PBS KIDS Mathematics Transmedia Suites in Preschool Homes

A Report to the CPB-PBS Ready To Learn Initiative

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Executive Summary

During the summer of 2012, WestEd conducted a study of the PBS KIDS Mathematics Transmedia Suites in preschool homes as part of the *Ready To Learn* Initiative developed by the Corporation for Public Broadcasting (CPB) and the Public Broadcasting Service (PBS) with funding from the U.S. Department of Education. This report describes a study of a collection of mathematics activities and games available to children on the PBS KIDS Lab website. The focus of the current study is on the efficacy of three PBS KIDS transmedia suites (*The Cat in the Hat Knows A Lot About That*, *Curious George*, and *Sid the Science Kid* and their accompanying parent support materials) in increasing preschoolers' mathematics skills and enhancing their parents' ability to support their children's mathematics learning in the home environment. Transmedia suites are comprised of thematically linked content presented across formats (e.g., short-form videos, online games, mobile phone activities, in-classroom digital games) and across media devices (e.g., computers, interactive whiteboards, tablets, mobile digital devices).

It was predicted that use of *Ready To Learn*'s three PBS KIDS transmedia suites, along with the corresponding parent support materials available on PBS KIDS Lab, would increase preschool students' early mathematics abilities. In addition, it was predicted that use of the suites and related parent activities would increase parents' awareness of strategies to directly support their child's mathematics learning in the home environment. Specifically, the study applied a quasi-experimental design to address the following research questions:

(1) Does student use of the PBS KIDS transmedia suites increase children's knowledge and skills in mathematics?

(2) Does parents' awareness and support of their children's mathematics learning at home increase after interacting with their children around the suites and using support materials related to the suites?

Study Design and Methodology

The study of PBS KIDS Mathematics Transmedia Suites in preschool homes used a quasi-experimental, non-equivalent groups design, which randomly assigned two Head Start centers to either an intervention or comparison group. The study took place over eight weeks in the summer of 2012. The intervention was based on three PBS KIDS transmedia suites and was comprised of three overarching mathematics concepts found in those suites: numbers and operations in base ten, measurement and data, and geometry and spatial sense. The eight-week intervention encouraged participating parents and children in the intervention group to work together on PBS KIDS transmedia activities for 30 minutes per day for four days per week, and encouraged parents to attend weekly parent meetings at their child's preschool. According to fidelity surveys and electronic usage logs collected over the course of the study, on average, child/parent dyads played the online games three days per week for an average of 173 minutes per week. They were also actively involved in the hands-on home activities related to the online games. The majority (88.9%) of the child/parent dyads used the hands-on activities for 20-40 minutes per week.

Each week of the intervention focused on a specific mathematics concept and included four days of activities

for children at home (all hands-on activities in the program were taken from PBS KIDS Lab home activities). During each week of the study, parents in the intervention group met at their child's preschool for one hour. During each parent meeting, parents were encouraged to describe the activities they undertook with their children the previous week; whether they felt their children learned from those activities; and what challenges they had encountered. The comparison group was a "business-as-usual" comparison group in which child/parent dyads received intervention or instruction they would normally receive if the study of PBS KIDS Mathematics Transmedia Suites in preschool homes were not taking place.

Researchers recruited 90 child/parent dyads through two Head Start centers primarily serving families from a low-income community in Richmond, CA (mean age of child participants = 4 years, 5 months). Students in the study were primarily from low-income households, with two thirds of the students eligible for free or reduced price meals. About half of the students were Hispanic or Latino with significant subgroups of African American and Asian students. About one third of the students were English-language learners and 14% of the students received special education services.

Findings

The results indicate that the intervention was positively associated with gains in children's knowledge and skills in numerical sense, as measured by the standardized, nationally normed Test of Early Mathematics Ability, third edition (TEMA-3) assessment. Adjusted mean differences on the post-test measure of the TEMA-3 show that the intervention group exceeded the comparison group. Children who were exposed to Ready To Learn's PBS KIDS transmedia suites and related support materials in the summer of 2012 outscored their comparison group peers on the TEMA-3 by 4.82 problems. This difference was significant at the .01 level.

Findings from qualitative data analysis suggest that the three PBS KIDS Mathematics Transmedia Suites, along with their corresponding parent support materials available on PBS KIDS Lab, provided parents with a platform to involve themselves in their children's mathematics learning. In general, the parents played more than five games per week with their children (M=5.43, SD=0.86), which indicates a high level of engagement in their children's play with PBS KIDS transmedia games and the supporting hands-on home activities.

Data analysis suggests that the intervention assisted families with understanding children's mathematics development, helping them to create conditions at home to promote mathematics activities, and to apply PBS KIDS online mathematics games to support children's mathematics learning. To detect whether interacting with children around the PBS KIDS transmedia suites and using related support materials increases parents' awareness of their children's mathematics learning at home, researchers analyzed the composite sum scores for parents' awareness of their children's mathematics development reported on parent surveys. The results indicate that parents' awareness of their children's mathematics development significantly increased over the course of the intervention (Pre M=8.65 (2.01), Post M=10.26 (1.38), df=42, p< .001).

The results related to parents' awareness and support of their children's mathematics learning at home indicate that after the intervention, parents were highly involved in supporting their children's mathematics learning. They viewed themselves as facilitators and/or teachers when working with their children. They also felt empowered to teach their children with the support provided by the intervention program, and subsequently became more aware of their children's abilities, interests, and difficulties in regard to

mathematics. As evidenced by data from weekly fidelity surveys and focus groups, parents were interested in the project, felt guided and supported throughout the intervention, and were willing to be involved in their children's learning.

Parents reflected on their experience in the study by saying:

> *We love these [parent meetings], because they teach me how to learn to educate better my daughter. I am getting practical and simple advice, which is also very enjoyable. I think that she is having fun and learning and I am thankful for these activities that are so creative, and the enrichment for all the families.*

> *Thank you for the opportunity that this program is providing to help our children and to help us parents, so we help our children to prepare and advance in their studies, which helps us to get involved more with them and to know about their educational development.*

> *My child and I enjoyed participating in this study. She was able to learn a lot about numbers, and I learned different ways to teach her. PBS is a great learning resource.*

> *My son has enjoyed very much the games and it has given me the opportunity to share more time with him. I think he has enjoyed it and is learning. At the same time, I hope to continue helping him learn with all his games.*

> *I am very impressed that my son is using operations, geometry, spatial sense, measurement, data collection and analysis, algebraic thinking. I will continue to include them when we learn.*

Conclusion

The study results suggest that the CPB-PBS Ready To Learn Initiative's three mathematics-related PBS KIDS transmedia suites, along with their corresponding parent support materials available on PBS KIDS Lab, helped parents support their child's mathematics learning over the course of the eight-week intervention. In addition, parents indicated they had thought more seriously about introducing mathematics in the home environment, and would continue to support their children's mathematics learning.

Given the fact that the current project has limited dosage of the intervention related to important preschool mathematics concepts such as measurement and data, and geometry and spatial sense, future studies might extend the current program to a longer period of time, and include more PBS KIDS transmedia suites that address the corresponding mathematics concepts. For the current project, WestEd researchers supported participating families in learning mathematics by organizing the PBS KIDS transmedia suites and support materials, facilitating weekly parent meetings, and offering technical assistance. This approach is time consuming and expensive, which may limit the scale-up of the intervention model. Future studies can apply an alternative approach, such as the "train the trainer" model. For instance, researchers or professional development providers could offer comprehensive training and technical support to schools, districts, and communities to build their own capacities to support everyday mathematics learning at home using the intervention materials.