

Summative Evaluation of the *Ready to Learn Initiative*

Preschool Teachers Can Use a Media-Rich Curriculum to Prepare Low-Income Children for School Success: Results of a Randomized Controlled Trial



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Executive Summary

Preschool children who participated in a media-rich curriculum incorporating public television video and games into classroom instruction develop the early literacy skills critical for success in school, according to a new study. These foundational skills — being able to name letters, knowing the sounds associated with those letters, and understanding basic concepts about stories and print — all increased among the 4- and 5-year-olds in the study. These preschoolers were from traditionally economically disadvantaged communities where children are often far less prepared for school than their more affluent peers. The study was conducted between January and June 2009 by researchers at Education Development Center, Inc. and SRI International with a grant from the Corporation for Public Broadcasting and the U.S. Department of Education.

These gains among 4- and 5-year-olds are significant. Although a number of studies have shown that digital technologies are promising for improving learning in K-12 schools, technology use in *preschool* has been controversial. Critics argue that television and computers have no role in an active preschool classroom in which teachers seek to create a learning environment that promotes interaction among them and the children. The teachers who participated in this study were asked to engage their children in a range of media-rich literacy activities, from active video viewing to hands-on play with letters, sounds and books.

This study reports that preschool teachers who implement a curriculum that integrates video content with teacher-led activities can improve their students' early literacy skills. Given training and support in classroom activities to reinforce the skills presented in the videos, the teachers were able to conduct the curriculum successfully and help their students learn. This is noteworthy because the teachers in the study were similar to many preschool teachers serving low-income communities: They had little prior training in literacy instruction and worked in schools with limited access to curriculum materials of proven effectiveness.

The study was commissioned by the Corporation for Public Broadcasting to evaluate video and interactive games from *Super Why!*, *Between the Lions* and *Sesame Street*, which are produced for PBS as part of the *Ready to Learn Initiative*. To measure the impact of the study's curriculum, the researchers conducted a randomized controlled trial with 398 low-

income children from 80 preschool classrooms. The preschool teachers were randomly assigned to implement either a 10-week technology-supported literacy curriculum or a 10-week technology-supported science (comparison) curriculum. The researchers tested children in both sets of classrooms before and after implementation and provided both initial training and ongoing coaching for the teachers in both curricula.

Children who participated in the literacy curriculum outscored children in the comparison curriculum on all five measures of early literacy used in the study; four of the five differences were statistically significant. The posttest results were as follows.

- *Naming letters:* Children in the early literacy curriculum classrooms knew an average of 21.2 letters compared with 16.8 letters for children in the comparison classrooms.
- *Knowing the sounds of letters:* Children in the early literacy curriculum classrooms knew an average of 10 letter sounds compared with 6.3 for children in the comparison classrooms.
- *Knowing concepts of story and print:* Children in the early literacy curriculum classrooms earned 10.8 points on average on the test of story and print concepts, whereas children in the comparison classrooms scored an average of 9.5 points.
- *Recognizing letters in child's own name:* Children in the early literacy curriculum classrooms knew an average of 2.7 letters in their names, whereas children in the comparison classrooms knew 2.5.

Also of note was that every teacher who began the study remained in it and was able to carry out the curriculum as designed by the research team. With the help of training and coaching visits to classrooms, the preschool teachers delivered the curriculum with a high degree of fidelity and in ways that supported the active engagement of children. Teachers showed the children videos an average of nearly two times per week, almost exactly as the curriculum intended.

These results show that a media-rich curriculum with integrated professional development for teachers can prepare low-income children for school success. The results also provide evidence of the success for the Corporation for Public Broadcasting in its *Ready to Learn Initiative*, which promotes literacy using multiple forms of media to deliver educational programming in a variety of settings, including preschools.

The next steps are to test this curriculum in other settings and with other subjects.



Summative Evaluation Results from the *Ready to Learn Initiative*

Preschool Teachers Can Use a Media-Rich Curriculum to Prepare Low-Income Children for School Success

Integrating digital content from public television video and online games into preschool literacy instruction can help low-income children develop early literacy skills to prepare them for kindergarten.

Study Background

All children should arrive on the first day of kindergarten ready to learn. They should have the knowledge and skills that are the foundations for literacy, such as being able to name letters, associate letters with sounds, and understand the basic concepts of print.¹ Yet children from low-income families are least likely to begin school with strong literacy skills. Although early childhood education programs exist, they are not reaching the large numbers of children who could benefit from early learning support, nor are they being implemented well by early childhood educators who have limited formal training.² Further, strong evidence of effectiveness has been found for few programs: a recent review of experimental studies on the impacts of preschool curricula revealed that just two of 15 had significant positive effects on early literacy skills.³

Some studies suggest that digital technologies could play a role in improving the early literacy skills of preschoolers, but their use in early childhood education settings is controversial. Experimental studies of programs that incorporate interactive computer games,⁴ that use electronic “talking books,”⁵ and that include video content from educational television shows like *Sesame Street* and *Between the Lions*⁶ have shown positive effects on children’s literacy skills. At the same time, critics have argued that adults should not promote the use of technology like video or computers by young children, arguing that these technologies make children passive and reduce their opportunities

to learn through interactions with adults and peers. Curricula that use technology also can be hard for teachers to implement, because many preschools have limited access to technology and training for teachers to use it. Whether technology can be used effectively by preschool teachers and in ways that promotes children's active engagement is an important question for research to address.

Described here is a study on the efficacy of a media-rich curriculum based on the idea that children can learn best from *media synergy*, that is, when children have opportunities to learn a focused set of skills by engaging in repeated practice with them in many different formats and media.⁷ Participants in this study were low-income children ages 4 to 5 attending early childhood education centers and the teachers in these children's classrooms.

The study is part of the *Ready to Learn Initiative*, a program to develop educational television programming and outreach activities that increase school readiness for 2- to 8-year-old children living in low-income households. In 2005, the U.S. Department of Education awarded one of two *Ready to Learn Initiative* programming cooperative agreements to the Public Broadcasting System (PBS) and the Corporation for Public Broadcasting (CPB). Because the cooperative agreements emphasized scientifically based reading research, CPB commissioned the Education Development Center, Inc. and SRI International to collaborate as its external summative evaluation partner.

This summative evaluation is one of several studies being conducted to develop a stronger evidence base related to the potential of public media to help low-income children become ready to learn. This study is different from the others in its incorporation of digital content from multiple producers and reliance on a large number of early childhood educators from a variety of backgrounds for implementation.

The Media-Rich Early Literacy Curriculum



The 10-week media-rich early literacy curriculum that was the focus of the study integrated video from educational television programs and associated online games from three *Ready to Learn* producers with classroom activities to foster skills for later reading success. Full episodes of *Super Why!* and self-contained segments from *Sesame Street* and *Between the Lions* along with digital content produced by Sesame Workshop, Out of the Blue Enterprises, WGBH Boston/Sirius Thinking, Ltd. were integrated with whole-group classroom activities, small-group experiences, and individual exploration. Table 1 indicates the production components of the curriculum.

Table 1. Components of the Media-Rich Early Literacy Curriculum

Program: *Super Why!*

Producer: Out of the Blue Enterprises

Synopsis: Each episode is set in Storybook Village, which is populated by characters from popular fairytales. The main characters in the program are Red from “Little Red Riding Hood,” Pig from “The Three Little Pigs,” Princess from “The Princess and the Pea,” and Whyatt, the curious younger brother of Jack from “Jack and the Beanstalk.” In every episode, one of the friends encounters a problem with another Storybook Village character. To solve the problem, the friends transform themselves from children into “literacy-powered” super heroes: Alpha Pig with Alphabet Power, Wonder Red with Word Power, Princess Pea with Spelling Power, and Super Why with the Power to Read.

Included in the Curriculum: Five 24-minute episodes and shorter focused segments from the same episodes and three online games

Program: *Sesame Street*

Producer: Sesame Workshop

Synopsis: A part of PBS children’s programming for nearly 40 years, *Sesame Street* teaches letters and numbers and strives to foster imagination, build social skills, and model respect for people’s differences.

Included in the Curriculum: Sixty-eight focused segments, ranging from 15 seconds to 5 minutes, 7 seconds; and two online games

Program: *Between the Lions*

Producer: WGBH Boston, Sirius Thinking, Ltd. and Mississippi Public Broadcasting

Synopsis: Premiering in April 2000, *Between the Lions* is designed to advance the literacy skills of its viewers. Each episode dramatizes some of the experiences young children need to become successful readers, including segments that focus on concepts of print.

Included in the Curriculum: Nine focused segments, ranging from 1 minute to 6 minutes, 17 seconds; and one online game

Over the 10 weeks, the children had 25 hours of activities in which they actively watched episodes and segments, played online games, and participated in teacher-led activities. Table 2 shows the curriculum’s weekly schedule.⁸

Table 2. Schedule for a Week in the Early Literacy Curriculum

Day	Activity		
1	Warm-up	Full episode viewing	Hands-on follow-up
	Teacher-led introduction to episode, letters of focus, and new vocabulary <i>5 minutes</i>	Teacher guided with pause points and prompts <i>35 minutes</i>	Child-selected tactile and visual experiences: letter collage, clay, free writing, independent/buddy reading <i>20 minutes</i>
2	Focused viewing	Hands-on follow-up	
	Teacher-guided viewing of video segments focused on specific letters, with pause points and prompts <i>20 minutes</i>	Whole-group visual and auditory experiences: read-alouds, listening games <i>15 minutes</i>	
3	Computer games <i>10 minutes per child</i>		
4	Focused viewing	Hands-on follow-up	
	Teacher-guided viewing of video segments focused on specific letters, with pause points and prompts <i>20 minutes</i>	Whole-group visual and auditory experiences; listening games, graphing; “Does your name begin with the letter ___?” <i>15 minutes</i>	
5	Computer games	Quick review	
	<i>10 minutes per child</i>	Whole-group singing of alphabet song while pointing to each letter as it is sung and identifying the focused letters of the week <i>5 minutes</i>	

Focal Skills

The curriculum addressed the development of three early literacy skills: recognition of letter names, identification of letter sounds, and understanding of story and print concepts. Each of these skills is essential for later literacy development and has been shown to be strongly related to later decoding and comprehension skills.⁹

- The *letter naming* component targeted children’s ability to learn and recognize 14 uppercase letters. The 14 letters were used, rather than all 26, to provide more intense exposure to letters given the short duration of the curriculum. The choice of 14 uppercase letters was based on research on the order in which children tend to learn letter names.¹⁰
- The *letter sound* component was to help children connect sounds to the 14 uppercase letters used for teaching letter naming.
- The *story and print* concepts component was designed to help children learn to identify the front cover, title, and author of a book and how to open a book, turn the pages, and recognize that English print is read from left to right. This component also incorporates elements of story comprehension, to improve children’s ability to make predictions about what will happen in a story, retell a story, and change sentences in a story.

Integration of Different Media and Formats for Learning

Video from *Sesame Street*, *Between the Lions*, and *Super Why!* was the anchor for hands-on and teacher-led curriculum activities. Entire episodes of *Super Why!* were shown to retain the integrity of the narrative format. Self-contained segments from *Sesame Street* and *Between the Lions* that dealt with target skills were selected and used for focused viewing. Online games created by the programs’ producers, Out of the Blue Enterprises, Sesame Workshop, and WGBH Boston/Sirius Thinking, Ltd., provided additional support for the curriculum by targeting the same early literacy skills. All three of these educational programs are intended to develop early literacy skills of preschool children, the target age for the study. Researchers also adapted traditional teacher-led activities commonly used in early childhood settings to include as part of the curriculum.

Teacher-Led Focused Viewing Activities

Research has indicated that children can learn more when adults view educational television with them.¹¹ The curriculum called for early childhood educators to engage children in active viewing of segments and episodes. When showing video to the children, teachers introduced the key skills, paused the video to encourage active processing of information, and reflected on areas of learning embedded in the video.

In some focused viewing and postviewing activities, children repeated the actions of characters, such as writing letters in the air as the character Princess Presto does in *Super Why!* episodes. During the curriculum, teachers led discussions for 96% of the videos they had shown participating children.

Opportunities for Repeated Practice

The curriculum sequence gave children multiple opportunities to develop and practice focal skills. They watched whole episodes and self-contained segments several times and participated in repetitive teacher-led, small-group, and individual activities. Review and repeated focused viewings occurred on consecutive days and over the course of the 10-week curriculum so that skills introduced in earlier weeks as part of initial viewings were reviewed in the following weeks. Teachers were expected to show each video segment in the weekly curriculum twice. Researchers found that they showed *Super Why!* episodes an average of 2.3 times, *Sesame Street* segments an average of 1.9 times during a typical week, and *Between the Lions* episodes an average of 1.8 times.

Intensive Support for Implementing Early Childhood Educators

Centers participating in the literacy curriculum received teachers' guides containing daily scripts and 10 weeks of activities, as well as manipulatives such as magnetic letters, clay, pointers, alphabet charts, and letter and word cards. Teachers received five picture books to use to explain concepts of print and emphasize oral language. They read each book twice to the children during the 10-week period. Four of the five books were featured in animated video segments displaying the book's text during focused viewing experiences. The fifth book, an alphabet book, was intended to strengthen alphabet knowledge.

To increase the depth and quality of implementation, teachers also received ongoing professional development. It began with a two-hour orientation led by a coach to familiarize them with the materials and key elements of the curriculum. After this initial training, coaches provided on-site support that included examples of good teaching practice, observing, and assisting the teachers with implementation. Coaches made an average of eight visits to each class during implementation, with the average visit being about two hours long. Between visits, coaches provided support by telephone and e-mail.



Research Design

The summative evaluators conducted a randomized experiment in early childhood education centers to test the impact of the curriculum. They randomly assigned teachers in each participating center to either a treatment or comparison group, using a screening tool and a blocking procedure described below to make sure the groups were equivalent in their literacy environments outside the curriculum. The treatment group teachers implemented the literacy curriculum, and those in the comparison group implemented a science curriculum.

Evaluators recruited centers in New York City and the San Francisco Bay Area. Evaluators targeted centers serving children between the ages of 4 and 5 from low-income households. The promise of intensive professional development proved to be particularly appealing to teachers who agreed to participate, perhaps because they have so few opportunities to advance their own learning. To help recruit centers, evaluators also provided a modest incentive of \$500 for classroom supplies and \$200 for teachers.

Attrition was very low. No classroom left the study, and only 9.9% of children who completed a pretest did not complete a posttest, mainly because they had left the centers participating in the study. There was no difference in attrition between the treatment and comparison groups. In addition, there were no differences in pretest scores between children who left the study and those who stayed.

Participants

Centers and Classes

Researchers screened classes at centers that expressed interest in participating in the study, as follows. Each participating class was required to have the technology to show video and play online games. Classes needed to have at least five children at the target age range (4 to 5) whose participation in the program and literacy testing would not be hampered by a lack of English language skills or by disabilities. In addition, at least half of the children in each participating class had to be from low-income families, defined as any family that receives financial support for their children to attend preschool. The researchers randomly selected eligible children from the classes to be part of the study.

Eighty classes at 47 different centers participated in the study. These centers ranged in type: some were Head Start, others run by school districts, and others part of small, privately run facilities, some home based. More than two-thirds of the early childhood educators (69%) had a postsecondary degree.

The evaluators measured the literacy environment quality using the Early Language and Literacy Classroom Observation Tool (ELLCO). To ensure that the classrooms in each condition were similar in the kinds of literacy learning opportunities generally provided children before the curriculum, researchers randomly assigned classes to each condition using ELLCO scores as a blocking variable.

Children

A total of 398 children (mean age at pretest, 4 years, 9 months) participated in the study. A majority (60%) of these children spoke English at home, and a third (31%) spoke Spanish at home. Some (8%) spoke both languages at home. Overall the children in the sample, 20 different languages were spoken at home. Although groups were equivalent at baseline in background characteristics, for some scores on outcomes treatment children were higher. These differences were not statistically significant, however.

Comparison Curriculum Components

In designing a comparison condition, the evaluators sought to support a clear interpretation of outcomes. They supplied a curriculum for participating early childhood educators to implement, but the topic was science not literacy. The science curriculum was of the same intensity and duration as the literacy curriculum and had a similar mix of public media¹² and hands-on materials so that any effects of the early literacy curriculum could be attributed to the digital content, not simply to excitement about using video and computers in the classrooms. In addition, the evaluators provided similar levels of support for teachers in the comparison and curriculum conditions to reduce the chance that differential excitement about or frustration with implementation would affect children's scores.

Measures

The study measured progress on a specific set of children's early literacy skills:

- Subtests from the Phonological Awareness Literacy Screening (PALS) measured children's knowledge of letter names, letter sounds, and common initial sounds.
- An assessment developed by researchers from the University of Pennsylvania and Mississippi State University measured children's knowledge of story and print concepts.

- A measure developed by the research team, in consultation with a literacy researcher from Washington University, measured letter knowledge of children who had just begun learning letters; this measure sought to capture children’s knowledge of the letters in their own name.

The study took place in spring 2009; from pretesting through posttesting, the duration was 16 weeks. Those who assessed the early literacy skills of each participating child within a 3-week window before and after the 10-week curriculum were blind to the group a class or child was assigned to. In some cases the assessor assigned to a child was different for pretest and posttest; in some cases the assessor was the same.

The evaluators used weekly implementation logs and coach update surveys to document the enactment of curriculum activities and to identify implementation challenges for coaches so that they could address them as they arose.

After the study, teachers completed surveys about their impression of study curricula and the professional development they received and about their backgrounds, including their training and ongoing professional development experiences.

Parents of children in the study provided demographic information via a telephone survey as well as information about the literacy and media environment in their home.

Approach to Analysis

The evaluators compared posttest scores of children in the literacy condition with those of children in the science condition for each outcome by fitting hierarchical linear models¹³ to the data and controlling for pretest scores. The magnitude of effects when using pretest scores as covariates were similar for models fit to the data that did not include pretest scores or that analyzed gains. A second set of models fit to the data explored potential moderating variables, including mother’s education, ethnicity and home literacy environment.

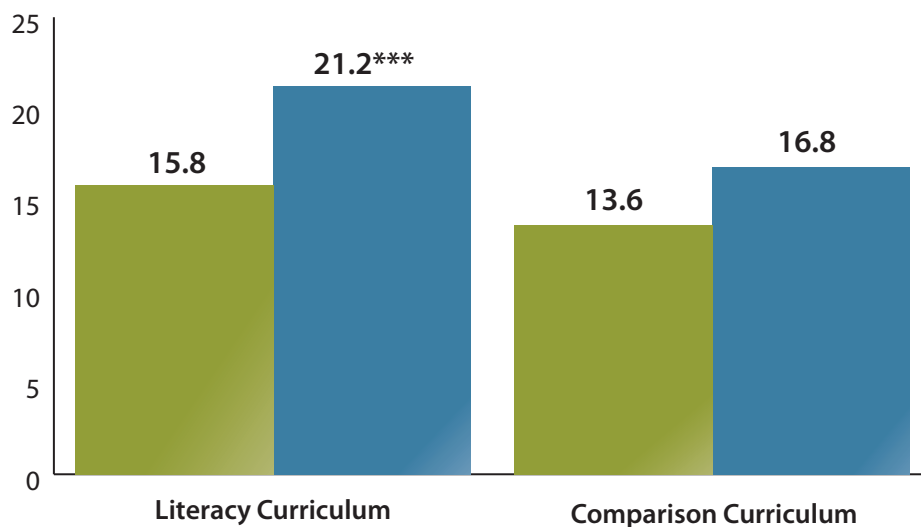


Results

On four of the five measures in the study, the differences were statistically significant in favor of the literacy condition.

PALS Letter Recognition (Letter Naming). Children in the early literacy condition knew an average of 21.2 letters at posttest compared with 16.8 letters for children in the comparison condition (Figure 1). This difference was statistically significant ($p < .001$). Children in the early literacy condition learned on average 2.3 more letters than children in the comparison condition. The estimate for the standardized effect size of the early literacy curriculum on letter naming was +0.34 standard deviations.

Figure 1. Impacts on Uppercase Letter Recognition (Letter Naming)



*** Difference in posttest scores of literacy condition children, controlling for pretest scores, was greater than that of comparison condition children at $p < .001$.



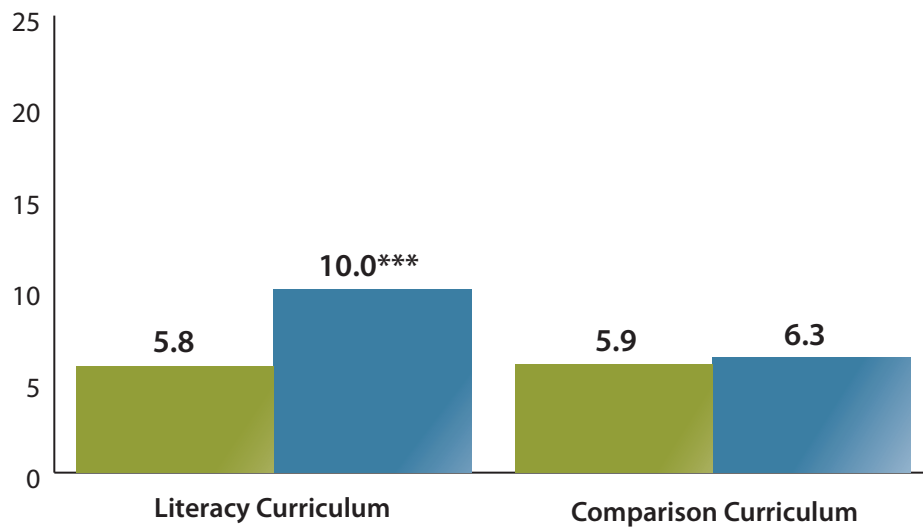
Pretest



Posttest

PALS Letter Sounds. On the posttest, children in the early literacy condition knew an average of 10.0 letter sounds compared with 6.3 for children in the comparison condition (Figure 2). This difference was statistically significant ($p < .001$). In the early literacy condition, children learned 3.8 more letter sounds on average than children in the comparison condition. The estimate for the standardized effect size of the early literacy curriculum on letter sounds was +0.53 standard deviations.

Figure 2. Impacts on Letter Sounds

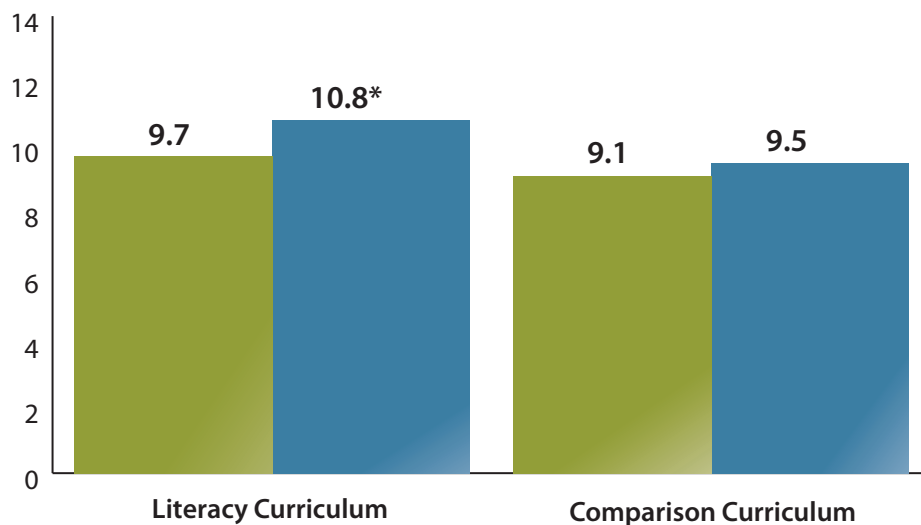


*** Difference in posttest scores of literacy condition children, controlling for pretest scores, was greater than that of comparison condition children at $p < .001$.

■ Pretest ■ Posttest

Story and Print Concepts. Children need to be able to identify the correct orientation of a book, left-to-right reading, title and author name, and key story elements when asked to recall them. These skills were the focus of a story and print concepts measure. The scale for this test was 0 to 19 points; children earned between 1 and 2 points for each answer correct on the test. The average posttest score for children in the early literacy condition was 10.8 and that for children in the comparison condition was 9.5 (Figure 3). This difference was statistically significant ($p = .026$). On average, children in the early literacy condition increased their scores on the concepts of print measure 0.5 more than children in the comparison condition. The estimate for the standardized effect size of the early literacy curriculum on story and print concepts was +0.26 standard deviations.

Figure 3. Impacts on Story and Print Concepts

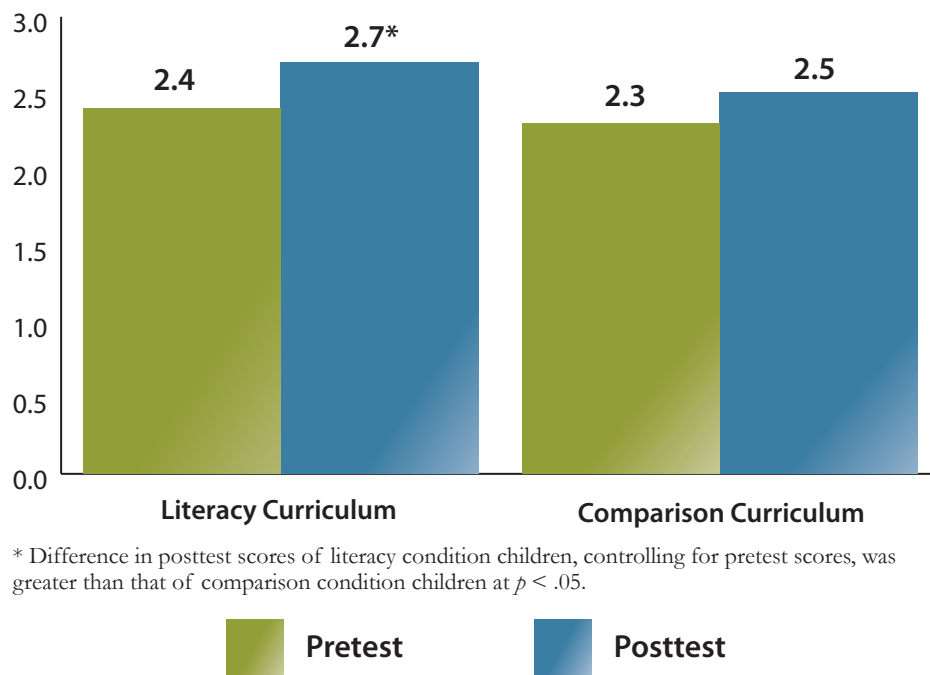


* Difference in posttest scores of literacy condition children, controlling for pretest scores, was greater than that of comparison condition children at $p < .05$.

Pretest Posttest

Knowledge of Letters in Name. Children just learning their letters are likely to be able to identify letters in their names. For this task, assessors randomly arranged on a tray six magnetic letters of the same color, three of which were letters from the child's name. The assessors then asked children to identify the letters in their name. The assessors recorded the number of letters children could identify. No children had fewer than three letters in their name.

Figure 4. Impacts on Children's Knowledge of Letters in their Name



Children in the early literacy condition knew an average of 2.7 letters in their names on the posttest, whereas children in the comparison condition knew 2.5 (Figure 4). This difference was statistically significant ($p = .035$). Children in the early literacy condition learned an average of 0.07 more letters (out of three) in their own name than children in the comparison condition. The estimate for the standardized effect size of the early literacy curriculum on knowledge of letters in their names was +0.19 standard deviations.

Scores on the PALS Beginning Sound Awareness measure were not significantly different between the early literacy and science conditions ($p = .082$), although both groups demonstrated growth between the pretest and posttest.



Moderating Variables and Study Limitations

Children's age was related to some of the outcomes. Age in months at pretesting (as reported by early childhood education center directors) moderated two of the statistically significant outcomes, letter sound awareness and knowledge of letters in the child's name. On average, the older the child, the higher the scores on the literacy measures. This finding suggests that children's scores are related to maturation, independent of exposure to literacy instruction in the curriculum.

Ethnicity also moderated results for two outcomes, upper case letter names and knowledge of letters in the child's name. Scores for Asian and Pacific Islander students were higher than for students of other ethnic backgrounds on these measures.

Mother's education (as reported on the parent survey) moderated results on one of the statistically significant outcomes, PALS letter sounds. For that measure, posttest scores were higher on average for children with more educated mothers. This finding suggests that home literacy environment, above and beyond the environment provided in schools, was related to outcomes.

Compared with early literacy programs available to most preschools, this curriculum addressed a more focused set of early reading skills through systematic repetition and integrated the use of video programming and online games. By contrast, most preschool curricula provide broad exposure to literacy skills and do not use technology.² Also, the findings may not be generalizable to all preschool children in the United States because it was conducted primarily in urban areas. Yet the results are consistent with prior studies of similar programs conducted in rural areas and on Native American reservations by Deborah Linebarger and colleagues at the University of Pennsylvania.¹⁴



Conclusions and Implications

The results show that digital media, including public television programming and web-based games, can support early literacy skills when thoughtfully integrated with teacher-led interactive activities. Although children in each group improved their literacy scores, children in the early literacy condition showed significantly more improvement than those in the comparison condition. In the study, educators with limited experience in implementing early literacy curricula of this level of intensity helped achieve these results with a diverse sample of low-income children. Key features of the curriculum were a strong focus on the early literacy skills critical for later reading success, opportunities for practice and reinforcement through multiple tasks (including hands-on, teacher-led, child-initiated, and technology-based activities), and integration with teacher-led activities that focus on the same skills.

The sample for the study included children at great risk for reading difficulties from low-income families who would have fallen behind children from similar backgrounds without this curriculum. Many children knew few of their letters and even fewer letter sounds at the outset of the curriculum, putting them at a disadvantage relative to other students who will arrive at kindergarten knowing all their letters and many letter sounds. The fact that the curriculum studied proved effective in a randomized controlled trial with this population makes it among the few preschool curricula with strong evidence of a positive impact.

As a point of comparison, the magnitude of the estimated effects of the literacy curriculum was larger than the magnitude of effects reported in the recent U.S. Department of Education-sponsored review of 15 preschool programs. In that review, reported effects of curricula on phonological awareness ranged from -0.16 standard deviations to +0.32 standard deviations. For 13 of the programs reviewed, estimated effects on these skills were lower than the effects estimated for this curriculum. The phonological awareness test used in these studies tested many of the skills tested in this study.

Although the professional development aspect of the curriculum needs more study, our belief is that the coaching provided early childhood educators was critical to success. A core element of the curriculum was providing the educators with models of how to

engage children in making connections with content presented via video and guiding them in making explicit the skills that children practiced when playing computer games. The early childhood educators in this study learned these new techniques quickly and were provided with opportunities to try them out and then receive feedback from an experienced coach.

Further field trials are needed to replicate these findings with other populations and to determine the optimal blend of activities and level of coaching for supporting early literacy learning. It may also be desirable in subsequent studies to include a second control group with no supplemental instruction or public media content. The design could allow for children in that group to receive the curriculum after the study ends.

Information on Who Conducted the Study



The collaborative evaluation team includes researchers from two institutions: the Education Development Center's Center for Children and Technology and SRI International's Center for Technology in Learning.

Education Development Center, Inc./Center for Children and Technology

The Center for Children and Technology is a part of the Education Development Center, Inc., a nonprofit international research and development organization dedicated to improving the quality, effectiveness, and equity of education throughout the United States and in more than 35 countries. Since 1981, CCT has been at the forefront of creating and researching new ways to foster learning and improve teaching through the development and thoughtful implementation of new educational technologies. CCT's work is centered in three areas: research, including basic, formative, and program evaluation; design and development of innovative technology prototypes and products; and the implementation and operation of large-scale technology integration efforts.

SRI International/Center for Technology in Learning

SRI International is an independent, nonprofit research institute conducting client-sponsored research and development for government agencies, commercial businesses, foundations, and other organizations. The mission of the Center for Technology in Learning is to improve learning and teaching through innovation and inquiry. CTL research and development activities contribute to the knowledge base on effective learning and teaching and embody research insights in the innovative design, use, and assessment of interactive learning environments. In its development, research, and evaluation work, CTL seeks to create tools that lead to better teaching and learning, to develop assessments and conduct evaluations that contribute to the evidence base about the effectiveness and conditions for success of technology-supported innovations, and to inform both the policy and research communities.

Acknowledgments

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