Journal of Educational Psychology

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Online First Publication, September 9, 2013. doi: 10.1037/a0032143

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0022-0663/13/$12.00 DOI: 10.1037/a0032143

Live Webcam Coaching to Help Early Elementary Classroom Teachers Provide Effective Literacy Instruction for Struggling Readers: The Targeted Reading Intervention

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This study evaluated whether the Targeted Reading Intervention (TRI), a classroom teacher professional development program delivered through webcam technology literacy coaching, could provide rural classroom teachers with the instructional skills to help struggling readers progress rapidly in early reading. Fifteen rural schools were randomly assigned to the experimental or control condition. Five struggling readers and 5 non-struggling readers were randomly selected from eligible children in each classroom. There were 75 classrooms and 631 children in the study. Teachers in experimental schools used the TRI in one-on-one sessions with 1 struggling reader in the regular classroom for 15 min a day until that struggler made rapid reading progress. Teachers then moved on to another struggling reader until all 5 struggling readers in the class received the TRI during the year. Biweekly webcam coaching sessions between the coach and teacher allowed the coach to see and hear the teacher as she instructed a struggling reader in a TRI session, and the teacher and child could see and hear the coach. In this way the classroom teacher was able to receive real-time feedback from the coach. Three-level hierarchical linear models suggested that struggling readers in the intervention schools significantly outperformed the struggling readers in the control schools, with effect sizes from .36 to .63 on 4 individualized achievement tests. Results suggested that struggling readers were gaining at the same rate as the non-struggling readers, but they were not catching up with their non-struggling peers.

Keywords: individualized instruction, literacy coaching, educational technology, rural classroom teacher, struggling readers

American schools have come under increasing scrutiny, largely because many children are not acquiring the skills they need to succeed in the larger culture (Grissmer, Flanagan, Kawata, & Williamson, 2000). The National Center for Education Statistics (2009) has reported that two thirds of fourth graders are not able to comprehend difficult texts, and 63% of fourth graders are reading only at a very minimal level of proficiency. Of those families in poverty, only 28% of their children are reading at this minimum level of proficiency in fourth grade (Haager, Klingner, & Vaughn, 2007; Lyon, 2001). These low levels of reading proficiency are especially true for rural children from low-wealth communities who come to school with lower readiness skills than other children (Lee & Burkham, 2002). These lower readiness skills are due in part to the proportionately greater child poverty rates in rural versus urban areas with the gap between rural and urban poverty growing over the last 10 years (O'Hare, 2009). Since poverty is the most potent predictors of school success, even greater than mother education, two parent families, and a host of other demographic variables (Brooks-Gunn & Duncan, 1997), it is important to understand the context of schooling in these low wealth rural communities as well as develop and evaluate school programs that may be effective for children in the context of poverty.

The higher child poverty rate in rural communities impacts schooling, with a poorer tax base for schools, lower teacher pay, less educated teachers, and less access to educational resources (Amendum, Vernon-Feagans, & Ginsberg, 2011; Vernon-Feagans et al., 2012; Provasnik et al., 2007). When trying to improve student achievement, rural schools face challenges of geographic isolation and low population density that often lead to less ready access to state-of-the-art professional development for teachers

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Support for this research was provided by Institute of Education Sciences Grant R305A040056 for the National Research Center for Rural Education Support awarded to Tom Farmer and Lynne Vernon-Feagans.

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coupled with less access to technology in the classroom (Dewees, 2000; Vernon-Feagans, Gallagher, & Kainz, 2010). The issues faced by rural schools were underscored by a Government Accountability Office (2004) report that sampled rural school principals. The report highlighted rural school needs for better technology and teacher professional development.

The professional development program for classroom teachers evaluated in this article tries to address some of the needs of schools in rural low wealth schools with respect to both technology and teacher professional development. The Targeted Reading Intervention (TRI) provides teachers with professional development for struggling readers through state-of-the-art webcam coaching that allows literacy coaches thousands of miles away to provide real time feedback to teachers in their classrooms as the teachers instruct struggling readers. The program also provides extensive website materials for instruction, webcam workshops and webcam team/grade level meetings, as well as e-mail correspondence between teacher and coach.

Technology and Early Reading

Most of the previous research on the use of technology for early reading has focused on computer assisted instruction (CAI) developed for use by children who need or want additional instruction and practice in reading. This technology allows students to work on their own to supplement regular instruction in the classroom, minimizes teacher involvement, and has been shown to be effective in improving the early reading skills of children, including children with different skill levels and different ethnic and socioeconomic backgrounds (Blok, Oostdam, Otter, & Overmaat, 2002).

Recently, there has been particular emphasis on developing and examining CAI for children at risk for early reading disability (Chambers et al., 2011; Huffstetter, King, Onwuegbuzie, Schneider, & Powell-Smith, 2010; Saine, Lerkkanen, Ahonen, Tolvanen, & Lyytinen, 2011; Torgesen et al., 1999). These studies have demonstrated that children at risk for reading problems can progress in basic reading skills through CAI delivered by trained and specialized teachers/tutors in the resource room setting or in a mobile computer lab. One study demonstrated that an extended day program that used a web-based instructional framework was more effective than direct instruction delivered by a specialized teacher for children with significant reading delays in elementary school (Cole & Hilliard, 2006). Chambers et al. (2011) demonstrated that schools that used tutor-led small group instruction with a reading software could significantly improve the reading of struggling students in comparison to schools that did not use this tutor and software. Although these studies were important in underscoring the value of CAI for young at risk readers, they were likely costly if sustained because of the need for a specialized trainer or teacher who assisted the children during CAI.

Little research has focused on using technology to help the classroom teacher become more effective in instructing struggling readers except to introduce teachers to ancillary software that can supplement instruction in the classroom. A survey of elementary school teachers suggested that teachers used technology as a supplemental tool for instruction but did not use technology as the central tool for instruction (Franklin, 2007). Thus, studies of technology use by classroom teachers have assessed the effectiveness of ancillary software packages for improving reading with mixed results as to the efficacy of such software for struggling readers. For instance, Lewandowski, Begeny, and Rogers (2006) found that at-risk elementary school readers practicing alone did not improve fluency, whereas both tutor- and computer-assisted groups of children significantly improved in reading speed and accuracy. Struggling readers who received training via computer performed as well as students who received individualized tutoring. On the other hand, Mathes, Torgesen, and Allor (2001) found that although the Peer Assisted Learning Strategies (PALS) reading program improved student reading, the addition of a phonological awareness computer software for struggling readers did not significantly improve reading over the traditional PALS program. Again, these computer programs probably saved time for the classroom teacher since the teachers did not have to be as involved in student learning but may have failed to help improve classroom teacher instructional literacy practices.

Some recent studies have focused on using technology to improve the teaching of preschool classroom teachers who are in Head Start or in pre-kindergarten programs for children from at risk backgrounds. These studies have used video and web based video platforms to promote effective professional development in literacy for these preschool teachers. In a series of studies examining the effectiveness of *My Teaching Partners*, teachers were asked to video themselves and then send the DVDs to a research team who in turn would give the teachers feedback on their classroom literacy practices in a few weeks or a month. Teachers also had access to a website for information on the program. This kind of professional development technology has proven effective for preschool teachers who serve a diverse group of learners (Mashburn, Downer, Hamre, Justice, & Pianta, 2010; Pianta, Mashburn, Downer, Hamre, & Justice, 2008). Especially interesting for the current study was Mashburn et al.'s (2010) study that compared two delivery systems to preschool teachers in a randomized control trial. Preschool teachers in the first condition had access to a literacy video library via a highly developed website with instructional materials for the teachers to easily access. The second condition allowed teachers access to the literacy video library but also allowed teachers to view their own teaching video clips on the website with reflective questions about their instruction. In addition, this group also participated occasionally in video conferencing with a literacy/language coach to discuss teaching practices. Mashburn et al. found that preschool classroom teachers who had both access to the video library but also had occasional coaching via the website and videoconferencing improved their children's vocabulary skills more than teachers who only had access to the video library. Another important recent study used a randomized control trial to examine the effectiveness of a literacy/language professional development program for preschool teachers called *Classroom Links to Early Literacy* under two different conditions: live literacy coaching of teachers versus video coaching (Powell, Diamond, Burchinal, & Koehler, 2010). In this case, both face to face and video coaching involved observing the teacher for 90 min every 2 weeks and giving her oral and written feedback in addition to written feedback on the videotaping of herself during teaching. This one semester study found that in both conditions, children who used their program had large gains in all areas of literacy and that there were no differences between the live and video conditions. This latter study suggests, as other

research without technology has found, that professional development with the addition of coaching may be the most effective way to improve the instruction of classroom teachers, especially in literacy.

A series of studies by Connor and colleagues (Al Otaiba et al., 2011; Connor et al., 2011; Connor, Morrison, & Petrella, 2004; Connor et al., 2009) have used technology in early elementary school in a different way to help classroom teachers. They have used software that individualizes instruction in reading for children and have used literacy coaches that help the classroom teacher use the software effectively in individualizing instruction. Their Instruction × Skill interaction studies have been very innovative and have certainly shown that their software in conjunction with live literacy coaching in the classroom is very effective in helping all children progress in early reading.

These innovative technologies for delivering professional development to teachers in the form of a website that contained teacher videos of themselves teaching with later feedback and using innovative software to individualize instruction, although important, may be limited because classroom teachers were not able to receive immediate real-time feedback about their teaching practices with individual children that may be only accomplished through real time coaching of classroom teachers (Carlisle & Berebitsky, 2011; Elish-Piper & L'Allier, 2011; McGill-Franzen, Allington, Yokoi, & Brooks, 1999). In addition, these programs did not help teachers directly with their instruction of struggling students but rather focused on improving effective instruction for all children in the class.

Coaching, Early Reading, and the Targeted Reading Intervention

This recent research using technology supports the previous work on the importance of literacy coaching as a way to scaffold the skills of classroom teachers to make changes in classroom instruction. Research over the last 10 years has suggested that the most effective way to promote better teaching of reading by classroom teachers is by developing professional development programs that include the addition of ongoing support of teachers through the effective use of literacy coaches. Professional organizations like the International Reading Association (2004) and other research on coaching (Elish-Piper & L'Allier, 2011; McGill-Franzen et al., 1999; McKenna & Walpole, 2008) have demonstrated that materials and workshops alone are not enough to improve literacy instruction for classroom teachers, but the addition of having a literacy coach for the classroom teacher can improve teacher reading practices that are linked to improved student outcomes. For instance, Carlisle and Berebitsky (2011), in a quasi-experimental study of Reading First, found that professional development workshops alone were not as effective in improving first grade student decoding skills as professional workshops that also included literacy coaching over the school year. Coaches in this study visited classrooms and worked one-on-one with teachers to give feedback on their teaching, modeled methods of instruction, and served as a literacy resource. This real-time feedback for classroom teachers was available using previous technology (Mashburn et al., 2010; Pianta et al., 2008; Powell et al., 2010) because teachers' videos of themselves teaching requires extended time by literacy coaches/consultants to observe the videos and provide feedback to teachers. Furthermore, previous video coaching has had coaches watch the teacher for prolonged periods of time and then the teacher received delayed feedback on literacy instructional practices.

As Kennedy and Deshler (2010) have recommended, technology should be used only when it fits appropriately within the theory of change and enhances the underlying mechanisms of professional development in a positive way to maximize the possibility that teachers become more effective teachers for struggling readers. The delivery system of the Targeted Reading Intervention used a professional development program that targeted struggling readers. The TRI included the use of literacy coaching weekly through webcam technology that allowed the immediate feedback that is accomplished through live one-on-one literacy coaching. That is, coaches thousands of miles away were able to see and hear the classroom teacher as she provided reading instruction to a struggling reader and the coach could give the teacher real time feedback on practices as well as problem solve about the best strategies to use with a particular struggling reader. This webcam approach to help classroom teachers instruct their struggling readers could help avoid the need for a specialized teacher to implement remedial reading programs (Amendum et al., 2011). Using webcam technology may also be more cost effective and feasible in rural areas where geographic isolation may prevent access to high quality professional development (Vernon-Feagans et al., 2012; Provasnik et al., 2007).

Thus, the intervention described in this study (The Targeted Reading Intervention) was developed in order to provide classroom teachers with particularly effective reading strategies for struggling readers in early elementary school. These strategies were implemented with the help of a literacy coach who worked with the teacher so she learned the strategies in instructional one-on-one diagnostic teaching sessions so the teacher could see the progress of individual struggling readers. Technology was used that allowed the literacy coaches to see and hear the teachers in these one-on-one sessions and give real time feedback to maximize teacher instructional change. Within our more elaborated model of teacher change, we included coaches who scaffolded the experience of teachers as the teacher worked individually with one struggling reader in the hope of changing the way the teacher delivered instruction to struggling readers. Thus, teacher experience of being coached and working with one child at a time has been hypothesized to be one mechanism for improving effective teacher instruction (Morgan, Timmons, & Shaheen, 2006; Risko et al., 2008).

Summary

The TRI has a number of unique elements that together may create the most effective instruction for struggling readers within the regular classroom setting. First, unlike many other interventions, the TRI uses the classroom teacher to deliver the intervention to each individual struggling reader through efficient, diagnostic one-on-one instructional sessions. Second, the TRI iterative process of the teacher working with one struggling reader at a time helps the teacher understand and experience the success as she sees the struggling reader make rapid gains. Third, the TRI uses an innovative, web-based, collaborative coaching model. Biweekly,

each TRI teacher uses a laptop computer with a webcam in her classroom so that she can see and hear her literacy coach and the coach can see and hear her working with an individual struggling reader. Real time feedback and problem solving can be employed during these live sessions for individual children.

In this study, we sought to examine whether the TRI could accelerate struggling readers' early literacy skills so that they not only made significant progress across a year but that they began to catch-up to their non-struggling classroom peers. This required examination of struggling and non-struggling readers' performance in the intervention schools relative to each other and to struggling and non-struggling readers in the control schools. The research questions were the following: (1) Do struggling readers who participate in TRI demonstrate better performance on tests of early literacy at the end of a school year than struggling readers who do not participate in TRI?; (2) When compared to struggling readers in control schools and to non-struggling classroom peers, does the spring performance of struggling readers in the intervention schools indicate that they are catching up to their non-struggling classroom peers?

Method

Setting

Sixteen rural schools from five poor rural counties in different regions of the United States participated in the study, including schools in Texas, New Mexico, Nebraska, and North Carolina. All kindergarten and first grade classrooms in each school participated. Schools within each school district were pair matched on the following: percentage of free and reduced lunch, school size, percentage of minorities, and participation in *Reading First*. One member of each pair was randomly selected to be the experimental school. Difficulties with accessing the Internet led to the withdrawal of one small experimental school that contained one kindergarten and one first grade classroom. The 15 remaining participating schools included 75 kindergarten and first grade classrooms and 631 students. All schools received Title I funding.

Participants

The demographics of the 631 children who participated in the fall assessments are described in Table 1. Since all schools were in low-wealth counties, the reported maternal education of these children was generally just beyond high school. Approximately 50% of the children were from minority backgrounds, and half were boys. Teacher demographics are shown in Table 2 and are consistent with literature on rural schools. Teachers had more years of experience than reported for urban teachers, with an average of 15 years of teaching experience (Lee & Burkham, 2002).

Within each experimental and control classroom, teachers identified children who were struggling and non-struggling readers with the help of the TRI literacy coach, mandated state assessment data and classroom performance within 2 months of the beginning of the school year. Teachers then rated all the children in the class as to whether they were profiting from regular classroom instruction in reading and were on grade level. Based on this information, five struggling readers were randomly selected from those children rated as significantly below grade level in reading, and five non-struggling children were randomly selected from those children who were rated as on or above grade level in each classroom. Because of a variety of permission and attrition factors, there were approximately nine children who participated in each classroom.

We defined four groups of children for analysis purposes and to test hypotheses about the effectiveness of the TRI: struggling readers in experimental intervention schools (SRI), non-struggling readers in the same experimental intervention schools (NSI), struggling readers in non-intervention control schools (SRC), and non-struggling students in the same non-intervention control schools (NRC). In experimental intervention schools, there were 192 struggling readers (SRI) and 203 non-struggling readers (NSI). In the control schools, there were 107 struggling readers (SRC) and 129 non-struggling readers (NRC).

The Targeted Reading Intervention Using Webcam Coaching

The main objective of the overall Targeted Reading Intervention (TRI) was to help the classroom teacher acquire key reading diagnostic strategies to promote rapid reading gains in K–1 struggling readers through a technology driven professional development program that included ongoing biweekly coaching from a literacy consultant. The coaches all had extensive experience as teachers and/or reading coaches in early elementary school. Most were doctoral students in the School of Education. These coaches went through an intensive training that included videotaping themselves working with individual children and receiving feedback from the intervention director of the project. Finally, coaches were given feedback throughout the academic year with respect to the challenges of working with teachers who were not always motivated to implement the TRI, coincident with current literature on coaching (Al Otaiba, Hosp, Smartt, & Dole, 2008).

All teachers in the experimental group received a 3-day summer workshop to learn the TRI strategies and to practice them. The intervention director and the trained reading coaches led the 3-day institute. During the year, a literacy coach used cost effective webcam technology to meet with the teacher for about 20 min every 2 weeks over the instruction of an individual struggling reader. When the student made rapid progress, the student was transitioned to a small group, and another child was chosen to work one-on-one with the teacher. Through this webcam technology, the literacy coaches could help the classroom teacher use the TRI strategies effectively with each struggling reader in real time, help decide when a student was ready to be transferred to a small group session, and problem solve about students who were not making rapid progress. In addition, the literacy coach also met with each school team for 30 min bi-weekly through webcam technology to further reinforce the strategies and problem solve about individual children. Finally, workshops were also provided to the teachers every few months via webcam to support their developing understanding of the TRI process, models, and strategies. The TRI protected website contained all the training videos, instructions, and manuals that could be downloaded by teachers and links to downloadable books and so forth.

During the school year, the teachers implemented the TRI in 15-min one-on-one sessions with a struggling reader that included the following three parts each day:

Table 1
Child Demographics and Achievement Scores

		Kindergarten				First grade			
Variable	Statistic	NSC	SRC	NSI	SRI	NSC	SRC	NSI	SRI
Male	*N*	59	57	94	90	70	50	109	102
	%	0.59	0.63	0.55	0.54	0.50	0.64	0.33	0.54
White	*N*	59	57	94	90	70	50	109	102
	%	0.59	0.39	0.52	0.54	0.57	0.40	0.47	0.45
Maternal education	*N*	56	53	91	81	67	47	101	95
	M	14.18	12.64	13.63	13.06	13.67	13.15	13.52	12.99
	SD	1.99	2.25	2.13	2.33	2.16	2.03	2.40	2.37
Fall PPVT–III	*N*	53	54	94	90	67	48	109	102
	M	102.81	94.09	98.67	91.50	98.79	88.54	98.14	91.18
	SD	13.44	14.91	12.92	14.98	14.71	15.43	13.16	12.76
Fall WA score	*N*	58	57	94	89	69	50	107	102
	M	426.41	411.12	431.16	409.67	468.06	450.96	470.28	455.02
	SD	18.66	18.87	22.01	23.11	19.21	18.99	17.03	19.76
Fall LW score	*N*	59	57	94	90	68	50	109	102
	M	372.19	353.88	376.90	354.60	424.90	401.30	431.06	406.10
	SD	20.95	20.36	22.45	22.45	27.24	19.02	25.63	19.51
Fall PC score	*N*	59	57	94	90	69	50	109	102
	M	411.88	403.54	409.29	402.66	449.48	431.24	454.93	431.38
	SD	17.51	13.31	18.98	13.60	26.54	17.34	20.85	20.19
Fall SS score	*N*	59	57	89	88	70	50	109	102
	M	464.76	445.61	468.22	448.78	490.50	483.50	491.36	484.65
	SD	18.72	18.67	14.87	17.61	8.32	11.81	7.54	9.12
Spring PPVT	*N*	55	51	88	84	69	45	103	92
	M	105.15	96.63	100.50	95.62	103.29	94.38	100.51	91.67
	SD	17.12	12.68	13.85	11.50	15.19	15.42	15.44	14.61
Spring WA score	*N*	55	51	88	84	69	45	103	92
	M	460.38	449.10	465.24	456.81	482.64	466.73	484.93	474.21
	SD	17.18	20.83	17.95	21.41	15.35	17.02	19.05	16.77
Spring LW score	*N*	55	51	88	84	68	42	103	92
	M	408.78	389.71	418.39	403.04	458.49	434.40	463.65	442.90
	SD	21.09	16.21	22.70	22.38	23.71	20.63	22.05	19.43
Spring PC score	*N*	55	51	87	84	69	45	103	92
	M	435.96	417.04	445.06	428.60	472.84	456.07	475.01	461.92
	SD	22.73	18.64	22.09	21.38	13.09	17.21	12.43	14.45
Spring SS score	*N*	55	51	88	84	69	45	103	92
	M	484.44	477.63	489.73	483.93	498.75	491.93	497.18	494.36
	SD	10.41	13.83	6.87	10.70	5.11	8.92	8.45	6.24

Note. NSC = non-struggling readers in control schools; SRC = struggling readers in control schools; NSI = non-struggling students in intervention schools; SRI = struggling readers in intervention schools; PPVT–III = Peabody Picture Vocabulary Test—III; WA = Word Attack; LW = Letter Word Identification; PC = Passage Comprehension; SS = Spelling of Sounds.

1. Re-reading for fluency. The teacher asks the student to re-read a selection that she/he has read at least once in the recent past for the purpose of developing reading fluency. The teacher might model fluent reading with some of the text, depending on the skill level of the child. This is done even with children who are non-readers through scaffolding and modeling. For example, asking the child where to start reading and identifying initial sounds in words can be a way to help a beginner be successful, even when they have extremely limited alphabetic knowledge.

2. Word work. This innovative approach provides the teacher with a variety of assessment-based multi-sensory instructional strategies for helping the child manipulate, say, and write words. In the early stages, there are four major strategies that are employed using a white board and letter sounds (letter combinations) tiles to help children make words and to see, hear, and manipulate differences between words. These four strategies were adapted to four major levels of child skill in reading and writing words. Level 1 of Word Work was geared to children who had almost no knowledge

Table 2
Demographics of the Teachers

Variable	Treatment (n = 43)			Control (n = 32)		
	n	*M*	*SD*	*n*	*M*	*SD*
Race						
Black/African American	6			4		
White/European American	35			25		
Other	1			3		
Missing	1					
Gender						
Female	41[a]			32		
Age						
20–29	6			8		
30–39	11			8		
40–49	12			8		
50–59	11			7		
60+	3			1		
Certification level						
Elementary education certified	40			28		
Master's degree or higher	10			22		
Experience						
Total years teaching		17.60	10.77		13.33	9.69
Total years teaching current grade		8.95	7.88		5.31	8.95
Total years teaching at current school		8.00	5.59		7.45	8.00
Total years teaching in current county		12.53	8.93		9.45	8.56

[a] One teacher not reporting gender, and one male teacher in experimental schools.

of the alphabetic principle and focused on three-sound words with short vowels. Level 2 of Word Work was geared to slightly more advanced knowledge of the alphabetic principle and introduced children to four-sound words. The third level of Word Work allowed children more advanced phonics work with long vowel sounds that can be represented by a variety of vowel constellations. The fourth and final level of Word Work focused on multi-syllabic words.

Along with the help of their literacy coaches, teachers made decisions about when to progress to more challenging levels of word identification and adopt slightly different strategies. The graphic organizer for the teacher helped her understand the four levels and the key diagnostic criteria to place a child within these skill levels. Thus, teachers learned to assess the child's level of word identification and select a particular diagnostic strategy that matched the skill level of the child to achieve *instructional match* (Bear, Invernizzi, Templeton, & Johnston, 2003; Beck, 2006; Connor, Morrison, Fishman, Schatschneider, & Underwood, 2007; Connor et al., 2009; Morris, Tyner, & Perney, 2000). All TRI strategies demonstrate the alphabetic principle, help students learn phoneme–grapheme (sound–symbol) relationships, develop students' segmenting and blending abilities (phonemic awareness tasks), and help students recognize sight words. The four primary strategies are (1) *Segmenting Words*; (2) *Change One Sound*; (3) *Read, Write, and Say*; and (4) *Pocket Phrases*.

Segmenting Words helps children to acquire knowledge about the sounds in simple, but progressively more difficult words, by allowing the child to use the letter sound tiles to build words by saying and moving each tile. For example, a child with limited alphabetic knowledge would begin at the lowest level, targeting words that can be made with the following few letters: a, s, m, t, and p. Three-letter words with beginning consonants, such as "sat" or "mop" and not "top," would be chosen because these types of words are the easiest to teach phoneme segmentation since the teacher can stretch out the sounds more easily. For example, the teacher might place three letter-sound cards (t, m, a) at the top of the Word Work board and say,

> Hannah, I want you to help build a word right here [tapping lines on bottom of board]. The first word is "mat," /mmmmat/ [as she drags her finger along the three short lines at the bottom of the board in concert with the sounds she is making]. I wiped my feet on the *mat*. What sound do you hear *here* [pointing to Word Work board] in the word /mmmat/?

With feedback, the child will progress and this allows the teacher to gradually progress to more challenging words.

Change One Sound helps children contrast the sounds between words by placing selected letter sound tiles in front of the child and helping the child to make a word like "map" from the letter sound tiles and then asking him to change that word to "mop" by replacing the "a" tile with the "o" tile. As children become more proficient in this strategy, teachers may focus on medial, beginning or ending sounds and always in the contexts of real words.

Read, Write, and Say helps children to read new words and write those words on the white board. As children write the words they also say the words again.

Pocket Phrases helps children to remember sight words/phrases by writing these words/phrases on cards and asking them to show and read to others in their class or at home.

These four strategies, along with other more advanced strategies, can be used with TRI instructional levels that gradually expose the student to more and more alphabetic complexity, keeping him/her challenged. After each session, the teacher then goes back to her diagnostic map and develops a plan for the child's next session.

3. Guided Oral Reading (GOR). Strategies are employed in a text chosen at the child's instructional reading level, as guided by the *Word Work* sessions and *Diagnostic Map.* Teachers pay particular attention to scaffolding children's abilities to summarize, predict, make connections, and inferences. Vocabulary words that may be difficult are defined and a picture dictionary is available during this part each session. During a book-reading session the teacher might ask for the child to define a word, to answer what might happen next, or to answer a causal question about the storyline. Having children orally summarize the story at the end helps the teacher understand if the child truly understood the book as well as whether the child understands the conventions of storytelling. Having teachers ask concrete and abstract questions about the story also can help them understand whether the child understands the nuances of the story and help them understand whether the child understands what is demanded by different levels of questions.

Data Collection and Measures

All children in the study were administered a battery of standardized tests in the fall and again in the spring of the school year. Teachers filled out questionnaires about their professional background and classroom. All child assessments were done in the

schools in a quiet room. Trained graduate students or former teachers conducted the child assessments. The assessors participated in a 2-day training, which included the administration of the complete battery with non-participating students. Assessors were not informed which schools were experimental or control. The following measures were administered to children in the fall and the spring.

Four subtests of the *Woodcock–Johnson III Diagnostic Reading Battery* (WJ-DRB III; Woodcock, Mather, & Schrank, 2004) were administered to all children. *Word Attack* measures skill in applying phonic and structural analysis skills to the pronunciation of unfamiliar printed sounds and words. The initial items require the child to produce sounds for single letters. The remaining items require the child to read aloud letter combinations that are phonetically consistent, or regular, patterns in English orthography but are non-words or low-frequency words. The items become progressively more difficult. Word Attack has a median reliability of .87 in the 5–19 age range (Woodcock et al., 2004).

Letter Word Identification measures the child's word identification skills. The initial items require the child to identify letters that appear in large type, and the remaining items require the child to pronounce words correctly. The items become increasingly difficult as the selected words appear less and less frequently in written English. Letter Word Identification has a median reliability of .91 in the five-to-19 age range (Woodcock et al., 2004).

Passage Comprehension initial items measure symbolic learning and require the child to match a rebus with an actual picture of an item. The more advanced items employ a modified cloze procedure that requires the child to read a short passage and provide a missing key word which makes sense within the context of the passage. The items become increasingly difficult by removing pictorial support and by increasing passage length and difficulty as well as vocabulary complexity. Passage Comprehension has a median reliability of .83 (Woodcock et al., 2004).

Spelling of Sounds measures the child's spelling ability, in particular, phonological and orthographical coding skills. Initial items require the child to write single letters for sounds. Remaining items require the child to spell letter combinations that are regular patterns in English. Items increase in difficulty by requiring more complex spelling patterns. Spelling of Sounds has a median reliability of .74 (Woodcock et al., 2004).

The *Peabody Picture Vocabulary Test—III* (PPVT–III; Dunn & Dunn, 1997) is an individually administered, norm-referenced test of receptive vocabulary knowledge. Children are asked to select a picture that best represents the meaning of the stimulus word presented orally by the examiner. Alpha coefficients for the PPVT–III for elementary age students range from .92 to .95 (Dunn & Dunn, 1997).

Fidelity of Implementation

To assess fidelity of implementation of the TRI, classroom teachers reported exposure of each target child to the TRI as well as the teachers' adherence to the elements of the TRI to an on-site facilitator during the biweekly team meetings with the literacy coach. The teachers then entered the data online. The Fidelity data are summarized in Table 3 across kindergarten and first grade since there were no grade level differences on any of the fidelity measures.

Exposure was measured by the number of weeks that each child received the TRI over the course of the year and the total number of sessions per week. Each of the five target children received one-on-one TRI intervention an average of 6 weeks with 2.4 sessions per week for a total of about 14 sessions per child.

Adherence to the TRI was measured by the number of reported weeks that each of the three parts of the TRI were implemented with each child: *Re-Reading for Fluency*, *Word Work*, and *Guided Oral Reading*. Teachers reported that 80% of the week's *Re-Reading for Fluency* was implemented, 96% of the week's *Word Work* was implemented, and 92% of the week's *Guided Oral Reading* was implemented.

Results

Missing Data Methods

More than 85% of the sample participated in fall and spring assessments and provided demographic background information. To avoid imprecise regression estimation due to missing data, we created and analyzed multiple imputed data sets in SAS Version 9.1. Multiple imputation procedures use an iterative (chained equations) method to estimate the multivariate relations among study variables for cases with available data. These observed relations among study variables are then used to estimate plausible values for missing data. Creating multiple data sets with plausible values for missing data and aggregating solutions from analyses using multiple data sets provides the best approximation of relations among variables given no missing data (Graham, Olchowski, & Gilreath, 2007; Schafer & Graham, 2002). Consequently, the analysis of variance (ANOVA) and analysis of covariance (ANCOVA) models presented below were run on each of 20 imputed data sets, and model parameters were aggregated across the data sets using the PROC MIANALYZE function in SAS. The imputation model included the following: fall and spring assessment scores for all outcomes, child grade, child race (White, Black), child gender, mother's education, and dummy variables indicating school identification and randomized treatment status.

Preliminary Analysis

Before testing intervention effects on student literacy outcomes, we conducted preliminary analysis to verify the validity of teachers' identification of struggling readers. To validate teachers' identification, we compared fall scores on all outcomes of interest for struggling readers and non-struggling readers in the sample. These models were estimated in SAS 9.1 as three-level ANOVAs

Table 3
Fidelity of Implementation

Variable	*N*	*M*	*SD*
Total number of weeks of TRI	167	6.02	3.77
Number of sessions per week of the TRI	167	2.39	0.79
Proportion of weeks Re-Reading for Fluency done	167	0.83	0.25
Proportion of weeks Guided Oral Reading done	167	0.86	0.23
Proportion of weeks Word Work done	167	0.97	0.09

Note. Teachers with intermittent reporting of fidelity were dropped from the fidelity analysis. TRI = Targeted Reading Intervention.

accounting for the nesting of students with classrooms and classrooms within schools. Three-level models predicted fall scores as a function of a four-category intervention group variable at Level 2 (SRC, NSC, SRI, NSI). Follow-up contrasts of struggling versus non-struggling fall scores were conducted to test for mean differences in performance before intervention. For all outcomes of interest, struggling readers scored significantly lower than non-struggling readers did before this intervention. We present the results of the tests of mean differences in Table 4.

Tests of the Effects of the Intervention

Analytic strategy. Multi-level (hierarchical) models were used to examine our questions about the effectiveness of the TRI for struggling readers. Separate models were conducted for each of five outcomes: Word Attack, Letter Word Identification, Passage Comprehension, Spelling of Sounds, and PPVT. All models were estimated in SAS Version 9.1 as a three-level ANCOVA accounting for the nesting of students within classrooms and classrooms within schools. Effect sizes for significant treatment effects were calculated by dividing the contrast coefficient (mean difference) by the square root of total variation in the model.

The three-level ANCOVA predicted spring scores as a function of fall pre-test scores as a fixed effect at Level 1, a four-category intervention group fixed effect at Level 2, and a set of level-one fixed effects used as covariates across all models: gender is male, mother's years of education, grade (K = 0, first = 1), and race is White. This model estimated random effects for classroom and school intercepts. All covariates including the pre-test were centered for analysis, so that the intercept in the models reflected average spring scores for the treatment reference group, that is, struggling readers in intervention schools.

Intervention effects to answer Question 1 were established by testing the significance of the conditional mean difference between spring scores for struggling readers in intervention schools and struggling readers in control schools.

In order to answer Question 2 about whether our experimental intervention children were progressing at the same rate as their non-struggling peers, we used the following rationale. Considering that the performance of students in control schools represented expected performance for students in experimental schools if intervention were not administered, we proposed that evidence for catch-up would be clearly established given four effects: (1) significant and positive intervention effects between the SRI and the SRC; (2) non-significant differences between conditional spring scores for struggling readers in intervention schools (SRI) and non-struggling readers in intervention schools (NSI; i.e., controlling for fall scores students in intervention schools are changing at a similar rate regardless of struggling status); (3) significant differences between conditional spring scores for struggling readers in control schools (SRC) and non-struggling readers in control schools (NSC; i.e., non-struggling readers are changing at a greater rate than struggling readers are in control schools); and (4) non-significant differences between conditional spring scores for non-struggling students in intervention schools (NSI) and non-struggling readers in control schools (NSC; i.e., no evidence that non-struggling students in intervention schools are lagging compared to non-struggling students in control schools). These contrasts are presented in Table 5.

Table 4
Pretest Differences Between Struggling and Non-Struggling Readers

Variable	NS versus SR	*SE*	*p*
Fall WA	16.79	1.56	<.0001
Fall LW	21.13	1.67	<.0001
Fall PC	13.37	1.49	<.0001
Fall SS	12.73	1.06	<.0001
Fall PPVT–III	7.43	0.98	<.0001

Note. NS = non-struggling readers; SR = struggling readers; WA = Word Attack; LW = Letter Word Identification; PC = Passage Comprehension; SS = Spelling of Sounds; PPVT–III = Peabody Picture Vocabulary Test—III.

The reduced form equation for the model is as follows:

$$Y_{ijk} = \gamma_{000} + \gamma_{100}\,(\text{pre-test})_{ijk}\gamma_{020}\,(\text{treatment})_{jk} + \gamma_{300}\,(\text{male})_{ijk} + \gamma_{400}\,(\text{mother's education})_{ijk} + \gamma_{500}\,(\text{grade})_{ijk} + \gamma_{600}\,(\text{White})_{ijk} + u_{00k} + r_{0jk} + e_{ijk}$$

In this notation, fixed effects are represented by gammas (γ), and random effects are reflected in two error terms: a term for Level 3 variation between schools (u_{00k}) and a term for Level 2 variation between classrooms in schools (r_{0jk}). In exploratory models, we tested a Grade × Treatment interaction. Because that interaction was not significant for any of the outcomes, we excluded it from the final models. Results from the multi-level ANCOVA appear in Table 5. Formal tests of treatment main effects are represented twice in the table: first as the coefficient for the struggling control group listed in the fixed effects (SRC) and second as the formal contrast of struggling intervention (SRI) and struggling control (SRC) conditional means.

The table contains fixed effects, variance components, and group contrasts obtained through estimate statements for each of five outcomes. Within Table 5, we provide variance components for each model. Significance tests of the variance components indicated that the variation between schools was not significantly different from zero for any of the five outcomes. The variation between classrooms within schools was significantly different from zero for Letter Word Identification (LW), Passage Comprehension (PC), and PPVT–III only.

Word Attack. Controlling for differences in pre-test scores, TRI had a positive effect on struggling readers' *Word Attack* skills. Spring scores for struggling readers in intervention schools were 5.65 higher than scores for struggling readers in control schools ($b = 5.65$, $p = .04$). There was some evidence that TRI promoted catch-up for *Word Attack* skills. Non-struggling readers in intervention schools did not outperform struggling readers in intervention schools controlling for fall performance ($b = -0.55$, $p = .75$). However, non-struggling readers in control schools did outperform struggling readers in those schools, controlling for fall scores ($b = -5.13$, $p = .02$). There was no evidence that non-struggling readers in intervention schools underperformed relative to non-struggling readers in control schools ($b = 1.08$, $p = .64$). Above and beyond intervention effects, male students had lower spring *Word Attack* scores, and more maternal education was associated with higher spring scores.

Table 5
HLM Intervention Effects and Planned Comparisons

	WA				LW				PC			
Fixed effects	*B*	*SE*	*p*	*d*	*B*	*SE*	*p*	*d*	*B*	*SE*	*p*	*d*
Pretest	0.45	0.03	<.0001		0.64	0.03	<.0001		0.32	0.03	<.0001	
White	0.55	1.45	.71		0.66	1.42	.64		3.33	1.47	.02	
Male	−4.32	1.27	.00		−3.64	1.25	.00		−2.60	1.32	.05	
Maternal education	0.73	0.31	.02		0.64	0.31	.04		1.45	0.32	<.0001	
Grade	0.81	2.11	.70		11.43	2.24	<.0001		22.92	2.06	<.0001	
NSC	−0.53	2.68	.84		−0.03	3.11	.99		3.65	2.81	.20	
SRC	−5.66	2.72	.04		−8.39	3.20	.01		−7.65	2.88	.01	
NSI	0.55	1.68	.74		2.38	1.64	.15		8.29	1.63	<.0001	
Variance components												
Level 3 variation	10.44	8.81	.24		19.54	12.07	.11		13.31	10.59	.21	
Level 2 variation	16.73	9.01	.06		21.42	9.73	.03		18.21	8.55	.03	
Level 1 variation	217.69	13.89	<.0001		198.31	12.93	<.0001		216.55	13.76	<.0001	
Contrasts												
SRI vs. SRC	5.66	2.72	.04	**0.36**	8.39	3.20	.01	**0.54**	7.65	2.88	.01	**0.48**
SRI vs. NSI	−0.55	1.68	.75	**0.04**	−2.38	1.64	.15	**0.15**	−8.29	1.63	<.0001	**0.53**
SRC vs. NSC	−5.13	2.13	.02	**0.33**	−8.36	2.09	<.0001	**0.54**	−11.30	2.11	<.0001	**0.72**
NSI vs. NSC	1.08	2.62	.64	**0.07**	2.41	3.05	.43	**0.16**	4.65	2.77	.09	**0.29**

	SS				PPVT–III			
Fixed effects	*B*	*SE*	*p*	*d*	*B*	*SE*	*p*	*d*
Pretest	0.31	0.02	<.0001		0.65	0.04	<.0001	
White	0.78	0.71	.27		2.92	1.00	.00	
Male	−1.20	0.62	.05		0.78	0.84	.35	
Maternal education	0.50	0.15	.00		0.41	0.22	.07	
Grade	2.06	1.03	.05		−0.37	1.36	.79	
NSC	−0.98	1.30	.45		4.01	2.03	.05	
SRC	−3.23	1.33	.02		1.34	2.12	.53	
NSI	−0.12	0.83	.89		2.67	1.01	.01	
Variance components								
Level 3 variation	2.63	1.99	.19		5.57	5.21	.29	
Level 2 variation	2.78	1.79	.12		22.85	6.49	.00	
Level 1 variation	51.01	3.25	<.0001		86.48	5.57	<.0001	
Contrasts								
SRI vs. SRC	3.23	1.33	.02	**0.63**	−1.59	2.13	.46	**0.15**
SRI vs. NSI	0.12	0.83	.89	**0.02**	−2.38	0.98	.02	**0.22**
SRC vs. NSC	−2.25	1.05	.03	**0.44**	−2.60	1.30	.05	**0.24**
NSI vs. NSC	0.87	1.26	.49	**0.17**	−1.80	2.08	.39	**0.17**

Note. Bolded *d*s are significant effect sizes. HLM = hierarchical linear modeling; WA = Word Attack; LW = Letter Word Identification; PC = Passage Comprehension; NSC = non-struggling readers in control schools; SRC = struggling readers in control schools; NSI = non-struggling students in intervention schools; SRI = struggling readers in intervention schools; SS = Spelling of Sounds; PPVT–III = Peabody Picture Vocabulary Test—III.

Letter Word Identification. Controlling for differences in pre-test scores, TRI had a positive effect on struggling readers' *Letter Word Identification* skills. Spring scores for struggling readers in intervention schools were 8.39 points higher than spring scores for struggling readers in control schools (b = 8.39, $p < .01$). Again, there was evidence to that suggest that struggling readers who participated in TRI were beginning to catch up to their non-struggling peers. Struggling readers in the intervention schools made gains in *Letter Word Identification* skills that did not differ significantly from gains made by their non-struggling classroom peers (b = –2.38, p = .15). On the contrary, spring performance for struggling readers in control schools was lower than their non-struggling classmates' performance (b = –8.36, $p < .0001$). There was no evidence that non-struggling students in experimental schools underperformed relative to non-struggling students in control schools (b = 2.41, p = .43). Above and beyond intervention effects, male students had lower Spring LW scores, first graders had higher spring LW scores, and higher maternal education was associated with higher spring scores.

Passage Comprehension. Controlling for differences in pre-test scores, TRI had a positive effect on struggling readers PC skills. Spring scores for struggling readers in intervention schools were approximately 7.65 points higher than spring scores for struggling readers in control schools (p = .008). However, there was not strong evidence that TRI promoted catch-up. Struggling readers in intervention schools made less gain than their non-struggling classmates did (b = –8.29, $p < .0001$), and struggling readers in control schools made less gain than their non-struggling classmates did (b = –11.30, $p < .0001$). Above and beyond intervention effects, students with higher maternal education, white students, and first graders had higher spring PC scores.

Spelling of Sounds. Spring scores for struggling readers in intervention schools were 3.23 points higher than spring scores for

struggling readers in control schools ($p = .02$). Struggling readers in intervention schools gained at the same rate as their non-struggling classmates as evidenced by a non-significant difference in spring performance ($b = 0.12$, $p = .88$). On the contrary, spring scores for struggling readers in control schools were lower than those of their non-struggling classmates ($b = –2.25$, $p = .03$). There was no evidence that non-struggling readers in intervention schools underperformed relative to non-struggling readers in control schools ($b = 0.87$, $p = .49$). Above and beyond intervention effects, higher maternal education was associated with higher spring Spelling of Sounds (SS) scores, and first graders had higher spring scores.

PPVT–III. There was no evidence that TRI had a positive effect on PPVT–III skills ($b = –1.59$, $p = .46$). There was evidence that spring performance for struggling readers in control schools differed from non-struggling readers in those schools ($b = –2.38$, $p = .02$). There was no evidence that non-struggling readers in intervention schools underperformed relative to non-struggling readers in control schools ($b = –1.80$, $p = .39$). Above and beyond intervention effects, white students had higher spring PPVT–III scores.

Discussion

The results from this study, using webcam technology to coach classroom teachers to individualize reading instruction for struggling readers, suggested that the TRI can significantly help struggling readers progress more quickly across a broad range of reading skills, including basic word reading, spelling, and passage comprehension skills over 1 year in comparison to children who did not receive this intervention. Furthermore, there was evidence that across some of these achievement measures in word reading and spelling of sounds the children in the TRI experimental group were able to progress at the same rate as their non-struggling peers. On the other hand, there was no evidence that the TRI could eliminate the gap between struggling and non-struggling readers in reading or improve receptive vocabulary over a one year period.

This study was important in a number of ways. First, webcam technology appeared to be an effective and efficient method to deliver professional development to remote rural schools using webcam coaching for classroom teachers. This study is one of only a few that has used technology to deliver professional development to classroom teachers (Mashburn et al., 2010; Powell et al., 2010) and the only one to use live webcam literacy coaching for classroom teachers that provided live and immediate feedback on teaching practices. In previous recent studies, teachers were given feedback on their teaching practices through delayed feedback from literacy consultants viewing videotapes of teachers' instructional practices. Moreover, as we have mentioned before, the live webcam sessions where the coach could see and hear the teacher working with a struggling reader and give real-time feedback were also likely critical in helping the teacher implement the intervention more quickly. In addition, the use of webcam technology allowed the teacher to have control of when the sessions took place and created efficiencies for the time allotted for the coaching sessions. For the current study, a half-time doctoral student could coach up to 12 classroom teachers at a time, given the flexibility afforded by the use of this technology. Although there was no cost/benefit analysis attempted in this study, there is no doubt that the webcam technology was very affordable. Laptop computers were inexpensive at about $800 a piece, and iChat and Skype were free to the users. The webcam technology could be implemented in almost any school since even remote rural schools have adequate Internet access. Thus, webcam technology as a tool for professional development builds on the previous work of others who have used videotape technology to provide professional development (Mashburn et al., 2010; Pianta et al., 2008; Powell et al., 2010).

Second, the TRI produced larger effect sizes than other studies, especially given that the classroom teacher was the one implementing the intervention. Across a broad range of reading assessments, the TRI produced effect sizes from .36 to .63 for kindergarten and first grade children over a 1-year period compared to children who did not receive the intervention. The current study had strong effects on both word level reading and reading comprehension, with a strong effect size of .48 on reading comprehension, even after accounting for school and classroom variance as well as maternal education, gender, and race. In addition, on two of the four reading measures, the TRI experimental children progressed at the same rate of growth in reading as the non-struggling readers in the same classrooms. Most other successful reading programs have been able to improve word reading skills over 1 year but many found no or small effects on reading comprehension (Foorman, Francis, Fletcher, Schatschneider, & Mehta, 1998; Torgesen et al., 1999). For instance, in a review of 42 one-on-one early reading intervention programs for at risk students, it was found that the effect sizes for word reading and passage reading were the greatest, with effect sizes from .41 to .54, whereas the effect sizes for reading comprehension were a modest .28 (Elbaum, Vaughn, Hughes, & Moody, 2000). In the current study, the effect sizes for word reading skills were .36 and .54, and the effect size for spelling was .63, certainly comparable to other studies. However, the effect size for reading comprehension in this study was almost double the average reported by Elbaum et al. (2000) across 42 intervention studies. This comprehension effect was probably due to the greater emphasis placed on reading comprehension compared with many other early reading interventions that often focus on improving children's decoding skills. The TRI emphasized not only word reading skills but comprehension skills during both *Word Work* and *Guided Oral Reading*, which made sure children could define the words they were reading, summarize stories they read, and answer complex questions about the texts, including causal and prediction questions.

In addition, previous studies that have used technology to help the classroom teacher, using video feedback on practices, have found positive effects, but the effect sizes in these studies were considerably smaller than reported in the current study. For instance, the most recent studies, using video feedback on language and literacy practices to help teachers in preschool (Mashburn et al., 2010; Powell et al., 2010), reported effect sizes for the children in the study of .1–.29. Although these were significant and important, the effect sizes in the current study for both word level reading and reading comprehension were .31–.63. These findings may suggest that future work consider webcam technology for feedback to teachers as the most effective way to get gains in reading for struggling readers.

Third, and a particularly important finding from this study, was the fact that the classroom teachers implemented successfully an

intervention for struggling readers with the help of literacy coaches. Most successful reading interventions for struggling readers have either used a specialized teacher to deliver the intervention outside the regular classroom or they have found effects only on word level reading (Foorman et al., 1998; Hurry & Sylva, 2007; Torgesen et al., 2001, 1999). This method of coaching classroom teachers appeared to be just as effective in helping struggling readers as employing one-on-one tutors. Elbaum et al. (2000) reported effect sizes for 42 tutoring interventions, with an average effect size of .41, which is comparable to the results in this study. Previous interventions using classroom teachers have not been particularly effective in helping struggling readers in early elementary school as suggested by reviews of the literature (Risko et al., 2008). Thus, this study is somewhat unique in not only demonstrating that the classroom teacher can implement effective instruction for struggling readers but that the students gain on a broad range of reading measures, including both word level reading skills and reading comprehension. Although we do not have direct evidence from this study, we believe, like other studies have argued, that literacy coaching (Carlisle & Berebitsky, 2011; International Reading Association, 2004) allowed teachers to get real time feedback on individualizing instruction for particular struggling readers (Scanlon, Gelzheiser, Vellutino, Schatschneider, & Sweeney, 2008; Speece, Case, & Molloy, 2003) that in turn enabled the children to gain in early reading.

Fourth, the teachers in this study were able to implement the TRI literacy strategies with relatively little training and with relatively modest instructional time per student. On average, teachers worked individually with a child two to three times per week for 6 weeks, with an average of 14 sessions for each child over the course of the year. In programs like "Reading Recovery," which used a specialized teacher, both more sessions and longer sessions were needed to achieve rapid progress (Elbaum et al., 2000; Schwartz, 2005). Even though our study used fewer resources and less time with individual children, the effect sizes for this study were comparable to those reported for a host of studies reviewed by Elbaum et al. (2000), all of which used a specialized teacher to deliver one-on-one intervention. Given the fewer resources available in low-wealth rural schools, the possibility of using the classroom teacher as the vehicle to help prevent reading failure in struggling readers and doing so with not much time taken away from the instructional day may have many benefits that hopefully can be replicated in future studies.

Limitations

There are a number of limitations in this study. First, there was a small school that was dropped from the study because of problems with technology. Even though there were only two classrooms in this school, this lack of participation of the school compromises our ability to make strong causal inferences. Second, there was limited information on fidelity. We were able to document exposure and adherence of the implementation (O'Donnell, 2008), but we were not able to measure the actual quality of the implementation. In future studies, it will be important to objectively observe the biweekly coaching sessions to more carefully document the quality of implementation beyond amount and adherence. This can now be done with the new capabilities to digitally record the iChat or Skype sessions. We believe that the webcam coaching was the most important aspect of the intervention that led to change in student reading because of previous research that has demonstrated the importance of coaching (Al Otaiba et al., 2011; Carlisle & Berebitsky, 2011; Connor et al., 2011, 2009), but since we did not have a study that separated the effect of the summer institute from the coaching, we can only speculate on the reasons for the TRI success. We do know from previous work that workshops and institutes do not seem to be enough to produce real change in teachers that leads to improved reading for children (Garet et al., 2008; McGill-Franzen et al., 1999). Last, the TRI was not implemented long enough or intensely enough to allow the struggling readers to catch up with their non-struggling peers. Although the struggling readers were able to gain at the same rate as their non-struggling peers in three areas of early literacy when they received the TRI, the program was not able to allow the struggling readers to catch up with their non-struggling peers. It appears that future efforts may need programs, like the TRI, to be implemented more often for each child over 1 year, or for struggling readers to be involved in the TRI over multiple years, to make sure most struggling readers can catch up to their non-struggling peers.

Summary

Even with these limitations, this study is one of the first to suggest that the regular classroom teacher can learn effective instructional strategies using webcam literacy coaching that can lead to significant early reading gains in struggling readers and hopefully prevent reading failure in subsequent grades. It appears that efficient webcam technology may have contributed to the effectiveness of TRI by providing the regular classroom teacher with easy access to live feedback in the regular classroom on an ongoing basis over the school year. This webcam technology may be particularly effective in delivering professional development to classroom teachers in rural schools because these teachers do not have easy access to professional development opportunities due to geographic isolation. Webcam coaching may also be effective not only for rural schools but a wide variety of schools and could also be used to deliver professional development in other content areas for improving the instruction of classroom teachers.

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Received December 7, 2011
Revision received September 25, 2012
Accepted December 18, 2012 ■