The effects of online homework on student achievement

ASSIGN BUSTER

Background

The effect of homework on students has been a highly debated issue for over a century. Most American high school students and teachers see mathematics as a regular practice. However, it is constantly being scrutinized for how much to give, how often to give it and what the homework should entail. Typically, a teacher will assign homework during class, and each student will complete the assigned math problems at home. The next day or class, the teacher will review the answers in a full classroom discussion. Students spend a significant amount of time each day doing mathematics homework and reviewing the homework in class. The focus of how homework effects student achievement is an important one given the ultimate goal for a teacher is that the students become successful and make an impact in the world. This study focuses on whether using an online mathematics homework tool affects student achievement in mathematics.

I, Brittney Hamilton, am a Brandman University Master's program student, and I will personally be conducting the research. I am currently enrolled in the Master of Arts in Special Education program at Brandman University, while I continue to complete my teaching credentials at the same university. I received my Bachelor of Science in Child Learning and Development from University of Texas at Dallas. I was raised in Chino, California and am currently working as a behavior therapist and supervisor for students with autism. In the past few years I have observed the curriculum and mandated testing required for high school mathematics teachers, and I have also seen a steady decline in targeted instruction. Through this research project, I hope

to find a solution to the homework epidemic that continues cause much controversy.

Problem Statement

According to student achievement scores, the United States has fallen behind the rest of the world in student success reported by numerous studies. (Baines, 2007). While parents and teachers understand the importance of practicing mathematics, the value of school homework policies sometimes leads to disagreements. One important issue is that students may not receive timely feedback or help as they practice. Timely feedback is better for students than receiving no feedback at all, and conflicting results suggest that immediate feedback may be better (Corbett & Anderson, 2001).

Purpose

The purpose of this study is to determine whether using an online mathematics assistant tool that provides students with immediate assistance and feedback effects student achievement in mathematics. Teachers use a numerous of different homework plans that often occur within the same school or district. Through my research, I have found many studies on the length of homework, the amount of time students should spend on homework, but very few researches have been done to include interactive online assistance. I believe that if students had an online platform to use that assists students while they solve mathematics problems, students will have greater mathematics achievement.

Rationale

The study is important to field of education, more specifically mathematics, for numerous reasons. First of all, majority of teachers will give out some type of homework assignment to their students. Teachers need to be aware of the type of homework they are assigning and the importance of immediate feedback for students. There are good reasons to believe that the online mathematics tool could provide benefits for student learning when the feedback is frequent and as the task level and teachers are prepared to make sense of and use the feedback in an instructionally meaningful manner.

Secondly, as educators, we want our students to be successful and as a nation, we want our students to be comparable to others around the world. This means that we need to keep up on our research to find the best practices that make our students successful. If we do not find the best practices regarding homework, students would be wasting valuable at-home time when learning is critical to student achievement (Pascal et al, 2001).

Definition of Key Terms

Homework: (Defined by Cooper, 1989) “ Any task assigned to students by school teachers that is meant to be carried out during non-school hours” (p. 86).

Homework: (Defined by Keith, 1982) “ The amount of time students spend studying outside of class” (p. 248).

Student achievement: Researchers define either as a student’s score on a standardized test or a student’s grades in their classes

ASSISTments: an online platform that assists students while they solve mathematics problems. Chapter Two: Literature Review

Typically, the purpose of giving students mathematics homework is to provide to the student with extra practice. Previous research and literature reviews show a generally positive or neutral effects for homework on academic achievement (Cooper, Robinson, & Patall, 2006; Maltese, Robert, & Fan, 2012). Research has also found that effects of homework are more positive in middle and high school than elementary school. This is particularly true for mathematics homework (Eren & Henderson, 2011).

While the general consensus of parents and teachers is that practicing mathematics is important, the value of school homework policies is sometimes disagreed upon. One important issue is that students may not receive timely feedback or additional help to complete the homework assignment. The public has debated whether homework increases learning, how homework may affect students’ well-being, and what kind of homework is more effective (Galloway & Pope, 2007). A type of formative assessment includes using collective data of the students’ classwork to give them beneficial feedback and guidance. Meanwhile, the teacher uses the data to adjust instructional learning to meet the student’s needs. Frequent use of formative assessments can improve achievement, particularly when the results are used to adjust instruction (Speece, Molloy, & Case, 2003). Multiple studies have that timely, nonevaluative, supportive, and specific

feedback and guidance are beneficial to students (Azevedo & Bernard, 1995; Shute, 2008). As mentioned earlier, timely feedback is better for students than receiving no feedback at all. An extensive literature review suggested that immediate feedback may be more useful to students for procedural tasks and that delayed feedback may be useful for conceptual or transfer tasks (Shute, 2008).

In another related study, researchers found that when teachers collected answers to mathematics problems from students using networked handheld calculators and used the data to adapt their instruction to fit students' needs had a positive effect (Pape et al., 2012). The studies that found no effect studied interventions that relied on infrequent assessments, such as benchmark tests, and provided feedback across many tasks, and not the task level. However, the intervention used here provides daily feedback to students and teachers, and the feedback is at the task level. Despite mixed results overall, it is logical to assume that a formative assessment could provide benefits for student learning when the feedback is given frequently and at the task level and also when teachers are prepared to use the feedback in an instructionally meaningful manner.

Moving forward, related literature in mathematics education has recommended using technology for formative assessment (Drijvers et al., 2016). The present study was designed with this in mind by researching whether technology could improve student academic achievement by incorporating formative assessment practices related to online homework. While formative assessment has been proven effective, it is not easy for a math teacher to provide every student with timely feedback. However,

technology can provide each student with timely feedback and scaffolding with the problems. It can also provide the student with additional practice opportunities that match a student’s individual needs as set by the teacher. Technology may help teachers to adapt instruction by automatically organizing data that indicate which topics deserve more attention, which students need additional help, and what wrong answers need to be addressed (Roschelle et al., 2016).

The intervention being tested is called ASSISTments (Hefffernan & Heffernan, 2014). ASSISTments is an online platform that assists students while they solve mathematics problems. ASSISTments had shown positive results in previous experiments, but those were relatively short and involved small numbers of teachers (Kelly et al., 2013; Mendicino, Razzaq, & Heffernan, 2009; Singh et al., 2011). Although initial experiments were small in scale, ASSISTments has potential for larger adoption. The ASSISTments approach requires minor changes to school and instructional policies. For example, it is not essential to change the textbook that is used, the degree of homework that is assigned, or the pace and order in which mathematics topics are taught. Interventions like ASSISTments can be delivered at a reasonable cost as long as students have access to the basic technology. Basic technology includes a one to one tablet or laptop computer. Students in this research are all assigned one to one Chromebooks that are allowed to be taken home with the student providing equitable access. As an increasing number of states and regions deploy technology, it is important to understand which intervention programs can leverage the hardware to improve learning (Roschelle et al., 2016).

Chapter Three: Methods

Participants

This research study with conducted with a group of ninth grade students at a high school in Corona, California. The school is a prosperous, suburban school district with a high level of parental and community involvement and support. Students also have been assigned one to one Chromebooks to use for classwork as well as homework. The study consists of five different classes of 175 students; 93 girls and 82 boys. Of these students, 32 of them have IEP or 504 plans that contain additional supports for the students in the classroom. To have comparable data, one class of 35 students will be the control group that will not participate in the ASSISTment online homework help and will be given assignments using the book and related worksheets.

Materials

In order to conduct this study, each student will need to be ensure active use of their Chromebook. Each Chromebook will have the online ASSISTment ready and available. To measure students' levels of achievement prior to intervention, data from previous years state Smarter Balanced standardized testing of math scores and previous grades will be collected. The students will also be given pre and post-surveys regarding their feelings on the effectiveness of the intervention and if they felt there was a relationship between homework and their grade on assessments. The surveys consist of Likert-scale questions, written response questions, and questions where students were asked to check all that applied. The surveys consisted of ten questions. Scores from the end of the year Smarter Balanced standardized assessment along with end of the year grades will also be compared.

Data Collection

Data will be collected through Mixed Method methodology. Prior to the school year beginning, scores from the Smarter Balanced standardized test for the math section was collected. To begin the study, students were trained in the classroom on how to use the ASSISTment online mathematics tool. The teacher went around to each student and watched them perform a problem to ensure each student knew exactly what they were doing. Before the tool was implemented at home for homework, the teacher assigned it as classwork and assisted students as necessary until every student felt confident in completing at home. The following week, students began receiving homework assignments using ASSISTment. Data was collected from September to June, during the academic school year. The control group received homework using the textbooks and related worksheets that aligned with the homework the students were doing online. Usage of ASSISTments were tracked directly via system log files. After each trimester, scores were analyzed and used to determine if the implementation of online mathematics was helping the students. In addition, the students will take a student survey in which they will be asked to state whether they agree or disagree with comments regarding ASSISTment mathematics tool. For example, " I feel more confident completing homework using ASSISTment." There will also be a section at the end for comments in which qualitative data will be collected for positive and negative comments.

Data Analysis

Data would be analyzed through students' scores on the Smarter Balanced standardized tests and overall math grade, which includes multiple

assessments. Scores from the Smarter Balanced standardized tests will be compared to the last year scores in addition to the control groups' scores. The scores will be averaged out and compared. Surveys taken from the beginning of the school year and end of the school year will also be compared to determine if students' opinions changed after the intervention. Positive and negative comments will be taken into consideration. I assume that the students who choose to be active participants on ASSISTments who struggled in math prior to the intervention, will see a greater benefit in academic achievement. I also assume that when compared to the control group, scores will be higher for the students who using the online homework intervention. Ultimately, the intervention has potential for wider adoption to test across the United States.

Chapter Four: Discussion

Limitations of the Study

There are several limitations of this study. First, the adopted school for the study provides Chromebooks to all students. Other settings might have less or variable access to this type of technology. Inequitable access to technology might result in smaller effects. Given the technology, some students may not have access to Internet at home. This may affect results. The school is also located in a suburban area, results may vary on location. The study was convenience-based, which means I was only able to include four classes to participate. Normally, a larger sample is desired as results can be measured across grade levels, school progress, district progress, state progress, and nation-wide progress. Finally, the newness of the ASSISTment online mathematics may be a limitation. Students had been

accustomed to completing their homework through the traditional textbook and paper. Some students may have trouble transitioning to the new method.

Possible Outcomes

Possible outcomes for this study result in either a positive effect on academic achievement or a negative or neutral effective on academic achievement. Results for the first outcome suggest that as compared with the control group, achievement was higher in the classes that used the online homework intervention embracing ASSISTments. In addition, the intervention provided a greater benefit to students with lower, rather than higher, prior mathematics achievement. Outcomes through student surveys indicate that students had a positive attitude towards the intervention. Student surveys suggest the intervention was beneficial and increased overall homework completion.

The second outcome suggest that when compared with control group, achievement was equal to or lower in the classes that used the online homework intervention. Through student surveys, results indicated that students did not like the ASSISTments homework intervention and felt as if in inhibited their progress. Potential related teacher professional development may be needed to diagnose potential difficulties with online homework intervention.

Implications for Teaching and Research

Although there are limitations in this study, the results are important to educators. First off, it is extremely important to be aware of students'

thoughts and feelings towards homework. In this study, students are surveyed prior to the intervention on their feelings towards homework. Expectations of the online mathematics homework intervention will be expressed to students and explained its purpose. Students should know what is expected of them in terms of completing the online homework. If the students are aware of their teacher’s expectations of the online homework at the beginning of year, students will likely benefit from the intervention.

In addition, it is important that future teachers receive adequate training and professional growth from the online intervention. While the researcher was familiar with the intervention, other teachers will need to learn the potential implications of the intervention and how to adjust the settings to meet the needs of each student. Professional growth and development of teachers will allow teachers to work through potential discrepancies or glitches.

Finally, interventions like this one can also bring a new personalized option to schools. While schools tend to have a similar homework policy for all students, teachers can assign mathematics homework to all students using ASSISTments. However, the assignments do not need to be identical as students can show mastery of a content area after a few minutes. These students may benefit from a more intensive approach challenging them to move beyond the lesson. ASSISTments could help math teachers assign some problems uniformly while personalizing some assignments so that particular students have additional opportunities to improve.

Where Could I go From Here?

This research can definitely be implemented to its full potential in the near

future. Prior to completing the research, I would meet with the administration to present my proposal for schoolwide online mathematics homework intervention. My proposal would include professional staff growth and development to teach teachers how to use the intervention. I would also provide tangible evidence as the outcomes of the intervention. Evidence will include the students standardized assessment scores prior the intervention and post intervention. In addition, evidence of assessments done in the classroom will be provided. Finally, administration will have access to the pre-and post- surveys done by the students. Administration will see the positive effective the intervention has had on the students.

If approved, I would reach out to the online mathematics homework intervention ASSISTments to schedule a formal training with a representative of the company. It would be very important that all parties are fully informed and committed to the new intervention program. If we can all work together, the research can be done through a school-wide research. Teachers will be asked to present their students with a survey prior to beginning the intervention as well as a survey at the end of the year. I predict my proposal will be accepted as administration will be blown away by the success of the intervention. If successfully done school wide with positive results, I am hoping to take my research district wide and eventually through multiple districts.

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