

# 2012 Preschool Pilot Study of PBS KIDS Transmedia Mathematics Content

## EXECUTIVE SUMMARY

REPORT TO THE CPB-PBS *READY TO LEARN* INITIATIVE



September 2012

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## CONTEXT

The CPB-PBS *Ready To Learn* initiative, funded by the U. S. Department of Education, brings engaging, high-quality media to young children who may be at risk for academic difficulties due to economic and social disadvantages. The initiative aims to deliver early mathematics and literacy resources on new and emerging digital platforms such as tablet computers, interactive whiteboards (IWBs), and smartphones, as well as better-established technologies such as computers, video displays, and gaming consoles, and to create learning experiences that leverage the unique capabilities of these various technology platforms.

## STUDY OVERVIEW

The 2012 Preschool Pilot Study of PBS KIDS Transmedia Mathematics Content (Preschool Pilot) is an important part of the multiyear *Ready To Learn* summative evaluation initiative by the Education Development Center, Inc., (EDC) and SRI International (SRI) for the Corporation for Public Broadcasting (CPB) and the Public Broadcasting Service (PBS). In this phase of the evaluation, we explored the potential of using technology (interactive whiteboards and laptops) and PBS KIDS transmedia resources (digital videos and interactive games) to enhance preschool mathematics teaching and learning. We used the Preschool Pilot to develop and test curricula supplements and teacher professional development programs and produce research designs and research instrumentation in preparation for a more rigorous study of transmedia use in early childhood classrooms involving a larger sample of children and teachers—the 2013 preschool randomized controlled trial (preschool RCT). At the same time, we used the study to gather important and useful knowledge about preschool mathematics instruction and the possibilities and constraints shaping the use of leading-edge technologies and transmedia resources in present-day preschool classrooms. The study included child assessments, classroom observations, teacher surveys, and weekly logs completed by both coaches and preschool teachers.

## METHODS AND SAMPLE

For the Preschool Pilot sample, we drew largely on preschool centers and agencies that participated in the 2009 literacy RCT or the [2011 context studies](#). These preschool centers and agencies serve primarily 3- to 5-year-old children from low-income families in diverse communities. We used a design-based research approach to develop two mathematics curriculum supplements—one rich in transmedia and one using only hands-on materials—that each covered 10 weeks of material for teachers and children. We then collected data

on the implementation of the math curricular supplements from the participating classrooms using weekly teacher logs, weekly coach logs, and classroom observations. To assess preschool teachers' attitudes and beliefs toward mathematics, we asked teachers to complete a questionnaire. Teachers in both the transmedia-rich and comparison conditions were asked to complete this questionnaire prior to implementation and then again at the end of implementation. To assess children's mathematics outcomes, we administered two early mathematics assessments; in addition, to assess children's self-regulation, we administered a recently developed and validated measure of young children's behavioral self-regulation.

## FINDINGS

Findings from the CPB-PBS *Ready To Learn* Study fall into three broad categories: (1) the integration of PBS KIDS transmedia-rich activities; (2) curriculum supplement content, including the concepts and skills addressed by the supplements, the design and sequence of activities, and the use of materials, involving both hands-on materials and the integration of transmedia and technology; and (3) the professional development and coaching components associated with the supplements.

### INTEGRATION OF PBS KIDS TRANSMEDIA-RICH ACTIVITIES AND ROUTINES IN EARLY MATH INSTRUCTION

**Video co-viewing was a “gentle” introduction to math skills.** Videos used in the PBS KIDS transmedia-rich supplement were well received by preschool teachers and children in all classrooms that participated in the Preschool Pilot.

**PBS KIDS Interactive whiteboard games were an opportunity for scaffolding.** PBS KIDS IWB games were a powerful context for children's math learning, given the combination of teacher scaffolding, opportunities for children's active participation, the transmedia's affordances for practicing math skills, and the whole-class setting in which the activity was implemented.

**Computer Center time was an opportunity for independent practice and child collaboration.** The most effective implementation of a Computer Center-time activity combined a structured introduction to the game highlighting the math skill, explicit connections between the PBS KIDS IWB game and the PBS KIDS computer game, the expectation that children would work collaboratively in pairs and delegation of roles to children, and a sustained amount of time spent on the target game(s).

**Adult mediation was key to maximizing children’s transmedia-rich math learning.**

Extending interactions or incorporating new ones allowed teachers to introduce background information, explain and illustrate new vocabulary, provide additional opportunities for practicing math skills, and expand on the connections between the *Ready To Learn* transmedia-rich activity and other learning activities.

## MATH CONTENT AND CLASSROOM ROUTINES

**Supplement activities and materials that hewed to common and well-established preschool instructional formats were well received by preschool teachers.**

In general, preschool teachers felt that manipulative materials that children could touch, feel, and move offered important opportunities for practicing a number of math skills. Coaches and teachers reported that PBS KIDS IWB games captured the interest of children, not least on account of the opportunity for tactile play offered by the technology.

**There were challenges associated with the implementation of the “Math Circle” activities.**

Preschool teachers struggled with the complexity that they attributed to multistep, multipart activities. They worried that the variety of math skills addressed, combined with the time taken to complete the activity, had a negative influence on children’s engagement and math learning.

**Repeating activities did not elicit a favorable response from teachers and children.**

Teachers related that children “did not want to do the same activity again and again” and that “when [there] is too much repetition, children started to get bored.”

## PROFESSIONAL DEVELOPMENT AND COACHING

**The implementation of both supplements required a significant amount of planning and preparation on the part of teachers.**

Organizing materials and setting up for activities was one of the recurring challenges reported by teachers. On a number of occasions, classroom observers noted that teachers appeared unfamiliar with the structure and steps of an activity while they were implementing it; teachers also acknowledged that sometimes they did not have time to read through the activity prior to enacting it in the classroom.

**Some teachers enacted several instructional moves that supported children’s sustained attention to, and engagement with, math activities.**

In contrast, other teachers encountered several instruction-related challenges during the implementation of the supplements. A focus on activity completion, as well as the need to troubleshoot technical issues and manage behavior, sometimes overshadowed attention to target math skills.

**Coaching in all classrooms attended to certain fundamental needs but was flexible.**

Because preschool teachers’ needs and the contextual factors affecting implementation

in classrooms were diverse, coaches adjusted the support they provided to fit the unique features of each teacher’s classroom.

**Successful implementation of the supplements called for just-in-time guidance from knowledgeable coaches.** It was an important goal for coaches to get to know the classrooms and the instructional dispositions and practices of the teachers to whom they were assigned in order to understand as much as possible about how teachers were enacting particular activities, the manner in which teachers and children were responding to the supplements, and other contextual factors affecting implementation.

## TEACHER OUTCOMES

After implementing the PBS KIDS transmedia-rich supplement, more preschool teachers reported feeling like a “mathematics person” and feeling like they taught mathematics as well as they taught other subjects. These patterns were not as evident in the comparison condition. In addition, in the PBS KIDS transmedia-rich group, some teachers reported feeling more confident, while other teachers reported feeling less “confident in their ability to facilitate students’ communication about mathematics (for example, discussions, questions, and journals)” after completing the PBS KIDS transmedia-rich curriculum supplement. This pattern was not as evident in the comparison condition, where we only observed more teachers reporting feeling less confident.

Our approach involved some initial training and support during implementation. This method may have helped some teachers gain confidence in their ability to facilitate children’s math learning. However, our approach may not have offered enough professional development opportunities to ensure all preschool teachers understood and felt comfortable adopting instructional strategies to foster young children’s math learning. In order to ensure teachers feel well-equipped to teach mathematics, it will be important for the curricular supplements to include a strong professional development component that allows teachers to gain understanding of mathematics concepts and skills and hence confidence in their practice.

## CHILD OUTCOMES

Repeated measures analyses of the child outcome data indicated that there was a significant effect of time; in other words, children made significant improvements in both mathematics and self-regulation skills. These improvements, however, did not differ across conditions. Findings from multilevel analysis of the child outcome data also indicated that there were no main effects of condition. Although we had limited power to detect effects (due to our small sample size), these findings indicate no differences in children’s learning across conditions. This might be due to the presence of enhanced support for mathematics instruction in both the PBS KIDS transmedia-rich and comparison classrooms, leading to uniform improvements across conditions.

# FUTURE CONSIDERATIONS

The CPB-PBS *Ready To Learn* Preschool Pilot Study, as a test-run before the larger *Ready To Learn* preschool RCT, provided the intended information to inform the RCT: it confirmed many of our core assumptions about early math learning with transmedia as well as our general approach to conducting the research. It also indicated areas in which we should focus our RCT efforts. Specifically, we found as follows:

- Preschool teachers and preschool center directors were willing and able to endure the disruption of a large-scale technology deployment, especially when it also brings the promise of powerful new learning tools well suited to existing routines.
- The instruments, especially those intended to capture child and teacher outcomes, were well matched to the implementation.
- Professional development and coaching were integral components to successful PBS KIDS curriculum supplement enactment. In particular, a flexible and responsive coaching model, as was implemented in the Preschool Pilot, is promising; however, more structured and consistent teacher professional development and coach training will be necessary to support both teachers and coaches at scale during the preschool RCT.
- Preschool teachers in general seemed to experience a new “awareness” and knowledge about their ability to teach mathematics and their children’s ability to engage and comprehend more complex mathematical concepts, suggesting that continued support both in the form of professional development and high-quality curriculum supplements has the potential to impact general preschool mathematics instructional practices.
- Young children from traditionally underserved communities were deeply engaged with the mathematics learning environments created as part of the PBS KIDS transmedia-rich and comparison supplements.
- Both conditions provided new experiences for many preschool teachers—a focus on mathematics and concrete activities—while many teachers in the PBS KIDS transmedia-rich condition experienced a double innovation: the first due to the changes in their physical classroom with the influx of technology, the second as a result of teaching new material in sometimes unfamiliar ways.

## About EDC/CCT

Education Development Center, Inc. is a global nonprofit organization that develops, delivers, and evaluates innovative programs to address urgent challenges in education, health, and economic development. EDC manages more than 300 projects in 35 countries. For more than 25 years, EDC's Center for Children and Technology 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.

## About SRI/CTL

SRI International is an independent, nonprofit research institute conducting client-sponsored research and development for government agencies, commercial businesses, foundations, and other organizations. SRI's Center for Technology in Learning (CTL) evaluates large-scale technology innovations, designs assessments that enhance teaching and learning, develops tools to help students master complex ideas, builds online communities of learners, and offers strategic learning consulting services.

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