The Effect of Using Technology

on the

Motivation of Second and Third Grade Science Students

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Abstract

The purpose of this study was to examine how motivation to learn science, which was measured by assessing grades, on-task behavior, and interest in the concepts taught, was affected by regular use of one-to-one technological devices in the classroom. Previous research suggests that technology allows teachers to teach more effective science curricula and may increase students' motivation. Five female students aged seven through nine at a private school in Maryland were taught similar science units with and without using one-to-one technology. Students completed interest surveys before and after each unit as well as daily exit tickets and an end-of-unit quiz for each unit. Additionally, the researcher recorded students' on-task behavior throughout both units using time sampling. The results from this study did not reflect a statistically significant difference in student interest or grades between units with or without technology or between days with and without technology in the unit which used it three or more days per week. However, all students reported enjoying using laptops during instruction. Results indicated that students' on-task behavior was significantly higher during the unit in which one-to-one technology was used. Results and suggestion for future studies regarding the use of technology to enhance motivation are discussed.

CHAPTER I

INTRODUCTION

Science is a very important component of the curriculum for students at elementary, middle, and high school levels. Project 2061, completed by the American Association for the Advancement of Science in the 1980's, discussed the importance of young children being taught science concepts and skills, so that they can make informed personal and societal decisions as they get older. After the publication of Project 2061, states began to establish science standards, and researchers examined the best practices for developing and implementing effective science curricula (Fortus, 2008). In so doing, researchers have found many obstacles to and ways to augment implementation of comprehensive science curricula.

Overview

Teaching science at the elementary level can be difficult for many reasons. First, studies suggest there is not enough time allocated for the teaching of science (Trygstad, Smith, Banilower, Nelson, & Horizon Research, 2013). Next, having students design and conduct experiments can be messy and hazardous and can be impossible when there is only one teacher to help them (Tucker, 2015). Furthermore, many teachers do not have sufficient content knowledge or professional development regarding teaching science effectively (Martindale, 2011). In her role as a second and third grade teacher, this researcher has found that many students do not appear motivated to learn science which likely negatively affects their learning. While these obstacles are difficult to overcome, a review of literature review suggests that introducing technology into the science classroom may be one way to address many of these obstacles.

Technology tools, including Smart Boards, iPads®, laptops, and Student Response Systems increasingly are available in today's classrooms. These technologies may be able to address many of the problems that teachers face when teaching science. Technology tools can facilitate implementation of differentiated lessons, which allows instructional time to be used more effectively. These tools can enable the design and completion of experiments with available-supervision and teachers can use online resources for support as they explain concepts. Perhaps most importantly, the use of technology tools has been shown to increase students' motivation to learn science concepts and skills. For example, Rafool, Sullivan, and Al-Bataineh (2012), found that students who were assigned technology-related tasks in science demonstrated increased motivation and indicated that they preferred the technology tasks over pencil and paper methods.

This researcher noticed that her grade two and grade three students were becoming less interested in learning science than her students in prior years had been. However, she also noted that her students were frequently were discussing and interested in their electronic devices and technology. Research such as that reported by Godzicki, Godzicki, Krofel, and Michaels (2013) indicates that students' motivation to learn can be increased by incorporating technology into instruction. Therefore, this researcher was interested to learn whether her elementary level students' motivation to learn science concepts and skills would increase if lessons incorporated use of one-to-one technologies.

Statement of Problem

The purpose of this study was to examine how motivation to learn science, which was measured by assessing grades, on-task behavior, and interest in the concepts taught, was affected by regular use of one-to-one technological devices in the classroom.

Hypotheses

The hypotheses tested follow and compared the grades, on-task behavior and interest in the units using and not using technology to deliver instruction.

Grades

Students' grades are unrelated to whether or not technology was used in science class.

ho_1: *mean unit quiz scores in units taught without technology = mean unit quiz scores in units taught with technology*

ho2: mean unit grades in units taught without technology = mean unit grades in units taught with technology

Students' daily grades (exit ticket scores) are unrelated to whether or not technology was used for the lessons in the Technology Condition.

ho3: mean daily exit ticket grades in individual lessons without technology during the technology unit = mean daily exit ticket grades in lessons with technology in technology unit

On-task behavior

Students' on-task behavior is unrelated whether or not technology was used in science class.

ho4: mean daily ratings of on-task behavior in unit without technology = mean daily ratings of on-task behavior in unit with technology

Students' daily on-task behavior is unrelated to whether or not technology was used for the lesson in the Technology Condition.

ho₅: mean daily ratings of on-task behavior in individual lessons without technology during the technology unit = mean daily ratings of on task behavior in lessons with technology in technology unit

Interest

1. Change in interest in the science topic is unrelated to whether or not technology was used in science class

    ho₆: mean changes in ratings (post unit-pre unit) of interest in science topic taught without technology = mean changes in ratings (post unit-pre unit) of interest in science topic taught with technology

Operational Definitions

The **independent variable** for this study was the amount of one-to-one technological devices used during science class. For the first three weeks (the Rocks and Soil unit), there were no one-to-one technological devices used. During the second three weeks (the Matter unit), one to one technological devices were used at least three times a week for 30 or more minutes during science class. Descriptions of the technology devices used follow.

iPad®: A touch screen tablet that has many applications such as games, videos, songs, and websites. The iPads'® apps were used individually by the students during lessons to introduce and review Science content.

Laptop: A technological device that is used by one person that easily is moved from location to location. Laptops are able to access the internet for websites, games, and movies. The laptops used in this study had Microsoft Office® software. Laptops were used

individually by students during lessons to watch videos, play games, explore matter related websites, and use Microsoft Office® tools**.**

Smart Board™ Response System (SBRS): The SBRS is both a software and hardware tool. The teacher has the software on his or her computer to create questions. A receiver is linked to the computer and each student has his or her own transmitter to input answers. These devices were used to help the students review information about the science unit studied.

Dependent variables included the students' grades, on-task behavior and interest in the science.

Students' grades were based upon their completion of daily exit tickets. These grades were averaged at the end of each unit. In addition, a quiz was administered at the end of each mini-unit. For each unit/condition, the mean daily exit ticket scores and unit quiz grades were averaged to yield a composite mini-unit grade.

Students' on task behaviors were rated on a scale from zero to six points before the mini-units for one week. Then on-task behavior ratings were made each day during both mini-units and averaged.

Students' interest in the science topics taught, which was assessed with a brief, teacher made interest survey (see Appendix A). The students completed an interest survey before and after each mini unit, one of which was taught with and one of which was taught without technology. Results were tabulated to determine if students' interest in the topics changed during the course of the units.

CHAPTER II

REVIEW OF THE LITERATURE

Many students in today's educational system do not remember a time when they were not surrounded by technology. Most children spend at least some time each day using an electronic device whether it is a television, tablet, laptop, Ipod®, or video game system ("Zero to eight," 2014). Despite their interest in and eagerness to use technology, many students are expected to be motivated to acquire skills and learn content in subject areas that are part of the elementary school curriculum without the use of technology. One subject that could be greatly enhanced for students through the use of technology is science. This literature review focuses on teaching science content and skills to elementary aged students and motivating them to learn scientific content and skills through using technology.

Section one examines the importance of students learning scientific content and skills, what constitutes an effective science curriculum, and challenges related to teaching science at the elementary school level. Section two explores the concept of motivation. The third section discusses what types of technology can be used in a classroom and how technology can help address the challenges described in section one. Finally, the last section examines how technology can be used as a motivator for students when learning science concepts and skills.

Science Education

Science is a very important subject that students can and should begin to study during their early years of schooling. Project 2061 was completed by the American Association for the Advancement of Science (AAAS), and explains why science literacy is important for everyone (Fortus, 2008). According to Fortus,

Project 2061 defined science literacy as a thorough knowledge of the key concepts and principles in science; an understanding of the inter-dependency of mathematics, science, and technology; a recognition of the strengths and limitations of science; and the ability to use this knowledge for personal and social purposes (Fortus, 2008, p. I-352).

Project 2061 explains that people must be able to use scientific knowledge for personal and societal decisions. If students are not exposed to scientific concepts in their early years of schooling, they may have more difficulty learning and applying scientific knowledge as they get older. Not long after Project 2061 was completed, state education departments across the country developed standards for science (Fortus, 2008). These standards are to be taught to students, and students must begin acquiring these standards early in their schooling. In contrast to this view, earlier in the twentieth century, some educators believed that young students could not learn science content and skills. However, more evidence in the past few decades has shown this view to be incorrect (French, 2012). French states, "Young children are inherently motivated to learn about the world they live in" (par. 29). Children are curious and want to learn more about the world, and gaining scientific knowledge can help them do this. Current educational leaders conclude that science is an important subject that should be introduced at an early age.

Much research has been conducted to determine the best way for students to learn scientific content and skills; however, there are some challenges associated with meeting these conditions. Fortus (2008) has listed several criteria that have been established as important components of a science curriculum. One criterion is that phenomena must be shown. This can be done by the teacher or student, inside or outside the school. The challenge with this criterion is that very little time is devoted to teaching science in elementary grades (Trygstad et al., 2013). Students cannot see phenomena if they are not given enough time for science instruction in school. A second criterion is that a science curriculum must have students design experiments

and create and use models (Fortus, 2008). A challenge for this criterion is that hands-on experiences can be hard to conduct with students because they need supervision and help (Tucker, 2015). Furthermore, many schools do not have the necessary resources to enable students to perform science experiments. A third criterion of an effective science curriculum is to use computer-based technology with simulations and visuals (Fortus, 2008). A final criterion of an effective science curriculum is that the teacher should act as a facilitator and guide the students in their learning (Fortus, 2008). A problem with meeting this condition is that teachers often do not have the necessary background or training to teach science. In one study, 85 percent of California teachers surveyed said they had had no professional development in the area of science in the past three years (Martindale, 2011). The criteria and challenges described above suggest that a thorough science curriculum involves many components which sometimes can be difficult to meet.

Types of Motivation

Much research has been conducted to study motivation, and there are many different theories regarding motivation. One theory of motivation is called the Expectancy-value Theory. This theory discusses engagement and involvement in tasks. It also examines value beliefs which are "the reasons why an individual would want to become or stay engaged in an academic task" (Summers, 2008, p. I-113). According to Summers, there are different values associated with value beliefs. The utility value refers to whether or not the new task is going to be useful for the person in the future. Students will not want to do something if they do not feel it will be something they ever will have to do again in their lives. Another value is the attainment value which refers to how important it is to do well. Some students are highly motivated by grades or other reflections of their attainment. Intrinsic value suggests how much a person enjoys a task

while doing it. Many administrators believe that students not enjoying tasks can result in behavior problems. Finally, cost belief is what the person considers to be the negative aspects of completing the task. According to the Expectancy-value Theory, making tasks engaging and enjoyable could increase motivation.

Motivation can be viewed as intrinsic or extrinsic. Intrinsic motivation occurs when a student wants to do well without any outside influence. When something in the environment causes a student to want to do well, such as a reward, extrinsic motivation is involved. Interestingly, one study found that "while intrinsic motivation to learn science -interest in and enjoyment of particular science subjects -had a considerable effect on science achievement of adolescents, extrinsic motivation to learn science - instrumental and future-oriented motivation - had no effect on science achievement" (Areepattamannil, Freeman, & Klinger, 2011, p. 248). This conclusion suggests that students must want to learn science content and skills and be interested in this learning for them to perform at their highest level. According to findings from a study by Painter (2011), students must have autonomy to feel competent and have more intrinsic motivation to learn. Based on these findings, it appears that to improve students' motivation to acquire scientific knowledge, teachers should focus on increasing students' intrinsic motivation rather than their external motivation.

Technology in Schools

Technology is very important to students because they have grown up in a world full of technology. According to the article "Zero to eight" (2014), 72% of children eight years of age eight and under in the United States had used mobile phone devices for apps, videos, and games. In addition, the researchers found that the amount of time children use devices had tripled in three years. In 2014 the average time spent using devices was 15 minutes a day. "Nearly six out

of 10 children (58%) watch TV at least once a day, compared with 17% who use mobile devices on an everyday basis, 14% who are daily computer users, and 6% who play video games every day" ("Zero to eight," 2014, par. 10). The amount of time children spend using technology each day most likely has increased since the survey was completed. It is difficult for a teacher to compete with technological devices for students' attention. Because students are used to using technology outside of school, they want to use it in school as well.

Children use many types of technology that also can be employed within classrooms. Smart Boards and Promethean Boards are used in many schools. In 2009, 23% of teachers had an interactive whiteboard in their classroom (U.S. Department of Education, 2010). This number most likely has increased in the past seven years. These interactive white boards allow the students to interact with a technological device. Games and other activities can be completed on these boards. Additionally, many schools have laptops or computer labs in which students can use the technology to play games, use the internet, and use Microsoft Office® tools. According to Herold, there is now at least one computer to every five students in public schools (2016). These devices can be used in many different ways across many different subject areas. Furthermore, some schools have students use mobile devices, such as iPads, smart phones, or other tablets, to access games, the internet, and use the calculator or note application (Wylie, 2016). These technological devices already are being used in schools and could be incorporated readily into a science curriculum.

Incorporating technology into the science curriculum may help solve some of the problems of effectively teaching the science curriculum to students. First, technology supports teachers in differentiating instruction, thus enabling students to engage in scientific activities that are based on their instructional level. Bronson notes that technology will allow teachers to

"provide specific instructional plans based on individual student needs" (2016, par. 3). In addition, activities that cannot be conducted in the classroom due to lack of resources can be recreated using technological devices. For example, students may experience dissecting a frog using an app rather than by using a real frog. As stated by Fortus (2008), phenomena need to be presented by the student or teacher. According to Bull and Bell, using technology in the classroom can allow "visualization of abstract phenomena, and simulations of experiments that would otherwise be impossible in school classrooms" (2008, p.3). Technology tools allow students to experience phenomena that they might not have been able to experience without technology.

Fortus (2008) states that for a science curriculum to be effective, students must use computers. Furthermore, technology allows students to do independent work without causing disruption, creating a hazard, or needing constant supervision. Enabling students to create and design their own experiments is a component of an effective science curriculum, and technology can promote increased opportunities for students to engage in these experiences (Fortus, 2008). Furthermore, some 21st century skills include being able to create and evaluate information using technology (Partnership for 21st Century Skills, 2011). When students create and design their own experiments, they are utilizing these 21st century skills. Finally, technology can accommodate teachers who do not have sufficient training or confidence to teach science, thus enabling them to be more effective facilitators. For example, a teacher who does not fully understand the concept of plant and animal cells would be able to locate and use a website that students can explore to learn about the concept. These examples based on recent studies indicate that many of the problems associated with science education, particularly those associated with

motivation, practicality, access to materials, and illustrations of concepts can be addressed in part by incorporating technology.

The Influence of Using Technology on Student Motivation

Student Response Systems are one form of technology that have been studied and shown to increase student's motivation (Abode, 2010). When using the Student Response System, students have a transmitter and the teacher has a receiver and software on his or her computer. The teacher asks a question and then students respond and data are transmitted to the software on the teacher's computer. The answers can be projected on the screen, and teachers can keep answers to collect achievement data about his or her students. A study conducted by Abode (2010) using third grade classes from November 2009 until February 2010 involved having one class use the Student Response Systems and one class not using the system. Both classes were taught the same content. Students took a pre-test and a post-test and some students were interviewed after the process. The School Achievement Motivation Rating Scale was used in this study. Results from the study indicate that motivation increased for the treatment group. These results suggest that the Student Response Systems were effective in increasing motivation.

Many students are adept at playing video games and video games can be used to increase students' motivation. Students can play games on computers, laptops, tablets, or mobile devices. One study conducted by Jones (2011) involved third grade students playing a Timex Attack Game to help them learn multiplication facts. The students played the game for one hour per week for 16 weeks. The students took a pre and post intervention survey that measured their motivation and self-efficacy in math. The teachers also completed a survey to measure their views on students' motivation. At the end of the study, results suggested that students were more

motivated to learn math. They viewed math as a personal need. They also wanted to spend time on the skill and felt working hard in math would help them have good grades. The students' motivation relates to the Expectancy- value Theory. The students found the value in what they were doing and it helped to motivate them. Use of technology appeared to increase students' motivation in math. Whether it could do so in other subjects, including science, appears to warrant consideration.

Many children enjoy playing computer games that enable them to be immersed in another world, and these games can be used to motivate students. A study conducted by Wyss, Lee, Domina, and MacGillivray (2014) included female college students who completed a pre-intervention survey, an assignment, and then a post-intervention survey. For the assignment, the students had to explore Cotton Island in Second Life to complete a scavenger hunt and learn about cotton. The assignment involved three to five hours of students' time. Following completion of the assignment, the students were administered a survey that measured their learning motivation. The survey followed the ARCS model which is attention, relevance, confidence, and satisfaction. Overall, the results were positive. Findings from the study suggest that using a virtual game can help motivate students and may enhance their learning experience.

Incorporating technology throughout all content areas can increase students' motivation A study completed by Godzicki et al. (2013) included first, fourth, fifth, and eighth grade students at two different schools. The tools used for the experiment were a Teacher-Survey on Technology, Teacher Survey on Student Motivation and Engagement, and, a Student Survey. The Student Survey had students reflect on their motivation and engagement. The data were collected from August until December 2012. The intervention used in all classes and content areas was a technology-supported learning environment. Different forms of technology were

used throughout the study including, but not limited to laptops, Ipads®, Ipods®, interactive whiteboards, student response systems. At the end of the study, students retook the Student Survey, and it was found that their motivation had increased.

Using technology has been found to increase student motivation in the science classroom. In a study conducted by Rafool et al. (2012), the motivation of fourth grade and high school students was assessed after completing technology tasks. The researchers had the students respond to a 10 item, five-point Likert Scale after completing each technology task. The four technology applications to science tasks used were a blog, a movie, a Prezi, and a graphic website. Results from the study suggest that using technology increased students' motivation. The students also indicated that they preferred using technology to learn rather than pencil and paper methods.

Summary

Today's students are growing up in a society saturated with technology. They want to use technology in the classroom just as they do at home. Teaching younger students science is very important, but it can be difficult to have a comprehensive and successful science curriculum at the elementary school level. Research findings suggest that using technology can address many of the challenges that teachers face when teaching science content. In addition, incorporating technology in the science classroom may increase students' motivation. Given findings that technology can improve motivation and learning, further research into what applications are the most beneficial and efficient appears warranted to help students become better science consumers and critical thinkers.

CHAPTER III

METHODS

The purpose of this study was to examine how motivation to learn science, which was determined by grades and ratings of on-task behavior and interest, was affected by using one-to-one technological devices in instruction.

Design

This sample was a convenience sample because the students participating in the study were chosen based upon their enrollment in the researcher's class. The study was completed using a quasi-experimental design which examined how the dependent variable, motivation, as reflected in grades, on-task behavior, and interest in science concepts, was affected by the use or non-use of one-to-one technological devices during science instruction. The independent variable was the extent of use of one-to-one technological devices in science class.

Participants

The participants in this study were five female students in grades two and three at a private school in northeastern Maryland for students. The school serves students with learning differences and has an enrollment of 72 students who are predominantly Caucasian. Two of the participants were seven years old, two were eight, and one was nine. All of them were Caucasian and were enrolled in the same science class, and all were identified as having at least one type of learning difference.

Instrument

Three criteria were assessed to reflect the participants' motivation to participate and perform in science classes. These included students' ratings of their interest in the lessons and topics, their actual performance on assessments related to the topics, and their on-task behaviors during instruction.

Interest Survey

All students completed a teacher-made pre- and post- survey before and after each mini-unit. The survey asked the students how familiar they were with the topic, how interested they were in the topic, and how much they enjoyed science class at the time. A copy of the survey is located in Appendix A.

Grades

Teacher-made exit tickets were completed by the students each day to determine their understanding of the daily objectives and to determine students' daily grades. Additionally, students completed a quiz at the end of each mini-unit. For each unit/condition, the mean daily exit ticket scores and unit quiz grades were also averaged to yield a composite mini-unit grade.

On-task Behaviors

The researcher assessed students' on-task behavior each day using a teacher- made check sheet (see Appendix B). Using a timer set for every five minutes during each lesson, the researcher put a check on the sheet next to the student's name if the student was demonstrating on-task behavior. At the end of each lesson, the checks were totaled to yield a score with a range

from zero to six per day. At the end of each mini-unit, mean daily checks earned during the science lessons were computed for each student for the technology unit, the non-technology unit and for technology and non-technology days within the technology unit.

Procedure

The researcher introduced the topic of the first mini-unit, Rocks and Soil, to the students. The students then completed the pre-survey (Appendix A) about their knowledge of and interest in the topic. The researcher explained the rating scale to the participating students and reviewed the numeric ratings for each question.

During the subsequent three weeks, the researcher taught the science lessons using no one-to-one technological devices. The researcher recorded students' on-task behavior each day during science instruction, and administered exit tickets to determine daily grades. At the end of the first mini-unit, the researcher gave the students a Rocks and Soil Quiz and re-administered the interest survey. Finally, the daily on-task behavior ratings and grades were averaged for the unit.

The second mini-unit began as soon as the first mini-unit ended. This mini-unit was on Matter. The students again completed the interest survey when the topic was introduced, and the researcher began teaching the three week mini-unit using one-to-one technological devices at least three days a week for thirty minutes or more. The researcher recorded on-task behavior and gave daily exit tickets. The researcher also recorded in a notebook the dates on which technology was used, which technology was used, how it was used, and any other observations that she noted during that class time (Appendix E). These data were needed so that the students' grades and motivation on days using and not using technology could be compared within the

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technology condition. At the end of the mini-unit, students completed a Matter Quiz and were again re-administered the interest-survey. Finally, the on-task behavior data and grades were averaged for the Matter (with technology) unit.

CHAPTER IV

RESULTS

The purpose of this study was to examine whether motivation to learn science, determined by grades, on-task behavior, and interest in the concept, was affected by regular use of one-to-one technological devices in the delivery of science units.

Hypotheses

Grades

The initial null hypothesis for this study was that students' mean grades would not differ significantly across the technology and no technology conditions. Two t-tests for paired samples were run to test hypotheses one and two by comparing the mean scores on unit quizzes and unit grades for the units taught with and without using technology. The unit grades were computed by averaging students' daily exit ticket and unit quiz scores. Descriptive statistics and t-test results follow in Tables 1 and 2, below, and indicate that the mean differences were not large enough to be determined statistically significant, so both null hypotheses one and two were retained.

ho_1: mean unit quiz scores in units taught without technology = mean unit quiz scores in units taught with technology

ho2: mean unit grades in units taught without technology = mean unit grades in units taught with technology

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Table 1

Descriptive Statistics for Unit Quiz Scores and Grades for Units Using and Not Using

Technology

Compared		Mean	N	s.d.	SEM
Unit Quiz Scores	With technology	85.6	5	5.367	2.400
	Without technology	88.6	5	12.798	5.723
Unit Grade	With technology	86	5	8.754	3.915
	Without technology	89.1	5	11.104	4.966

Table 2

Results of Paired Samples t-tests Comparing Unit Quiz Scores and Unit Grades for Units Using

and Not Using Technology

	t	df	Mean difference	s.d.	SEM	95% Confidence interval of the difference	Significance (p)
Exit Ticket Scores	-.598	4	-3	11.25	5.020	-16.938-10.938	.582
Unit grade (average of Unit test score and mean exit ticket score)	-1.181	4	-3.1	5.867	2.624	-10.385-4.185	.303

Exit Ticket Scores within the Technology Unit

As technology was not used daily in the "technology" condition and to further

assess the relationship between daily achievement and use of technology, hypotheses 3,

presented below, also was tested to compare students' mean daily exit ticket grades for individual lessons taught with and without technology during the technology (Matter) unit.

ho3: mean daily exit ticket grades in individual lessons without technology during the technology unit = mean daily exit ticket grades in lessons with technology in technology unit

Mean daily exit ticket scores were computed for each student for the days which they were present during the Matter unit, which included technology as part of instruction. Two students missed one day each during the Matter unit, which was accounted for when averaging the exit scores for the eight days with and four days without technology which comprised the Matter unit.

To test hypothesis three, the mean exit scores for the eight days on which technology was used and the four days on which technology was not used during the Matter unit were compared using a t-test for paired samples. The results in Tables 3 and 4 indicated that these mean exit scores were not statistically significantly different (t= -.553, p < .610). Therefore, hypothesis three was retained.

Table 3

Descriptive Statistics for Students' Exit Scores on Days Using and Not Using Technology During the Matter Unit

Test	Condition/Day	Mean	N	s.d.	SEM
Exit Ticket Scores	With technology	2.55	5	.386	.173
	Without technology	2.66	5	.564	.252

Table 4

Results of Paired Samples t-test Comparing Exit Scores for Unit using Technology

	t	df	Mean difference	s.d.	SEM	95% Confidence interval of the difference	Significance (p)
Exit Scores	-.553	4	-.103	.42	.186	-.620 - .414	.610

On Task Behaviors

It also was hypothesized that students' on-task behavior would not differ across the two conditions or across days when technology was used or not within the Matter unit. Hypotheses four and five, which related to on-task behaviors follow.

ho4: mean daily ratings of on-task behavior in unit without technology=mean daily ratings of

on-task behavior in unit with technology

ho5: mean daily ratings of on-task behavior in individual lessons without technology during

the technology unit = mean daily ratings of on task behavior in lessons with technology in

technology unit

In calculating the percentages of on-task behaviors for each student, absences and partial class attendance were accounted for by calculating the percent of on-task ratings earned for the portion of class each student attended. For example, if a student was present for half of

class but was on-task for all three of the three ratings assigned, she was assigned a 100% for that day.

Descriptive statistics of the percent of affirmative ratings of on-task behaviors follow in Table 5 for the non-technology and technology units and for the days with and without technology within the technology condition (Matter unit). Table 6 depicts the results of the t-tests for paired samples which compared the ratings of on-task behavior between the Rocks and Soil and Matter units and within the Matter unit.

The results indicated that students were rated as being on-task on average 95% of the time during the technology unit and 84.8% of the time during the non-technology unit. Comparison of these means yielded a t statistic of 5.156, which was statistically significant (p<.007), so null hypothesis four, which suggested that on task behavior would not differ significantly across technology conditions, was rejected.

Within the technology unit, on-task behaviors were observed significantly more often during the eight days on which technology was used than during the four days on which it was not used (t= 3.511, p < .025), so null hypothesis five was also rejected.

Table 5

Descriptive Statistics for Students' Daily Percent of Affirmative Ratings of On-Task Behaviors (out of 6) Across Units and Within the Technology Unit

On-Task Behavior N=5	Condition/Days	Mean Percent	s.d.	SEM
Overall Units				
Matter	With technology	95	.028	.012
Rocks and Soil	Without technology	84.8	.061	.027

Within Matter (Technology) Unit				
	With technology (8)	99.11	1.230	.550
	Without technology (4)	87.22	7.425	3.321

Table 6

Results of Paired Samples t-tests Comparing On-Task Behavior Across the Units and Across

Days with and without Technology Within the Technology Unit

	t	df	Mean difference	s.d.	SEM	95% Confidence interval of the difference	Significance (p)
Across Units	5.156	4	10.2% (.102)	.044	.020	.047-.117	.007
Within Matter Unit	3.511	4	11.88 % (.1188)	7.57	3.384	2.488 - 21.280	.025

Interest

The researcher also was interested in comparing whether students' interest in the science topics taught was affected by the use of technology during science class. While the content of the units varied, the lessons' presentation and assessments were made as parallel as possible with the exception of using one-to-one technology devices to deliver instruction and practice in the Matter unit. Hypothesis 6 (below) was postulated and tested to determine whether interest differed across the units.

ho6: mean changes in ratings (post unit-pre unit) of interest in science topic taught without technology = mean changes in ratings (post unit-pre unit) of interest in science topic taught with technology

To summarize and compare interest scores, students were asked to rate the following three items from the survey located in Appendix A from 1 (none) to 5 (a lot) before and after each of the two science units:

1. How much do you know about this topic?
2. Do you want to learn more about this topic?
3. How much do you think you will (before) or did you (after) enjoy Science class during this unit?

Each student's responses to these three items were summed to yield a total interest score before and after each unit. Descriptive statistics for the responses to the three items and total changes for both units follow in Table 7. The total changes in interest were calculated by summing the differences between the post and pre-unit ratings for the three items.

Table 7

Descriptive Statistics for Ratings of Interest in the Units

Ratings N=5		Pre			Post			Change in Mean Ratings (post-pre)	s.d. of Change
		Mean	Range	s.d.	Mean	Range	s.d.		
Technology Unit (Matter)	Item 1	2.6	1-5	2.19	3.8	2-5	1.64	1.2	
	Item 2	4.2	1-5	1.79	4.8	4-5	.45	.6	
	Item 3	3.4	1-5	2.19	4.8	4-5	.45	1.4	
	Total (Sum of Mean Changes)							3.2	6.53
Unit without Technology (Rocks and Soil)	*Item 1*	2.6	1-5	1.52	5	5-5	.00	2.4	
	Item 2	5	5-5	.00	3.6	1-5	1.95	-1.4	
	Item 3	4.2	2-5	1.3	4.4	3-5	.89	.2	
	Total (Sum of Mean Changes)							1.2	3.27

A t-test for paired samples was run to compare the mean total changes in interest ratings

for the two conditions. These were 3.2 for the with technology condition (Matter Unit) and 1.2

for the without technology condition (Rocks and Soil Unit). Results, which follow in Table 8,

indicate that while the interest ratings for the unit with technology changed more than those for

the unit without technology (3.2 vs. 1.2 points), the mean difference of two between these mean

total changes for the three interest-related items was not large enough to be determined

statistically significant (t = .988, p < .379). Thus hypothesis 6, that the changes in interest would

be the same for both units, was retained.

Table 8

Results of T-test for Paired Samples Comparing the Total Mean Changes in Ratings of

Interest for Units with and without Technology

	t	df	Mean difference	s.d.	SEM	95% Confidence interval of the difference	Significance (p)
Change in Interest	.988	4	2.0	4.53	2.02	-3.62-7.62	.379

Finally, items four and five on the interest survey found in Appendix A were completed after each unit to assess in an open-ended format what students liked or did not like about each unit or how it was taught. Their responses were varied and challenging to interpret. For instance, for the unit that did not use technology, one student reportedly enjoyed rock collecting outside of the classroom because students were allowed to keep the rocks. However, two students did not enjoy collecting rocks from outside the classroom because they found it tiring. Two students reported enjoying the use of playdoh to create objects because they were able to play with the playdoh for a little while after they finished their work. Another student did not enjoy using the playdoh because it felt sticky. One student enjoyed the experiments that were completed during this unit because they found them fun and interesting. A fifth student enjoyed using clipboards when the unit was reviewed because they were "fun and interesting". Finally, two students reported that they did not enjoy class when the textbook and other reading materials were used because they felt they were not fun and one student felt the class reads books too often. In summary, there was no one activity reportedly enjoyed in full or by all nor any particular activity that was least enjoyed by the students in the non-technology unit.

For the technology unit, the students' responses about what they liked about the unit were unanimous. They all enjoyed using the computers. When asked what they liked about the unit, the students said that the laptops were fun and they enjoyed watching videos, playing games and using BrainPop. One student indicated that she enjoyed using the laptops because she is good with technology. The responses given for what the students did not like in the technology unit were not unanimous and some matched the answers from the non-technology unit. Two students did not enjoy the days when textbooks were used. They said that the textbooks are not fun, and they dislike having to flip to find the page. One student said she did not enjoy using the iPads because it was boring while another student said she did not like the unit at any time when laptops were not being used because she feels computers "are awesome". Finally, one student said she did not enjoy watching a long video because she already knew the information and was bored. Overall, students enjoyed using the laptops in the technology unit and did not enjoy using textbooks in either unit.

CHAPTER V

DISCUSSION

The purpose of this study was to determine whether using technology in the science classroom increased motivation in second and third grade students. Three hypotheses were tested to determine whether mean unit quiz scores, unit grades, and daily exit ticket scores were equal for the units with and without technology as it was assumed that motivation would affect both performance and grades Each of these hypotheses was retained as no significant differences were found for students' grades across units or across lessons with and without technology in the technology condition.

The fourth null hypothesis, which stated that students' on-task behavior would be equal in the units with and without technology was rejected as the mean percentage of time on task was significantly higher during the unit which incorporated technology. The fifth null hypothesis, which stated that the mean daily ratings of on-task behavior in lessons would be equal on days in the technology unit that did and did use technology also was rejected.

Hypothesis six stated that the mean change in ratings of interest in the science topics would be equal for the units with and without technology and was retained as the mean difference in the total changes in ratings of interest for units with and without technology was not large enough to be determined statistically significant.

Implications of Results

The results indicated that using technology did not appear related to the students' grades. This might suggest that if a teacher wants to increase his or her students' grades, he or she does not necessarily need to use one-to-one technology in the classroom.

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These results suggest that increased use of technology in science class appears to be related to students' on-task behavior. Students were rated as being on-task significantly more often during the technology unit on the days when technology was used (t= 3.511, p < .025) and during the unit using technology when compared to the unit that did not use technology (t= 5.156, p <.007). The researcher also observed that one student was taken out of the classroom four times during the unit without technology due to negative behaviors, such as whining, refusing to work, and not following directions. She was not taken out of class once during the unit with technology, and her behavior was more positive on the days when technology was being used. The student was more on-task, which could have led to less time for negative behaviors. Results from this study appear to suggest that students' attention and behavior might benefit from increased technology use during science instruction.

Participants completed interest surveys before and after completing each unit. While the mean change in interest between the two units was not statistically significant, it was noted that all students reported that they enjoyed using the laptops during the technology unit. Most students enjoyed the videos on the laptops and iPads in the technology unit as well. Some students indicated that they did not enjoy using the textbooks in either the unit with or without technology. On two different occasions when textbooks were used, one student said, "I hate the textbook!" However, the researcher noted that on a day on which the students used the laptops to review textbook information, the students were all on-task and attentive to the lesson and no comments were made about the information or the way the information was presented.

Theoretical Consequences

In Chapter II, it was noted that incorporating more technology in the science classroom may motivate students. This study was conducted to determine whether the students in second

and third grade were more motivated to learn science when technology was included in the lesson as evidenced by grades, interest, and on-task behavior. On-task behavior relates to student engagement and attention. If students are engaged and attentive to a task, it suggests they may be motivated to complete it. Many studies, such as the one completed by Godzicki et al. (2013) consider both engagement and motivation because they are correlated with on-task behaviors. Motivation also can be correlated to interest and grades. If students are interested in what they are learning, then they are more likely to be motivated to learn the content. Additionally, if students are motivated and interested in what they are learning, their grades are likely to be positively affected. Given these relationships among attention, interest and achievement, grades, on-task behavior and interest were quantified and used as possible indicators of motivation. Results suggested that on-task behavior differed across conditions, but grades and interest did not.

Threats to Validity

The primary threat to validity of this study is that the instruments used in this study were not supported by reliability or validity data because all were constructed by the researcher. Another threat to validity is that student motivation could not be measured directly. However, on-task behavior, grades, and interest in the subject likely are related to motivation as described above. Another likely threat to validity is that the sample was extremely small, and included only Caucasian females. A larger and more diverse sample, inclusion of participants of varied ages, and using controls to determine what technology relates to particular outcomes would have allowed for clearer depiction of how the variables may inter-relate for various populations and in varied subject areas. Additionally, students' ratings may not have accurately represented their feelings. Despite efforts to keep the measurement simple, these participants may have been too

young to understand or complete the rating scale accurately. For example, one student said "I don't like science" during several science classes throughout the unit which did not use technology; however, she gave the unit a high rating of 5 on her survey.

Another threat to the validity of the study was that the technology most used in the technology unit was laptops. The SBRS and iPads® were each used once during the mini-unit. As noted, future studies should control for the type of technology and programs used to better determine what particular effects each has on the variables of interest (motivation, achievement, on-task behavior, and interest).

Controlling more for the difficulty of unit content may also have improved the validity of these findings. In this study, the first unit was on a topic that is concrete, rocks and soil, while the second unit was about a more abstract concept, matter, which may have affected the exit ticket and quiz grades. There was a notable difference in the size of the variances of unit quiz scores and unit grades between the units which may have been related to the differences in the units' difficulty. In addition, the units were fairly brief. Longer units may change the results.

A final threat to the validity of the study is that overall student behavior was not quantified in the study. Students who exhibited negative behaviors were removed from the classroom and their on-task behavior ratings were adjusted but not diminished when they were removed for behavioral issues. However, it was observed that negative behaviors decreased during the unit in which technology was used. Future studies might include ratings of both on-task behavior and general behavior to obtain more accurate data.

Connections to Previous Studies

The review of literature suggested that using technology can increase students' motivation to learn science. The current results only partially support this finding. Students' motivation for learning science, as determined by grades and interest, did not increase significantly when technology was used, although students were more on-task on days technology was used and during the unit using technology. A study completed by Abode (2010) reflected increased student motivation when Student Response Systems were used. Rafool et al. (2012) also found that using various technology tools in science increased student motivation. While students' on-task behavior increased in this study, their grades and expressed interest did not reflect a similar or significant increase. While the findings were not consistent, a review of all findings along with observations of students made by the researcher suggest that being on task reflects increased student interest (and motivation), despite the failure of the brief survey used to reflect this conclusion.

Godzicki et al. (2013) used many different forms of technology including laptops, Ipads®, Ipods®, interactive whiteboards, and student response systems and found that student engagement and motivation appeared to increase with the use of technology. This study also utilized several different forms of technology, including laptops, Ipads®, and student response systems, although primarily it used laptops. This study found an increase in on-task behavior with use of technology, which likely is related to student engagement. The discrepancy of results related to interest in this study and motivation in the study of Godzicki et al. may reflect differences in the ways students' interest and motivation were assessed. Use of more similar ratings for motivation might yield results that are more in aligned with past studies.

Implications for Future Research

Additional studies should be conducted to determine how technology relates to and can increase students' motivation and consequent achievement. Future studies should use more diverse and larger groups of students and include control groups to enable the results of varied uses of technology on varied content to be compared. Future studies also might include teacher surveys because teachers' observations and insights can be valuable and more accurate than self-reports, especially if the students are not old enough to accurately complete surveys themselves. Using ratings of motivation more parallel to those in other studies also might render results which are more easily compared to past findings. In addition, future studies can use more diverse technology programs and designs which permit comparison to determine whether particular applications have specific effects on students' motivation. Furthermore, future studies should use larger and more comparable units of study. Finally, future studies should account more specifically for all types of behaviors to determine what effects, if any, use of technology has on general, on-task, and negative behaviors.

Conclusions/Summary

In conclusion, the results of this study indicate that while students' grades were not significantly affected, students' engagement and on-task behavior may increase when technology is utilized. Teachers of students who have attention difficulties or students who are not engaged in science class might benefit from incorporating use of one-to-one technology tools within their classroom.

Future research is needed to determine confidently if and how technology use is related to and might increase student motivation. However, this researcher found that even with these

inconclusive findings, incorporating technology into the classroom had some benefits which were also noted in the literature. For example, technology can provide experiences for the science classroom which might not otherwise be possible and students seemed more on-task and reported enjoying the activities which incorporated use of laptops. Future studies which minimize the threats to validity that confounded these results should be conducted to help teachers determine how to best use technology to pique students' interest and heighten their motivation to learn.

References

Abode, I. A. (2010). *The impact of student response system on third graders' learning,*

   motivation, and engagement (Doctoral dissertation). Retrieved from ProQuest. (UMI No.

   3424347)

Areepattamannil, S., Freeman J. G., & Klinger, D.A. (2011). Influence of motivation, self-

   beliefs, and instructional practices on science achievement of adolescents in Canada.

   Social Psychology of Education: An International Journal 14.2(2011), 233-259.

   http://dx.doi.org.goucher.idm.oclc.org/10.1007/s11218-010-9144-9

Bronson, L. (2016). *How technology can help teachers in the classroom*. Retrieved from

   http://www.uscranton.com/resources/teaching-tips/how-technology-can-help-teachers-in-

   the-classroom/#.V4aFTvkrJD8Bull, G. & Bell, R. L. (2008).

Educational technology in the science classroom. In R. Bell, J. Gess-Newsome, & J. Luft (Eds.),

   Technology in the secondary science classroom (1).

   Retrieved from http://static.nsta.org/files/PB217X-1.pdf

Fortus, D. (2008). Science. In T. Good (Ed.), 2*1st century education: A reference handbook*

   (38). http://dx.doi.org.goucher.idm.oclc.org/10.4135/9781412964012.n38

French, L. A. (2012). Science education in the early years. In O. Saracho & B. Spodek

   (Eds.), *Handbook of research on the education of young children*. Retrieved from

   https://goucher.idm.oclc.org/login?url=http://search.credoreference.com.goucher.idm.ocl

   c.org/content/entry/routsmch/Science_education_in_the_early_years/0

Godzicki, L., Godzicki, N., Krofel, M., & Michaels, R. (2013). *Increasing motivation*

   and engagement in elementary and middle school students through technology-

supported learning environments. Retrieved from ERIC on EBSCOhost. (Accession

    Order No. ED541343)

Herold, B. (2016, February 5). Technology in education: An overview. In *Education*

    Week. Retrieved from http://www.edweek.org/ew/issues/technology-in-education/

Jones, V. C. (2011). *The effects of computer gaming on student motivation and basic*

    multiplication fluency (Doctoral dissertation). Retrieved from ProQuest. (UMI No.

    3484339)

Martindale, S. (2011). Elementary schools not teaching enough science. *The Orange*

    County Register. Retrieved from http://www.ocregister.com/articles/Science-323609-

    elementary-schools.html

Painter, J. (2011). *Autonomy, competence, and intrinsic motivation in science education: A self-*

    determination theory perspective (Doctoral dissertation). Retrieved from ProQuest. (UMI

    No. 3495728)

Partnership for 21st Century Skills (2011). *Framework for 21st century learning*. Retrieved from

    http://www.p21.org/storage/documents/1.__p21_framework_2-pager.pdf

Rafool, B., Sullivan, E., & Al-Bataineh, A. (2012). Integrating technology into the classroom.

    The International Journal of Technology, Knowledge, and Society 8(1), 57-71. Retrieved

    from

    http://eds.a.ebscohost.com.goucher.idm.oclc.org/ehost/pdfviewer/pdfviewer?vid=11&sid

    =be41cfbf-645d-439b-8398-058df5112cc9%40sessionmgr4001&hid=4103

Summers, J. (2008). Cognitive approaches to motivation in education. In T. Good (Ed). *21st*

    Century education: A reference handbook (12).

    http://dx.doi.org.goucher.idm.oclc.org/10.4135/9781412964012.n12

Trygstad, P.J.,Smith, P.S., Banilower, E. R., Nelson, M. M., & Horizon Research, I. (2013). The

    status of elementary science education: Are we ready for the next generation science

    standards?. *Horizon Research Inc.* Retrieved from

    http://files.eric.ed.gov/fulltext/ED548249.pdf

Tucker, K. (2015). Problems grade 4 teachers face teaching elementary science. *Seattle PI.*

    Retrieved November 15, 2015 from http://education.seattlepi.com/problems-grade-4-

    teachers-face-teaching-elementary-Science-6057.html

U.S. Department of Education, National Center for Education Statistics. (2010). Teachers' use

    of educational technology in U.S. public schools: 2009. Retrieved from

    https://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2010040.

Wylie, J. (2016). Mobile learning technologies for 21st century classrooms. In *Scholastic.*

    Retrieved from http://www.scholastic.com/browse/article.jsp?id=3754742

Wyss, J., Lee, S., Domina, T., & MacGillivray, M. (2014). Cotton island: Students' learning

    motivation using a virtual world. *Decision Sciences Journal Of Innovative*

    Education,*12*(3), 219-232. Retrieved from

    http://eds.b.ebscohost.com.goucher.idm.oclc.org/ehost/pdfviewer/pdfviewer?vid=3&sid=

    8f4bfd32-7252-4bc4-a548-e2d250a2240a%40sessionmgr120&hid=111

Zero to eight: Children's media use in America 2013. (2014). *The Education Digest 79.6*(Feb

    2014) 59-63. Retrieved from

    http://search.proquest.com.goucher.idm.oclc.org/education/docview/1496698428/7B75A

    6E062014389PQ/1?accountid=11164

Interest Survey

Student: _____

Unit/Topic: _____

Date: _____

Rate these questions from 1-5 using the following scale.

1 = none
2 = a little bit
3 = some
4 = quite a bit
5 = a lot

1. How much do you know about this topic? _____

2. Do you want to learn more about this topic? _____

3. How much do you think you will (before) or did you (after) enjoy Science

   class during this unit? _____

4a. What did you like most about this unit or how it was taught?

   4b. Why?

5a. What did you like least about this unit or how it was taught?

   5b. Why?

Appendix B

On-Task Behavior Rating

	5 mins	10 mins	15 mins	20 mins	25 mins	30 mins	Notes
J							
E							
W							
L							
C							

If off-task, it was for:

Moving about= M

Talking to peer= T

Daydreaming= D

Doing something other than lesson= O

ABSENT=A in each box

A. Exit Ticket- Rocks and Soil Unit

   1. Are all rocks alike? _____

   2. What is one way rocks can be alike? _____

       _____

   3. What is one way rocks can be different? _____

B. Exit Ticket- Rocks and Soil Unit

   1. A rock is a

      a. living part of Earth

      b. a nonliving part of Earth

      c. a mix of tiny rocks and bits of dead plants and animals

   2. Where are two places you can find rocks? _____

      and _____

C. Exit Ticket- Rocks and Soil Unit

    1. All rocks are the same color

      A. True

      B. False

    2. All rocks that are the same size weigh the same amount

      A. True

      B. False

3. All rocks sink in water

    A. True

    B. False

A. Exit Ticket- Matter Unit

Circle the three things made of matter

    a. Dog

    b. Air in a balloon

    c. Reading

    d. Hugging

    e. Water

    f. Working

B. Exit Ticket- Matter Unit

Write three things that are made of matter _____

_____, and _____

C. Exit Ticket- Matter Unit

Write down the name of your object. Write down three properties about your

object. _____, _____,

and _____

Appendix D

Rocks and Soil Quiz

1. Bits of rock and soil that plants and animals need are
    a. rocks
    b. minerals
    c. soil

2. a mix of tiny rocks and bits of dead plants and animals
    a. rocks
    b. minerals
    c. soil

3. A nonliving part of Earth is
    a. rock
    b. mineral
    c. soil

4. What are three ways that rocks and minerals can be different from each other? (3 points)

    *   _____

    *   _____

    *   _____

5. What are two ways that rocks and minerals are used? (2 points)

*   _____

*   _____

6. What are the three types of soil? (3 points)
    a. clay soil
    b. beach soil
    c. sandy soil
    d. brown soil

e. planting soil

f. top soil

Directions: Decide if the statements are true or false. Write T for true or F for false

7. Soil is formed very quickly _____

8. Soil can be different colors and textures _____

9. All soil can hold a lot of water _____

10. Plants grow best in sandy soil. _____

11. There are nutrients in the soil. _____

12. The layer of soil beneath topsoil is called subsoil. _____

Matter Quiz

1. Anything that takes up space and has mass
   a. mass
   b. matter
   c. property

2. The amount of matter in an object
   a. patter
   b. property
   c. mass

3. the look, feel, smell, sound or taste of a thing
   a. property
   b. matter
   c. mass

4. What are three things that are made of matter? (3 points)

   _____
   _____
   _____

5. What are two things that are not made of matter?

   _____
   _____

6. What are the three states of matter? (Circle 3) (3 points)

a. liquid
b. mass
c. solid
d. property
e. matter
f. gas

Directions: Decide if the statements are true or false. Write T for True and F for False

7. The more mass something has, the more it weighs _____
8. A property of a lemon is that it tastes sour _____
9. We can measure matter using only rulers _____
10.   A piece of paper is a solid _____
11.   Juice is a solid _____
12.   Smoke is a gas _____

Appendix E

Technology Usage in the Matter Unit

Date	Type	How was it used	Notes
3-14-16	Laptops	Students followed a Word document that outlined what they were supposed to do. It included watching a teacher made-video, reading a poem, looking at pictures and writing on paper if they are made of Matter or Not.	The students were very engaged. Some complications and neediness (questions) due to inexperience with technology.
3-15-16	Laptops	Students followed a Word Document that outlined what they were supposed to do. It included a teacher made-video, looking at pictures and finding things made of matter, a sorting activity, and then it had the students go to Paint to make a picture that included things made of matter.	Students were very needy. They didn't quite understand the directions. (Lots of questions) But they were engaged and enjoyed getting to make pictures in Paint. Some minor technical complications.
3-17-16	Laptops	Students went through a PowerPoint that auditory and visual information about Mass. They had questions on the PowerPoint that they answered on paper. The PowerPoint had videos for them to watch (mostly teacher made)	Students did well- better with following directions. On task behavior was high for all five students. Less neediness than in the first two tech lessons.
3-29-16	Laptops	Students went through a Power Point. It had auditory and visual information. They had to take notes from the presentation. They had to watch videos and do a vocabulary sort.	Some students finished earlier than others. They had a longer time to draw pictures in Paint. It was difficult to determine how long this lesson would take.
3-31-16	Smart Board ™ Response System (SBRS)	Teacher made questions to review the unit so far. Students had a SBRS that they used to answer questions about matter, mass, and properties.	30 minutes seemed long. This activity was less independent than using the laptops- students had more

			wait time.
4-1-16	Laptops	Students went through a Power Point presentation. It had auditory and visual information. They did a vocabulary sort, sorted items as solids or not, watched videos and made predictions on their worksheets. They watched other videos and answered questions from the PowerPoint on their worksheets	Students doing better with technology as they have more experience with it.
4-4-16	Ipads	Students had to visit various websites and apps to watch videos and complete activities that were about matter.	Students were excited when the Ipads were brought out. Most seemed familiar with tablets.
4-6-16	Laptops	Students followed a Word document that had instructions. They watched videos, did some sorting activities, and answered questions from the Word document on paper.	Good review lesson. Students engaged and did not need much assistance. One student had technical difficulties.