Effectiveness of Technology-Based Homework

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Abstract

This study examined the impact of technology-based homework on student performance. A comparison was made using two classes of world history students; one with traditional paper and pencil homework assignments and another using technology. The purpose of this study was to examine the effect of technology-based homework on student achievement as measured by classroom exams. The null-hypothesis was that there would be no significant increase in student achievement on classroom exams because of the use of technology- based homework. Through a convenience sampling of fifty-four tenth-grade honors world history students were chosen for this study; twenty-eight in the control and twenty-six in the experimental groups. The study was done the second semester of the 2013-2014 academic school year in Baltimore County Public Schools. Using an independent *t*-test to examine performances of both groups on the final exam demonstrated a rejection of the null-hypothesis with a significant difference in scores [t(50)=-2.091, p <.05].

CHAPTER I INTRODUCTION

The current student population has been inundated with technology since they were very young. It appears that this population is more capable of digesting information if it is available to them instantaneously via the Internet rather than through physical media such as textbooks and newspapers. After surveying students this past year, nearly all have access to technology outside the classroom. If such technologies could be used to bolster homework/activities, this strategy could help prepare students for in class assessments.

After reviewing the research, which will be examined in depth in Chapter II, there appears to be an increase in student achievement as a result of technology use. The research suggests that if students gain some intrinsic motivation then they might accomplish better results though the use of nontraditional homework (Hwang, Chen, Shadiev, & Li, 2011).

Overview

This study will examine the effects of online homework in comparison to traditional homework on the performance of students on classroom tests. The students will be chosen using a convenience sampling in a world history class the researcher teaches. The research will be a pre-experimental study because of the use of sampling.

The research focus was selected because the current classroom is turning into one where technology is infused throughout course content. To become a 21st century learner means that the students and teachers need to adapt their learning and teaching styles to the ever-changing nature of the advancements in technology. Since the researcher currently works for Baltimore County Public Schools, one of the nation's largest school districts, and they have adapted their

vision to include having students become 21st century learners, it becomes necessary to see if there is any advantage in the use of online homework versus traditional homework.

Statement of Problem

The purpose of this study is to examine the effect of technology- based homework on student achievement as measured by classroom exams.

Hypothesis

There will be no significant increase in student achievement on classroom exams because of the use of technology- based homework.

Operational Definitions

Independent Variable: *Technology- based homework* is defined as traditional homework assignments being accessed, assigned, and completed via a class wiki or other educational tool such as Edmodo. Online discussions are set up to better understand a topic in class. Also, the concept of a flipped classroom can be done by having the students view videos online, comment on them via the class wiki and be prepared to apply them in the classroom.

Online homework is defined as homework that requires access to a class wiki where students must access materials, videos, and online discussions and which will be graded as a home assignment.

Dependent Variable: *Student Achievement* is operationally defined as student performance on classroom examinations.

CHAPTER II

REVIEW OF THE LITERATURE

This literature review examines the link between completed homework assigned by the classroom teacher in a traditional academic classroom and the achievement of students on their classroom assessments. The review will focus on the importance of and need for homework and then examines the difference between traditional homework and technology- based homework assignments. Finally, this review examines methods of technology- based homework assignments that have been successful.

Importance of Homework for Student Achievement

There seems to be a debate in the academic world on the importance of assigning homework for students if those students do not complete it - a disconnection between perceived importance and the actual link to academic achievement level by the student. According to Paschal, Weinstein, and Walberg (1984), homework completion outside of class equates to studying which than correlates to higher achievement on tests. These authors explain that homework takes the place of leisure-time activities such as television and, further, that American students achieve less on tests because of the amount of time dedicated to leisure activities. Once students understand that there is a correlation between homework completion and higher achievement, then students might be more likely to complete homework assignment and buy into their education.

Students need to realize that their success in school and further academic activities beyond the secondary schools into their college years relies on their completing their home assignments. In research authored by Anliker, Aydt, Kellams, and Rothlisberger (1997), motivational strategies were examined that would increase student understanding of the

importance of homework to their academic achievement. They concluded that once students understood that their academic success could be linked to their homework completion, their attitude and scores improved as well as teacher perceptions of those students. In order to enhance students arriving at this conclusion, they need to feel as though their grade will be directly affected by homework completion. Once the buy in by the students is fully achieved, then their success on tests can be linked to their end assessments.

Arora, Rho, and Masson (2013) hypothesized and substantiated that once students are made accountable for graded homework, their test scores improve. In order for this to be the case, students need to feel as though their homework is adequately graded. Once students have this understanding then the likelihood of completing assigned homework will increase.

There may be a variety of teachers, administrators, and parents who have concluded that homework is not necessary because of the potential for cheating or the low completion rates making homework a waste of time for both the educator and the student. Cooper (1989) reported that there were both positive and negative effects when dealing with homework. This author explained that there are five negative effects of homework: (1) satiation or loss of interest, (2) loss of leisure-time activities, (3) parental interference, (4) cheating, and (5) the difference between the high and low achievers. He goes on to state that there are also several positive effects of homework, specifically: (1) immediate achievement and learning, (2) long-term academic effects, (3) non-academic effects such as time management skills, and (4) greater parental appreciation. The key to getting student buy in to the importance of homework is to focus on the positive effects and minimize the negative effects.

Homework is important not only for traditional English- speaking classrooms but also for those who are English as second language learners. Bang, Suarez-Orozco, Pakes, and O'Conner

(2009) examined how homework was beneficial for students who do not speak English as their first language. They concluded that there is a direct correlation between homework completion and student achievement on tests but also on student proficiency with English. This study suggested that homework is not only important for achievement regarding whatever is tested in the course but also in developing necessary skills in order to survive in society.

The importance of homework is nearly incalculable. There is a linear connection between a student's understanding of the importance of the assigned homework and their completion of that homework. Additionally, there is a connection between completing homework and it being graded which has a correlation to student's achievement on class tests. Not only is there a connection between from homework completion and achievement but there is also evidence that there is a link to out-of-class-skills ranging from time management to the learning of a second language.

Traditional Homework versus Technology-Based Homework

Traditional Homework

Until recently, the classroom teacher was limited in the type of homework that they chose to give their students in order to prepare them for upcoming classroom work and tests. Teachers could give students a reading with a worksheet to complete. Students could be required to reflect on a particular topic via pen/pencil and paper or they could complete questions from a textbook. . Students could go to the library and conduct research or complete a physical model of some type for a science classes. These tangible products that students are able to physically hand in to the teacher as evidence of out of class assignments are what are considered to be traditional homework.

There are a variety of positive factors when one assigns traditional homework and there are also various disadvantages. The concept of physically having a reading to hold and mark up for analysis and/or writing out complex mathematic problems to help visualize the core concepts that a classroom teacher wishes their students to practice has merit. After all, this style of homework has worked for generations of students and teachers. A study done by Demirci (2010) focuses on the comparison of physics homework done by a group that was assigned and completed their work online and one that was given their homework using a traditional pen to paper technique. Their findings were that the initial complexity of physics homework, at least at the college level, was best digested by their students if done the traditional way. This study demonstrated that the students in advanced mathematics and sciences might best be served in a way that allowed them student to fully visualize their mapped out word problem via the traditional pen and paper methodology

There are various other homework assignments that a traditional homework approach might be beneficial. When it comes to close reading and analyzing text, it might still be easier for students to focus on a physical document that they are able to write on versus looking at a computer screen. Hwang et al., (2011) suggests that homework is best used when students have the ability to foster, what he calls, metacognitive learning, which he suggests is done through annotations. This researcher further explains that this achievement of metacognitive learning through annotation is best accomplished easiest done through paper-based homework. Even though Wong focuses on mathematics, the idea of annotation can be applied to the other academic courses. Social studies and English classes make use of complex readings that often require close examination in which annotations are most helpful.

In an increasingly technology-based society where students are inundated with laptops, smart televisions, tablets, and smart phones, etc. they have become accustomed to interactions in the online world. This is something that the traditional homework cannot provide,. Students today are being trained by this new media to require immediate feedback otherwise the value of the activity seems pointless. Why would a student sit down at a table and complete their assigned homework when they view it as a physically daunting task when they would rather be surfing the Internet or playing video games? Traditional homework may need to adapt. In Cooper's (1989) article, the negative effects of homework- denial of access to leisure-time activities and cheating - have been presented as reasons why homework is not completed. A lot has changed since 1989 in terms of access to technology. Imagine if cheating was as simple as looking up the answer on the internet and copying it down or the leisure activity might be something as alluring as playing on the new Xbox I.

Traditional pen and paper homework does not have the excitement or immediacy that students have come to expect in their technological lives. Hwang et al., (2011) adequately point out that students have more buy in and learn at a more measureable rate when their homework has immediate feedback given to them. This feedback could be as simple as knowing if their answers are right or wrong, or if they have peer interaction on a writing prompt. Even if the student's metacognitive learning is not fully developed by the lack of annotations the familiarity of the immediate feedback could help foster student completions. Traditional homework cannot give this immediate feedback. This is also expounded upon in another study done by Butler, Pyzdrowski, Goodykoontz, and Walker (2008). These researchers state that the immediate feedback given to students by online homework helps prepare them for classroom achievement.

Technology-Based Homework

As students are increasingly engaged in technology at home, in the classroom, and later in the workplace, traditional homework has become an outdated tool. Students are more likely to focus on the negative effects of homework as previously stated by Cooper (1989), taking away from the student's at- home leisure time. If educators were to somehow integrate their homework using the technology that the students are not only used to using but also associate with their leisure time, then there will more than likely be a change in attitude toward the necessity of homework by those students. For the purpose of this research, anything that is not considered a traditional homework assignment but incorporates the use of a computer, tablet, or even a phone will be considered a technology-based homework.

As stated previously in this review, the traditional style of pen to paper homework does not meet the needs of the modern student. In the study by Hwang et al., (2011) and Butler et al., (2008) the researchers focus on the necessity of immediate feedback on assignments that are given to students to complete at home. With the immediate feedback on being right or wrong as is the case in Hwang's article, or the quiz over the material assigned as in the Butler article, the idea that the utilization of technology at home to help students immediately, provides students in a sense of immediate achievement.

As stated in the opening of this literature review, there is substantial research on the completion of homework and achievement on tests. Adding an online element is just adapting to the changing times. In a study done by Affouf and Walsh (2007), the authors followed over 1600 students over a three-year period completing homework online. They concluded that there is a correlation in the achievement of the online studies and the final examination score for their

algebra course. This conclusion supports the use of online homework to enhance achievement on tests.

New technology- based homework may present issues that need to be addressed before it can fully be an effective tool. As stated by Demirci (2010), complex mathematics and science such as physics may require a traditional pen to paper technique when completing homework. Cooper (1989) also addressed the issue of cheating in regard to technology-based homework.. Examples could include copying and pasting from outside sources, or outright plagiarism. At some future point in the advancement of the technology, these negative aspects may be addressed.

In a study by Jaggars, Edgecombe, and Stacey (2013), the authors looked at the importance of the instructor having an active role in online coursework. They concluded that the students got more out of the home assignments if the instructor was engaging and if the students were having high levels of interaction with both the instructor and their peers via the online activities. Even though this study refers to online courses, the concepts of online homework is similar enough to draw a conclusion that if students do not feel that their time working on these online assignments is not appreciated by others then there would be less motivation to complete them. In an age when technology makes lives of everyone easier it is important to slow down as a teacher and provide meaningful feedback continually so that the students continue to commit to online learning.

Current Methods of Technology-Based Homework

Even though most of the studies examined in this literature review deal with college, mathematics and/or science classes, the findings could definitely be applied to all courses that a typical public school could offer. Lee & Heyworth (2000) focus on a computer tutor program

that can be administered for various subjects. They refer to it as a Homework Administrator and they claim that it can handle the minor tasks that a teacher would normally do when helping students, such as marking student errors and collecting student errors. This study shows that there are programs already developed that can be applied to a variety subjects. If companies were seeing that there was a need for advanced homework programs in the secondary classrooms, then they could offer software that accompanies a curriculum so that a teacher could better assign homework that would help foster better test scores.

If computer programs such as the ones mentioned by Lee et al., are not available might not be available then there are other physical ways that online homework can be fostered. In a study by Treder, Kutash, Duchnowski, Rudo, Sumi, and Harris (1999), the researchers examined the use of laptops in schools and for homework assignments. When it came to homework they found that the use of the technology at home was the strongest predictor of success. By simply having access to technology to complete their homework, students were more likely to gain enrichment from homework and therefore more likely to complete it.

Online homework does not have to be something as elaborate as complex programs designed to determine if the student comprehended a reading by double checking their highlighting skills or even as cumbersome as physically giving them laptops from the school. In a study by Richards-Babb, Drelick, Henry, and Robertson-Honecker (2011) the effectiveness of online quizzes on student achievement were examined. The authors found that quizzes as online homework assignments helped enhance study habits of students but also reduced time on task. Even though this study was done with chemistry students, the effects could definitely be applied to all subjects taught at public schools.

Again, the issue of immediate feedback for students requires repeating. These online course assignments are often done through online wiki's. Since there has been a multitude of success with online courses at the college level there is nothing to stop teachers from setting up online assignments and discussion as was mentioned in the Jaggers et al., (2013) study. Online quizzes, classroom chats, readings, etc. that are necessary for student engagement, buy in, and achievement can be done through these online classrooms done through wiki's.

CHAPTER III

METHODS

The purpose of this study is to examine the effect of technology- based homework on student achievement as measured by classroom exams.

Design

The study is pre-experimental in that the sampling groups were not chosen randomly. The study was done in such a way that there was one control, traditional handwritten homework, and the experimental group that was given the online homework.

The control group was given physical copies of worksheets to complete and turn in for homework credit the next day. These worksheets typically are primary and or secondary sources that the students need to analyze and respond to answer questions.

In contrast, the experimental group was required to register for an online class wiki where assignments were posted periodically for them to complete. A total of 33 assignments were used in this study that included a mixture of YouTube documentaries they were required to watch and respond to in an online post. Students were often required to comment on two other student posts to receive full credit for homework. There were also similar homework assignments that the control group received but which were submitted electronically rather than the next day in class. Online quizzes and web-quests were also a part of the class wiki.

Participants

Since this is a convenience sampling of the researcher's first and second period honors world history classes, there were not many options in choosing participants. The first period honors world history class became the control group and the second period honors world history class became the experimental group.

The control group started out with twenty-nine students, one of whom left the study due to expulsion. Of the remaining twenty-eight students, twelve were male (44.4%) and sixteen were female (55.5%). Seventeen students were African-American (62.9%), eight were Caucasian (25.9%), two were Hispanic (7.4%), and one was Asian (3.7%).

The experimental group started out with twenty-seven students and three were withdrawn due to rescheduling of classes or moving out of the school's district. Two students were added midway through the research bringing the total to twenty-six students. Of the twenty-six students thirteen were male (48%) and thirteen were female (52%). Thirteen students were African-American (48%), ten were Caucasian (40%), two were Hispanic (8%), and one was Asian (4%).

Instrument

The instrument in this study was developed by Baltimore County Public School's, Secondary Office of Social Studies. It was the final exam issued to all tenth grade world history students in the county. The exam was developed and approved by the county. An examination of the assessment shows face validity in that it measures world history content. Official reliability and validity information was unavailable.

Procedure

The research began at the start of the second semester of the 2013-2014 academic school year specifically on January 22, 2014. The control group did not receive any special instructions and was given homework and tested as it was during the first semester. This was accepted without question by both classes. The experimental group was taken to the computer lab on the first day of the second semester to register for the class's new online wiki. After 100% of the students registered, they practiced posting assignments and responding to online posts. It took a

few weeks of prompting students in the experimental group to check the wiki in class then they were left to check the wiki on their own without prompting. Assignments were completed with varying frequency, but the majority of the class completed the online assignments on time.

CHAPTER IV

RESULTS

The purpose of this study was to examine the impact of online homework versus the traditional paper and pencil homework assignments. The study was conducted the second semester of the 2013-2014 school year with 54 high school sophomores. The control group, consisting of 28 students, was given traditional homework assignments and the experimental group, consisting of 26 students, was given their homework electronically. The null hypothesis of this study was that there would be no significant increase in student achievement on classroom exams because of the use of technology- based homework. After examining the data from the final examination given in class the following are the results.

An independent *t*-test was run to examine performance of both groups on the final exam. Results showed a significant difference in exam scores [t(50) = -2.091, p <.05]. The experimental group performed better on their exams. The null hypothesis was rejected.

Table 1.

Group	Exam Score
Control	62.81 (12.34)
Experimental	69.52 (10.62)

Means and Standard Deviations of Exam Scores by Group

CHAPTER V

The purpose of this study is to examine the effect of technology- based homework on student achievement as measured by classroom exams.

DISCUSSION

The results of the research rejected the null hypothesis and shows that there is a significant difference in the exam scores from those who used traditional homework to those who used technology- based homework.

Implication of the Results

Since there is evidence that the use of technology- based homework assignments can increase test scores on final exams educators should seriously consider the use of online discussions, electronic access to homework, and any other technology- based system created to help teachers and students achieve. There are various websites that can be utilized that make it easier for both teachers and students to have access to online resources and discussion boards. Edmodo, classroom wikis, blackboard are just some of the websites available for teachers and students to utilize. Since the results of this study show that there are significant differences in the test scores between the experimental and control groups, [t(50) = -2.091, p <.05], on top of the increasingly aggressive school initiatives to use technology in education, homework is a perfect opportunity for educators to increase student involvement, exam scores, and implement school led initiatives.

Threats to Validity

Even though this study shows that there is a significant difference in exam scores between the control group using the traditional homework and the experimental group using technology- based homework there are several threats to the validity of this research. Threats

include sample used, limited amount of time used for research, and the testing of each sample group.

The two classes and students used in this study were not chosen by random but were instead chosen by convenience. The identification of subjects was drawn from the researcher's classes. Both classes were an honors world history and the majority of the students were sophomores. In the control group there were 3 out of 28 students that were not sophomores and in the experimental group there were 4 out of 23 students who were not sophomores. Some of the students in the experimental group failed world history on the gifted and talented level and were placed this year in the honors world history to complete the credit. Honors level is a less rigorous class than gifted and talented, those students were already introduced to the same content just at a more rigorous level. This could help account for the higher test scores. Another issue with the sample was the control group was during the first period of the school day that tended to see large amounts of students tardy and thus miss critical instruction. Four of the students in the control group had already failed the course the year before taking the final examination and thus might not have tried to take the test seriously. Another student in the control group was suspended during the final exam and had to take it during the make-up sessions several days later that could elicit less motivation.

The amount of time and the type of exam used for the purpose of this study could cause some issues with the results. It was not until the second semester of the 2013-2014 school year that the researcher implemented technology- andbased homework for the experimental group. A way to make this a more valid study would be to use a larger sample size, randomized students/classes, and implement technology- based homework the entire academic school year.

The last issue with the validity of this research is the testing itself. Without a pre-test, there is no way of knowing if the control and experimental groups were of similar ability at the start of your study. This makes interpretation of results challenging. Also, since the exam used in the study was that created by Baltimore County Public Schools there is not any official reliability or validity information was unavailable.

Connections to Literature

Chapter II of this study explained that there was little research done on specific high school technology- based homework and achievement on final examinations. The studies either discuss how homework helps increases the chances of enhanced student achievement on tests (Paschal et. al, 1984) or it shows why students have a lack of motivation for doing work outside of class as was discussed by Anliker et al., (1997) and Cooper (1989) dealing with student understanding of importance of homework and reasons why students have a negative outlook on homework.

The types of research done do show and are further confirmed by this study that students are around technology so much that the motivation to complete their homework online or through some other technology- based technique is higher. The lag in the time students get feedback greatly diminishes as was discussed by Hwang et al., (2011) and Butler et al., (2008) dealing with achievement using programs that give immediate feedback.

In a study by Jaggars and Stacey (2013), the authors looked at the importance of the instructor having an active role in online coursework. These authors concluded that the students got more out of the home assignments if the instructor was engaging and if the students were having high levels of interaction with both the instructor and their peers via the online activities.

The students in the experimental group received feedback and grades for their technology- based homework assignments in this study that speaks to the findings of Jaggars et al., (2013).

The difference in this study versus the previous studies presented in Chapter II is that this one focuses on the specifics on homework. This study focused on technology- based homework and how it increased the achievement of students on the final examination. Other studies focused on the necessity of homework, specific programs, the need for immediate feedback, and college-level achievement. This study focused on high school.

Implications for Future Research

There is a lack of research concerning specific high school students' ability to utilize technology- based homework assignments and how it links to both intrinsic motivation and ultimately achievement on exams. Since there are studies dealing with achievement on the collegiate level, there needs to be more done on high school achievement. There also needs to be more research done on the types of technology- based homework assignments that give the best results.

The results of this study show that there is a significant difference between those who used traditional homework and their achievement on tests and those who used technology- based homework and their achievement on tests. Since there were various limitations to this particular study, there is a necessity for more research to be done to address the limitations. A larger sample size with students who have been tracked over a longer amount of time combined with a pre-test that could determine if the students of both the control and experimental groups started off at the same level of achievement would correct the limitations of this study.

Conclusion

There is still a necessity for more research to be focused on the contribution that technology-based homework can make to student achievement on final examinations. This study does show that there is a significant improvement in scores between the control group that used traditional homework and the experimental group using technology- based homework. The experimental group's achievement indicates that educators need to utilize some type of homework system that uses technology and that the traditional paper and pencil homework assignments do not appeal to the learning abilities of twenty-first century learners.

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