Early Mathematics Education For All:
Evaluation of an Intervention Using Multiple Methodologies and Outcomes

Symposium Justification

This symposium will include three studies, using different methodologies and outcome measures (mainly mathematics, but checking language and literacy outcomes as well), all of which (a) evaluated the same early childhood mathematics intervention and (b) focused on issues of fidelity and dosage. The session chair will introduce the session, authors, and studies, as well as briefly describe the intervention, including its theoretical and empirical bases.

Presentation 1's researchers used data from a large urban public prekindergarten program to examine the impact of attending a prekindergarten program that implemented the mathematics intervention at scale across an urban public school district on children’s mathematics, language, literacy, executive function and emotional development. They examined teacher characteristics predictive of fidelity-to-curriculum and dosage and whether higher fidelity-to-curricula and dosage were associated with higher student outcomes. The program had small-to-moderate impacts on all examined child developmental domains. Having a Bachelors degree in Early Childhood Education was positively related to dosage and fidelity-to-curricula. Preliminary path models indicated that dosage and fidelity-to-curricula were not significant predictors of children’s outcomes within the treatment group, nor was teacher quality.

Presentation 2 will review the overall treatment effects from a large-scale randomized trial of the math intervention, and then focus on the examination of the effects of the specific student-related technology component on children’s math learning. Linear mixed models were used to predict children’s spring achievement based on the amount of time they spent on the computer activities. Independent models were run for each outcome measure, controlling for child demographics (gender, race/ethnicity, disability status, and age), as well as pre-test score and the interval between assessment sessions. Even after accounting for the overall quality of the mathematics environment, results showed that time on the computer still significantly predicted children's outcomes on all four math measures. This finding is particularly important because the children in the study were all from at-risk backgrounds.

Presentation 3 will similarly will review the overall treatment effects from a different large-scale randomized trial of the same math intervention in two cities, and then focus on the examination of the effects of the technology component on children’s math learning, with a focus on fidelity of implementation and dosage. Previous reports revealed statistically and practically significant effects of the intervention in mathematics outcomes (effect size, .72) and language (effect sizes ranging from .13 to .29), but not literacy (letter naming). Observational measures of fidelity and software-collected dosage were positively and significantly impacted child test scores, but other measures (mentor reports, teacher logins, or percentage of software modules assigned by the teacher) did not have a significant impact beyond those measures.

The discussant, Christopher Hulleman, will critique these perspectives and presentations, offering commentary on how the individual presentations and the common themes advance our knowledge of causal relations important for educational effectiveness.

First and second choice of conference section: First choice: Track 1, Early Childhood Mathematics and Science Education; Second choice: At-Risk or Underserved Learners in Mathematics and Science
Presentations

Introduction

Douglas H. Clements (clements@buffalo.edu, SESSION CHAIR), University at Buffalo, SUNY

Presentation 1:

Christina Weiland (PRESENTER and CONTACT) (christina_weiland@mail.harvard.edu), Hadas Eidelman, (hadas_eidelman@mail.harvard.edu), Hirokazu Yoshikawa (hirokazu_yoshikawa@gse.harvard.edu), Harvard University

"A Regression Discontinuity Analysis of the Impact of Building Blocks in an Urban Public Prekindergarten Program and Associations between Fidelity-to-Curriculum and Child Outcomes"

Presentation 2:

Karen Anthony (PRESENTER and CONTACT) (karen.anthony@vanderbilt.edu, Amy Holmes (PRESENTER) (amy.b.holmes@vanderbilt.edu), Dale Farran (dale.farran@vanderbilt.edu), Mark Lipsey (mark.lipsey@vanderbilt.edu), Vanderbilt University; Douglas H. Clements, Julie Sarama (jsarama@buffalo.edu), University at Buffalo, SUNY; Kerry Hofer (kerry.g.hofer@vanderbilt.edu), Carol Bilbrey (carol.bilbrey@vanderbilt.edu), Elizabeth Vorhaus (elizabeth.vorhaus@vanderbilt.edu), Vanderbilt University

"The Effect of Time Spent on Mathematics-Related Computer Activities on Children’s Achievement Outcomes in Pre-Kindergarten"

Presentation 3:

Julie Sarama (jsarama@buffalo.edu, PRESENTER and CONTACT), Douglas H. Clements (PRESENTER) (clements@buffalo.edu), Mary Elaine Spitler (mspitter@buffalo.edu), University at Buffalo, SUNY; Christopher B. Wolfe (cwolfe1ster@gmail.com), Indiana University - Kokomo

"Measurement of Fidelity of Implementation to a Core Technology Component and Effects on Outcomes in an Early Mathematics Intervention"

Discussant:

Christopher Hulleman <hullemcs@jmu.edu>