASS scores from the two within-lesson cycles were averaged across the three domains (Concept Development, Quality of Feedback, and Language Modeling) to arrive at a single CLASS score representing overall IS, and the same was done for the outside-lesson cycles. In the control classrooms, two 15-minute segments were coded, all selected randomly from normal language-arts instruction, total 30 minutes of instruction coded for each teacher in the control condition. In total, 170 segments were coded for CLASS.

Inter-rater agreement for CLASS coding was assessed for a randomly selected 26 segments, reflecting 15% of all segments coded. Percentage of within-one agreement for each domain ranged from 69% (Teacher Sensitivity) to 100% (Negative Climate), with an overall agreement percentage of 89%. This approach to calculating agreement was used (within-one) as it is the predominant approach used to assess reliability for the CLASS instrument (see Pianta et al., 2008). Any disagreements were resolved through conferencing.

Results

The first research question concerned the extent to which implementation of *Let's Know!* was related to teachers' use of specific language-focused comprehension supports during language-arts instruction. In addressing this question, the dependent variable was the overall sum for teachers' use of specific supports as based on the Snippets tool. Scores were summed, given

that certain techniques would be more likely to be seen in certain lesson types more than others. Table 1 provides descriptive data regarding teachers' use of the supports for the two groups of teachers; note that the data for the experimental teachers includes Snippets scores as coded during a *Let's Know!* lesson and outside of a *Let's Know!* lesson. Examination of the summed data (bottom row) suggests that the experimental teachers employed these language-focused comprehension supports at a greater volume during a *Let's Know!* lesson (M = 24.06, SD = 10.07) as compared to their own normal language-arts instruction (M = 9.21, SD = 10.29), and as compared to control teachers (M = 11.28, SD = 10.52).

To test whether these differences were significant, quantile regression analysis was used. Quantile regression is a regression-based technique developed for economics that does not have any assumptions of normality. Thus, it is an excellent approach for examining data such as the Snippets sum scores, which are sums of several items of count data, and which were not normally distributed for non-*Let's Know!* instruction (Mean = 9.85, skew = 1.23). This positive skew was the result of floor effects, which reflected the rarity with which teachers outside of the intervention used the comprehension-supporting techniques. In the present study, the quantile regression analysis provides an estimate of the differences between the two groups at the *median* of the outcome, and can also be extended to points beyond the median. This is particularly of interest when examining count data, as there is substantially less variability, and thus less room for there to be differences between the two examined groups, at the tails of the distribution than at the median. More information about quantile regression and its application in the social sciences can be found in Petscher, Logan, and Zhou, (2013).

For our purposes, quantile regression was conducted to compare experimental teachers' Snippets sum scores during a *Let's Know!* lesson as compared to teachers in the control

condition; group served as the predictor and the sum of all Snippets supports served as the dependent variable. We analyzed group differences at three a-priori chosen points in the distribution of the post-test snippets sum score: teachers at the 25th quantile, the 50th quantile (the median), and the 75th quantile. All quantile regression analyses were conducted with SAS Proc Quantreg. The Sparsity estimator was used to estimate confidence intervals, as is recommended for small sample sizes. Additionally, the Smooth optimization algorithm was used when data was not normally distributed. Note that both grade and site were included in the models presented herein, so as to test for possible clustering effects. However, neither were significant predictors of Snippets or CLASS scores, so these variables were removed for purposes of parsimony.

As shown in Table 3, there were significant differences between the two groups of teachers at the 25th percentile ($p < .01$) and at the 50th percentile ($p < .001$); differences between the two groups at the 75% percentile were not significant ($p = 07$), though the confidence interval was very large (see Table 3). It is important to note that only one teacher in the experimental condition scored below the median on this outcomes; as a result, the point estimate at the 25th percentile may reflect in part a lack of data, and should be interpreted with caution.

A second quantile regression was carried out using the Snippets sum score, this time comparing experimental teachers during normal language-arts instruction (outside of a *Let's Know!* lesson) and teachers in the control condition. There were no significant differences between the two groups along the points of the distribution (i.e., 25th percentile, $p = .53$; 50th percentile, $p = .42$; 75% percentile, $p = .89$). A summary of the results from both quantile regression analyses are displayed in Figure 1, which show that implementation of a *Let's Know!* lesson by experimental teachers had a slightly larger impact on teachers' use of language-focused comprehension supports at the lower end of the distribution than for teachers at the higher end.

This is evidence by the narrowing of the gap between the two groups at the 75th percentile relative to the 25th percentile. However, while the effects appear to be differential, they actually do not significantly differ across quantiles (Q25 vs. Q75, $F_{(1,99)} = 2.62$, $p = 0.11$). The other contrasts were smaller in magnitude and also were not significant (quantile comparison test were conducted in R, and are based on Petscher et al., 2013).

The second research question concerned the extent to which implementation of *Let's Know!* was related to the global quality of language-arts instruction in PK-3 classrooms, as indexed using a commonly applied measure of classroom quality, namely the CLASS (Pianta, Karen, et al., 2008). Table 2 provides descriptive data regarding CLASS scores on the three IS domains (Concept Development, Quality of Feedback, and Language Modeling), as well as the overall IS composite, for the two groups of teachers. Note that for experimental teachers, CLASS scores were coded to reflect instruction both within a *Let's Know!* lesson and outside of a *Let's Know!* lesson during typical language-arts instruction.

The first comparison of interest was to examine CLASS scores for experimental teachers when implementing a *Let's Know!* lesson as compared to teachers in the control condition. The CLASS data were analyzed using quantile regression to test for differential treatment effects at the 25th, 50th and 75th quantile of the distribution. Table 4 displays the results of an analysis comparing experimental teachers during a *Let's Know!* lesson with teachers in the control condition. Impacts at each quantile are displayed graphically in Figure 2. At the low end of the distribution, experimental teachers at the 25th quantile outscored teachers in the control group by .5 points on the IS dimension; however, this difference was not significant (t =1.65, p = .10). At the middle of the distribution, experimental teachers scored an average of 1 point higher on the IS dimension than teachers in the control condition, a statistically significant difference (t = 3.49,

$p < .01$). Likewise, experimental teachers at the high end of the distribution scored an average of 1 point higher on the IS dimension than teachers in the control condition; however, there was greater variability in teachers' scores at the 75th percentile, thus producing a non-significant result ($t = 1.5$, $p = .14$).

Discussion

The present study is situated within an educational climate in which many constituents are interested in identifying effective ways to improve reading-comprehension instruction in the early primary grades. The Common Core State Standards (Common Core State Standards Initiative, 2010), for instance, represents a nationwide policy-specific effort in which children's reading comprehension is heavily emphasized within learning standards. In part, the current interest in promoting the nature of reading-comprehension instruction stems from research showing that primary-grade language-arts instruction may not provide students with adequate opportunities to build their comprehension skills, particularly in kindergarten and first grade settings (Connor et al., 2004; Connor et al., 2006). In light of numerous studies and theoretical frameworks asserting the important role of children's language skills to their achievement of skilled reading comprehension (e.g., Cain et al., 2004; Connor et al., 2004; Perfetti, 2007; Williams et al., 2009), an emerging body of work is focused specifically on identifying effective ways to improve children's language skills within classroom instruction. Logically, we can speculate that enhancing children's exposure to high-quality language-focused comprehension instruction in P-3 is a worthy route to improving language skills in the short term and reading comprehension in the longer term.

In the present study, we examined classroom instruction in pre-kindergarten to third grade classrooms as a function of teachers' use of an experimental curricular supplement

designed to heighten the quantity of quality of language-focused comprehension instruction during language-arts instruction. The curriculum under investigation, *Let's Know!*, uses a systematic scope and sequence of instruction organized over four thematic units to bring about change in children's language skills, encompassing vocabulary, grammar, comprehension monitoring, inferencing and reasoning, and text structure. To date, we are aware of few curricula or programs that are designed to improve children's skills across these multiple dimensions of oral language (but see Clarke et al., 2010; Williams, 2005; Williams et al., 2004; Williams et al., 2005). Given evidence showing that early primary-grade teachers provide relatively a limited quantity of language-focused comprehension instruction (Connor et al., 2006; Justice et al., 2008; Walpole, Chow, & Justice, 2004), even in the context of adopting language-focused curricula (Connor et al., 2006; Justice et al., 2008; Pence et al., 2008; Pianta, Mashburn, et al., 2008; Walpole et al., 2004), the present study examined whether pre-K – grade 3 teachers' use of the *Let's Know!* supplement affected proximal and distal classroom processes corresponding to language-focused comprehension instruction.

The first finding of note is that teachers who implemented *Let's Know!* exhibited greater use of language-focused comprehension supports than teachers assigned to the comparison group. This is apparent in comparisons of experimental teachers to control teachers, as well as experimental teachers to themselves, the latter by virtue of comparing teachers' use of the sum total of comprehension supports both within and outside of a *Let's Know!* lesson. Effects were both statistically and practically significant, showing the clear impacts of *Let's Know!* lessons on the volume with which pre-k to grade 3 teachers use specific comprehension supports. Given that it is not particularly surprising that pre-k to grade 3 teachers are able to implement curricular lessons as planned, it is the within-group comparison that is the most compelling. Study findings

show that language-arts instruction specific to *Let's Know!* lesson implementation resulted in the greatest distinction between experimental and control teachers with respect to their use of language-focused comprehension supports, and this differentiation spanned the distribution of teachers.

The second finding of note is one of particular import, as it concerns the impacts of *Let's Know!* on a measure of classroom quality that is distal to the curricular content. Specifically, comparisons of experimental and control classrooms on the Instructional Support domain of the CLASS, which represents classroom quality specific to concept development, feedback quality, and language modeling, showed that implementation of *Let's Know!* lessons significantly heightened the overall instructional climate; the effect was practically significant. This effect, based on the quantile-regression findings, was most prominent for teachers in the middle of the distribution of CLASS scores, corresponding to average classroom quality (at least in relation to the teachers in this study). Although the CLASS is a commonly used measure of classroom quality (Burchinal, Vandergrift, Pianta, & Mashburn, 2010; Early et al., 2006; Howes et al., 2008; LoCasale-Crouch et al., 2007; Mashburn et al., 2008; Raver et al., 2008), there is little evidence in the literature as to how classroom quality as assessed via the CLASS might be improved (Raver et al., 2008). Indeed, professional-development research involving large numbers of pre-K teachers has shown that even in the context of intensive efforts to improve teachers' instructional quality (curriculum provision plus coaching), only modest increases in the CLASS are seen over an academic year (Hamre et al., 2010). A compelling result of this study is that we find elevated classroom quality, relative to typical language-arts instruction, when experimental teachers implementing static structured lesson plans during *Let's Know!* implementation.

We interpret this result as showing that teachers' use of scripted lessons, which provide specific guidance on how to address curricular objectives, how to use specific language-facilitating techniques, and the order by which to sequence of delivery, can result in overall higher-quality teaching, at least during language-arts instruction. Although many prior studies have reported the positive effects of scripted or semi-scripted lessons on students' learning (e.g., Berkeley, Marshak, Mastropieri, & Scruggs, 2011; Denton et al., 2011), there are few studies of which we are aware that have examined the general quality of scripted lessons relative to typical instruction. Given that many pre-K teachers show only limited uptake of the presumed key elements of curricula that emphasize use of general language-facilitating techniques across the classroom day (Girolametto & Weitzman, 2002; Pence et al., 2008; Piasta et al., 2012; Powell et al., 2010), it is an important finding that use of scripted lessons does not negatively affect the quality of their interactions with children; on the contrary, the scripted lessons within *Let's Know!* appear to *elevate* the quality of critical classroom processes.

There are limitations to this work warranting note. First, the research design was quasi-experimental. Therefore, any causal interpretations should be made cautiously. Second, the teachers self-selected into this study. It is impossible to know if results would generalize to a more general pool of teachers, although a strength of the work is that the work spanned four states and the teachers worked in diverse settings and had a range of experience. Third, study findings include only classroom processes associated with curriculum implementation and do not extend to student outcomes. While we can speculate that significant improvements in teachers' use of language-focused comprehension instruction would enhance students' language skills, this is not confirmed at this time. Last, coders were not blind to the conditions to which teachers were assigned, although they were blind to the primary study hypothesis. Although reliability of

coding was assessed for both the tools used in this study, the lack of blinded coding may have introduced bias into study procedures.

Despite these limitations, the results presented here are positive with respect to the impacts of an experimental language-focused curricular supplement for substantially heightening language-focused classroom processes. Future research will determine the extent to which these findings are replicated with larger groups of teachers and, more importantly, contribute to meaningful improvements in students' language and reading skills.

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Appendix A

Overview of *Let's Know!* Unit Layout (by lesson type)

Week	Lesson	Lesson Type
1	1	Hook
	2	Read To Me
	3	Words to Know
	4	Curriculum-Based Measures*
2	5	Text Mapping
	6	Words to Know
	7	Integration
	8	Read to Know
3	9	Read to Me
	10	Text Mapping
	11	Integration
	12	Words to Know
4	13	Text Mapping
	14	Integration
	15	Words to Know
	16	Read to Know
5	17	Read to Me
	18	Text Mapping
	19	Integration
	20	Read to Know
6	21	Read to Know
	--	Curriculum-Based Measures*
7	22	Stretch and Review*
	23	Stretch and Review*
	24	Close

*Curriculum-based measures are administered at the close of the first week, to preview for the teacher the specific language skills to be targeted during the unit, and during the sixth week to provide a formative assessment of students' gains in targeted language skills. The Stretch and Review lessons embedded in Week 7 are designed to provide teachers an opportunity to use formative findings to provide any additional instruction needed. These lessons are not prescribed.

Appendix B

Description of *Let's Know!* Lesson Types

Lesson Type	Description	Language Skills Targeted
Hook	Builds student engagement with the unit focus through hands-on or interactive activities	None
Text Mapping	Teaches students about how various texts are organized, how to map information from one text to another, and how to identify navigational words that signal text structure	Text-Structure Knowledge (cause-effect, compare-contrast), Narrative Comprehension (main idea, summarize), Vocabulary
Integration	Provides students the opportunity to interact with complex texts, and to make connections to text through high-level discussions	Predicting, Verbally Reasoning, Inferencing, Comprehension Monitoring
Read to Know	Provides students opportunity to choose their own text; teaches them to read with a goal in mind	Metacognition, Narrative Comprehension (main idea, summarize)
Read to Me	Models reading comprehension strategies and rich vocabulary while building students' engagement	Predicting, Verbally Reasoning, Inferencing, Comprehension Monitoring, Vocabulary
Words to Know	Promotes children's knowledge and use of a core set of 8 vocabulary words aligned to the unit focus	Vocabulary
Close	Provides students a hands-on experience in which they can get integrate the skills and knowledge developed over the unit	None

Appendix C

Snippets Categories and Definitions

Support	Description
PREDICTION	Teacher explains, models, or asks students to make predictions based on prior knowledge and/or evaluate previous predictions.
INFERENCE	Teacher explains, models, or asks students to infer about text, unknown vocabulary, or to take characters' point of view.
SUMMARIZE	Teacher explains, models, or asks students to summarize, sequence, or retell a text.
MAIN IDEA	Teacher explains, models, or asks students to identify main ideas, key concepts, or supporting details of text.
CAUSE-EFFECT	Teacher explains, models, or asks students about cause-and-effect relationships in text.
COMPARE-CONTRAST	Teacher explains, models, or asks students to compare and/or contrast information in text.
METACOGNITION	Teacher explains, models, (i.e. "thinks aloud") or asks students to explain how they know something or why they think something.
COMPREHENSION MONITORING	Teacher explains or models comprehension monitoring, including asking students to evaluate if a text makes sense.
FEATURES OF TEXT	Teacher references words, images, charts, or graphs in text, to include asking students to label or discuss features of text (i.e., cover, table of contents, title, author).
TEXT STRUCTURE	Teacher instructs or asks students about the structure of text (i.e., identifying if a text is narrative or expository).
TEXT CONNECTIONS	Teacher models or asks students to make connections from text-to-self or text-to-world experiences.
TEXT MAPPING	Teacher models or asks students to examine graphic organizers related to text (e.g., story maps, tables, Venn diagrams).
DEFINITION	Teacher gives or asks for the definition of a word, including referencing the relations among words in a lexical field.
VOCABULARY IN CONTEXT	Teacher models or asks students to use a new word in a sentence or in a different context that makes reference to features of the word (i.e. An insect can fly).
REPEAT / RECALL	Teacher asks students to repeat, say, or read a new vocabulary word.
COLLABORATIVE CONVERSATIONS	Teachers provides explicit opportunity for students to engage in discussions and conversations as a small or whole group (e.g., think-pair-share).
TEACHER RESPONSIVITY	Teacher elaborates, repeats, extends or gives descriptive feedback regarding students' contributions.

Table 1

Snippets Items and Mean Scores (SD) by Condition

Support	Condition		
	Experimental		Control
	LK Lesson	Language-Arts Instruction	Language-Arts Instruction
Prediction	.67(.31)	.10 (.40)	.22 (.42)
Inference	.18 (.10)	.37 (1.00)	.33 (.13)
Summarize	.03 (.10)	.30 (1.64)	.22 (.14)
Main Idea	1.59 (.48)	.17 (.91)	.11 (.63)
Cause-Effect	.00 (.00)	.00 (.00)	.00 (.00)
Compare-Contrast	1.84 (.47)	.03 (.18)	.00 (.63)
Integration	.00 (.00)	.00 (.00)	.00 (.00)
Metacognition	.84 (.25)	.30 (.84)	.28 (.34)
Comprehension Monitoring	1.22 (.43)	.27 (.98)	.00 (.57)
Features of Text	1.28 (.39)	1.17 (2.57)	.39 (.52)
Text Structure	.03 (.03)	.00 (.00)	.00 (.03)
Text Connections	.50 (.42)	.13 (.43)	1.50 (.55)
Text Mapping	1.94 (.67)	.00 (.00)	.57 (.76)
Definition	1.84 (.44)	.17 (.46)	.67 (.59)
Vocabulary in Context	1.50 (.38)	.03 (1.8)	.28 (.51)
Repeat / Recall	1.16 (.42)	.07 (.25)	.89 (.56)
Collaborative Conversation	6.66 (.63)	3.93 (4.00)	4.33 (.85)
Responsivity	2.78 (.89)	1.60 (2.53)	.40 (.52)
Snippets Sum	24.06 (10.07)	9.21 (10.29)	11.28 (10.52)

Note: Experimental teachers were coded during a *Let's Know!* lesson (LK Lesson) and during normal language-arts instruction. Control teachers were coded only during normal language-arts instruction. Snippets Sum is the summation of all supports.

Table 2

CLASS Instructional Support (IS) Domain Means (SD) by Condition

Domain	Condition		
	Experimental		Control
	LK Lesson	Language-Arts Instruction	Language-Arts Instruction
Concept Development	3.11 (1.35)	2.22 (1.22)	2.18 (1.34)
Quality of Feedback	2.89 (1.14)	2.64 (1.38)	2.35 (1.23)
Language Modeling	3.48 (1.00)	2.46 (1.17)	2.78 (1.21)
Instructional Support (Composite)	3.16 (1.06)	2.44 (1.17)	2.43 (1.17)

Note: Experimental teachers were coded during a *Let's Know!* lesson (LK Lesson) and during normal language-arts instruction. Control teachers were coded only during normal language-arts instruction. Scores represent the average across two 15-minute cycles.

Table 3

Quantile Regression Results: Predicting Language-Comprehension Supports (Snippets Sum) for Let's Know! Lessons compared to Control Teachers' Language-Arts Instruction

		Estimates	CI low	CI high	*t*	*p*
Percentile						
0.25	Intercept [a]	0.00	-4.97	4.97	0.00	1.00
	Treatment	18.00	9.38	26.62	4.20	0.00
0.50	Intercept	9.00	-0.28	18.28	1.95	0.06
	Treatment	16.00	5.77	26.23	3.15	0.00
0.75	Intercept	21.00	12.16	29.84	4.78	<.0001
	Treatment	9.00	-0.76	18.76	1.85	0.07

Note. [a] = only one teacher in the Let's Know! group had a score below the median on the Snippets Sum score. Results at the 25th percentile should be interpreted with caution.

Table 4

Quantile Regression Results: Predicting CLASS Instructional Support for Let's Know! Teachers compared to Control Teachers

		Estimates	CI low	CI high	*t*	*p*
0.25	Intercept	1.83	1.47	2.19	10.08	<.01
	Treatment	0.50	-0.12	1.11	1.65	0.10
0.50	Intercept	2.00	1.63	2.37	11	<.01
	Treatment	1.00	0.42	1.58	3.49	<.01
0.75	Intercept	2.67	1.57	3.76	4.89	<.01
	Treatment	1.00	-0.34	2.34	1.5	0.14

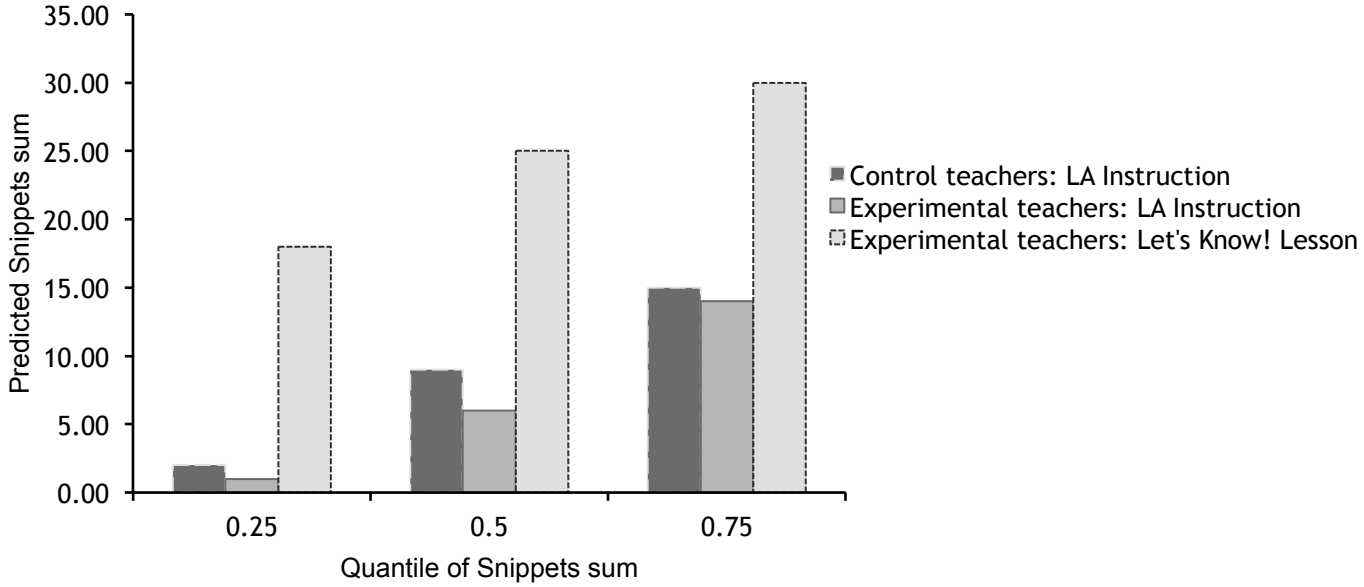

Figure 1. Graphical representation of quantile regression results for Snippets sum. Lines represent the predicted Snippets sum score for the control and experimental teachers at the 25th, 50th, and 75th percentiles of Snippets sum scores. At each point in the distribution, differences between the control and experimental teachers during LA instruction were not different, but control teachers were significantly different from experimental teachers when providing *Let's Know!* Lessons. LA instruction = language-arts instruction.

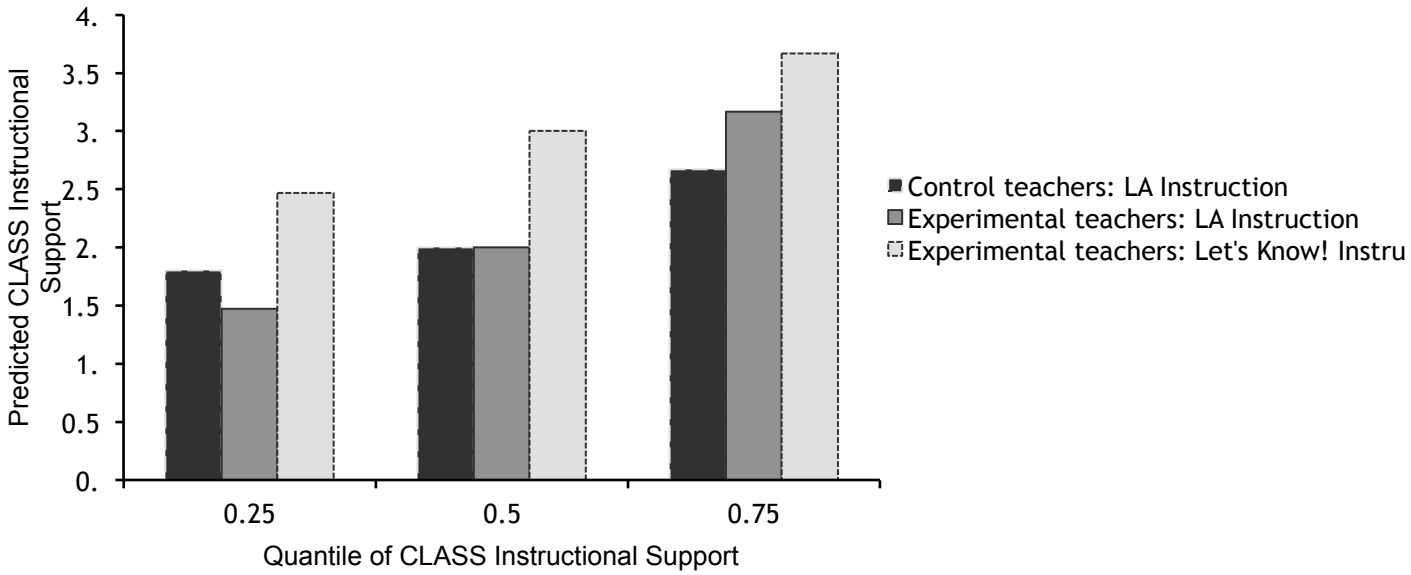

Figure 2. Graphical representation of quantile regression results for CLASS Instructional Support (IS). Lines represent the predicted CLASS IS score for the control and experimental teachers at the 25th, 50th, and 75th quantile of CLASS IS scores. Differences between groups were non-significant at the 25th and 75th quantiles. At the median (.50 quantile) experimental teachers scored significantly better than control teachers ($t = 3.49$, $p < .01$). LA instruction = language-arts instruction.