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A Blended Learning Approach to Increasing Student Achievement in a Sixth Grade Mathematics

Classroom Using Flipped Classroom with Tiered Activities

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A Blended Learning Approach to Increasing Student Achievement in a Sixth Grade
Mathematics Classroom Using Flipped Classroom with Tiered Activities

Submitted on May 11th, 2016,

in fulfillment of final requirements for the MAED degree

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Date _____

Abstract

This study was designed to examine the impacts of a blended learning classroom on student achievement by implementing the flipped classroom paired with tiered activities. Throughout the twenty-two day study, four sixth-grade mathematics classrooms were asked to view and take notes on teacher-created instructional videos outside of the classroom and complete individual chosen activities for a specific letter grade. Data sources included pre-assessments, reports of video completion and lesson checks through the use of Schoology.com, post-assessments, and a student survey. Results showed increases in student achievement over two chapters in daily lesson checks and quizzes. The blended learning strategy proved to be very successful on one chapter's post-assessment, while additional support was needed for the second chapter. This study showed the importance of balance in technology and direct-instruction and its effects on student achievement in a mathematics classroom. Further implication includes investigating other differentiated activities that can be paired with the flipped classroom.

Keywords: blended learning, flipped classroom, tiered activities, student achievement

“What are you going to do about it? We are going to have to shake things up if we don’t start getting better results.” These were the words my principal sharply communicated at an emergency math department meeting before school began in August. Our district Minnesota Comprehensive Assessment (MCA) scores were at an all-time low and administration, especially our superintendent was not happy. Mathematics student achievement has been a concern in my district for the past few years, but this year it has caused administrators and educators to explore different options in regards to instruction. From chapter tests to quizzes to the MCA scores, students have struggled to meet our district’s benchmark of proficiency (80%) to show growth in the mathematical concepts required at grade level. The sixth grade MCA scores have wavered a bit the last five years and have consistently fallen short of the 80% benchmark, which is a significant concern in the district. The successive MCA mathematics scores for sixth grade were 56.50% in 2010-2011, 72.50% in 2011-2012, 60.80% in 2012-2013, 65.10% in 2013-2014, and the lowest score of 50.30% in 2014-2015. These scores provide evidence that increasing mathematics scores should be a priority in the district.

Not only did students struggle with meeting proficiency benchmarks on the MCAs, but also on sixth-grade chapter tests and quizzes. Each year, students with varying backgrounds have received the same mathematic instruction. After researching and combing through the data, the big question remained: How do educators meet the vast range of educational needs while ensuring growth in student achievement? By incorporating the blended learning model, defined as a “pedagogical strategy by which students learn via a mixture of face-to-face and digital instruction” (Schoology, 2016, p 3), we may achieve this goal. Through the use of technology, the blended learning model engages students in the learning experience and enhances their critical thinking abilities to deepen the learning process (Schoology, 2016).

The school district in this study took the initiative to move towards a 1:1 laptop program four years ago which has allowed teachers to have a plethora of resources at their fingertips. The 1:1 laptop program has made it easier for educators to support the blended learning model as it connects classroom strategies with various technologies to strengthen educational concepts. Educators can experiment with technology in hopes of enhancing instruction in the mathematics classroom by incorporating technology concepts such as the flipped classroom model. The flipped classroom model provides a different way of presenting the material to the students. The flipped classroom takes the lecture part of the instruction and places it in videos or podcasts for students to watch at night as their homework (Morgan, 2014). The flipped classroom frees up class time for educators to create hands-on investigations, resolve any miscommunications, and partake in in-depth discussions regarding the topic.

When educators use the flipped classroom model, differentiated instruction should be used in the classroom by educators to meet the needs of all learners and increase student achievement by providing multiple avenues to engage students in the various content areas (Moon, 2005). There are numerous strategies educators can use in the classroom to differentiate. One strategy I chose to explore was tiered activities. Tiered activities allow students the choice of their level of achievement while addressing a particular standard, fundamental concept, or generalization (Kapusnick & Hauslein, 2001; Pierce & Adams, 2004). In a tiered lesson, the teacher handles creating tasks and possible outcomes centered on a particular concept.

The flipped classroom model with tiered activities action project was conducted at a middle school in a suburban community in southeastern Minnesota. It involved ninety-seven students in sixth-grade mathematics classes, in which 52.6% were female, and 47.4% were male. The mathematics class was predominantly White (94%) with a small percentage of African

American students (3%) and Asian students (2%). Twenty-four percent of the sixth-grade students qualified for free and reduced lunch. Of the ninety-seven students, ten received special education services and were on an Individualized Educational Program (IEP) while three students were on a 504 plan.

Scores in the mathematics department, district-wide, have been inconsistent and missing the 80% proficiency benchmark from year to year. To help improve scores, strategies need to be investigated to increase student achievement. Through research and implementation, I hope to answer two questions: What is the impact of the flipped classroom on student achievement in a sixth-grade mathematics classroom? How does allowing students to choose their grade using tiered activities to differentiate instruction impact student achievement?

Literature Review

Educators typically work with a diverse set of students that represent a broad range of educational needs and daily they strive to meet the varied needs of the students without losing focus on increasing student achievement (Moon, 2005). Educators want to see growth in student achievement in the classroom, but it can be difficult to identify strategies that will work for all students. This literature review will focus on the blended learning model as one possible strategy to support growth in students' academics. It will examine how technology and differentiated instruction strategies can be blended together to enhance curriculum.

It will, in particular, investigate how the flipped classroom with tiered activities impact student achievement.

Blended Learning Approach

Williams (2002, as cited in Vaughan, 2007) defined blended learning "as the combination of face to face and online learning" (p. 82). Blended learning is a mixture of traditional teaching

approaches and learning technologies to create flexible learning opportunities for students (Vaughan, 2007). The blended learning model helps teachers to integrate technology in and out of the classroom and then uses the instructional time to differentiate to meet the needs of the students (Kleber, 2015). Hybrid, or blended, courses include a balance of technology and face-to-face time to complement and reinforce one another. Hybrid courses are designed to take advantage of the best features of both possibilities of instruction (“Hybrid or Blended,” 2016). The ever-growing wealth of technologies available has created new opportunities for students to interact with their peers, teachers, and content, inside and outside of the classroom (Vaughan, 2007). Blended learning increases independent work time, encourages collaboration and communication with peers and teachers, and offers more time for modified re-teaching (Kleber, 2015). Technologies and differentiated instruction have many advantages, but by combining them in a balanced manner, they create an instructional approach that increases student achievement. Poon (2013) has pointed out that, “several research studies have demonstrated that using blended learning as a delivery method contributes to improved learning outcomes for students... and resulted in students achieving higher grades, greater knowledge, and greater understanding of the concepts” (p. 275). Blended learning allows for more active and meaningful learning while still creating the relationship with face-to-face conversations (Poon, 2013). One study polled 105 middle school students who had experienced both blended and traditional learning to determine their preferred classroom environment. Only three students stated they favored the traditional classroom method of teaching over blended learning (Kleber, 2015).

Technology has a lot to offer in the blended learning classroom to meet the needs of all learners. Using technology to create a balance of learning is beneficial and aligns to meet the needs of today’s generation (Brunsell & Horejsi, 2013). Interactive software programs, such as

Khan Academy, Front Row, TenMarks, BrainPop, and IXL, allow teachers to enhance the curriculum by incorporating technology to differentiate instruction aligned with the standards. The software programs partner with teachers and empower students to learn at their own pace and learning level in and outside of the classroom.

Flipped Classroom Approach

One way to use technology in a blended learning model is the *flipped classroom* approach. The flipped classroom takes the lecture part of the instruction and places it in videos or podcasts for students to watch at night as their homework (Morgan, 2014). Class time is then used for extra guidance and work time on the assignments. There are many advantages to this model of learning; however, Brunsell and Horejsi (2013) noted that “showing video lectures alone is not flipping your classroom - you must add active learning experiences” (p. 8). One such advantage to the flipped classroom is time. Watching the videos at night frees up valuable classroom time for teachers to offer extra guidance to those students who are struggling and provide more challenging activities for those who find it easy, as well as providing great opportunities for one-on-one mentoring or collaborating (Morgan, 2014; Roehl, Reddy, & Shannon, 2013).

Students who are absent from class benefit from the flipped classroom because they are better able to retrieve the information and knowledge of the content without falling behind their peers. They can come to class prepared for the practice of the standards. Students also have the opportunity to watch the information as many times as needed to understand the material and have it at their fingertips when parents are not able to provide the needed support or information to help (Morgan, 2014; Siegle, 2014). The flipped classroom has many advantages for teachers as well. The class time is available to provide immediate feedback and make connections with

students regarding their understanding of the information. Teachers can verify areas of concerns and reteach any potential misunderstandings of the content (Siegl, 2014).

Differentiated Instruction

“Students do not all learn the same way, so we cannot teach them all the same way” (Levy, 2008, p. 162). To meet the needs of all learners and increase student achievement, differentiated instruction should be used to provide multiple paths to engage students in the content (Moon, 2005). Tomlinson (2001, as cited in Moon, 2005) defined differentiated instruction as “the recognition, articulation, and commitment to plan for students’ differing needs” (p. 227). Differentiated instruction can be observed in an assortment of ways depending on the teacher in the classroom.

According to Anderson (2007), teachers use differentiated instruction to change the content, process, or product based on student readiness, interest, and learning profile. The content refers to “what” is taught. When teachers differentiate the content, students receive the same curriculum, but content is varied based on their ability and prior knowledge (Levy, 2008). For instance, some students might read about the same topic with texts of varied complexity, or some students might read about the topic while others watch a short video about the topic.

Differentiating content allows students to be more successful with the appropriate level of work. Teachers may also differentiate the process by creating an assortment of activities based on differing student abilities, learning styles, and interests (Levy, 2008). Teachers are responsible for adjusting their teaching style to reflect the needs of the students and creating different levels of support (Levy, 2008). The product can be differentiated to increase student achievement by allowing students to demonstrate what they have learned according to student strengths (Levy, 2008). Through various collections of formative and summative assessments teachers create,

students can successfully show what they have learned in a way that is best for them (Levy, 2008).

Differentiated Instructional Strategies

A goal of differentiation is to support high levels of student achievement. To aid in promoting high student achievement in a differentiated classroom, teachers incorporate strategies for students to engage in the information, make sense of it, and then demonstrate their level of mastery (Moon, 2005). Teachers can incorporate a wide array of strategies that vary by subject area and activity to encourage success in the classroom. A few of these differentiated strategies include learning contracts, learning centers or stations, independent study, menus, and/or curriculum compacting (Anderson, 2007; Kapusnick, R. & Hauslein, C., 2001).

Another way to increase student achievement through differentiated instruction is creating tiered lessons or activities. Tomlinson (1999, as cited in Pierce & Adams, 2004) described tiered lessons as “the meat and potatoes of differentiated instruction” (p. 60). Tiered activities encourage success by allowing students to choose the level of accomplishment while still addressing a particular standard, fundamental concept, or generalization (Kapusnick & Hauslein, 2001; Pierce & Adams, 2004). In a tiered lesson, the teacher handles creating tasks and possible outcomes centered on a particular concept. Students are then able to choose the items to complete to reach a particular point value or grade. Teachers can tier the lesson by content or through the assignments, homework, reading, materials, or assessments (Levy, 2008).

Flexible grouping offers teachers another way to differentiate in the classroom. Flexible groups in the mathematics classroom separate students into readiness, interest, and learning styles. The flexible groups should be based on benchmarks regarding the needs of the students and the goals of the lesson by the teacher (Levy, 2008). Most often in the mathematics

classroom, flexible groupings are created based on needs or abilities. Groups focus on knowledge of the concept and where the student is at that time. Below-grade-level groups are offered further instruction and additional support to gain the knowledge of the standard, while the at grade level and above grade level groups are provided with more challenging activities to enhance their knowledge of the content. The key with flexible groupings is that they are just that: flexible. Teachers should be assessing students frequently and changing groups as needed based on the results (Levy, 2008).

Technology provides teachers another avenue to assist in differentiated instruction in the classroom. Technology is growing at a rapid pace and has the potential to increase student learning daily. When technology is used effectively, it is an excellent tool to be used in the classroom, especially with the implementation of 1:1 laptop programs (Siegle, 2014). A study by Gulek and Demirtas (2005), examined the impact of participation in a laptop program on student achievement. The study indicated that students at Harvest Park Middle School, who were enrolled in the laptop immersion program, achieved higher GPAs than non-participating students in the particular grade level. In that same study, results showed that there was a big difference in 6th, 7th, and 8th graders' end-of-course grade in Mathematics and English compared to those middle school students without laptops. There was a higher percentage of laptop students who received A grades and a lower percentage who received F grades compared to their classmates with no laptop (Gulek & Demirtas, 2005).

There are many ways teachers can differentiate to meet the needs of their students. It is important for teachers to identify the standards and content that is to be covered and choose an appropriate instructional strategy that best fits the students, the content, and the teacher's needs.

Effects on Student Achievement

McTighe and Brown (2005) found that “the more active the learner in the learning process, the higher his or her achievement of understanding” (p. 238). Instructional lessons should be created by teachers to aid and support their students’ needs and ultimately their success. Students are more likely to succeed when they make personal connections to the material or the project. Creating a link helps spark an interest, which then motivates the student to do well or to investigate the subject area (McTighe & Brown, 2005).

In differentiated classrooms, students with flexible options demonstrate their knowledge of the concept to allow students to participate actively in their learning. Through the different options, students “are exploring, creating, making decisions, and playing an important role in their own learning process” (Anderson, 2007, p. 51). When students are put in the control seat, they feel they have the power to take charge and guide themselves through the process while assuming responsibility for their decisions. This transfer of authority results in greater student achievement (Anderson, 2007).

Teachers who have used a blended learning model in the classroom have seen an increase in student achievement. Brunsell and Horejsi (2013) reported that in one study, out of 500 teachers surveyed, 70% of them reported increases in student standardized test scores in their blended learning classrooms. Blended learning connects the digital learning with traditional classrooms while enhancing the use of technology. Classrooms that have incorporated a flipped model in a blended learning environment, have seen an increase in student achievement. Teachers at Clintondale High School in Michigan reported that the amount of direct student contact time has quadrupled since starting the flipped classroom model (Fulton, 2014). Math teachers in Byron, MN, have calculated that proficiencies on Calculus chapter tests have increased by 9.8% and by 5.1% in Algebra II classes (Fulton, 2012).

To summarize, the literature showed that student achievement can be increased by using strategies that provide instruction to meet the needs of the students. Blended learning offers teachers a practical solution for effectively teaching with technology in the classroom. The blended learning approach helps meet the district, state, and national standards by using the flipped classroom model to support the use of technology.

Methodology

I conducted research on the flipped classroom with tiered activities in a public middle school setting in four sixth-grade mathematics classrooms. Initially, classroom baseline data was collected, and then the flipped classroom with tiered activities study was implemented, and observations were made while data was collected over a twenty-two day period. A variety of assessment and measurement tools were implemented throughout the action research project. The data sources included: pre-assessments for each chapter, reports of video completion and lesson checks through the use of Schoology.com, post-assessments, and a student survey. The listed data sources were designed to study impact of the flipped classroom, paired with tiered activities, on student achievement.

Creation of Materials Before Implementation

Before the action research project could be implemented in the classroom, the procedures for the flipped classroom had to be created. The most time-consuming item was the creation of the lesson videos. Each video was created using a powerpoint and then recording and discussing each step while solving the problem. I used the website Screencastomatic.com to record and then uploaded the recording to YouTube. The YouTube lesson was then linked to an accessible folder to all sixth-grade mathematics students in our district's learning management system, Schoology. In Schoology, a folder was set up in each math period to hold all the videos and

lesson checks. The folder option was set to student completion, which made it impossible for the students to move on to the next item until the first item was complete.

All students have been provided a laptop by the school but students who did not have access to the internet at home were at a disadvantage in the flipped classroom model. Students who did not have internet access were given an alternate path to obtain the videos and assignments. With the help of a free website (www.keepvid.com), I was able to convert the YouTube links to mp4 files to provide students the needed information. The mp4 file could be played without internet access, ensuring all material was given to students regardless of remote internet capabilities. Students transferred and saved the files on their computer before the chapter began.

Next, a note packet was created to enhance students' note-taking skills and comprehension of the material. The note packet organized the problems from the video in a sequential manner to help focus on the important concepts from the lesson. It provided designated areas for students to write down the learning objective of each lesson, definitions of vocabulary words, and a variety of math problems to practice the specified skill.

The tiered activities checklist was also created for the chapter. The tiered activities were differentiated by letter grade for students to complete. The activities were broken down into letter grade sections which provided specific assignments for the students to strive for. Students had the opportunity to choose the grade they wanted to achieve for points. The checklist included textbook problems, some problems from IXL.com, a problem-solving packet, and a puzzles packet. Students were graded on the correct answers in each section and needed to fulfill the requirements in the first letter grade to continue on for more points.

To document observations throughout the flipped classroom with tiered activities process, I kept a daily journal. The journal included a checklist of items an educator needs to complete or think about before implementing a flipped classroom. It also included observations of evidence that support the effectiveness of a flipped classroom, evidence that would question the effectiveness, and improvement for future use.

Classroom Procedures

Once I had arranged all the materials for the implementation of the flipped classroom, students were presented the model of the flipped classroom with the help of YouTube videos, various articles, and descriptions. The presentation allowed students to understand the layout of the flipped classroom, such as where to access the videos and how to complete the lesson checks. The tiered activities checklist was also given out to explain the opportunity for students to choose the assignments as to what grade he/she would strive for and achieve for the chapter. Also at this time, the students received a parent notification letter (Appendix A) to take home. This letter described the goal of the action research project, and it allowed parents the right to exempt their student's data from the final results in the report.

After the students and parents had been made aware of the process, students completed the Chapter 5 pre-assessment (Appendix B) and then completed a pre-assessment (Appendix C) before the start of Chapter 6. The purpose of the pre-assessments were to assess prior knowledge of the material to study possible growth in student achievement throughout the chapter. After the pre-assessment had been completed, implementation of the project and data collection in each chapter began.

Each night, students were expected to watch the lesson video, take notes in the note packet, and answer the three-five question lesson check. The completion of these items took

students about twenty minutes each night and could be easily monitored in the Schoology reports (Appendix D) and was beneficial as it reinforced student accountability needed for a flipped classroom to be successful as well as provided insight of student understanding before each class. Based on the lesson check scores, errors and misinterpretations of particular concepts were identified and were able to be addressed immediately in class. When there was a concept that the whole class struggled with, I was able to provide the students with more in-depth discussion and examples. Brainpop.com offered short clips describing concepts that helped the class and whiteboards were used to work out problems. If I noticed only a few individual students struggle with a concept, I was able to conference one-on-one with him/her during work time to clear up the misunderstandings.

Students participated in discussions with the teacher and their peers each day to review the lesson and notes and participated in brief hands-on activities to enhance their learning. An example of an activity done in class was on unit rates which included movement by recording the number of jumping jacks in sixty seconds. Students wrote a unit rate from this information and then practiced converting to various times, such as how many jumping jacks were completed in one second or one hour? Also, students moved around the room quite a bit throughout the chapter to complete example problems on white boards to practice the given concept.

When conversations and activities about the previous night's video were done, students were given an exit slip with three-five questions that mimicked their lesson check to be completed by the end of the hour. The exit slips were to show possible growth in student understanding of the concepts by comparing the comprehension of the material from the videos alone to the instruction from the teacher after the videos were viewed. The comparison helped create data results which showed the degree of student learning from only watching videos to the strength of

understanding the material with instruction from the video and teacher. All lesson check and exit slip scores were documented in a Google sheet.

Students were then given the rest of the time to work on the tiered activities (Appendix E and F). Each student had to complete the minimum grade of a C which included a page assignment from the textbook for each lesson and then particular IXL problems. To earn a B, they were to complete the C section and add a problem-solving packet and more IXL problems. For an A, sections from C and B were to be complete in its entirety and then a few more IXL problems with a puzzles packet. Students were provided with ample class time to achieve their desired letter grade.

Quizzes (Appendix G, H, I, and J) were given after the third and fifth lesson to check for understanding of the materials. Each quiz consisted of ten questions from the lessons before to check for comprehension. Then at the end of the chapter, students practiced problems by reviewing in stations and took the post-assessment (Appendix K and L). All scores were recorded in a Google sheet.

On the last day of the flipped classroom with tiered activities project, students took a student survey (Appendix M) to provide appropriate and valid feedback. The survey asked a variety of questions to find out how students felt about the flipped classroom model, the tiered activities, and the method they prefer in a mathematics classroom. Students rated their feelings and confidence towards the flipped classroom and provided commented on attitudes towards the chapter. Students were provided the opportunity to give feedback on suggestions to make it better for future use.

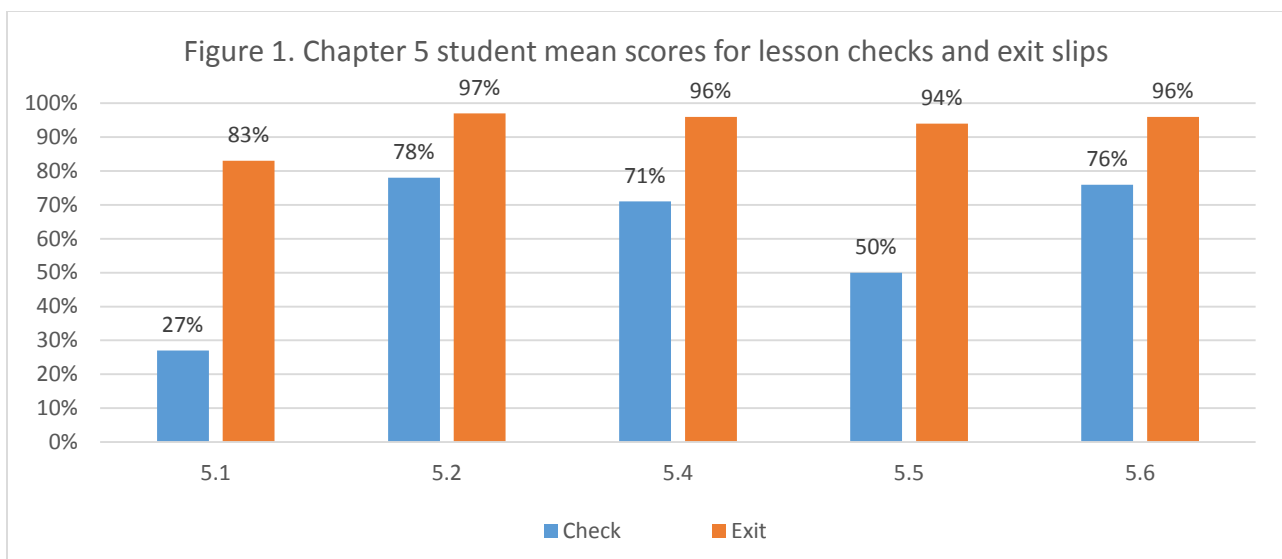
In the next section, I will analyze the data to determine the impacts of the flipped classroom, paired with tiered activities, on student achievement in a sixth-grade mathematics

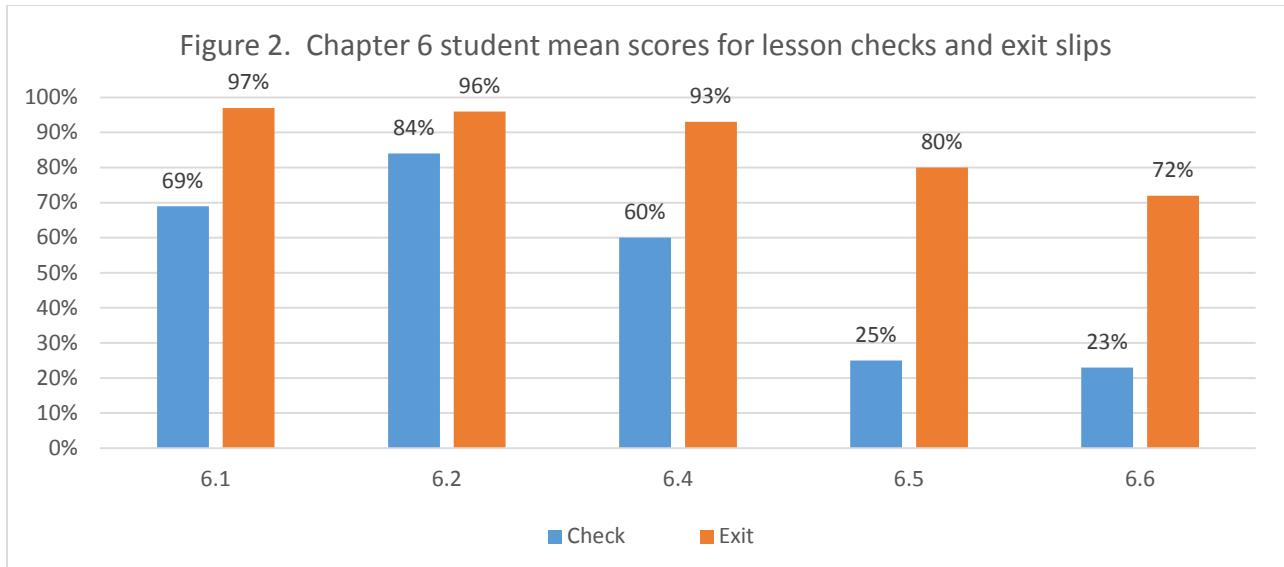
classroom. The data will be compared to past years’ performances and examined to make conclusions.

Analysis of Data

The purpose of this study was to examine the blended learning model by investigating the impact of a flipped classroom, paired with tiered activities, on student achievement in a sixth-grade mathematics classroom. A number of data points were collected throughout the study to analyze potential growth. The data points included: a pre-assessment, lesson checks, exit slip scores, quizzes, a post-assessment, and a student survey.

Lesson checks were collected after students viewed the nightly lesson videos. The checks consisted of three-five problems that covered the specific concepts from the video to check for understanding. The next day, the students received clarification of the concepts, as well as participated in various activities to strengthen their knowledge of the material. Then students took a three-five question exit slip that demonstrated their learning after viewing the video and receiving in-depth explanation from the teacher. Figures 1 and 2 show the average scores of growth from the lesson checks to the exit slips.





As shown in Figures 1 and 2, blending technology with classroom activities proved to be helpful to student achievement. The average scores grew from every lesson check to exit slip; as much as 56% in one particular lesson. Individual student scores grew as well. Every student scored the same or higher on each lesson check to the exit slip in both Chapter 5 and 6.

Quizzes were given after the first three lessons, then again after the next two in each chapter. Quizzes offered students a chance to showcase their knowledge of the concepts and find areas of weakness before the post-assessment. Figure 3 shows the results of each quiz, compared to past years' scores.

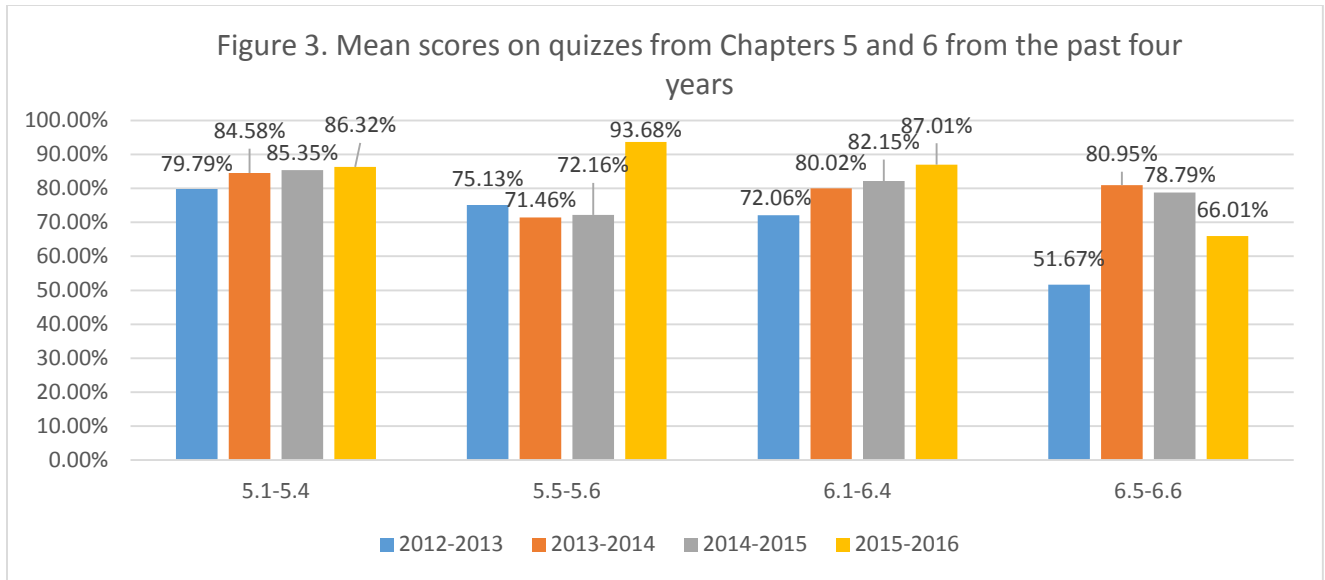
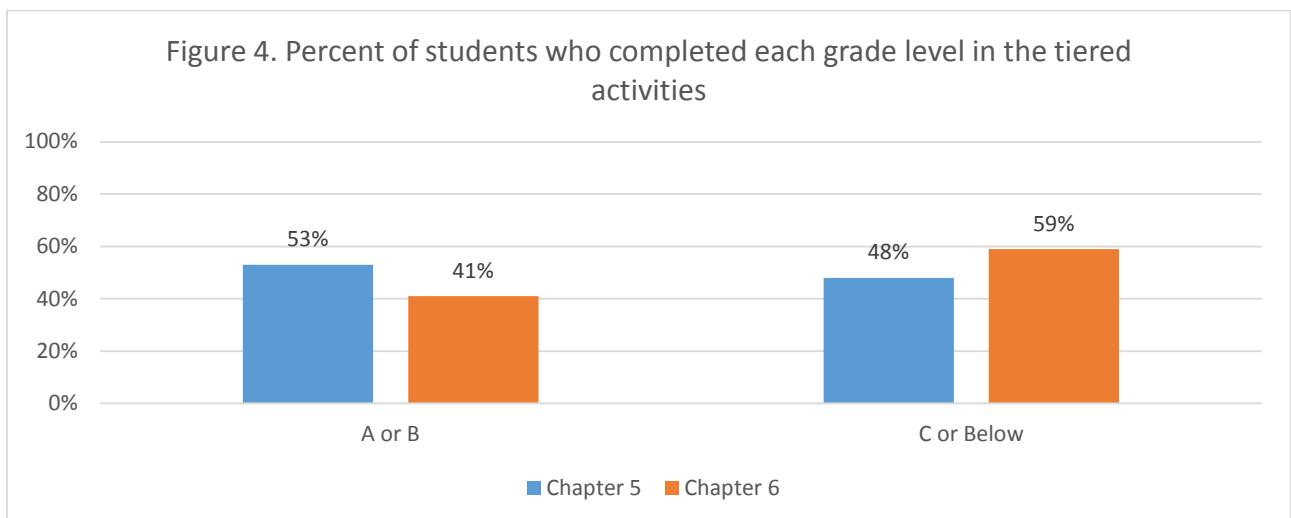


Figure 3 shows the comparison from the past four years on each particular quiz and as it shows, 2015-2016 quiz scores are the highest on all but one. When looking at Chapter 6 quiz scores, the 6.5-6.6 score from 2015-2016 is the next to lowest over the past four years. This year’s students struggled with the concepts from these lessons and needed remediation to clear up misunderstandings.

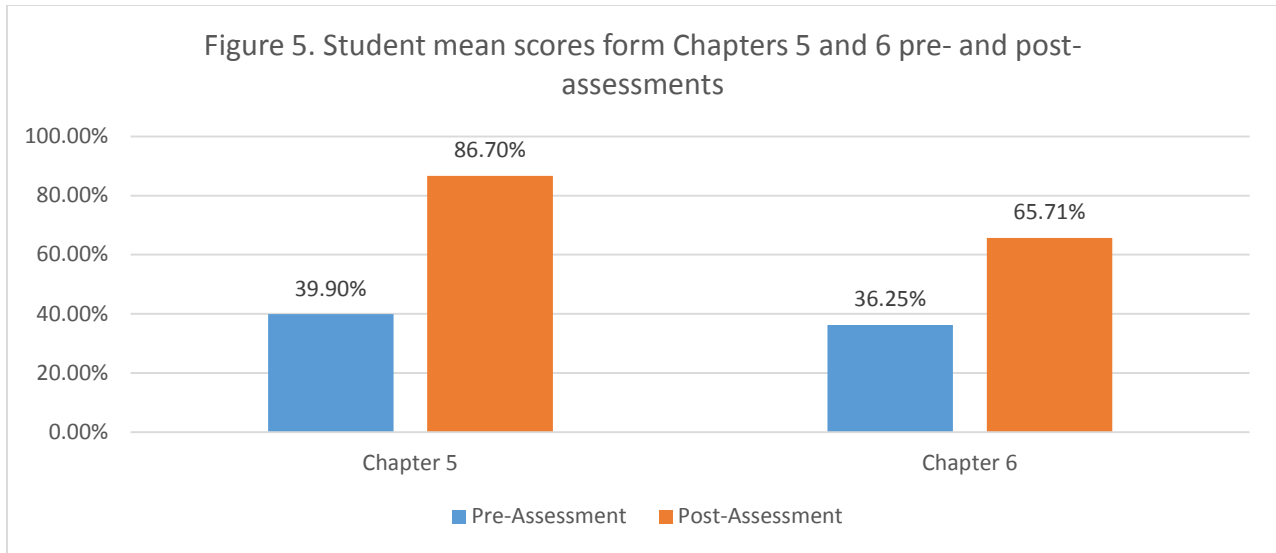
The low quiz scores could be attributed to students’ prior knowledge of the concepts in Chapter 6. Students scored well on the Chapter 5 quizzes and the first quiz in Chapter 6 because they were able to recount their experience with the material and apply their prior knowledge. Based on the quiz scores for 6.5 and 6.6, the traditional teaching method may have been more successful than the blended model because new concepts were introduced to the students. The blended model provided many positive results in a number of areas throughout the project, but results showed that students struggled to understand and apply unfamiliar concepts. For future implications, understanding what the students know, or do not know, will help to determine which teaching method is best for increasing student achievement.

Over the course of each chapter, students were to complete tiered activities to achieve the grade letter they wanted to receive. They had the option of finishing items in the A, B, or C section of the given assignment. Each section had a number of items for students to finish and items needed to be completed in the previous section in order to get credit for the next grade level. For example, to receive a grade letter of a B, students needed to complete all of the items in the C and B segments. It was stressed that all students strive for an A, but ultimately it was their decision. Individual motivation of the students played a large part when they chose what grade level they were willing to strive for. Figure 4 shows the breakdown of the percent of students who chose each grade.



As seen in Figure 4, 53% of the students in Chapter 5 strived for the A or B, while 48% settled with the C (the minimum requirement). In Chapter 6, 41% strived for the A or B, while 59% settled with the C or below.

At the beginning of each chapter, students took a pre-assessment to examine their level of knowledge of the material. It was a starting point that provided information of what skills needed to be taught in-depth throughout the chapter. After the implementation of the flipped classroom with tiered activities, students took a post-assessment to assess their comprehension of the skills.



In Figure 5, Chapter 5 showed that the average in the students’ scores from the pre-assessment to the post-assessment grew by 46.8%. It also showed that the students scored very well on the Chapter 5 post-assessment (86.70%). In comparison, the Chapter 6 post-assessment grew by 29.46%, which is showing growth from the pre-assessment, but not as much as Chapter 5.

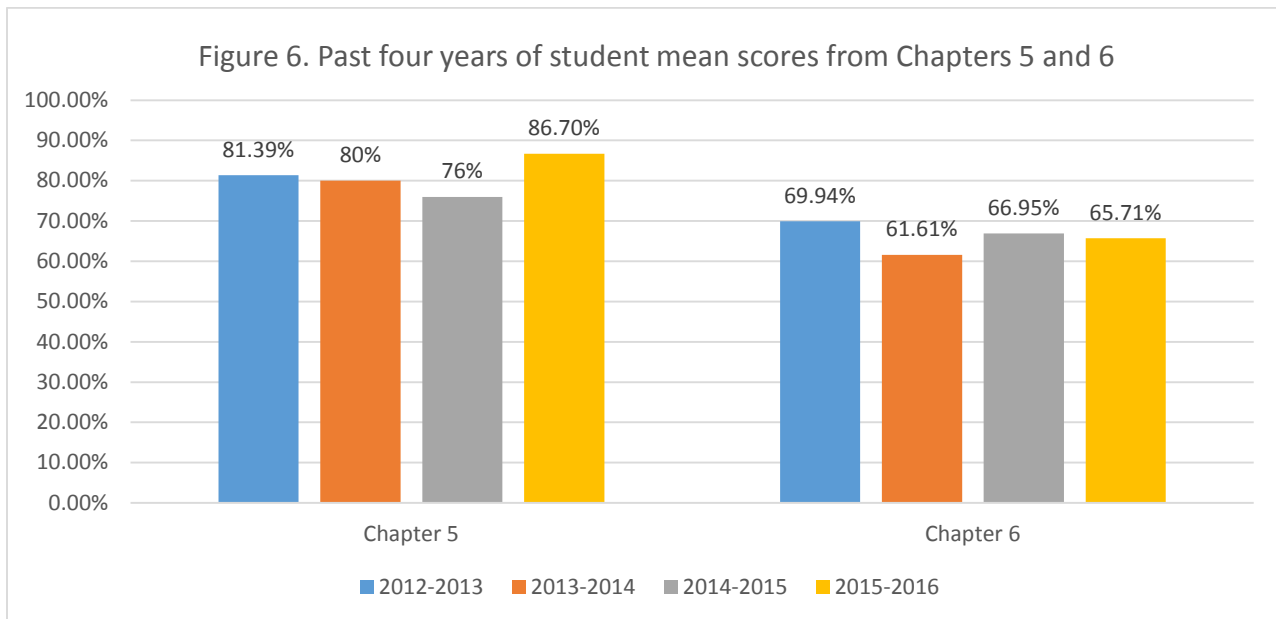
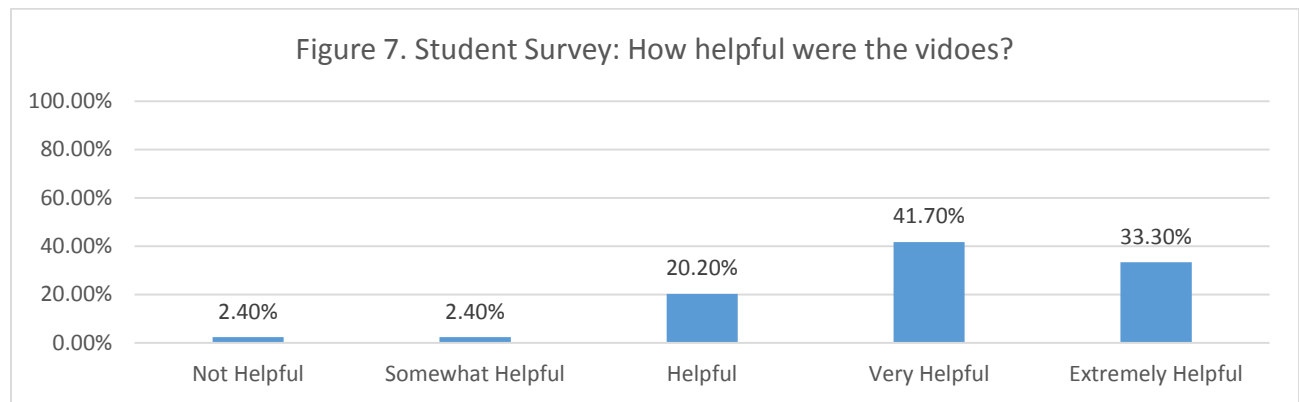


Figure 6 compared the post-assessment scores from Chapter 5 and 6 from the past four years. As seen in the scores of Chapter 5, there has been some decline in the class average, but

2015-2016 increased and was the highest average score. Unfortunately, Chapter 6 did not have the same growth results as Chapter 5. The scores have wavered up and down a bit over the four years, but they have typically stayed in the same score range.

Students were given a survey to identify strengths and weaknesses of the flipped classroom with tiered activities. Students were asked a series of questions of which they were to rate themselves and provide open-ended answers about their feelings and needs. They were asked to answer each item as honestly as they could and reflect on the processes in mathematics from the previous chapters. The next few figures present that data found from the survey.



Students were asked to rate themselves from not helpful to extremely helpful on how they perceived the videos assisted in their learning of the content. About 95% of the students agreed that the videos were helpful, which told me that the videos I created provided the information in a meaningful way for them to learn.

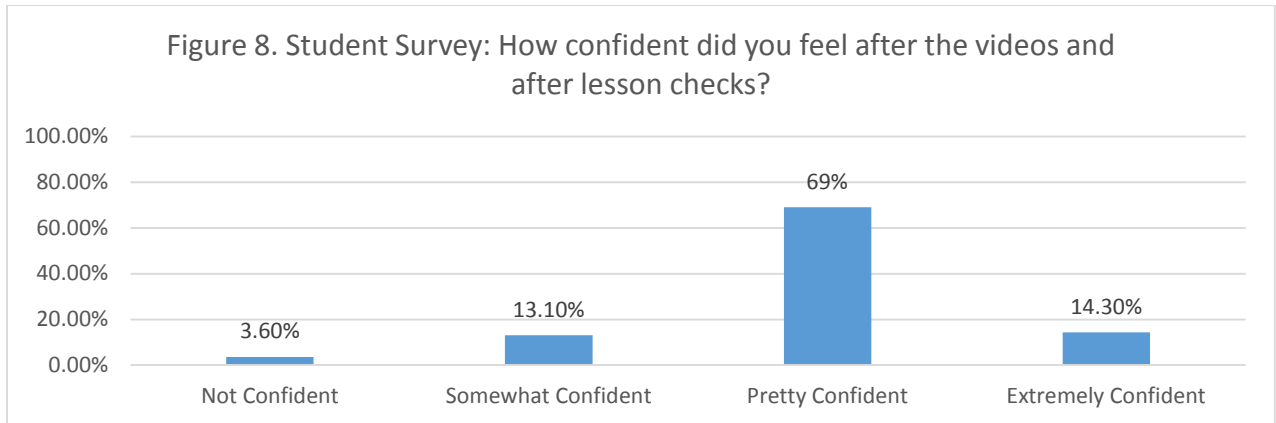
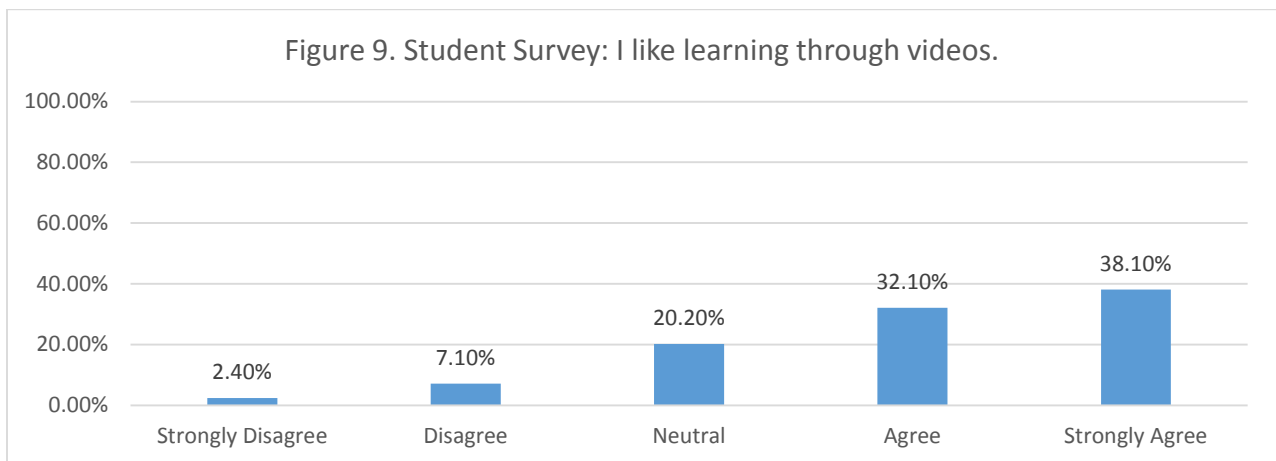
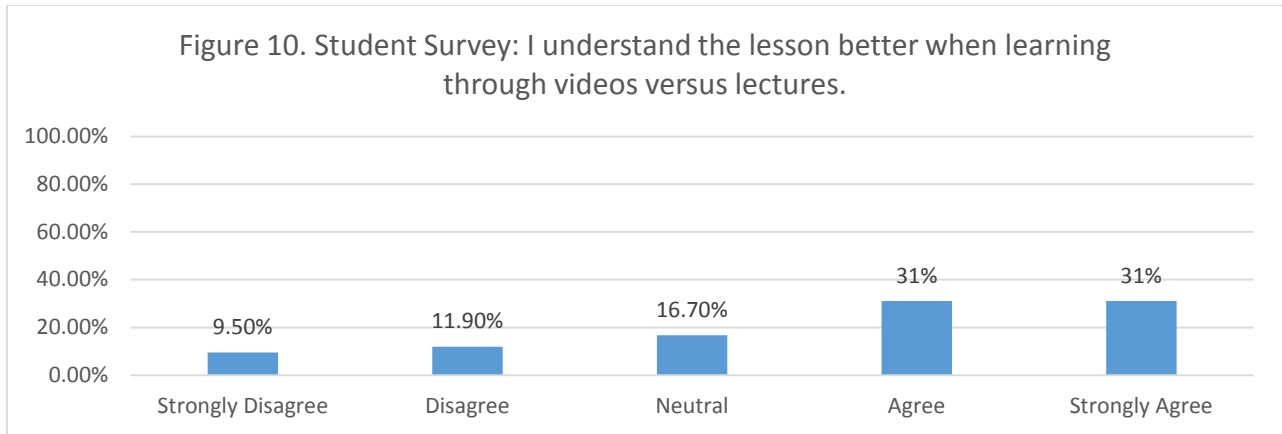


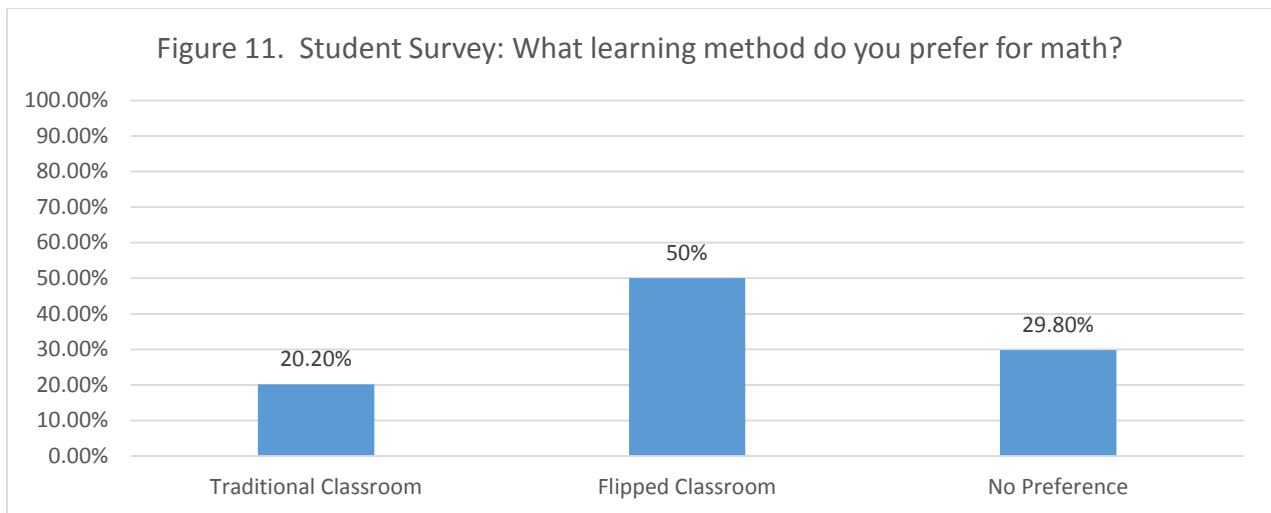
Figure 8 helped me to know if the lesson checks should stay in the process or decide if it something that could be taken out for future use. About 80% of the students said they are confident of their concept skill after viewing the video and then taking a small question check to assess their understanding.



“I like learning through videos” question provided information of the use of technology to learn math. It helped to reflect on the use of videos and determine whether or not sixth-grade students feel they can learn through viewing the concepts.



The last student-rated question on the survey asked students, “What learning method do you prefer in mathematics class?”



Students had the opportunity to write their feelings about the study in two open-ended questions. What did they like about the flipped classroom with tiered activities? And what suggestions would you offer to make it better? Eighty-four sixth-graders responded to the survey questions.

Table 1 Responses to Open-End Survey Items

Survey Question 6: What did you like about the flipped classroom with tiered activities?

- I enjoy doing homework in class instead of taking it home (21 students responded this way)
- I like how you can pause, rewind, or replay the video if you don't understand it or are absent (24 students responded this way)

- **I like how you can go at your own pace with the notes and assignments** (18 students responded this way). Quote from one student: "I liked that you let us work by ourselves and just let us go at our own pace and we got work time."
 - **I like getting one-on-one help from the teacher in class** (13 students responded this way). Quote from one student: "I like being able to do it myself in class without my mom checking it and saying something is wrong when it's actually right. My teacher lets me know right away if it's right."
 - **I like how we are able to pick our own grade** (8 students responded this way). Quote from one student: "I liked that you can chose the grade you want but you have to work for it"
-

Table 2 Responses to Open-End Survey Items

Survey Question 7: *What suggestions do you have for the flipped classroom with tiered activities?*

- **Nothing!** (29 students responded this way). Quote from one student: "I don't really see anything that should be different everything was 100% awesome."
 - **Not have so much due in each section** (19 students responded this way)
 - **Include more examples in the videos** (6 students responded this way).
 - **Assign worksheets instead of book pages** (3 students responded this way). Quote from one student: "I would like worksheets instead of having to write all the school work out."
 - **No suggestions provided** (57 students responded this way).
-

In the next section, I will draw conclusions from the results of the flipped classroom with tiered activities. I will also discuss implications for future research and possible changes to the program.

Action Plan

After analyzing the data, the blended learning model with tiered activities appears to have an overall positive impact on sixth grade student math achievement. . With a balanced combination of technology and differentiated instruction, the blended learning model offered students opportunities to grow in mathematics class. There were many aspects of the study that had positive outcomes that will continue to be implemented, as well as areas of concern that will need to be addressed before executed in the classroom again.

The greatest strength of the flipped classroom was the ability to have more time in the classroom with students. The extra time helped students to participate in valuable discussions to clear any misunderstandings and create opportunities to work with hands-on activities. It also provided time for students to receive one-on-one instruction to assist in learning the various concepts. As seen in the increase of percentages from the lesson check scores (after the video was viewed) to the scores of the exit slips (after instruction was given), students understood the concepts better after they viewed the video and received in-class instruction. The data analyzed showed that the combination of technology and teacher directed-instruction appeared to enhance student understanding of the concepts for most topics.

Growth in student achievement was evident in the quizzes and post-assessments throughout the study. The increase of student achievement on the quizzes and post-assessment can be linked to students' attitudes towards the flipped classroom model. As noted in the survey results, 95.2% of the students said that the videos ranged from helpful to extremely helpful, while their confidence level of understanding (pretty confident to extremely confident) was 83.3% after watching the videos and taking the lesson checks. Seventy percent of students liked learning through the videos and 62% agreed that they understood the lesson better when taught through video lecture. When thinking about future flipped classroom instruction in mathematics class, 50% of the students said they would rather learn through the flipped classroom model while 29.8% said they do not have a preference of traditional or flipped classroom teaching. It is hard to ignore the preference of this learning style in the large percent of students who like the flipped classroom, as well as ignore the 29.8% who said they did not have a preference in learning styles. It is valuable to recognize their ability to learn in different settings so it will be important to look into differentiated instruction and include activities and instruction that meets the needs of all

students. It is evident the students enjoyed learning in the flipped classroom model and is a teaching style that should continue to be implemented to increase student achievement.

There are areas of concern that need further attention before the flipped classroom with tiered activities should be implemented again. Students did not show growth from previous years on the Chapter 6 post-assessment (65.71%), as well as the 6.5-6.6 quiz (66.01%). Both scores were the third lowest from the four years of data. This lower percentage could be attributed to the lack of prior knowledge of the concepts in Chapter 6. Students knew some of the material before Chapter 5 began, but struggled to identify main parts in Chapter 6. The chapter included new vocabulary and a few new concepts which required more effort from the students. Because of the effort it would take to learn a new concept, some students struggled to stay focused throughout the chapter. To enhance future instruction, I will implement the traditional teaching method to help support students' knowledge of the concepts. I will also provide extra time (days) to work with the material by incorporating more hands-on activities and examples to increase understanding of the sections.

One of the major concerns going into this study was keeping students motivated with the videos and tiered activities. In Chapter 5, students had a renewed sense of energy and were fully aboard with the new idea. Unfortunately, the novelty of the flipped classroom wore off for many students as they decided they did not want to put forth the motivation and effort needed to do well in Chapter 6. In Chapter 5, 53% of the students achieved the grade of an A or B by completing the tiered-leveled activities, while 48% worked for a C or lower. In comparison, in Chapter 6 only 41% of the students completed the work for an A or B, while 59% settled for the grade of a C or below. The percent of students who went for the A or B decreased 12% from Chapter 5 to Chapter 6. Students pushed themselves a bit more to be in the A or B range, while in Chapter 6,

24% decided that meeting the required tasks wasn't important to them. The drop in percentages could also be contributed to the amount of work that was expected in each letter grade category. Some students may have seen the assignments as busy work versus adding to understanding and decided not to put forth the energy to complete it. One student was overheard saying, "I don't know if I want to do that much work." This comment made me think about what tiered activities were offered and how they could be improved to provide valuable enhancement of the concepts for the chapter for future use. Instead of tiering activities for letter grades, future differentiation could include providing projects, creating hands-on activities, producing videos or websites, and providing differentiated online assessments to show what information they learned.

As a result of this study, I have identified areas of growth for the blended learning environment with the flipped classroom model and tiered activities. One area focuses in on Chapter 6. For future instruction, I plan on spending more time on the chapter to help students with the concepts they struggled with. Because of the new material, offering additional time and resources may provide more positive student achievement on the quizzes and post-assessment. In the last two sections of Chapter 6, I plan on using more traditional instruction to practice the concepts as evidence showed they were the sections students struggled the most with. I also plan to investigate motivation in a middle school mathematics classroom. I saw the lack of motivation through the tiered activities and want to provide students with practical, real-world, hands-on opportunities and technological devices to enhance their desire to increase their mathematical knowledge.

Another area I would like to investigate further is the implementation of the flipped classroom, alone, without tiered activities. It would allow me to compare possible growth in

student achievement with the flipped classroom to the traditional classroom to see which one would have a bigger impact.

The overall experience of the flipped classroom with tiered activities has been very positive and has provided beneficial data that confirmed technology and direct-instruction should be balanced together in the classroom. Through this study, students not only increased student achievement on the majority of quizzes and test, but gained insight to different learning styles and using technology in a mathematics classroom. Technology is an ever-growing resource that should be blended with face-to-face instruction to help meet the needs of students.

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Appendix A

Implementing Flipped Classroom to Improve Math Scores**Assent Form**

1-4-2016

Dear Parents,

In addition to being your child's 6th grade math teacher, I am a St. Catherine University (St. Kate's) student pursuing a Masters of Education. As a capstone to my program, I need to complete an Action Research project. I have been researching flipped classrooms to improve student achievement because many sixth grade students are struggling to meet proficiency in various chapter tests and on the standardized math test (MCAs).

In the coming weeks, I will implement the flipped classroom model as a regular part of the 6th grade math class. All students will participate as members of the class. I plan to analyze the results to determine if the flipped classroom model is an effective strategy to improve math skills.

What is flipped classroom?

The flipped classroom model "flips" the traditional teaching method and incorporates the use of technology. For homework, students will watch a teacher-made video (anywhere from 5-15 minutes) at home, and then use class time to receive differentiated instruction. Differentiated instruction refers to the process of providing different support to different students according to their needs'. For instance, your student will have the opportunity during class to clarify and review the math skills by completing tiered activities. The tiered activities will allow your student the choice of their grade by finishing the expectations in one of the levels.

What data will be collected?

I will analyze scores from the pre-test, quizzes, and post-tests throughout Chapter 5 and Chapter 6. I will compare the pretest and posttest scores of your student, as well as compare the scores from the entire class to previous years' data of chapter test scores and student growth in these units compared to their results on previous units. I will be collecting data from Schoology as your student watches the videos and answers the 2-3 question quick check on the nights it is assigned. Through this process, I will be noting observations in a journal to identify impacts, if any, of the flipped classroom.

The purpose of this letter is to notify you of this research and to allow you the opportunity to exclude your child's data from my study.

If you decide you want your child's data to be in my study, you don't need to do anything at this point.

If you decide you do NOT want your child's data included in my study, please note that on the back of this form and return it by 1-8-2016. Note that your child will still participate in the unit but his/her data will not be included in my analysis.

In order to help you make an informed decision, please note the following:

- There is no extra work for the student or families as a result of this research. Math lessons will be in the form of a video and will be assigned as homework. Students are to watch the assigned video, take notes, and answer the two-three question quiz.
- I am working with a faculty member at St. Kate's and an advisor to complete this particular project.
- I will be writing about the results that I get from this research. However, none of the writing that I do will include the name of this school, the names of any students, or any references that would

make it possible to identify outcomes connected to a particular student. Other people will not know if your child is in my study.

- The final report of my study will be electronically available online at the St. Kate’s library. The goal of sharing my research study is to help other teachers who are also trying to improve their teaching.
- There is no penalty for not having your child’s data involved in the study, I will simply delete his or her responses from my data set.

If you have any questions, please feel free to contact me, kpeterson@ssd.k12.mn.us or at 533-1419. You may ask questions now, or if you have any questions later, you can ask me, or my advisor Dr. Kevin Mackin (651) 690-6798, who will be happy to answer them. If you have questions or concerns regarding the study, and would like to talk to someone other than the researcher(s), you may also contact Dr. John Schmitt, Chair of the St. Catherine University Institutional Review Board, at (651) 690-7739.

You may keep a copy of this form for your records.

Mrs. Krystal Peterson

Date

OPT OUT: Parents, in order to exclude your child’s data from the study, please sign and return by 1-8-2016

I do NOT want my child’s data to be included in this study.

Student Name

Signature of Parent

Date

Appendix B**Chapter 5 Pre-Assessment****Multiple Choice**

Identify the choice that best completes the statement or answer the question.

1. Choose the most appropriate customary unit for the measurement of the distance across Lake Tahoe.
 - a. feet
 - b. kilometers
 - c. inches
 - d. miles

Show all of your work.

2. Sarah's basketball league has 68 nine-year olds and 52 ten-year olds. Write the ratio of nine-year olds to ten-year olds in all three forms.
3. Elizabeth took 10 minutes to make 8 volleyball serves. Mary took 8 minutes to make 7 volleyball serves. Which student made more serves per minute?
4. You can get 308 calories from eating 4 carrots. How many calories can you get from eating 1 carrot?
5. Brady and Cole collect semi-precious stones. At the Rockhound Hut, Brady paid \$44 for 9 pounds of snowflake obsidian. At The Solid Rock Shop, Cole paid \$15 for 3 pounds of the same type of stone. Who made the better buy?
6. Determine whether the ratios $\frac{6}{10}$ and $\frac{9}{14}$ are proportional.
7. Determine whether the ratios $\frac{3}{4}$ and $\frac{12}{16}$ are proportional.
8. Find a ratio equivalent to $\frac{3}{10}$
9. Find a ratio equivalent to $\frac{13}{8}$
10. Use cross products to solve the proportion $\frac{r}{2} = \frac{14}{10}$
11. Use cross products to solve the proportion $\frac{r}{10} = \frac{21}{50}$
12. The Johnson family is preparing for a birthday party. They think they will need 4 cupcakes for every 3 children who attend. How many cupcakes will they need if they are expecting 12 children?
13. Convert 2.5 feet to inches. **12 inches = 1 foot**
14. Convert 704 ounces to pounds. **16 ounces = 1 pound**
15. Convert 192 pints to gallons. **8 pints = 1 gallon**
16. Susan drank a 13-fluid-ounce bottle of water before soccer practice. After practice, she drank 6 cups of water. What is the total amount of water Susan drank? **8 fluid ounces = 1 cup**

Appendix C**Chapter 6 Pre-Assessment**

Make sure to show all of your work.

1. Write 19% as a fraction in simplest form.
2. Write 84% as a fraction in simplest form.
3. Write 45% as a decimal.
4. Write 21% as a decimal.
5. Write 0.01 as a percent.
6. Write 0.71 as a percent.
7. Write $\frac{7}{10}$ as a percent.
8. Write $\frac{5}{8}$ as a percent.
9. Find 25% of 120.
10. Find 35% of 40.
11. A container is filled with marbles of various colors. If the container has a total of 720 marbles and 70% of the marbles are yellow, how many yellow marbles are in the container?
12. 113 is 51% of what number? If necessary, round your answer to the nearest tenth.
13. What is 88% of 116? If necessary, round your answer to the nearest tenth.
14. What percent is 30 of 50? If necessary, round your answer to the nearest tenth.
15. Find the percent of change when 76 is decreased to 38. If necessary, round your answer to the nearest tenth.
16. Find the percent of change when 21 is increased to 100. If necessary, round your answer to the nearest tenth.
17. Find the percent of increase or decrease from 300 to 216.

18. The price of a train ticket from Oklahoma City to Phoenix is normally \$186.00. However, the train company is offering a special 25% discount to children under the age of 16. What is the sales prices of a ticket form Oklahoma City to Phoenix for someone under the age of 16?

19. Paisley is out to eat with her family. Her total bill comes to \$42.36. If Paisley decides to leave a tip that is 12% of the total bill, how much should she leave for the tip?

20. Tim makes bracelets for \$24.98. He sells them at a 118% increase in price. What is the retail price of the bracelets?

Appendix D

Schoology Reports

The screenshot displays a Schoology interface for a '6.1 Check' assignment. The page includes a navigation menu on the left with options like 'Materials', 'Updates', 'Gradebook', 'Mastery', 'Badges', 'Attendance', 'Members', 'Analytics', and 'Workload Planning'. The main content area shows a table of student results. The table has the following structure:

| Name | Submissions/ Attempts | Latest Attempt | Final Score | Gradebook Grade | View Attempts |
|------------|-----------------------|-----------------|-------------|-----------------|---------------|
| [Redacted] | 1/1 | 1/25/16 2:14pm | 3/3 | 3/3 | View Attempts |
| [Redacted] | 1/1 | 1/25/16 2:02pm | 1/3 | 1/3 | View Attempts |
| [Redacted] | 1/1 | 1/25/16 4:31pm | 2/3 | 2/3 | View Attempts |
| [Redacted] | 1/1 | 1/25/16 7:37pm | 3/3 | 3/3 | View Attempts |
| [Redacted] | 1/1 | 1/26/16 12:25pm | 2/3 | 2/3 | View Attempts |
| [Redacted] | 1/1 | 1/25/16 4:37pm | 2/3 | 2/3 | View Attempts |
| [Redacted] | 1/1 | 1/26/16 2:12pm | 1/3 | 1/3 | View Attempts |
| [Redacted] | 1/1 | 1/26/16 1:30pm | 2/3 | 2/3 | View Attempts |
| [Redacted] | 1/1 | | 2/3 | | |

The bottom of the screenshot shows the Windows taskbar with the system clock indicating 3:35 PM on 2/3/2016.

Appendix E

Chapter 5 Tiered Activities

Math class looks a little different this chapter; it’s because we are going to FLIP the classroom! Your homework each night will be to view the videos, take notes in your note packet, and complete the Lesson Check quiz (all on Schoology). Your class time will then be used to work on the assignments below. All items are due on the day of the chapter test!!

*Use the lines to the left of each item to check it off when completed

| | |
|---|--|
| <p>To earn a C, complete the following assignments:</p> <p>___ 5.1 Watch video, fill out 5.1 notes, and complete the 5.1 Check</p> <p>___ 5.1 Page 272 #1-10</p> <p>___ 5.2 Watch video, fill out 5.2 notes, and complete the 5.2 Check</p> <p>___ 5.2 Page 276 #1-8</p> <p>___ 5.4 Watch video, fill out 5.4 notes, and complete the 5.4 Check</p> <p>___ 5.4 Page 285 #13-28</p> <p>___ 5.5 Watch video, fill out 5.5 notes, and complete the 5.5 Check</p> <p>___ 5.5 Page 289 #1-15</p> <p>___ 5.6 Watch video, fill out 5.6 notes, and complete the 5.6 Check</p> <p>___ 5.6 Page 294 #5-8, 10-18</p> | <p>To earn a C, complete the following IXL:</p> <p style="text-align: center;"><u>IXL SmartScore of 80</u></p> <p style="text-align: center;">R1 R2 R3 R4 R5 R6 R7 R8 R9</p> |
| <p>To earn a B, complete the following:</p> <p>___ Complete all items in the C section</p> <p>___ Complete the Chapter 5 Problem Solving Packet (pink)</p> | <p>To earn a B, complete the following IXL:</p> <p>___ All the IXL from the C section</p> <p style="text-align: center;">AND</p> <p style="text-align: center;">S1 S3 S4</p> |
| <p>To earn an A, complete the following:</p> <p>___ Complete all items in the C section</p> <p>___ Complete all items in the B section</p> <p>___ Complete the Chapter 5 Puzzles, Twisters, and Teasers Packet (green)</p> | <p>To earn an A, complete the following IXL:</p> <p>___ All the IXL from the C section</p> <p>___ All the IXL from the B section</p> <p style="text-align: center;">AND</p> <p style="text-align: center;">U2 U4</p> |

Appendix F

Chapter 6 Tiered Activities

Math class looks a little different this chapter; it's because we are going to FLIP the classroom! Your homework each night will be to view the videos, take notes in your note packet, and complete the Lesson Check quiz (all on Schoology). Your class time will then be used to work on the assignments below. All items are due on the day of the chapter test!!

*Use the lines to the left of each item to check it off when completed

To earn a C, complete the following assignments:

___ 6.1 Watch video, fill out 6.1 notes, and complete the 6.1 Check

___ 6.1 Page 331-332 #14-26

___ 6.2 Watch video, fill out 6.2 notes, and complete the 6.2 Check

___ 6.2 Page 335 #12-22

___ 6.4 Watch video, fill out 6.4 notes, and complete the 6.4 Check

___ 6.4 Page 344 #10-26

___ 6.5 Watch video, fill out 6.5 notes, and complete the 6.5 Check

___ 6.5 Page 348 #10-22

___ 6.6 Watch video, fill out 6.6 notes, and complete the 6.6 Check

___ 6.6 Page 354 #7-14

To earn a C, complete the following IXL:

IXL SmartScore of 80

R11 R12 R13 R14 R17 R18

To earn a B, complete the following:

___ Complete all items in the C section

___ Complete the Chapter 6 Problem Solving Packet (pink)

To earn a B, complete the following IXL:

___ All the IXL from the C section

AND

R15 R16 U5

To earn an A, complete the following:

___ Complete all items in the C section

___ Complete all items in the B section

___ Complete the Chapter 6 Puzzles, Twisters, and Teasers Packet (purple)

To earn an A, complete the following IXL:

___ All the IXL from the C section

___ All the IXL from the B section

AND

U6 U7

Appendix G**5.1-5.4 Quiz****Show all of your work.**

1. A box contains 18 green blocks, 10 blue blocks, and 8 red blocks. Write the ratio of blue blocks to red blocks in all three forms.
2. In a school, there are 350 students in 5 classes. Write the ratio of students to classes in all three forms, in simplest form.
3. In the Cosman family, there are 6 adults and 14 children. Write the ratio of adults to children in all three forms, in simplest form.
4. It takes Larry 54 minutes to paint a fence with a length of 12 meters. On average, how long did he take to paint 1 meter of fence?
5. Raina earned \$72 for 18 hours in a part-time job. How much did she earn each hour?
6. Dawson plans to drive 300 miles to Talen's house. He would like to make the drive in 5 hours. What should be his average speed in miles per hour?
7. Tonya can purchase packets of tea in four sizes. Which of the following is the best buy?
 - a. 2 lb packet for \$4.34
 - b. 4 lb packet for \$6.26
 - c. 7 lb packet for \$9.45
 - d. 9 lb packet for \$12.75
8. In one school, there are 12 students for every classroom. In another school, there are 36 students for every 4 classrooms. Determine whether the ratios of students to classrooms are proportional in both schools.
9. Determine whether the ratios $\frac{40}{48}$ and $\frac{16}{24}$ are proportional.
10. Determine whether the ratios $\frac{12}{20}$ and $\frac{18}{30}$ are proportional.

Appendix H**5.5-5.6 Quiz**

Show all of your work.

1. Use cross products to solve the proportion $\frac{z}{7} = \frac{17}{28}$

2. Use cross products to solve the proportion $\frac{n}{8} = \frac{49}{32}$

3. Use cross products to solve the proportion $\frac{b}{4} = \frac{13}{20}$

4. Convert 7.5 feet to inches. **12 inches = 1 foot**

5. Convert 200 ounces to pounds. **16 ounces = 1 pound**

6. Convert 256 pints to gallons. **8 pints = 1 gallon**

7. Jenny drank a 12-fluid-ounce bottle of water before tennis practice. After practice, she drank 3 cups of water. What is the total amount of water Jenny drank? **8 fluid ounces = 1 cup**

Appendix I
6.1-6.4 Quiz

Show all of your work.

1. Write 29% as a fraction in simplest form.
2. Write 86% as a fraction in simplest form.
3. Write 96% as a decimal.
4. Write 6.78 as a decimal.
5. Write 0.82 as a percent.
6. Write 0.395 as a percent.
7. Write $\frac{2}{5}$ as a percent.
8. Write $\frac{5}{8}$ as a percent.
9. Find 70% of 45.
10. Find 5% of 55.

Appendix J**6.5-6.6 Quiz**

Show all of your work.

1. What percent of 177 is 239? If necessary, round your answer to the nearest tenth.
2. 92 is 76% of what number? If necessary, round your answer to the nearest tenth.
3. 62 is 68% of what number? If necessary, round your answer to the nearest tenth.
4. 14 is what percent of 30? If necessary, round your answer to the nearest tenth.
5. Find the percent of change when 52 is decreased to 36. If necessary, round your answer to the nearest tenth.
6. Find the percent of change when 35 is increased to 51. If necessary, round your answer to the nearest tenth.
7. Find the percent increase of decrease from 225 to 441.
8. The regular price of a basketball is \$18.89. It is on sale for 10% off. What is the sales price?
9. The regular prices of a tablet is \$129.99. It is on sale for 15% off. What is the sales price?
10. Sarah buys hand-painted bowls for \$8.95 and sells them at a 112% increase in price. What is the retail price of the bowls?

Appendix K**Chapter 5 Post-Assessment****Multiple Choice**

Identify the choice that best completes the statement or answer the question.

1. Choose the most appropriate customary unit for the measurement of the weight of a dog.
 - a. ounces
 - b. kilograms
 - c. tons
 - d. pounds

Show all of your work.

2. Jon's summer baseball league has 36 thirteen-year olds and 48 fourteen-year olds. Write the ratio of thirteen-year olds to fourteen-year olds in all three forms.
3. Larry took 22 minutes to do 13 math problems. Julia took 24 minutes to do 12 math problems. Which student completed more problems per minute?
4. You can get 640 calories from eating 8 apples. How many calories can you get from eating 1 apple?
5. Tony and Tiffany collect semi-precious stones. At the Rockhound Hut, Tony paid \$38 for 9 pounds of snowflake obsidian. At The Solid Rock Shop, Tiffany paid \$19 for 3 pounds of the same type of stone. Who made the better buy?
6. Determine whether the ratios $\frac{8}{12}$ and $\frac{10}{18}$ are proportional.
7. Determine whether the ratios $\frac{6}{8}$ and $\frac{12}{16}$ are proportional.
8. Find a ratio equivalent to $\frac{8}{3}$
9. Find a ratio equivalent to $\frac{5}{7}$
10. Use cross products to solve the proportion $\frac{c}{6} = \frac{12}{18}$
11. Use cross products to solve the proportion $\frac{x}{10} = \frac{32}{40}$
12. The Anderson family is preparing for a family reunion. They think they will need 22 juice boxes for every 6 children who attend. How many juice boxes will they need if they are expecting 15 children?
13. Convert 4.5 feet to inches. **12 inches = 1 foot**
14. Convert 256 ounces to pounds. **16 ounces = 1 pound**
15. Convert 672 pints to gallons. **8 pints = 1 gallon**
16. Marissa drank a 12-fluid-ounce bottle of water before tennis practice. After practice, she drank 3 cups of water. What is the total amount of water Marissa drank? **8 fluid ounces = 1 cup**

Appendix L**Chapter 6 Post-Assessment**

Make sure to show all of your work.

1. Write 58% as a fraction in simplest form.
2. Write 27% as a fraction in simplest form.
3. Write 24% as a decimal.
4. Write 60% as a decimal.
5. Write 0.93 as a percent.
6. Write 0.65 as a percent.
7. Write $\frac{3}{8}$ as a percent.
8. Write $\frac{4}{5}$ as a percent.
9. Find 20% of 130.
10. Find 70% of 90.
11. A jar is filled with buttons of various colors. If the jar has a total of 420 buttons and 85% of the buttons are green, how many green buttons are in the jar?
12. 144 is 46% of what number? If necessary, round your answer to the nearest tenth.
13. What is 23% of 157? If necessary, round your answer to the nearest tenth.
14. What percent is 13 of 373? If necessary, round your answer to the nearest tenth.
15. Find the percent of change when 37 is decreased to 31. If necessary, round your answer to the nearest tenth.
16. Find the percent of change when 40 is increased to 83. If necessary, round your answer to the nearest tenth.
17. Find the percent of increase or decrease from 280 to 84.

18. The price of a train ticket from Orlando to Atlanta is normally \$118.00. However, the train company is offering a special 75% discount to children under the age of 16. What is the sales prices of a ticket form Orlando to Atlanta for someone under the age of 16?

19. Josh is eating at a restaurant. His total bill comes to \$24.90. If Josh decides to leave a tip that is 15% of the total bill, how much should he leave for the tip?

20. Julia makes necklaces for \$36.98. She sells them at a 115% increase in price. What is the retail price of the necklaces?

Appendix M

Student Survey

Flipped Classroom in 6th Grade Math Class

This survey is designed to receive feedback on student experiences with the flipped classroom in math class. Please take your time and answer the questions truthfully. This is anonymous and confidential. Thank you! *Required

How helpful were the video lessons?*

1 2 3 4 5

Not Helpful

Extremely Helpful

How confident did you feel about the lesson AFTER watching the video and AFTER the lesson check?*

- Not confident
- Somewhat confident, but need more help
- Pretty confident
- Extremely confident, I am ready for the test!

I like learning through videos.*

1 2 3 4 5

Strongly Disagree

Strongly Agree

I understand the lesson better when learning through videos versus lectures.*

1 2 3 4 5

Strongly Disagree

Strongly Agree

What learning method do you prefer in math?*

- I prefer the traditional method, with the teacher teaching math during class then homework at night
- I prefer the flipped classroom method - watch the videos at night, then homework during class
- I have no preference. I learn the same both ways

What did you like about the flipped classroom?*

What suggestions do you have for improving the flipped classroom?*