The Impact of Technology on Student Achievement

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Abstract

The purpose of this study is to examine the impact of technology on achievement in American Government. The hypothesis is that technology will have no impact on student achievement. A quasi-experimental design was used. The data from the research suggests that technology had no impact on student achievement. Both the control and treatment group achieved similar results.

CHAPTER I

INTRODUCTION

The purpose of this study is to examine the impact of technology on achievement in American Government. By using a quasi-experimental design, two groups of students will be measured on achievement. The control group will receive lessons based on textbook readings and Baltimore County curriculum resources. The experimental group will receive lessons based on technology. A pre-test and post-test will be administered to measure which group's achievement was greater.

The researcher, a high school American government teacher has seen students engage more in activities that use technology as a tool for instruction. As school shifts to students using computers and not pencil and paper, it is important for students to become masters at using technology in order to make them skilled in a competitive world.

As the world becomes more dependent on technology for everyday life schools have had to adjust as well. Districts around the country are attempting to give students access to computers in every class. Educators are being encouraged to use as much technology as possible to help increase students' cognitive ability. Studies differ on whether technology has an impact on student achievement. Studies have shown the correlation between online discussion forums leading to achievement (Chang, Chen, Cheng, Lin, Liu, & Sung, 2013), while other studies have shown no increase in social studies classes from the use of technology (Kingsley & Boone, 2006). Many students have a smart phone which is a tool they are familiar with and is like having a computer in their hand. In addition to their smart phones, laptops and tablets have become a part of everyday life for students. This study will explore the use of the following technologies to improve student achievement Interactive Whiteboards, Icivics lessons, Board Builder, Kahoot!, and various videos embedded into Microsoft PowerPoint.

<div align="center">**Statement of the Problem**</div>

The purpose of this study is to determine whether the use of technology will have a significant impact on the academic achievement in American Government.

<div align="center">**Hypothesis**</div>

The use of technology will not demonstrate a significant improvement in the academic achievement of American Government students.

<div align="center">**Operational Definitions**</div>

Academic Achievement:

Students take two unit exams developed by the researcher. The unit exams will use questions from the Government HSA. The difference in the two scores will be used to analyze student achievement in American government.

Government HSA: Required test by the state of Maryland to prove proficiency in American Government.

Technology: The application of knowledge, equipment, machines, tools, techniques, and methods to solve problems.

Kahoot!: Online assessment tool.

ICivics: Online curriculum that has interactive lessons.

Interactive Whiteboard: An interactive whiteboard is an instructional tool that allows computer images to be displayed onto a board using a digital projector. The instructor can then manipulate the elements on the board by using his finger as a mouse, directly on the screen.

Board Builder: Presentation tool for students to either view lessons or create projects.

CHAPTER II

LITERATURE REVIEW

After the No Child Left Behind legislation was passed in 2001 schools have had to enhance education through the use of technology (U.S. Department of Education, 2001). Baltimore County Public Schools through Blueprint 2.0 has adopted polices to meet the goals of the federal government. Under Blueprint 2.0 Baltimore County Public Schools is to, "Ensure a learner-centered, personalized, blended environment powered by digital learning and interactive curriculum access that is flexible anytime and anywhere." (Blueprint 2.0 ... Our Way Forward, 2015). This literature review will examine the effects of technology on educational achievement. The first section will examine the types of technology being used in the classroom. The second section of this literature review will look at if technology increases achievement. The third section will examine the impact of technology on engaging students. The final section will compare textbook lessons to technology based lessons.

Types of Technology Used in the Classroom

Not all technology can be used in the classroom. The technology must have a purpose and students must be able to use it. A common website used by American government teachers is icivics.org. This website has engaging games that students enjoy. Web-based applications are being used more in school because the results show more achievement for the students (O'Bannon & Britt, 2012). Google Earth is another form of digital technology being used in the classroom (Guertin, Stubbs, Millet, Tsan-Kuan, & Bodek, 2012). Using this can engage students in learning about different regions of the world.

Some web based tools can have a negative impact on student learning (Kay, 2014). If the web-based learning tools chosen are difficult or distracting for students their achievement actually drops. Students' achievement also will not increase if the online web-based learning

tool is too juvenile or easy for them. Good quality web-based learning tools when aligned with good lesson plans leads to higher student achievement. Web-based learning tools that make students create their own questions are the most effective for student achievement. Students were more engaged when they were able to use a student response system (Lumpkin, Achen, & Dodd, 2015). Students were able to answer questions anonymously and therefore would not be nervous to answer orally in fear of rejection. This made students feel more comfortable in class and led to better discussions.

Interactive whiteboards are another new form of technology being used in classrooms, though with mixed results. The positives seen from interactive whiteboards were that the classroom environment was seen to be better in rooms that had interactive whiteboards as compared to the classrooms that did not (Schipper & Yocum, 2016). The interactive whiteboards were able to be used to address the multiple intelligences that can improve the learning environment. The features of the technology, when used effectively, were shown to be engaging the students and encouraged interaction and collaboration. The negatives seen from interactive white boards were school districts are paying thousands of dollars to the purchase of these whiteboards but little effect is being seen. The use of interactive whiteboards does little to impact student achievement. While the classroom environment is improved by having interactive whiteboards the real question is whether schools should be investing in a product that is not showing student achievement. It is also fair to questions how teachers are using this piece of technology. Some veteran teachers do not know how to use the interactive whiteboards and have very little training on how to use them effectively

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How Can Technology Increase Student Achievement

The main goal for school districts around the world is to have students achieve and reach the goals of the districts. Baltimore County Public Schools uses computers to provide a learner centered environment where students should enhance their education (Blueprint 2.0 ... Our Way Forward, 2015). There is research that shows technology does increase student achievement when used appropriately. Chang, et al. (2013) found that students who used Online Discussion Forums performed better on the final exam than students who did not. Math classes have found that students who use digital lessons instead of standard lessons will increase achievement and retention (Ozerbas & Erdogan, 2016). When digital curriculum is used it is more attractive visually for students and engagement is higher. A reason for the achievement could be the familiarity students had with the computers. Eyyam and Yaratan (2014) found that students were able to increase math scores by using a digital math curriculum compared to a standard curriculum.

Wilder and Berry (2016) found that student academic achievement was the same when comparing technology based lessons in a math classroom. Students in American history had little difference in posttests scores after using a software program (Kingsley & Boone, 2006). The group that used the software program improved their scores by 12% while the control group improved theirs by 6%. Wilder and Berry (2016) found that while students' scores were the same regardless of groups the retention of the students who used the digital curriculum was higher than students that did not use the curriculum.

Technology and Student Engagement

Common knowledge amongst schools is that technology engages students more. Math resources do keep students more engaged on the lessons as they work (Kingsley & Boone, 2006). These programs are more stimulating for the students because they are more interactive than just using pencil and a paper to complete math problems. Technology can be used for students so they can show their knowledge in various ways. They can create a blog or wiki in order to be assessed (Friedman & Heafner, 2008). Engagement is one of the main jobs of a teacher because if a student is engaged and interested in the content then he or she is more likely to learn and retain the information. When using technology as a tool for learning students were more engaged and learned more when they worked by themselves on projects (Bai, 2009). Students also collaborate more when using technology based lessons (Schipper & Yocum, 2016). Students discuss answers and ask questions to their colleagues about content they do not understand. The technology being used must be relevant and on par with the cognitive abilities of the students or they will not be able to achieve (Bai, 2009).

Studying current events is also a strategy to engage students (Virtue, 2007). Students can research current events by using technology and comparing it to the environment they live in. Making the content connect to the students' world is another way to engage while using technology. A student can uses various web tools to engage in content (Guertin et al. 2012). Students also expect engaging lessons instead of standard lectures (Lumpkin et al. 2015). Students want the infusion of technologies to help them learn and enjoy the process of learning, rather than having to listen exclusively to lectures. Yazedjian and Kolkhorst (2007) argued that unless students were forced to break out of the routine lecture of large classes, many of them resisted engaging in discussions and persisted in doing only the minimum. PowerPoint slides,

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blogs, classroom response systems, and video clips are have been used prior to engage students. These technologies have been found to enrich and extend learning and actively engage students. (Lumpkin et al. 2015). Surveying student has also showed that students prefer the implantation of technology in class because it keeps them engaged.

You cannot just use any type of technology in the classroom and expect it to work. The technology used must be relatable to the students and have a purpose (Lumpkin et al. 2015). The technology needs to be relevant and easy to understand for the students (Virtue, 2007). The technology used does not need to be state of the art. PowerPoints are engaging enough for students and can be used to increase engagement and student achievement (Lumpkin, et al. 2015).

Comparing Traditional Lessons to Technology Based Lessons

Digital technology for use in the classroom is relatively new to schools all around the world. Textbooks are being be phased out while digital learning is the new preferred tool for school districts. Lessons today are usually either a standard textbook lesson or a digital resource the teacher has implemented. Teachers now use digital assessment tools like Plickers or Kahoot for formal assessments. A comparison of these lessons must be done to see which lessons lead to higher achievement.

According to Jarvinsen and Rasinen, (2014) there is no difference in achievement for students when comparing digital resources to the textbooks. When assessing you must use an assessment that is valid compared to how the student learned. When comparing digital lessons to textbook lessons a common test must be used to analyze results.

When comparing textbook lessons to digital lessons students prefer the digital lessons more than the textbook lessons (Yildirim & Demir, 2013). Students claim that the digital lessons

and digital assessments are "stress-free" compared to when they had to learn using a textbook. Learning was more positive when using a digital lesson compared to a textbook lesson. However, it is still important that both types of lessons and assessments are given. Students learned faster and better when using the digital resources compared to the textbook. Students still need to know how to use a textbook to locate information. Not everything they do in school is going to be engaging as a digital resource. History students seemed to enjoy using a digital textbook more than a written text book. Students were able to interact with more media that allowed them to listen to primary sources and secondary sources instead of only being able to read them. Students seemed to enjoy clicking on different sections of information instead of reading out of a textbook. Digital tools do allow students to interact more with the content. They can click on pictures and listen to songs therefore it is pleasing to multiple styles of learning.

Summary

Whether it is the most effective way of learning technology based lessons are the present and future of education. The days of copying vocabulary terms from the glossary section are over. It is up to school leaders and teachers to find the most effective technology and use it appropriately. The review of this literature has demonstrated that technology mostly improves student achievement. It has also proven that students are engaged more when they get to use technology routinely in class. The technology used must align with state standards as well as challenge students and help them access the world they live in.

<div align="center">**CHAPTER III**</div>

<div align="center">**METHODS**</div>

The purpose of this study was to examine whether the use of technology would have a statistically significant impact on students' achievement in American Government. The independent variable was technology lessons based off of Interactive Whiteboards, Icivics lessons, Board Builder, Kahoot!, and various videos embedded into Microsoft PowerPoint. The dependent variable is the unit test that my government team created. The students' post test scores will be compared to their pretest scores.

<div align="center">**Design**</div>

A quasi-experimental design involving a convenience sample was used to determine whether the technology lessons would have an impact on the academic achievement in American Government.

<div align="center">**Participants**</div>

Participation in this convenience sample study was based on students that were in two of my standard level American Government classes at a public school in eastern Baltimore County, Maryland. The two classes were chosen because they are both standard level classes and all of the students are in the ninth grade. The control group consisted of 25 ninth grade students and the treatment group consisted of 22 ninth grade students. The study included 25 male students and 22 female students. The demographics of the group was 23 African-American students, 20 Caucasian students, and four Hispanic students. Five students in the study had Individualized Education Plans and three students had 504 plans.

Instrument

This study used assessments developed by the government team at the high school. Every question on the pretest and posttest was a question that had previously been used on the American Government High School Assessment (HSA). The pretest had 16 selected response questions and 1 Brief Constructed Response (BCR) item. The pretest was administered early March 2018. The posttest had 16 selected response questions and 1 BCR and was administered as a unit test in mid-April 2018.

The test items used were valid with respect to content coverage because the assessment limits of the American Government align with the Baltimore County Curriculum. The indicators that were used were 1.2.2 The student will analyze legislation designed to protect the rights of individuals and groups and to promote equity in American society, 1.2.4, The student will evaluate the principle of due process, 1.2.5 The student will analyze elements, proceedings, and decisions related to criminal and civil law, 1.1.2 The student will evaluate how the principles of government assist or impede the functioning of government.

Procedure

Two standard American Government classes were chosen for this study. The classes were chosen because each class had only ninth graders who were ages 14-15. The classes were similar in demographics and pre American Government test scores. The independent variable was lessons that used only technology beginning in March. The group that received the treatment was randomly chosen and the other class became the control group. The students were not told that they were being compared to another class. The unit that being studied was the judicial branch. Students were given a pretest on the indicators at the beginning of the unit. For this time period one group was given lessons that were developed by Baltimore County Public

Schools. A few adjustments were made in order to have activities for an eighty-five minute class but none of the adjustments involved technology. The treatment group was given activities that they only could use their computer for, there was no usage of the curriculum guide or textbooks. Interactive Whiteboards, Icivics lessons, Board Builder, Kahoot! and various videos embedded into Microsoft PowerPoint were used for the students. Students were told to use the bored builders created by myself to access the content for that day. On the boards the researcher was able to put on photos, documents, videos, and other sources they could use to learn about the topic for the day. The researcher was also able to use the website Icivics.org for games that related to the content we were covering. Videos and interactive whiteboards were used to review the material near the end of class. Kahoot! Was used as a formative assessment tool so the researcher could measure student growth.

At the end of the unit students in both the control and treatment group were given the dependent variable (the department's American Government test based on the Maryland High School Assessment) and were measured on how much their posttest grade improved their pretest grade. The paired t-test was used to determine if the pre-to-post change in mean test scores was statistically significant at the .05 level.

CHAPTER IV
RESULTS

The purpose of this action research study is to determine whether the use of technology will have a statistically significant impact on the achievement of ninth grade students taking American Government. Achievement was measured by pre and post unit tests developed by the researcher based on the Maryland Government HSA. The researcher found that there was no significant difference in the control and treatment group.

A quasi-experimental design used two standard level classrooms as a convenience sample. The two classes were similar in terms of class size, academic level, and demography. One class was randomly chosen to receive the treatment (technology) and the other class therefore became the control (non-technology). The null hypothesis was retained with the posttests being the same regardless if a student was in the control or treatment group.

The two-sample independent samples t-test was used to test for a statistically significant difference between the treatment and control samples in mean pretest scores. No statistically significant pretest difference was found. The two-sample t-test was then used to test for a statistically significant difference between mean posttest scores. No statistically significant posttest difference was found. The customary p-value of 5% was used to decide if the observed difference was statistically significant. Using $p < .05$ keeps the chance of a false positive small without making rejection of the null hypothesis virtually impossible. Five percent strikes a balance between the chance of a false positive and a false negative.

Cohen's Delta effect size was computed to measure the standardized difference between the control and treatment scores independent of the sample size. The effect sizes for pre and posttest were in the very small category, according to Cohen (1977) and Wuensch (2015).

For this action research study, the population is all classes of ninth grade American Government similar to the classes used in this study wherever they exist.

Table 1

Hypotheses Tests: Technology v. No Technology for Pretest

Technology	N	Mean	S.D.	t-test	p	Statistically Significant	Cohen's Delta Effect Size
Yes	22	22.73	9.09				
No	25	22.20	7.51	0.22	0.83	No	0.06, very small

Table 2

Hypotheses Tests: Technology v. No Technology for Posttest

Technology	N	Mean	S.D.	t-test	p	Statistically Significant	Cohen's Delta Effect Size
Yes	22	74.09	13.68				
No	25	74.20	13.59	0.03	0.98	No	0.01, very small

Summary of Results

There was no significant difference between the technology classroom and the control classroom American Government pretest means. That is, prior to the experiment, both groups started at the same level. There was no significant difference between the technology classroom and the control classroom American Government posttest means. That is, after the experiment, both groups were at the same level. Both groups gained virtually the same amount, on average, from pre to post. There is no evidence of a differential treatment effect on American Government exam scores.
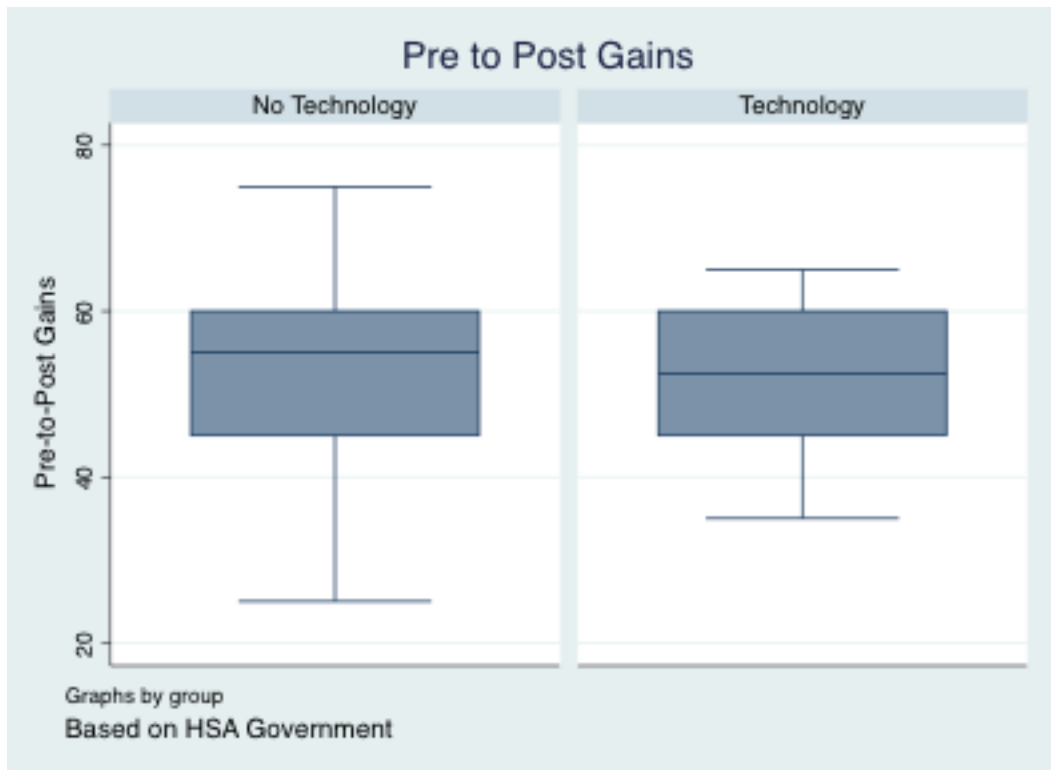
Figure 1 Distribution of Pre to Post Gains by Group

The box plot shows how the distribution of gains is virtually identical for the control (no technology) and the treatment (technology) classrooms. In any box plot, the bottom of the box is the 25th percentile, the line near the middle of the box is the median or 50th percentile, and the top of the box is the 75th percentile. The vertical distance from the bottom to the top of the box is the inter-quartile range. The so-called whiskers the vertical line atop the box and below the box show the range of the top and bottom 25 percent of scores. One way to interpret a box plot is the lower half of the box is "low-average," the upper half is "high-average." A person in the lower whisker is "below average," and a person in the upper whisker is "above average." The researcher does notice that the control has more variation (students more spaced apart) in the below and above average segments than the treatment group.

CHAPTER V

DISCUSSION

This study examined if technology would impact students' scores on the American Government HSA. The pre and posttest were both created based off of previous questions used on the American Government HSA. Based on the results of the study, the original null hypothesis was supported by the data. On the pretest, the tech group had a 0.5 item advantage, which translated to a standard effect size of .06. On the posttest, the paper group had a 0.1 item advantage, which was a .01 standardized effect size. The results are the same, virtually no evidence of any reliable differences either on the pretest and the posttest. Technology did not have an impact on student achievement in this study.

Implications of Results

The null hypothesis that the population mean pretest and posttest scores will be the same for the control and experimental groups was retained. The results of this study compare to the results of Wilder and Berry (2016) where there was no significant difference between the use of technology lessons and standard lessons. It may be possible that using different technology for the students could have yielded a positive outcome.

Threats to the Validity of Study

Even though the null hypothesis was not rejected there were several threats to validity during the study. Time of day may have factored into the scores because the treatment group has class before lunch while the control group has class before the end of the day. It is not clear which group was more affected by the time difference in when the classes took the quizzes, as well as if test anxiety differentially affected one group more than the other. These

issues need to be addressed in any future study comparing technology to paper testing. Students who struggle with standardized tests may have also lacked the confidence to take the assessments. The students are aware that they have to take a standardized test based off of the objectives learned and may have experienced some test anxiety.

Connections to Previous Studies

Determining if technology has an impact on student achievement has been the focus of several studies. Guertin et al. (2012) found that students had success using Google Earth to learn geography because it made geography real and relevant to the students. The researcher used icivics.org which has games that simulate different functions of the government. Students were asked to run a law firm that specializes in constitutional law in order to see how relevant the constitution is to the students' lives. There were several simulations that the students completed on the computer that made the content more relevant for students.

In this study students used the response system Kahoot for formal assessments. After a learning objective students would take a quick ten question Kahoot to identify if the students are making progress. Kahoot differs from the study conducted by Lumpkin et al. (2015) because Kahoot is not anonymous. Students create nicknames and score is kept for the entire group to see. This may have led to several students to not attempt the Kahoot because their score was too far behind to catch up or they did not try because they didn't see the value in the activity. The other study may have gotten more valid results because students did not have the fear of failing in front of their peers.

The researcher found no success in attempting to use online discussion forums similar to the study conducted by Chang, et al. (2013). Students were given homework assignments

to check the online forum to post a response and respond to at least two other students' responses. The students minimally logged on to complete the assignment.

The researcher used various video clips embedded into PowerPoints for students to visually see the content. Students were engaged and began to ask daily if there would be videos played for them. It was easier for students to recall information when the researcher reminded them of a hint from the video. The researcher did observe that students were more engaged in the group where technology was the focus of lessons in comparison with the control group.

Implications for Future Research

Identifying which technology is the most effective for students needs to be identified. It is unknown how well the students retained knowledge from Kahoot! or any of the online lessons. The background knowledge that students have for computers should also be assessed before conducting a similar study. Other technology tools that could be examined are Quizziz and Plickers.

Summary

The results of this study show that there was no significant difference in achievement between students who used technology and students who used standard lessons. The researcher did notice that engagement was higher in the group that used technology based lessons than the group that did not. Students in the treatment group did seem to enjoy coming to class more because the technology lessons were different from what they had in other classes that day.

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