BLENDDED CURRICULUM IMPACTS ACADEMIC PERFORMANCE AND AFFINITY FOR ACADEMIC TECHNOLOGY USE IN HIGH SCHOOL BIOLOGY CLASSROOM

A Master’s Research Project Presented to The Faculty of the Patton College of Education

Ohio University

In Partial Fulfillment

of the Requirements for the Degree

Master of Education

by

Megan Thornhill
This Master's Research Project has been approved
for the Department of Teacher Education

Dr. Ralph Martin, Ph.D., Professor Emeritus, Department of Teacher Education

Dr. Frans Doppen, Ph.D., Associate Professor and Chair of the Department of Teacher Education

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BLENDING CURRICULUM IMPACTS ACADEMIC PERFORMANCE AND AFFINITY FOR ACADEMIC TECHNOLOGY USE IN HIGH SCHOOL BIOLOGY CLASSROOM

MEGAN L. THORNHILL
OHIO UNIVERSITY

ABSTRACT

There is no doubt that the world is ever changing and advancing technologically. Just a quick look into the past will show that we have been advancing at a rapid rate, and students may not be properly trained to succeed in this ever changing environment, where jobs are being created faster than people can be trained. This study focused on student affinity for technology use in a secondary biology classroom, as well as the affect this increased technology use had on the students’ performance. A blended unit was constructed and 40 honors biology students participated in this curriculum and gave feedback via anonymous surveys. Although student attitude toward technology did not increase after the implementation of the blended curriculum, their performance did improve after the completion of the units. This indicates that, with future research and implementation; an increase in appropriately administered technology could lead to more successful performance both in and out of the classroom. As the job market continues to change, the way learners are educated should be changing to mirror what students will need to know to succeed. By continuing to teach in the pencil and paper methods of the past, students are being kept from truly realizing their full potential in and out of the classroom.
CHAPTER ONE: INTRODUCTION

The world seems to be getting smaller and smaller every day, and people are becoming more interconnected and are able to communicate with one another by simply pushing a button. As technology increases the distance between people seems to do the opposite. Not only is technology shaping and transforming personal lives, but also entire communities and cultures. “Today, computers and related inventions are driving the information revolution and transforming the U.S. economic landscape” (Carnevale, Smith, & Strohl, 2010, p. 15).

Technology is not only changing the way people interact, but the way they are working as well. Carnevale et.al (2010) states: just as the industrial revolution was critical to building a mass K–12 education system to feed workers into the manufacturing industries, the information revolution is spurring the development of a mass postsecondary system to fill the needs of sophisticated new industries, such as computer systems design or financial services.. Skill levels are being increased even for the most basic of jobs, technology is infiltrating all aspects of life, especially in a leading world country, like the United States (p. 15).

Georgia Hall (2006) comments on the importance of technology in this ever advancing world. The main focus of her paper is to discern the role of technology and its potential impact on the youth of today as they prepare for tomorrow. “[…] in order to thrive in the world today, young people need higher-end skills, such as the ability to communicate effectively beyond their peer groups, analyze complex information from multiple sources, write or present well-reasoned arguments, and develop solutions to interdisciplinary problems” (Hall, 2006, p. 41). These are the main focus of 21st century skills that currently, American school systems are not teaching or are trying to teach via a paper and pencil method and students are not experiencing this same
method at home where they are bombarded by various technologies. “The twenty-first-century student shows very few similarities to a student of the past” (Sawmiller, 2010, p. 45). Students today are bombarded with pressures and opportunities that their counterparts of even 25 years ago, did not have to deal with. A survey from NETDAY was somewhat able to pinpoint these differences, “Results from this survey indicate that 81 percent of students in grades 7–12 have an e-mail account, 75 percent use at least one instant messenger program, and 97 percent strongly believe that technology use is critical in the classroom” (Richardson, 2006, p. 6). This survey indicates that the students of today are being exposed to technology outside of the classroom and there seems to be a strong desire, at least in this survey, to have more technology use in the classroom. This means there is a disconnect between what the students are experiencing at school and their activities at home.

When discussing this gap between home and school technology use, Alison Sawmiller (2010) states, “their knowledge and interest in technology is rarely embraces and used in school. The gap between their at-home and at-school experiences, especially as pertaining to writing, is growing” (p. 45). Students are looking to have more technology use in the classroom, and to be able to incorporate their skills into their education. There are always two sides to every story, and this one is no exception. Some students may view technology use in the classroom negatively because they do not want to mix home life and school life. For some students, technology is a leisure activity. Playing games, using social media and websites, may be seen as relaxing and enjoyable to students, so instead of increasing the affinity for technology use in schools, incorporating more in the classroom may have an adverse effect and cause students to dislike technology since it is being used in schools. The idea is to appropriately implement
technology in the classroom to that the students are able to show what they know while still finding technology enjoyable.

One complication in the increased implementation of digital education is the teacher’s knowledge of the technology. Sawmiller (2010) comments on this point exactly, “Part of the concern may be the teacher’s comfort level with technology” (p. 47). The students will obviously have to become accustomed to increased technology use, but the less obvious fact is that the teachers will as well. According to Boling, Castek, Zawilinski, Barton and Nierlich (2008), this comes at a cost, “We came to understand that today’s students possess knowledge about the Internet that we, as teachers, have not yet acquired. Inviting our students to play the role of “expert” is not always comfortable because it means we must teach differently” (p. 506). According to their study and observations, allowing your students to play “expert” gives them a sense of control in the classroom, but this also means that the teachers need to adapt. When students know more than the teacher, and they are allowed to show it off, it can be very empowering and the teacher has to be self-confident and flexible to handle such a situation. However, allowing this to occur in the classroom, especially with a touchy subject like technology, can encourage participation and enthusiasm for the task at hand. However, if implemented correctly, technology use in the classroom can be a very powerful tool. “The mere existence of technology-based tools in the learning environment does not guarantee that learning will transpire” (Hall, 2006, p. 47).

*In the Science classroom*

The question still remains, however, when and where is the best time to implement an increase in technology usage? Scholars are suggesting that the science, or STEM, fields may be the ideal place to begin increased technology implementation (Colombo and Colombo, 2007;
Luehmann and MacBride, 2009; Paredes and del Barco, 2010; Sawmiller, 2006). Not only that, but according to current research, there is also a shortage of quality secondary science teachers and technology may help accommodate that shortage.

Colombo and Colombo (2007) discuss how technology may help lighten the load of this shortage: schools can increase access to science expertise by providing technical support that allows highly qualified science teachers to create text, podcasts, and vodcasts for class blogs; training other teachers to use these blogs with their students; and providing time for the grade-level teachers to meet regularly for discussions (p. 63).

Although this sounds like an ideal way to give the maximum number of students, access to quality science materials, there is still little documentation on the effect increased technology has on the students’ grades. This article focuses on the impact digital education has on both the students’ grades as well as their affinity for technology use in the classroom, by implementing digital units into the curriculum. This article contributes to current literature by addressing the issue of preparedness of American secondary students in an ever advancing technological world. The article strives to address this issue by providing an in-depth comparison of two digital classroom units and their traditional counterparts in two different biology classrooms through teacher and student interviews and surveys throughout the duration of the study, as well as analysis of grade upon its completion.

Research focus questions

The main questions that this study will focus on answering are:

1. How do the students perceive the impact of the digital lesson, on their understanding of the content and preparation for the future?

2. Did the blended units alter the students’ attitude toward technology use in education?
3. What is the impact on the students’ grades with an increase in educational technology?

The main goal of this paper is to identify the learning opportunities associated with the use of technology in the education process, so that appropriate technologies can be created and utilized in the classroom to better prepare for post-secondary life. During the course of this study it was expected that the students’ attitude toward technology use in the classroom would increase.

Key Terms

Blended learning: combining both traditional learning and distant learning, or e-learning, to better serve the students and incorporate 21st century skills into the curriculum.

e-learning: distant learning environments in which Internet and network technologies are used for the presenting and receiving the content. (Umit and Akbayin, 2012, p. 125)

Traditional instruction: Includes face-to-face instruction, and the typical “paper and pencil” methods. (Umit and Akbayin, 2012; Sawmiller, 2006).

21st Century skills: Skills necessary in the advancing technological world, by students upon leaving secondary education. Include: 1) mastery of core ideas and 21st century themes 2) learning and innovation skills 3) information, media and technology skills and 4) life and career skills (Partnership for 21st century skills, www.nea.org).
CHAPTER TWO: LITERATURE REVIEW

Introduction

Secondary teachers today are trying to better prepare students for the future, however, this may present more challenges than previously predicted. The world is changing at a rapid rate and education is slowly playing catch-up, but without proper modifications, the education system may not be preparing students for the post-secondary world they are going to face (Yeh, Chang, & Chang, 2011). Students are still being taught in a paper and pencil method as students were in the past. However, as Sawmiller (2010) points out, the students of today, are very different from their predecessors, and that means that the same methods of education may not be as useful as they were in years past. The current students are the leaders of tomorrow and without proper education, these students will not be prepared to take over an ever advancing technological world. These 21st century skills, as they are called, incorporate technology into the classroom and provide students tools to succeed in an advancing world.

One way that this may be possible is though planning lessons that demand more critical thinking and a higher-level output by the students. However, studies agree that an increase in technology use in education is crucial to the economy as well as helping students thrive and succeed after their secondary education. However, this technology cannot be thrown about in the classroom haphazardly. As Hall (2006) describes just because technology is there, does not mean that it is effective. The implementation of technology in education is not going to be a quick and painless process. In order to do it right, it is going to take a lot of planning and acclimating by teachers, administrators, students and parents. One of the ways that research discusses to ease the burden of implementation is to incorporate it first into places that have natural niches for technology. Rosen (2010) explains it this way, “To them [current generations
of learners], the smartphone, the Internet, and everything technological are not “tools” at all—they simply are. Just as we don’t think about the existence of air, they don’t question the existence of technology and media.” (p. 12). Meaning that students today are not simply using this technology, but it is almost hardwired into them and they are having to discover its powers on their own. However, it should be the goal of educators to ensure that students are accessing the full potential that this incredible technology has to offer and that they can do so appropriately both in and out the classroom.

21st century skills

According to the Partnership for 21st Century Skills, there are four main focuses for students to master by the time they leave secondary school, 1) mastery of core subjects and 21st century themes 2) learning and innovation skills 3) information, media, and technology skills and 4) life and career skills. The core subjects include, English, languages, arts, mathematics, economics, science, geography, history, and government and civics. These are centered on making students more global citizens and encouraging the following 21st century themes: 1) global awareness 2) financial, economic, business, and entrepreneurial literacy 3) civic literacy 4) health literacy and 5) environmental literacy. The second part of 21st century skills, learning and innovation skills, encompasses critical thinking and problem solving as well as communication and collaborating with peers and coworkers. The third point focuses mainly on technology and having students prepared to succeed in the ever advancing world. Not only for them to know how to use technology and information appropriately, but to also encourage critical thinking and implications of this information. Lastly, life skills are encouraged in order to promote health and independence to the students and include: flexibility, time management,
accountability, leadership skills and many other positive qualities. (From Partnership for 21st century skills website, www.nea.org).

Instead of creating students who can regurgitate information that they are fed in schools, the goals of the 21st century skills are to get students prepared for the next part of their lives and give them the tools to succeed. In a study by Assefa and Gershman (2012), the vast majority of people thought that “teaching 21st century skills is important for the future economic success of the United States” (p. 140). Along with this, those polled thought that the US education system was not doing an appropriate job preparing these students to be globally competitive (Assefa and Gershman, 2012). The job then becomes that of the teachers and administrators who are willing to implement these skills that appear to be necessary for students to have to succeed.

Technology in the Science classroom and student affinity

One of the first places studies suggest implementing more technology is in the STEM topics (Assefa and Gershman, 2012; Colombo and Colombo, 2007; Luehmann and MacBride, 2009; Paredes and del Barco, 2010; Sawmiller, 2006). The field of science naturally lends itself to the implementation of technology in a number of ways.

According to Assefa and Gershman (2012): science education inherently involves formulating hypotheses, testing, experimentation, inquiry, systematic investigation, observation, problem solving, and communicating findings that, we are prepared to argue, are closely associated to what students are expected to master by the way of 21st century skills (p. 141).

There are fears however, that a focus on technology and information skills and that scientific content will be overshadowed to make way for these requirements. If the increase in technology is taken too literally then these fears may actually be realized. Colombo and Colombo (2007)
include another idea, and that is that using technology to differentiate instruction may be beneficial to science. Since there is a lack of highly-qualified science teachers, using technology, in Colombo and Colombo’s study a classroom blog, more students will have access to a highly-qualified instructor, which has the potential to boost science performance in struggling schools.

The next struggle is determining what types of technologies to introduce. Many schools are experimenting with social media, such as Facebook, Twitter, or blogging sites (Colombo and Colombo, 2007; Luehmann and McBride, 2009). Others are focusing on more academic sites, like those put out by textbook companies or e-learning centers (Assefa and Gershman, 2012; Lowerison et.al., 2004). Then there is the issue of exactly how much technology to incorporate in the classroom. Both full e-learning and traditional learning have their drawbacks, and there are, naturally, proponents of each method. However, some are taking both traditional and digital learning and incorporating them so that the drawbacks are covered by the other instructional method.

Blended learning and impact on student performance

Blended learning is the idea that technological and traditional teaching can co-exist and actually complement one another to better relay both the 21st century skills and the course content to the students. The article by Umit and Akbayin (2012) focuses on combining these two styles of teaching in order to combine, “the strong and advantageous aspects of web-based learning with those of face-to-face learning” (p. 126). As previously mentioned, and as mentioned by Umit and Akbayin, there are negatives to both of these teaching styles. Web-based learning, or e-learning, has the drawback of lacking the student-teacher interaction that seems to be almost necessary for long-term learning, however, e-learning has an individualized
learning quality that traditional teaching appears to lack. With traditional teaching, student-teacher interactions are met and immediate answers to questions are given, but there can only be so much differentiation of instruction in the traditional classroom. To combat this, the idea of blending technology and traditional instruction came about because they seem to complement each other, one makes up for the other’s shortcomings. Although traditional teaching methods are the most widely used and accepted, it is difficult to teach 21st century skills, which focus so much on technology and being prepared for the “real world”, using this method. However, implementing a fully digitized unit to students who are used to being taught traditionally, may also fail. The idea of a blended curriculum put forth by Umit and Akbayin (2012) seems to carry quite a bit of merit.

**Conclusion**

Students need to be prepared for an advancing world, and one way to achieve this is by implementing the 21st century rules into middle and high school curriculums. American students are still being taught using a paper and pencil method of learning, but are being exposed to an entirely different world outside of school. Fact of the matter is, these students are going to be set out into the world outside of the school building, but will they have the appropriate tools to survive and thrive? Recent studies suggest that if the current education system is kept in place without adaptation, then US students are going to fall farther and farther behind their more progressive counterparts. One way to counter this decline in preparedness is through the 21st century skills, and a greater implementation of technology in the education process. Blended teaching techniques have the potential to provide a smooth transition into digital education as well as support the students with the traditional methods of face-to-face instruction. By
encouraging blended instruction, current students will be able to better prepare for the world outside of the classroom.
CHAPTER THREE: METHODS

This study was conducted at Nelsonville-York High School in rural southeast Ohio during the spring semester of the 2013/2014 school year. At the time of this study, there were about 350 students attending the high school and of those 350 students, about 60% qualified for free or reduced lunch. The community surrounding the school is small, and impoverished, and the school itself is listed as a high-needs school. The building was only three years old and contained the junior high and elementary school as well, all of which were connected by one long main hallway. However, the students were not permitted to wander between the various schools during the day, unless they acquired special permission. Many of the Nelsonville-York High School students participated in some sort of extracurricular activity, whether it is a sport, club, band, or choir, the majority of the students participated in these events. Nelsonville-York had a primarily young staff, and during this study, they were going through the re-accreditation process, which added another level of stress onto the faculty and staff. The overall purpose of this study was to determine if incorporating technology, in the form of digital learning, would be beneficial for students to better prepare them for the 21st century. Ideally, the incorporation of appropriate technology in the classroom will benefit the students’ grades, but also better prepare them for post-secondary life, whether that be higher education or the work world. Since Nelsonville-York did not, at the time of the study, incorporate much blended learning, but are planning on adding more technology to the curriculum in the coming years, this seemed like an appropriate environment to conduct this study.

Participants

The project focused on the sophomore biology students, of which there were 40 students, 27 girls and 13 boys, split between three periods. Students in all three class periods participated
in this study, as they were all honors biology classes, and the dynamics between the classes were quite different.

The first focus class was fifth period. This class was made up of 18 students, 14 girls and 4 boys. The gender distribution was evident in the classroom, but did not serve as an issue during much of the semester. One of the boys was very outspoken, but his female peers did not take to him very well, and his “know-it-all” nature seemed to be off-putting to them. This class was very chatty, and when there was any down time the students were instantly talking with one another; so much so that they had to be given a seating chart. Typically students were allowed to pick their own seats and choose their lab partners. However, after a set number of warnings, the students were given assigned seats. This class had quite a bit of energy and the majority of the students seem to be very grade oriented, more so than some of the other classes. This is the largest biology class and it is easy for them to get off topic. However, this class was chosen as one of the focus classes because they are willing to try new teaching/learning styles and the distribution of their grades ranges from top students to some of the struggling biology students.

The second focus class was eighth period. This class had only 10 students, 5 girls and 5 boys. This class was particularly quiet and the majority were lower performing students. These students were not very grade motivated and had to be kept on task using a variety of different methods. The students got along well in class, but there were a lot of conflicting attitudes in the class, and this caused some disagreements in the classroom at times.

The third focus class was ninth period. This class contained 12 students, 8 girls and 4 boys. The gender variation was not as evident in this class as it was in fifth period. The students in ninth period all got along with one another, and were all very eager learners. However, one student tended to exclude himself for fear that the other students did not like him. His grades
were below-average compared to his classmates, and his behavior was less than ideal in the classroom. However, throughout the year, this student behaved much more appropriately and his grades improved, which helped him to feel more comfortable with his peers and more readily participate in class activities. This class was very good-natured and less grade-oriented than the fifth and eighth period classes. The students in this class seemed to be more knowledge oriented and are typically not satisfied until they have a good understanding of the concepts, regardless of the grades the students received. This is not to say that the students were not at all concerned with their grades, but they had a more internal focus that getting good grades is centered on them understanding the content, as opposed to just being offered more points throughout the course.

The focus was on these three classes to determine student affinity for technology, perceived impact on their content understanding, and the actual impact that the blended units had on student performance.

Blended instruction

A class website including notes, videos, lectures, study sheets, assignments, and extra resources was constructed in order to give the students access to materials they may have needed during the class. The website was centered on making sure that the students had all of the necessary resources to succeed. The students were also required to submit multiple assignments via the designated class website, so that the assignments could be posted on the class website.

The class website was focused on three units; genetics, evolution, and ecology. The genetics unit focused on the fundamentals of inheritance, as well as Punnett squares and Mendelian genetics. This unit did not have as much technology integrated into it as the following units because the students and the instructor were getting accustomed to using the class website as well as virtual labs, and simulations. The second unit was about evolution and
was more technology dependent, and the students were shown more simulations and were required to participate in more virtual lab assignments. The evolution unit covered portions of three book chapters and having the class website helped the students keep track of what parts of the chapters and units we were going over. This unit covered natural selection and its 5 tenants, speciation, and the views of Darwin and Lamarck. These topics came from a variety of chapters so the information that the students needed to learn could be found on the website, as opposed to them relying so heavily on their textbooks. The final unit that was included in our blended lesson, dealt with ecology, which built perfectly off of the previous units of genetics and evolution. The ecology chapter dealt primarily with ecosystems, niches, and how different species are able to survive in various environments. For this unit, the students were again expected to participate in a number of simulations and online assignments, as well as select, read and respond to articles regarding any topic learned in these three units since they interlinked so well.

The blended lessons were composed of online simulations, clicker assessments (online formative assessments that the students use digital clickers to respond to individually), virtual laboratory procedures as well as online notes and a class website for resources such as videotaped lessons and enrichment activities. Each blended unit also consisted of online reviews and practice problems for the students as well as response/discussion questions for the students to respond to. Given the uncertainty that each student had access to a computer at home, the students were given class time to complete the various online portions of the unit. Also, the units were not fully digital in order to account for the learning curve of the students and the instructor. During the fall semester, the students had very limited introduction to technology in the biology class, which typically included a video here and there, and they were taught mainly using the
“traditional” method of notes, lectures, worksheets, and lab activities. It was feared that introducing the students to a fully-digital unit would skew the results simply because of the foreign nature of the teaching method. So a blended unit, including some online and some traditional methods, was used to account for this learning curve.

Data collection

In order to obtain information for the study, the students were given surveys both before the units were started and after they were completed. These surveys were used to see how much experience the students had with technology. The main focus was how often they used technology for leisure activities, what experience they had using it in school, and their attitude towards current technology use in their various classes, and how they would perceive their attitude to change if more technology was implemented. The post-survey was focused on student feedback on the units. How they felt the units went, which method they preferred, and any modifications or recommendations they had for the units.

In order to determine the effectiveness of each lesson, along with the student surveys, a grade analysis was also used to see how the blended lesson impacted the students. Because the blended units were introduced to all classes, the students’ pre- and post- blended unit grades could be compared. Instead of tracking each student individually, the students were grouped into three grade brackets, high-achieving (any grade 85% and above), middle-achieving (65%-85%), and low-achieving (below 65%) and the number of students in each of these groups was tracked from the beginning of the blended units through to the end, to see how the implementation of technology effected their grades. This looked at and compared the individual student to him/herself, in order to look at depth of content understanding, writing abilities, and the overall grade throughout the study. A comparison was also made between the students of each level
between the classes as well, to determine, again, if technology implementation was better suited for one group of students over another.
CHAPTER FOUR: RESULTS

The students were requested to complete a voluntary survey (both before and after the blended unit) to determine the student affinity for technology use in the classroom. A grade assessment was completed (also before and after the blended units) to look for any potential grade impact that the units had on the students. The students’ perceived impact on their understanding from the blended units were more difficult to assess and were done through short answer questions on the anonymous surveys. Overall, more students than not preferred the blended curriculum and felt that it did benefit their understanding of the content. Some of the responses from the students on the surveys were very positive regarding the blended units:

“I was able to access the notes and simulations from my phone whenever I needed them.”

“The extra resources and quizzes” (when asked what helped the students the most to understand new/challenging concepts).

“If I missed a day I always had the stuff I needed”

The students found the class website especially useful because it had everything localized in one place, including the simulations, virtual labs, student work and extra resources for the students.

Affinity for technology use

In order to determine how much exposure the students have to technology at home, they were each given a survey to fill out voluntarily regarding their frequency of technology use for school purposes. The surveys showed that, previous to the blended unit, the majority of them (86%) used a computer for homework at least twice a week, see Figure 1. For a variety of classes and disciplines, the students are being asked to use a computer, to complete their homework. The students were also asked if they had access to a computer at home or outside of school, and 14% of the students only have access to a computer while at school.
Surveys were given to the students before and after the blended units were implemented in order to determine the students’ affinity toward technology use both in and out of the classroom. The students answered that, before the blended unit, 62% of the students felt positively about using technology in the classroom, 16% felt somewhat positively about technology use in the classroom, and 22% did not feel positively at all about using technology for academic purposes, see Figure 2. After the blended unit, the percentage of students who felt positively about technology use in the classroom dropped by 5%, but the percentage of students who viewed technology use in the classroom extremely poorly, decreased by 6%.
The students who felt somewhat positively about technology use for academic purposes increased by 11%, see Figure 3. Students also have a higher affinity for technology use during leisure activities as opposed to for academic purposes. Seventy-six percent of the students responded positively when asked how they felt about using technology for leisure activities (such as Facebook, Twitter, computer/video games, blogging, etc.). Only 8% of the students responded that they did not like using technology for leisure activities, while 16% were either indifferent or felt somewhat positively about this type of technology use, see Figure 4.

![Figure 3: Student Affinity for Technology Use to Complete Academic Tasks, Post-Blended Unit](image1)

![Figure 4: Student Affinity for Technology Use During Leisure Activities](image2)

**Grade impact with increased technology use**

In order to look more objectively at the effectiveness of technology use in the classroom, a grade assessment was conducted to determine which of three grade brackets the students fell into before and after the blended units were concluded. Before the blended units were started, in the high, medium and low groups there were 11, 21, and 8 students, respectively. At this point the class website, and various other aspects of the blended unit were implemented and the
students final grades were recorded after the blended units had concluded, but before the end of year exam took place to account for any potential skewing of the resulting grades. After the conclusion of the blended units, the number of students in the highest grade bracket increased from 11 to 15 students. The middle achieving group decreased from 21 to 20 students, and the lowest achieving group decreased from 8 to 5 students, see Figure 5. An analysis of variance was run on the data to determine significance, however, none of the grade brackets had a statistically significant shift in student numbers (high: \( p = 4 \), middle: \( p = 0.25 \), low: \( p = 2.25 \)).

![Figure 5: Student distribution comparison between pre-blended unit and post-blended unit grades.](image-url)
CHAPTER FIVE: DISCUSSION/CONCLUSION

The goal of this study was to determine the affinity for technology use in the classroom that the students had as well as the impact that this increase in technology use had in the students’ academic performance. Although this blended curriculum was only implemented for about a month, there were still some very interesting results that support the increase in appropriate technology use in the classroom.

Student affinity for technology use for academic purposes

The students’ affinity for technology use did not increase from the beginning of the blended units, to the end, the number of students who felt positively about using technology for academic purposes actually decreased from the pre-blended unit survey to the post-survey. This is not what was originally predicted. It was presumed that the students’ affinity toward technology would increase with increased exposure in the classroom (Hall 2006, Yapici and Akbayin 2012), however, this is not what was seen during the research. In the written response questions on the surveys, some of the students were very opposed to the idea of using technology for academic purposes. The students stated, “I like using technology and the computer for personal stuff, not school. Its [sic] my escape.” This held true for a few of the students, which may lend to the decrease in affinity that was seen from the beginning of the research to the end.

Another factor that may have contributed to the decrease in affinity for technology use was the amount of time and when the blended units were incorporated into the curriculum. Because of the large number of snow days, as well as scheduled testing and time the students were out of the classroom, the blended units per postponed multiple times, because of the sporadic nature of class time throughout the winter months. This meant that the blended units
could not be maintained at the same level and length of time that was originally intended. If the students had received more exposure to the blended units, then their affinity may have increased because they were more accustomed to the methods used in the blended units. The expected result was that the more the students were exposed to this method of instruction, the more they would grow accustomed to it and grow to appreciate this methodology. Along with this decreased amount of implementation time, the instructor also had less time to correct any potential issues with the blended unit due to a severely decreased amount of time to complete the units. However, this result may also have been due to a fairly limited sample size of only 40 students. With an increase in implementation time, Yapici and Akbayin (April 2012) saw that student affinity toward the internet and the blended learning method increased as time went on. This indicates that with a full semester or year curriculum, affinity should increase with an increase in exposure by both students and instructors.

The question that still remained after collecting the data on student affinity for technology use, was *did this impact the efficiency of the technology use?* In other words, did the fact that the students did not like using the technology affect the impact that the blended unit had on the students’ performance, which was determined by the grade assessment.

*Grade impact with increased technology use*

Although the students’ affinity toward technology use for academic purposes did not increase, the grade assessment showed that the blended units may have had a positive impact on student performance. Grade parameters were established before the beginning of the blended unit, and the students were grouped into three categories based on current classroom grades, high-achieving (85% or above), middle-achieving (65%-84%) and low achieving (below 65%), and these same parameters were also used to group the students following the blended units. At
the conclusion of the blended units, there were, in fact, fewer students failing the course and in
the lowest-achieving grade bracket. The number of students in the highest-achieving grade
bracket (85% and above) increased, meaning that after the implementation of the blended units,
there was a general positive shift in student performance. Several other studies (O’Toole and
Absalom, 2003, Yapici and Akbayin April 2012) corroborated the findings, that a blended
learning model increased student academic performance.

Eyyam and Yaratan (2014) stated that, “it is an inevitable fact that, in learning
environments where educational technology is integrated into instruction, both students and
teachers experience benefits from using it” (32). This corroborates with the academic results
found in the study conducted, in that the students did see a grade increase after the
implementation of blended instructional units. However, a study conducted by Eyyam and
Yaratan (2014) also found that the students’ attitudes toward technology become more positive
with increased exposure to educational technology use. This could indicate that increased
student affinity toward educational technology does not truly impact its effectiveness. On the
contrary, the students may, over time, come to have an increased affinity for academic
technology use once they see that it is beneficial to them and their overall understanding and
performance in the classroom. Another reason for the varied results, may have been because of a
variation in students, or their perception on using technology for academic purposes may still be
negative because of other reasons. The students were asked to complete the post-survey after
they completed their final exam for the course, which may have led to the somewhat negative
responses received from the students.

The positive grade shift seen in the students’ performances may have also been due to the
simple fact that more points were available in the class at the final analysis than at the one
conducted before the introduction of the blended unit. To combat this, a percentage was used as an indication of student performance so that the pre- and post-blended unit assessments could be compared to one another. However, studies agree (Boling et.al. 2008, Carnevale et.al 2010) that an increase in *appropriate* technology use in a secondary classroom can positively impact student performance. Also, this positive impact on student grades could be altered by increasing the implementation time of the blended curriculum, this may lead to a more positive outcome (especially with student affinity) due to increased comfort with the curriculum from both students and teachers. Increased implementation will also allow for more concrete results, because of the extended amount of time the students will have access to this learning method.

**Implications/future research**

Increasing technology use in the classroom benefits students and teachers alike (Eyyam and Yaratan 2014), but there is research to suggest that it will also benefit students outside of the classroom as well (Assefa and Gershman 2012). According to the study conducted by Assefa and Gershman (2012), the national and global economy may depend upon students being educated with 21st century skills and similar studies suggest that the best place for the implementation of these skills may be in STEM classroom (Assefa and Gershman, 2012; Colombo and Colombo, 2007; Luehmann and MacBride, 2009; Paredes and del Barco, 2010; Sawmiller, 2006). In the future, researchers should look more closely at the link between STEM education and the development of 21st century skills in secondary students, and try and develop ways to capitalize on the characteristics of the STEM classroom (such as problem-solving, innate technology use and advancements, etc.) that make it such a great fit for increased technology implementations (Assefa and Gershman 2012). In order to ensure efficiency of increased educational technology, future research would include a longer implementation time in the
classroom, ideally an entire year with a blended curriculum, along with grade assessments, student interviews and properly spaced surveys to ensure consistent feedback and data throughout the implementation. Although the research conducted showed an increase in student performance, a more accurate representation of the impact of technology use in a secondary STEM classroom would have included a year-long blended curriculum with more frequent student feedback. This would ensure that a grade shift was most likely due to changes in technology use, as opposed to other external factors.

By implementing more technology and 21st century skills in STEM classrooms, students are being set-up to be competitive in the job market and are more likely to succeed in an ever growing and advancing world (Yeh, Chang, & Chang, 2011). Jobs are forever being created and outdated based on advancing technology, and by not maximally preparing students for this ever changing job market, education is not fulfilling its complete goal of student success. The role of education is to prepare student for what they are going to encounter outside of the classroom, and to give students the tools needed to succeed in the work world and beyond. By increasing the appropriate use of technology in the classroom, and show students the potential that technology possesses, they will be better prepared for the future, and jobs that have potentially not even been created yet (Carnevale et.al 2010).
WORKS CITED


Education & Narrative, (6), 5-36. Retrieved from Ebscohost database. (Accession No. 41774989)


APPENDICES

A. IRB approval
B. Surveys (both pre and post)
C. Plagiarism check
A determination has been made that the following research study is exempt from IRB review because it involves:

Category 1. research conducted in established or commonly accepted educational settings, involving normal educational practices

Project Title: Impact of Blended Learning on Grades and Affinity for Technology use in Academia in Secondary School

Primary Investigator: Megan Louise Thornhill

Co-Investigator(s): 

Advisor: Ralph Martin

Department: Education

Robin Stack, CIP, Human Subjects Research Coordinator
Office of Research Compliance

Date: 4/22/14

The approval remains in effect provided the study is conducted exactly as described in your application for review. Any additions or modifications to the project must be approved (as an amendment) prior to implementation.
B. Pre and Post surveys

Pre-survey

Do you have access to a computer at home? Yes No

How often do you use a computer for schoolwork?

Every night Once a week Twice a week

Once every other week Once a month Never

How positively do you feel about technology for academic purposes?

Not at all positive 1 2 3 4 5 Very positive

How positively do you feel about technology for leisure purposes?

Not at all positive 1 2 3 4 5 Very positive

Have you ever used blogging or online discussion? Yes No

If so, in what capacity (for classes, for leisure, etc.) please explain

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

How would you feel about using a class website as a way of sharing classroom information (assignments, websites, journal entries, etc.)

Not at all positive 1 2 3 4 5 Very Positive

How would your answer change if you were given class time to do the online class requirements?

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

34
Post-survey

Post-unit survey

How positively do you feel about technology for academic purposes?

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Very positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all positive</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

If your answer was different from your first survey, what changed your answer?

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
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How often did you access the class website?

<table>
<thead>
<tr>
<th>Never</th>
<th>A few times</th>
<th>Only when I missed class</th>
<th>Once a week</th>
</tr>
</thead>
<tbody>
<tr>
<td>Twice a week</td>
<td>Every other day</td>
<td>Everyday</td>
<td></td>
</tr>
</tbody>
</table>

Which part(s) of the website did you find most useful?

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______________________________________________________________________________
______________________________________________________________________________

What were some of the things you liked about this blended units and/or the classroom website?

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______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

What were some of the things you didn’t like, or would change about the units/website?

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
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