# Media-supported early math learning

## Results of a randomized control trial


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### Introduction

The goal of this study was to examine how technology and media can enhance mathematics teaching and learning in preschool. The target population was children at risk for academic difficulties due to economic and social disadvantages. We conducted a 10-week RCT integrating digital media with traditional hands-on activities to support early math teaching and learning with 699 children in 86 pre-K classrooms in the New York City and San Francisco Bay areas.

### Three-condition randomized control trial

| Condition | Transmedia Math Supplement | Technology & Media | Business-as-Usual |
|---|---|---|---|
| Math Instruction | 10-week PBS KIDS Supplement integrating digital and hands-on materials | Math as usual | Math as usual |
| Technology | IWB + laptops + Internet access + tech support | IWB + laptops + Internet access + tech support | Technology as usual |
| Media | Selected PBS KIDS videos and games | Teacher-selected | N/A |
| Professional Development | Math + technology training and coaching | Technology training and coaching | Post-hoc PD |

### Data Collection

*Child Outcomes*

- Pre- and post- standardized and supplement-aligned assessments of early mathematics

*Teacher Outcomes*

- Pre- and post- teacher surveys

*Implementation Outcomes*

- Observational data on the quality of instruction and fidelity to the Supplement
- Weekly teacher and coach logs

### Research Questions

1. What is the impact of the Transmedia Math Supplement and Technology & Media experience on young children's mathematics learning?
2. What is the impact of the Transmedia Math Supplement and Technology & Media experience on teachers' attitudes and beliefs about early mathematics education, and using technology and media to support mathematics learning?
3. To what extent do teachers in the Transmedia Math Supplement group implement the curriculum supplement with fidelity?
4. What are the successes and barriers, if any, that teachers in the Transmedia Math Supplement group encounter while implementing the curriculum supplement?

## Findings

### Child Outcomes

- Children in the Transmedia Math Supplement condition had significantly higher scores on the Supplement Based Assessment than children in the Business as Usual condition (1.51 points, g = 0.24, p<.001) and the Technology & Media condition (1.43 points, g = 0.22, p<.001).
- Children in the Transmedia Math Supplement condition had marginally significant higher scores on the standardized math assessment than children in the Business as Usual condition (1.09 points, g = 0.15, p=.064) and the Technology & Media condition (1.09 points, g = 0.15, p=.056).

### Summary of transmedia math supplement impact

| Impact Contrast | Coefficient | Std. Error | Hedges' g (Effect size) | p | Multiple Comparison Test* |
|---|---|---|---|---|---|
| **SBA** | | | | | |
| (1) PBS KIDS Transmedia Math Supplement vs. Business as Usual | 1.51 | 0.302 | 0.24 | <0.001 | Significant |
| (2) PBS KIDS Transmedia Math Supplement vs. Technology & Media | 1.43 | 0.288 | 0.22 | <0.001 | Significant |
| **REMA** | | | | | |
| (1) PBS KIDS Transmedia Math Supplement vs. Business as Usual | 1.09 | 0.589 | 0.15 | 0.064 | --- |
| (2) PBS KIDS Transmedia Math Supplement vs. Technology & Media | 1.09 | 0.571 | 0.15 | 0.056 | --- |

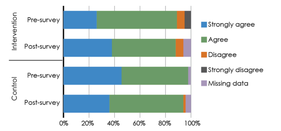
*Note: thresholds for statistical significance adjusted for six pair-wise comparisons using the Bejamini-Hochberg False Discover Rate procedure.

### Teacher Outcomes

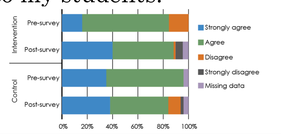
Teachers in the Transmedia Math Supplement condition reported significant changes in their confidence and comfort with early mathematics concepts and teaching with technology. They also reported greater increases in their understanding of the concepts of number/operations and geometry relative to Business as Usual teachers (p<.05).

### Teacher agreement levels with the following statements

I understand the concepts of numbers and operations as they apply to my students.




I understand the concepts of geometry as they apply to my students.




### Implementation Outcomes

- Teachers in the Transmedia Math Supplement condition generally implemented the Supplement as intended, using the distinctive features—the warm-up and wrap-up, the video and book-reading pause points, and the instructional strategies emphasized in the PD.
- Teachers had challenges using digital resources and fitting activities into the daily schedule. Notably, teachers in the Technology & Media condition received more on-site coaching support than did teachers in the Transmedia Math Supplement condition.

**Conclusions** As the centerpiece of a curricular supplement, transmedia can advance mathematics learning for young children from economically disadvantaged backgrounds, who are often less prepared for kindergarten than are their more socially and economically advantaged peers. Curriculum materials can be a powerful support for integrating technology and media into existing routines.


This research is part of the Ready To Learn initiative, which is a multi-year partnership between the U.S. Department of Education, the Corporation for Public Broadcasting (CPB) and the Public Broadcasting System (PBS). The contents of this poster were developed under a cooperative agreement from the U.S. Department of Education (Award No. U295A1005), but these contents do not necessarily represent the policy of the U.S. Department of Education, and you should not assume endorsement by the federal government.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