EDataSci

Effects of Blended Instructional Models on Math Performance

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About EDataSci

EDataSci is a research firm in education and other sciences. Senior Director Jeff McLeod holds a doctorate in quantitative methods in education and psychology. He is certified by WWC as a research reviewer under version 4.1 standards. He has over 20 years of experience as a senior psychometrician in high stakes testing programs and has consulted on a variety of outcome studies in education, psychology, and health sciences. LinkedIn page www.linkedin.com/in/jeff-mcleod-EDataSci

ESSA Tier 2 Evidence for Blended Instruction in Mathematics

Instructional interventions for K-12 children should be founded on a body of experimental evidence. The Department of Education instituted the What Works Clearinghouse which provides standards for the quality of such evidence for interventions.

Blended learning interventions implement both face-to-face direct instruction and educational technology as a complement to what is learned face-to-face. The technology component is considered an enhancement to direct instruction rather than a supplement.

The study presented here is a well-executed, large-scale investigation published by Bottge et. al (2011). It involved an implementation of blended learning for mathematics composed of face-to-face instruction on declarative math knowledge, i.e., recognizing facts, definitions, and concepts, augmented by computer-based, situated activities at a higher cognitive level that *applied the concepts* to real-life situations that the students were already familiar with.

The essential intervention used in this study depends on representing math concepts in engaging interactive media and providing multiple practice opportunities. The theory of effect is the understanding that this approach would facilitate working memory which is particularly important for low-achieving math students.

Effectiveness for the intervention was defined by math achievement tests.

Seventh grade students (N=335) from 31 middle schools participated in the study. The schools were randomly assigned to the blended learning condition or the comparison condition consisting of adherence to the regular school math curriculum. Students in

the study were selected because they had demonstrated difficulty in acquiring math knowledge. The length of the intervention was 2 years with measurements taken after the second year.

Results showed:

- An average increase for the blended learning condition of 17 percentile points in computation of fractions as measured by the Iowa Test of Basic Skills.

- Significant increases were also detected for fractions (34 percentile points) and problem solving (15 percentile points) but these are not part of the Tier 2 evidence.

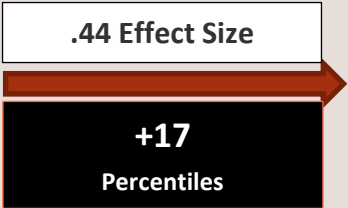ASU Prep Digital Academy offers blended learning implementations with a curriculum.

Alignment of Intervention Features

Feature	Tier 2 Study	ASU Prep Digital Academy
Computer-based activities to enhance direct instruction	X	X
Engaging multimedia materials to illustrate application of what is learned	X	X
Media implements Interactive curriculum	X	X
Multiple practice opportunities	X	X

Features of ASU Prep Digital Academy are those incorporated into the online Exact Path instructional design.

This Tier 2 evidence is germane to any educational context that reliably replicates the essential approach of blended learning and therefore one might expect positive results from blended learning with ASU Prep Digital Academy.

Tier 2 Evidence for Blended Learning in Mathematics

ESSA Criteria for Tier 2 Evidence	Study Characteristics of Mathematics Blended Learning vs Classroom
Well-designed and implemented experimental study that meets WWC standards with reservations.	Randomly assigned 31 schools with 350 children in 7th Grade math classrooms to a treatment (blended) and control (classroom only) condition. Treatment was blended learning. Outcomes were (1) Iowa Test of Basic Skills – fractions and problem solving, and (2) research-developed outcome measures which were not counted toward Tier 2 evidence.
Statistically significant positive effect on a relevant outcome.	1 statistically significant positive outcome. Blended Learning Fractions **.44 Effect Size** **+17** **Percentiles**
No strong negative findings from experimental or quasi-experimental studies.	Authors reported this large scale study was a culmination of a series of pilot studies which also showed significant positive outcomes.

Bottge, Brian A., Xin Ma, Linda Gassaway, Michael D. Toland, Mark Butler, and Sun-Joo Cho. (2014). Effects of Blended Instructional Models on Math Performance. *Exceptional Children*, *80* (4), 423–37.