

## **Young children and digital media: examining impact through three RCTs**

### **Background**

Since 2008, researchers have worked with the Ready To Learn (RTL) initiative, a partnership between the US Department of Education, the Corporation for Public Broadcasting (CPB) and Public Broadcasting Service (PBS), to examine how digital media supports children's learning. The program targets communities where many children arrive unprepared for the demands of school (Claessens, Duncan, & Engel, 2009). Studies have examined the design, development and use of digital media created under this initiative. We describe the evolution of three randomized controlled trial studies designed to provide insight into the impacts of digital media on math and literacy learning. Each study identified positive impacts on learning, but took different approaches in assessing impact.

Digital media can offer dynamic, multi-sensory representations of concepts, places, or people. Children can use digital media for virtual field trips, or use virtual manipulatives that provide immediate feedback to support understanding (Anderson et al., 2000; Crawley et al., 2002). Children can be intrinsically motivated by media experiences, (Renninger, 2000), and engagement with well-designed digital media is associated with gains in literacy, science, math and other skills (Fisch, 2004, McCarthy et al., 2012). Digital media can foster social interactions, increasing communication and collaboration, that can lead to the co-construction of extended conceptual understanding (Hong & Trepanier-Street, 2004). Although digital media hold potential for influencing learning, there is less consensus about the characteristics and conditions required for effective use.

This presentation describes the media integration model employed and assessed across these studies, and the challenges associated with RCT design to build knowledge about the impacts of digital media on early learning.

### **Study Objectives and Findings**

All studies targeted children and families from preschools serving low-income communities in New York City and San Francisco Bay areas where 50% or more of families were eligible for subsidized child-care. Children were pre- and post-tested individually using study-specific assessments.

Study 1: Early Literacy Focus, Preschool

This study design assumed that providing children unstructured access to high-quality digital media during the study period was unlikely to impact learning in a measurable way; rather, young children need repeated, purposefully scaffolded exposure to the resources. Thus, our study tested the use of resources in the context of classrooms. The study included 398 children in 80 classrooms, and examined how digital media could support early literacy. Participating teachers were randomly assigned to implement a 10 week media-supported literacy (intervention) curriculum supplement, or a 10-week media-supported science (counterintervention) curriculum supplement (a counterintervention was implemented in order to mitigate effects of the digital media). Before randomization, classrooms were observed and stratified by a literacy environment observation tool (ELLCO, Smith et al., 2008) score. The study used three assessments: Subtests from the Phonological Awareness Literacy Screening measure; a measure of children's knowledge of story and print concepts; a researcher developed measure to capture children's knowledge of letters in their own name. Researchers provided teachers with technology, initial training with study resources and ongoing coaching.

Children in the literacy condition made greater gains than comparison children on four of five measures of early literacy including letter naming and letter sound recognition, (WWC Quick Review, 2010). Findings suggested digital media can support learning, but did not fully address questions about effects of technology on student outcomes.

#### Study 2: Early Mathematics Focus, Preschool

This study included 966 children in 87 classrooms who participated in a 10-week RCT study. The study explored how digital media could enhance mathematics teaching and learning in preschools and included three conditions in an effort to address concerns raised following our first study. Conditions included: a Math Supplement condition (classrooms received interactive whiteboards and tablet computers, instructional support, and a classroom curriculum supplement to guide teacher's integration of technology); a Tech Only condition (classrooms received the same technology and instructional support mentioned above, but no classroom curriculum supplement); and a Business As Usual condition (teachers engaged in their typical mathematics activities). Outcomes included the Research-based Early Mathematics Assessment (REMA) Short Form, and a researcher-developed Supplement Based Assessment (SBA) that aligned with the mathematics targeted in the digital resources.

Children in the Math Supplement condition learned more of the targeted early mathematics skills as measured by the SBA, compared to children in Tech Only and BAU conditions. There were also marginally significant changes on the REMA that were

consistent with results from the SBA. This study needed to examine new media for the client, but built on the prior RCT by disentangling the technology from the media resource. Results suggested that use of digital media in classrooms can have positive effects. While encouraging, initiative partners were concerned that these findings did not address the environment where RTL resources are used most: in homes.

### Study 3: Early Mathematics Focus, Home

The third study explored how family engagement with children's digital media resources over 12 weeks influenced children's mathematical and approaches to learning (ATL) skills. The study included 197 children, recruited from preschools, and took place in homes. Families were randomly assigned to one of two study conditions: the PBS Kids treatment group was provided with technology (tablet and laptop) and a researcher-developed curated media experience including sequenced videos, games and offline activities addressing mathematical and ATL skills; the BAU condition families continued their typical home behaviors and practices. The study included a researcher-developed assessment of target math skills addressed in the intervention; and a Math Concepts and Problem Solving Checklist completed by the participant's preschool teacher.

Children in the intervention learned more mathematics skills related to ordinal numbers, spatial relationships and 3-D shapes, compared to BAU children, suggesting that digital media holds promise for supporting learning in homes, and that future studies should examine the scalability of this approach.

### **Conclusion**

These three studies provide evidence that the developmentally appropriate use of technology and digital media can have positive effects on young children as well as their parents and teachers. The proposed presentation will discuss this evidence, in conjunction with researchers' approach to thoughtfully integrating technology within a child's life, as well as within the parameters of an RCT.

## References

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