Registry of Efficacy and Effectiveness Studies

Study Title:
Efficacy of ASSISTments Online Homework Support for Middle School Mathematics Learning: A Replication Study

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Version History

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Section I: General Study Information

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Study start date: 2017-09-01
Study end date: 2021-08-31

Intervention start date: 2018-08-01

Timing of entry: Prior to collection of outcome data
Brief abstract:
Purpose. Mathematics education continues to be an important focus for national education improvement efforts and more districts are introducing technology as a part of their solution. We propose to conduct a replication study to generate additional evidence of the efficacy of ASSISTments, an online formative assessment platform that was shown to have beneficial impact on student mathematics learning in a prior IES-funded efficacy study in Maine (p < .01, g = .18). The proposed study will be conducted in North Carolina and will go beyond the Maine efficacy study to (a) increase generalizability by means of a more diverse population, (b) expand from an experimenter-selected measure to a state-administered end-of-year assessment, (c) investigate a more typical teacher professional development approach, while addressing the broad need for more replication studies in educational research.

Intervention. Teachers and students in Grade 7 will use the ASSISTments to support their homework. Teachers will assign homework online and receive diagnostic reports to facilitate their review of homework and adapt their instruction accordingly. Students will complete their homework on their computers and receive (a) immediate feedback on their answers to textbook problems, (b) hint messages to help solve difficult problems, (c) Skill Builders that track and adjust to their mastery status of knowledge, and (d) automatic reassessment to help improve their retention of previous mastered skills. Teachers will receive professional development to support their use of the reports as a formative assessment tool.

Control. Teachers in schools assigned to the business-as-usual control condition will use existing the instructional practices and technologies (other than ASSISTments).

Setting and Sample. The study sample will include 56 public middle/junior high schools in the state of North Carolina, with approximately 168 7th grade teachers and 9,000 students. The study is aligned with North Carolina's focus on digital learning and leverage the availability and support for technology in the state. We seek to recruit a sample that matches the diversity of the state. Generalizability analysis shows that by including a representative sample of schools in North Carolina, the population of middle schools in the U.S will be well represented (Generalizability Index = .863, indicating “high”).

Research Design and Methods. The study will use a school-level, delayed-treatment, clustered randomized experimental design to answer a set of research questions about the primary outcome, moderators, mediators, and implementation fidelity. Schools will be randomly assigned to either the treatment or control condition and will be asked to participate for 2 full school years (2018-19 and 2019-20). Data on implementation fidelity and contrast between conditions will be collected in both years.

Key Measure of Outcome. The Grade 7 North Caroline End-of-Grade assessment will be the primary measure of student math achievement.

Data Analytic Strategy. Efficacy will be analyzed using a three-level hierarchical linear regression model of mean differences in Grade 7 achievement between students in two conditions, controlling for prior achievement and other covariates. Moderator analyses will examine the impact of the intervention on the learning of students with low-baseline math achievement, and different race/ethnicity and socioeconomic backgrounds. Mediator analysis will examine the link between student learning outcome and teachers’ use of the ASSISTments reports to inform how they review homework review and target classroom instruction.

Keywords: Homework, Middle School, Mathematics, Replication, ASSISTments

Comments:

Section II starts on the next page.
Section II: Description of Study

Type of intervention: Practice

Topic area of intervention: Education Technology

Number of intervention arms: 1

Target school level of intervention: 7

Target school type: No targeted school types

Location of implementation: United States: South

Further description of location: North Carolina

Brief description of intervention arm: Teachers and students in Grade 7 will use the ASSISTments to support their homework. Teachers will assign homework online and receive diagnostic reports to facilitate their review of homework and adapt their instruction accordingly. Students will complete their homework on their computers and receive (a) immediate feedback on their answers to textbook problems, (b) hint messages to help solve difficult problems, (c) Skill Builders that track and adjust to their mastery status of knowledge, and (d) automatic reassessment to help improve their retention of previous mastered skills. Teachers will receive professional development to support their use of the reports as a formative assessment tool.

Brief description of comparison condition: Teachers in schools assigned to the business-as-usual control condition will use existing the instructional practices and technologies (other than ASSISTments).

Comparison condition: Business-as-usual

Comments: 

Section III starts on the next page.
Section III: Research Questions

Confirmatory research questions:

Question 1
Do 7th grade students in schools that use ASSISTments for homework learn more than 7th grade students in schools that do homework without ASSISTments, as measured by the North Carolina End-of-Grade test?

Question 2
Do the effects of ASSISTments vary for students with different levels of prior achievement?

Question 3
Do the effects of ASSISTments vary for students of different socio-economic status, race/ethnicity, or with other policy-relevant student characteristics?

Exploratory research questions:

Question 1
Do teachers use ASSISTments reports to adjust their homework review and classroom instruction?

Question 2
Do teachers’ adjustments to homework review and classroom instruction mediate the effects of ASSISTments on student learning?

Question 3
Do participating schools implement ASSISTments as intended by the developer? How much usage occurs? To what extent is each ASSISTments feature used? What are the effects of implementation fidelity and dosage on learning?

Comments:

Section IV-A: Study Design (Selection)

Study Design:
Randomized Trial (RT)

Comments:

Section IV-B starts on the next page.
Section IV-B: Study Design (Input)

Unit of random assignment of intervention: School

Assignment within blocks or selected strata: Yes

Define the natural blocks or purposefully selected strata: District

Probability of assignment to treatment the same across blocks or strata: Yes

Probability of assignment to treatment: 50%

Unit outcome data measured: Student

Intermediate clusters between unit of random assignment and unit of measurement: Yes

Description: Teachers

Design Classification:
RT: Multisite (Blocked) Cluster Randomized Trial

Comments

Section V: Sample Characteristics

Approximate number of students per intermediate cluster: 40

Approximate number of intermediate clusters per school: 3

Approximate number of schools in the comparison condition within each district:

Approximate number of schools in the intervention condition within each district:

Number of districts:

Certain students that were targeted for the study: Yes - 7th grade students

Certain students that were excluded from the study: No

Certain intermediate clusters that were targeted for the study: Yes - 7th grade math teachers only

Certain intermediate clusters that were excluded from the study:
Certain schools that were targeted for the study: No

Certain schools that were excluded from the study: No

Certain districts that were targeted for the study: No

Certain districts that were excluded from the study: No

Comments

Section VI-A: Outcomes (Selection)

Confirmatory question 1 - number of outcome measures: 1

Confirmatory question 2 - number of outcome measures: 1

Confirmatory question 3 - number of outcome measures: 1

Comments:

Confirmatory Question 1, Outcome Measure 1

Outcome domain: Student Achievement - Mathematics

Minimum detectable effect size: 0.18

Outcome measure: North Carolina End-of-Grade Test

Scale of outcome measure: Continuous

Normed or state test: Yes

Same outcome measure in treatment and comparison groups: Yes

Confirmatory Question 2, Outcome Measure 1

Outcome domain: Student Achievement - Mathematics

Minimum detectable effect size: 0.18

Outcome measure: North Carolina End-of-Grade Test
Scale of outcome measure: Continuous

Normed or state test: Yes

Same outcome measure in treatment and comparison groups: Yes

Confirmatory Question 3, Outcome Measure 1

Outcome domain: Student Achievement - Mathematics

Minimum detectable effect size: 0.18

Outcome measure: North Carolina End-of-Grade Test

Scale of outcome measure: Continuous

Normed or state test: Yes

Same outcome measure in treatment and comparison groups: Yes

Comments: 0.18 was the originally proposed minimum detectable effect size to IES for the current replication study. It was based on a published results from the original study, using a two-level HLM model. When 3-level model was applied (after the grant was awarded), the effect size from the original study increased to 0.22. Therefore, the team redid power analysis with targeted MDES being 0.22.

Section VII: Analysis Plan

Baseline data collected prior to start of intervention: No

Covariates to include at the student level in the model:
Gender, Free/reduced lunch status, Race, English Language Learner Status, Student Pretest

Covariates to include at the intermediate cluster level in the model:
Aggregate of Individual Characteristics, Aggregate of Baseline Scores, Teacher's background

Covariates to include at the school level in the model:
Aggregate of Individual Characteristics, Aggregate of Baseline Scores, Title I school, type of school

Analytic model:

Plan to handle cases with missing outcome data:
Delete cases with missing data for the outcome being analyzed

Comments:
Section VIII: Additional Materials
Right click to open files in a new window.

Links

No links have been added yet.

Files

File Name: Outcome analysis.docx
Description:

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File Name: Power analysis.docx
Description:

Comments