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Technological Resources versus Non-Technological Resources

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TABLE OF CONTENTS

Abstract

The purpose of this study is to help show that using technology as an instructional strategy will benefit students' knowledge on certain concepts. Improving focus and engagement will lead to increased knowledge of students. This study's participants included ten randomly selected second-graders. They focused on the concept of 2-dimensional and 3-dimensional shapes. At the beginning of this study, they were given a pre-assessment (see Appendix A) to show their current knowledge. When this study was completed, a post-assessment (see Appendix B) was given. Comparing the results of these two assessments helped to show that using technology, during teacher-led instruction, benefited the subjects' focus and understanding.

Chapter One

General Problem/Issue

All students are different and have various ways of learning material. Teachers need to find ways to accommodate to all of their students. When thinking about how to teach lessons, it is important to find out how each individual student learns best. Leasa, Corebima, Ibrohim, and Suwono stated, "VARK model learning style was developed by Fleming (Eom, Wen, & Ashill, 2006). In VARK model, students are classified into four types of learners namely Visual, Auditory, Read, and Kinesthetic" (2017, p. 84). This is a model that should be considered when thinking about planning for any type of instruction. There is not only one way to teach students, and thinking about each student's learning style before planning is important. Including a number of styles in teaching, to accommodate to all students, will help students reach their academic goals.

When planning lessons, teachers think about if the activity and/or resources used will benefit the students. Students in elementary, today, are exposed to technology multiple times a day. They enjoy using technology. From the American Psychologial Association website, I found that Common Sense Media did a study in 2015. This study showed that, "…53 percent of children 8 to 12 have their own tablet, and 24 percent have their own smart phone" ("Digital guidelines: promoting healthy technology use for children). Students are familiar with different tools involving technology. Will being able to implement resources that use technology into lessons help keep all types of learners engaged and motivated to learn the material? There are different resources that are beneficial for all types of learners. Technology is just one, but has become so comfortable to students. Teachers can find sources that apply to students who are visual, auditory, kinesthetic, and students who learn best by reading. When thinking about

technology, one may just think about internet games or applications. This could be seen as distracting to some teachers. There are a number of wonderful applications on tablets and educational websites that are motivating to students and do provide great instruction and feedback.

If students are inclined to learn the material, they will be more focused during the lesson. Being more focused will lead to higher student academic achievement. All teachers have the goal of reaching all their students' needs. Finding ways to implement a variety of resources to all lessons, will help reach all students which will lead to meeting those goals. Technology is a great resource and because it is so familiar to the students they tend to enjoy the lessons much more. Elementary students do not have high attention spans and can easily become distracted during lessons. Incorporating interactive materials will help eliminate this distraction that is seen throughout the day. Educational games on tablets or computers are enjoyable for students. They are able to "play" while learning, even if they do not see it that way. Even using programs, such as IXL, are more engaging than using a pencil and paper to solve a math problem. "IXL is an immersive K-12 learning experience that provides comprehensive, standards-aligned content for math, language arts, science, and social studies" (ixl.com, 2018). There are also other materials that do not involve a computer or tablet that help students learn. The question is, what is the best way to deliver this material to students while keeping them engaged and getting them motivated to learn? Does including technology help students obtain given material better than resources that do not involve technology?

Subjects and Setting

Description of subjects

The participants of this study were selected from 20 second grade students from a Title 1 school in rural Minnesota. Of these 20 students, 19 were Caucasian and one was Asian American. Three of the 20 students were on an Individualized Education Plan (IEP), one for emotional behavior disorder and two for learning disabilities. All three also receive Speech Language Services. There were twelve boys and eight girls who could have been chosen in this study, and their ages ranged from seven to eight years old. Out of the twenty students, five have parents who have been separated. Out of those five, two have been adopted at an older age.

Selection criteria

From the twenty students in this second-grade classroom, 10 students were randomly selected and separated into two groups of five. Another teacher, who does not know the students, randomly selected ten numbers between one and twenty. Each student was assigned a number at the beginning of the year. These numbers were assigned in alphabetical order by last name. From there, the first five numbers selected were put into one group. The second set of five numbers became the second group. Then, one of the groups was randomly chosen to receive math instruction with technology and the other did not.

Description of setting

This study took place in a rural town in Minnesota. The public school is a low-income, Title 1 school. This school receives extra services, such as free and reduced lunches, Targeted after school program, and Title 1 staff funding for small-group interventions. The average class size, in the primary grades, is 20 students.

There are 138 students, out of 405, in this elementary school that receive free and reduced lunch. The student population is predominately Caucasian Non-Hispanic. The percentage of Caucasian students is 89%, multiracial is 6.1%, American Indian is 2.5%, Hispanic is 2%, and Asian American is less than 1%.

Informed consent

In order to conduct this study, the Institutional Review Board and Minnesota State University-Moorhead, and the school district currently taught at, granted permission. Prior to conducting the research, the building principal and superintendent also granted permission. Correct protocol from the Review board by the University and school district was required and followed through.

Since this study was performed on second grade students, the participants' parents were required to be informed about the study and the reasoning for it. Information given to the parents helped them understand the purpose for the research. Also given to the parents was the description and process of how it will be conducted. Before beginning the study, the option to withdraw from the study was stated in writing. In this writing, parents were assured that student confidentiality would be protected. In order to show that parents were informed about the study, they were asked to give their consent, so their child could participate in the research, in writing.

Statement of Purpose

The purpose of this study was to measure how using technology as an instructional strategy will impact student focus and engagement with regard to math knowledge.

Review of Literature

Out of all the teachers in the world, not one teaches exactly the same. Every educator has their own techniques and their own skills that they implement in their lessons, but each teacher wants their students to succeed. Every educator has their own techniques and their own skills that they apply in their lessons. As a teacher, my promise to my students is to try my best to teach in different ways to help each of them individually succeed. I hope that other teachers do the best they can to help their own students achieve their own goals.

They all want to see improvements in each hope individual student. Over time, educators have used many different methods and materials to try to reach each students' needs. In this day in age, there is a lot of focus on technology in the classroom. What type of technology do we use? What lessons should it be used on? Will this benefit the students? All of these questions come into play when thinking about using technology in daily lessons. Hope

Out of those questions, teachers focus on the one about the students. Will this benefit the students? Chekour (2017) states, "Exposing students to the course content is often not enough for them to achieve academic success in mathematics. Implementing a variety of instructional strategies that increase students' motivation and meaningful learning are also necessary" (p. 21). Technology is something that students are familiar with. Why not use it as a tool in the classroom to help them achieve their individual goals?

Implementing Technology in the Classroom

Technology has been around for a long time. "Educational technology, defined broadly as both hardware and software that support education goals, is not a new approach to teach. In fact, educational technology has been in classrooms in different forms since the 1920s" (Delgado, Wardlow, McKnight, & O'Malley, 2015, p. 405). This goes to prove that technology will not be

leaving the classroom anytime soon. It is crucial for teachers to be able to implement it in their classrooms instead of just ignoring it. "Technology is a part of the air that students today breathe,' says Larson" ("Technology + Math = SUCCESS," 2017, p. 3). All children are exposed to it, either at school or home, every day. There are students who find technology easy to use and it is fun for them. If these are true, teachers should take advantage of that and incorporate it in their classrooms.

There have been studies that show 1:1 computing has improved students' achievement, motivation, and engagement (Varier, Dumke, Abrams, Conklin, Banes, & Hoover, 2017). If students are more engaged and motivated to work, their achievement will be higher. These three are very close connected. If students are more motivated and engaged with technology, why aren't all teachers using it during their daily lessons?

There are many veteran teachers that may not have been exposed to the newest findings in technology. It can be difficult to incorporate technology when it is somewhat foreign to them. According to the article by Nelson, Fien, Doabler, & Clarke (2016), "It is important for teachers to be aware of the strengths and weaknesses of potential programs in order to use them effectively to supplement instruction" (p. 297). Teachers need to do their research before implementing different technologies and educational programs in their classrooms. When a teacher is knowledgeable in a certain technology tool or program, they can introduce it to their students to help with engagement, motivation, and success.

Using Games/Applications as Learning Tools

In a study done by Musti-Rao, Lynch, and Plati (2015), they focused on studying a math fact application in a third-grade classroom. This study proved that this app is great for many reasons. The article broke down their findings from analyzing the app, "The Math Drills." They

focused on the different themes of the game, the arrangement of problems, assistants, answers, customizing math facts, the response input, error correction, and data collection. All these findings can keep the students focused and be set at the level of each individual student. Musti-Rao et al., (2017) "The app tracks students' performance on tests by recording the accuracy and rate of response. Using a racing theme, the scores are reported as the 'duration' it takes to complete the test, and the number of incorrect responses is indicated as 'pit stops'" (p. 115). The students are able to see their results of the problems they have solved. This gives them the opportunity to work on any incorrect problems. Also, being racing themed will help keep the students engaged because it is more game based.

This app is on that can be used on an iPad. iPads are popular in schools around the country. Some students also have iPads at home and some are able to use them in more ways than adults can. Classrooms that have this technology tool can choose educational applications that relate to the content and are appropriate for the level of each learner. Al-Mashaqbeh (2016) states, "The best practice in teaching of using the iPad is to choose the applications in a way that help approach teaching in a supportive and easy way (Herlihy, D (2011))" (p. 48). iPads can be a tool used to support different levels of learning. Teachers can do research to choose the most useful applications. Students are able to use the iPad and they are engaged with this tool because it is familiar to them.

Minecraft is another familiar program to students today. This is a game that has become more popular in education. "The building videogame, Minecraft, has been a sweeping sensation among the younger set since 2009" ("Minecraft in the Classroom: The Education Edition," 2017, p. 4). There are classrooms that are using this game as an educational tool for different math concepts. One classroom in Texas used Minecraft to build houses and find the area, perimeter,

and volume of their buildings. The teacher, Sara Richards, mentioned on the differentiation of the game. She said, "The kids who totally got the concepts were able to build these elaborate structures and challenge themselves to find the area and perimeter and volume of something more complicated. The kids who were unsure of themselves could build something smaller" (Herold, 2015, p. 12). The students are playing a game they may be familiar with and they are still able to get different levels of differentiation and work at their own pace, on their own level.

When thinking about differentiation, teachers need to make sure they understand each level their students are at. This can be difficult to find instruction materials for all different levels. Technology has been able to help with differentiation in the classroom. From a study conducted by Milman, Carlson-Bancroft, and Boogart (2014), they found that, "Of the survey respondents, 80.6% indicated they were able to differentiate instruction to address diverse learner needs using different applications" (p. 124). Being able to use tools to help find different applications, or programs, to meet the needs of all students is extremely beneficial to both the teacher and the student.

Technology in Mathematics

Technology can be used in numerous ways in the classroom. There have been a lot of advances to using different technological tools with math practices. As teachers become more familiar with the tools they are implementing, students are using more programs to help with their academic skills. In an article that conducted a study on using technology in elementary reading lessons, McDermott and Gormiley (2015), found, "One fourth-grade boy explained they (children) used the online program 'to improve your brain speed and memory' (Observational Notes, November 5, 2012)" (p. 138). These students are realizing on their own that they can use different programs to help with their fluency skills.

Along with fluency, comes vocabulary. Whether it is vocabulary in language arts or mathematics, expanding one's vocabulary is important. There are programs out there that can give students the opportunity to use different ways to enhance their vocabulary skills. In an article written by Steckel and Shinas (2016), they state, "…students may use an app such as Book Creator to create visual models of vocabulary terms to share with their classmates" (p. 23). This is important because students learn in different ways and visual learners are able to use technology to create a visual product.

If a teacher is used to teaching in one way, they may not be getting information across to all students and that can lead to students becoming unfocused and less confident in the material. Using technology can reach the learning styles of multiple students. In an article written by Johann Taljaard (2016), there is a discussion about computer tablets. This article mentions that computer tablets have the ability to meet the needs of students and can help students learn with their desired learning style (pg. 50). Some may be auditory and some may be visual. Luckily, technology can reach both. A study was conducted in a second-grade classroom in Ohio and from the article written by Smith (2017), a quote was taken from the teacher. She said, "He 'was in his comfort zone when surrounded with technology' and Spaite watched his confidence blossom and his peer interactions develop. He also became increasingly engaged in learning the content during math lessons" (p. 24). This student was working on math lessons, with technology, and was becoming more engaged. If students are more confident using technology on a skill, they are going to be more focused while working on that skill which will eventually lead to their success in a given skill. In an article discussing the use of technology versus other methods. Hawkins, Collins, Hernan, and Flowers (2017) mention, "However, drill and practice activities like these have been long criticized for not being engaging to students and potentially

encouraging the use of less efficient strategies such as finger counting" (p. 141). Paper pencil methods and flashcards have proven to be effective, but it is not as engaging to students today as technology is. Luckily, there are multiple programs that help with fact fluency and other math concepts.

Mastering concepts in elementary is crucial. Technology has proven to be a component to helping students better understand different concepts. In an article written by Rhonda Puckett (2013), she found a research study conducted by Cheung and Slavin. This study was about technology integration. Puckett (2013) stated, "Cheung and Slavin's (2013) determinations are based on student scores on pre-assessments compared to student scores on post-assessments, finding that technology implementation has a positive effect on the learning outcomes for students" (p. 6).

Statement of Hypothesis

The second graders (P) in the study that receive math instruction with technology (x) will score higher on given formative assessments (y) than second-graders who do not.

Chapter Two

Research Questions

As a class and grade level, we have had to find many supplemental resources for our math instruction as we do not fully agree with the way our curriculum works. As I created my lessons and activities, I thought about the best ways to teach concepts to the students. I needed to get information to them and find ways to help them retain what I teach. As I planned, I thought of the following questions:

1. Will implementing technology help increase student knowledge in a given math concept?
2. Will technology implementation help increase student engagement?

As I thought of these questions and how to answer them, I tried to find ways to incorporate technology into my lessons. The students are familiar with technology and have been exposed to a variety of tools in the classroom. Since my students were comfortable using technology and know the set rules, I was able to incorporate it in my daily lessons. I knew that having a routine would be a key factor in this study and because it was not be new to them, they would not think any different.

Research Plan

Methods and rationale

There were two measuring tools used in this study. These formative assessments were created by myself. One assessment was given, to each group, prior to starting the study. This checked their knowledge of recognizing 2-dimensional and 3-dimensional shapes. Following the study, the subjects were given a post-assessment to check their understanding and growth after instruction. These assessments were aligned to the Minnesota second grade math standards. These assessments were reliable and valid to the content being taught. The pre-assessment had

ten questions requiring the students to draw given shapes and name given shapes. The students received a word bank to help with correct spelling. The post assessment was similar to the pre-assessment, but had eleven questions.

To assure that these assessments were valid and reliable, the process of administration is important. There was no guidance, from the administrator, during either assessment. The steps below were followed during the study:

1. Administered the pre-assessment (Appendix A) to both small groups. The administrator read all of the shape names, from the word bank, to the students for each question.
2. The study was completed, based on the following schedule. Group 1 received instruction with technology, assisted by the teacher. Group 2 received instruction with other supplemental resources, also assisted by the teacher. Both groups received instruction to learn and understand the names of 2-dimensional and 3-dimensional shapes.
3. During instruction of both groups, the teacher took observation notes on the engagement of students.
4. Post-assessment (Appendix B) was administered to each group. Again, the administrator read all of the shape names, from the word bank, to the students for each question.
5. The data obtained was analyzed.

Schedule

This study took place over a fifteen-day period. On the first day, both groups were separately given the pre-assessment to show their current knowledge on 2-dimensional and 3-dimensional shapes. On the second day, Group 1 watched a YouTube video on 2-dimensional shapes. Group 2 was given a sheet of paper with shapes and shape names (see Appendix C). They looked at each shape and read the correct name that goes with that shape. On day number

three, Group 1 worked on ixl.com practicing naming different shapes. Group 2 was given names of shapes and had to draw the corresponding shape on an individual whiteboard. On the fourth day, Group 1 played a shape guessing game using topmarks.co.uk. Group 2 was shown a drawing of a shape and had to write the name of that shape on their whiteboard. On day five, Group 1 played a shape memory game on abcya.com. This game allowed them to match the name of a shape to an object they would see in the real world. Group 2 explored with popsicle sticks to create different shapes.

On day six, Group 1 explored with Quick Response (QR) codes, using an iPad, to identify the 2-dimensional shapes. Group 2 played a teacher created game to identify shapes. Day seven included having Group 1 solve shape riddles on turtlediary.com. Group 2 also solved riddles, but the riddles were on a task card (see Appendix D for an example). On day eight, Group 1 watched a YouTube video on the descriptions of 3-dimensional shapes. Group 2 received a handout with pictures and corresponding names of 3-dimensional shapes (Appendix E). On day 9, Group 1 worked on ixl.com naming 3-dimensional shapes. Group 2 completed a math journal page on shapes. Day ten consisted of Group 1 watching another YouTube video on the faces, edges, and vertices of a 3-dimensional shape. Group 2 used physical 3-dimensional shapes to participate in a teacher led discussion on the shapes' faces, edges, and vertices.

On day eleven, Group 1 worked on ixl.com again, but focusing on faces, edges, and vertices. Group 2 identified the faces, edges, and vertices on the 3D blocks. On day twelve, Group 1 played a guessing game with PowerPoint. Each slide had a picture of either a 2-dimensional or 3-dimensional shape or a description of the shape. They had to identify what shape was given. Group 2 had task cards that give them a shape name or description. They then used toothpicks and marshmallows to create the given shapes. On the thirteenth day, Group 1

worked on mathplayground.com playing Kangaroo Hop. They needed to identify both 2-dimensional and 3-dimensional shapes. Group 2 will played memory game with both categories of shapes. On the last day of separated instruction, Group 1 played a shape quiz game on education.com. Group 2 completed a math journal page where they had to identify shapes. On day fifteen, both groups separately took the post-assessment on identifying 2-dimensional and 3-dimensional shapes.

Ethical Issues

During this study, there could have been some problems that arose. The second grade students had a routine with small group settings, but they knew their groups and were comfortable with who they work with. This study required students to work with other students who may not have been in their small groups before. This could have been uncomfortable for them as each group varied in academic levels. I also think that seeing different activities, than what was usually done during our small group time, was a change for them. Each group was doing different activities, but they did not question this during the instruction.

Anticipated response

There were not any ethical issues that occurred during this study. The participants, and parents, were reminded that they could have chosen to be removed from the study at any time. If this were to have occurred, they would have been informed that the participants would have still received this instruction, but at a different time and not during the study. As the students found things to be different than usual, they were reminded that they were working on trying different activities and working with other peers.

Chapter Three

Data Analysis and Interpretation

Description of Data

The purpose of this study was to measure how using technology as an instructional strategy will impact student engagement with regard to math knowledge. Improving focus and engagement will lead to increased knowledge of students. On the first day of this fifteen-day study, students were given a pre-test to obtain their knowledge on shapes. For the next fourteen days, two groups of five students were then observed during math rotations. Student observation comprised a large part of data collected on engagement. Notes were taken on the conversations the students had, the level of each student's focus, and their formative scores on some educational games played. At the end of this study, the students took a post-assessment similar to the first one. The data was then compared to determine if technology integration played a role in the increase of engagement, which could lead to increase in knowledge of two-dimensional and three-dimensional shapes.

Participant Data

The participants in this study were randomly selected from a class of twenty second graders. From these twenty students, ten numbers were randomly chosen by another teacher. The first five were put into Group 1 and the second five were placed into Group 2. In this class, there are twelve boys and 8 girls. Group 1 had three males and two females. Group 2 had two males and three females. Table 1.0 shows each student's gender, age, and Standardized Testing and Reporting (STAR) math composite score from their test in March 2018. A score of 631 has a grade equivalency of the fifth month of fourth grade. This will give some insight on the level of each student that participated in this survey.

Table 1.0

Student Participant Data

Group	Identifying Number	Gender	Age	STAR Math Comp. Score
	Student 5	Male	7	544
	Student 8	Female	8	542
Group 1	Student 14	Male	7	540
	Student 17	Male	7	601
	Student 18	Female	8	619
	Student 1	Male	8	624
	Student 6	Male	8	631
Group 2	Student 12	Female	7	482
	Student 13	Female	8	396
	Student 15	Female	8	476

Assessment Data

Each student in this class took the same assessment. The ten students were graded and analyzed based on their knowledge of two-dimensional and three-dimensional shapes. The pre-assessment (Appendix A) had four questions on two-dimensional shapes and six questions on three-dimensional shapes. The post-assessment (Appendix B) had five questions on two-dimensional shapes and six on three-dimensional shapes. From day one, taking the pre-assessment, to the final day of the study, taking the post-assessment, the hope was that students would improve their knowledge on two-dimensional and three-dimensional shapes. Tables 2.0 and 2.1 show a breakdown of the assessments for each group.

Table 2.0

Group 1 Pre-Assessment Data

Student Number	Overall Score (% out of 100)
5	60%
8	100%
14	100%
17	80%
18	100%

Table 2.1

Group 1 Post-Assessment Data

Student Number	Overall Score (% out of 100)
5	100%
8	100%
14	100%
17	82%
18	100%

After looking at these tables, I see that the overall scores from the students in Group 1 did improve. Three of the students' scores stayed the same at 100%. One of the students improved from 60% to 100%, and one student improved from 80% to 82%. Student number 17 was absent for two of the days we worked on three-dimensional shapes, so this could be a factor in his

smaller increase from the pre-assessment to the post-assessment. The next table shows the overall scores from group number two. These students received instruction without technology.

Table 3.0

Group 2 Pre-Assessment Data

Student Number	Overall Score (% out of 100)
1	100%
6	70%
12	60%
13	20%
15	70%

Table 3.1

Group 2 Post-Assessment Data

Student Number	Overall Score (% out of 100)
1	100%
6	73%
12	73%
13	55%
15	91%

The students in this group did improve as well. There was one student who scored 100% on both assessments. The other four students showed increases of 3%, 13%, 21%, and finally, one student had an increase of 35%. During the fifteen-day study, student number 6 and student

12 were both absent. Student 6 was gone for two days, one of which was instruction on two-dimensional shapes and the other we discussed three-dimensional shapes. Student 12 was absent for one day during our two-dimensional shape lessons. Being absent does seem to play a factor into learning and retaining information. I did not reteach these lessons to any of the students that were absent during this study.

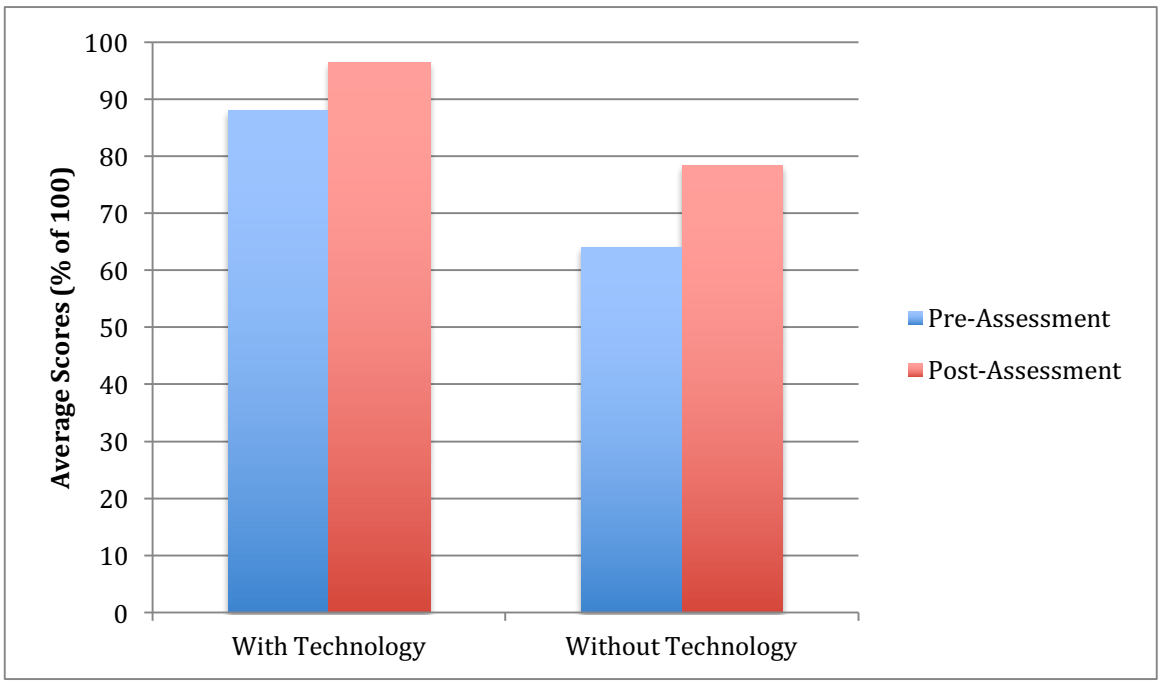
Research Questions

Will implementing technology help increase student knowledge in a given math concept?

This study was conducted to help determine how effective technology integration would be when teaching students on two-dimensional and three-dimensional shapes. Each student, in this study, received the same assessments. Group 1 was instructed with technology and group 2 used other supplemental resources not involving technology.

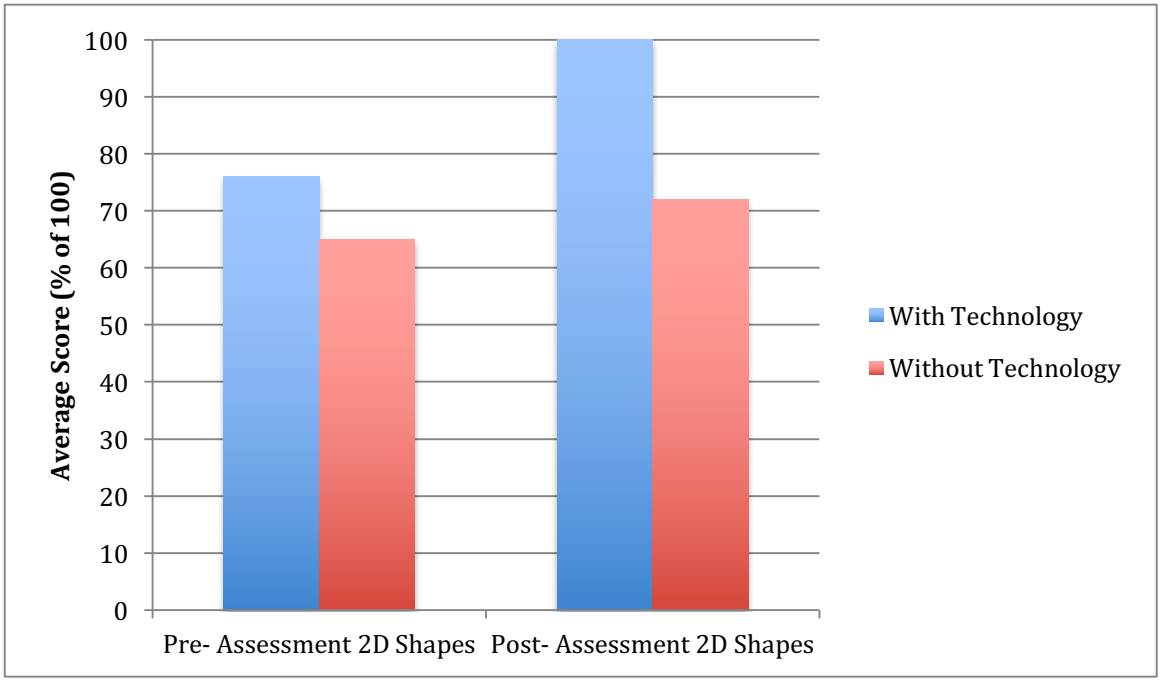
The figure below shows the average scores from both groups. On the pre-assessment, Group 1 had an overall average of 88%. The average for Group 2 was 64%. On the post assessment, Group 1 averaged 96.4% and Group 2 averaged 78.4%. This shows that Group 1 increased their scores by 8.4% and Group 2 increased by 14.4%.

Figure 1. Overall average scores of pre- and post-assessments for groups one and two.



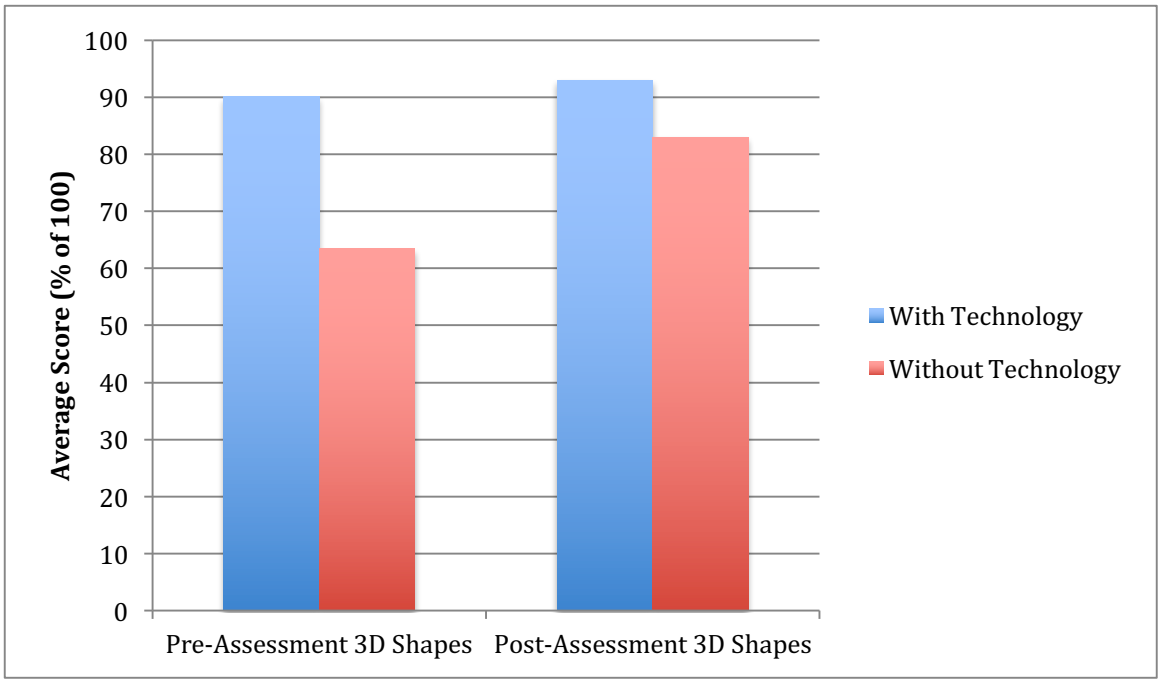
Looking at this data, Group 2 did show more improvement. They also had more room for growth from their pre- to their post-assessment. Group 1 started with a higher average and ended with a higher average. This shows that technology did help with the knowledge level of two- and three-dimensional shapes. I broke down the assessments into two different categories. The first being two-dimensional shapes and the second being three-dimensional shapes. The figures below show each group's understanding of the two concepts from their pre- to their post- assessment.

Figure 2. Average of two-dimensional shape knowledge on pre- and post-assessments for both groups.



As you can see, Group 1 showed a greater increase in this topic. They scored an average of 76% on their pre-assessment and then an average of 100% on their post-assessment. Group 2's average on their pre-assessment was 65% and they showed an increase of 7% with an average post-assessment score of 72%.

Figure 3. Average of three-dimensional shape knowledge on pre- and post-assessments for both groups.



For the three-dimensional shapes, group 2 showed a great increase of 19.6%, but Group 1 still received a higher average score. Before the study began, Group 1 had an average score of 90% on three-dimensional shapes. Concluding the study, they averaged 93% in this area. Group 2 started with 63.4%. Following instruction, on average, they answered 83% of these questions correctly.

Will technology implementation help increase student engagement?

During this study, I kept observation notes of both groups during the lessons. I took notes on multiple days, but not all because there were days I needed to focus more on instruction. These notes allowed me to observe their behaviors during activities, their level of focus, and level of engagement. Below are the dates that each group did an activity. Along with that, I have included the notes that I took during the study.

On day one (2/5/18), I took notes while Group 1 watched a YouTube video on two-dimensional shapes. Some of the notes I took were as follows.

> During this video, they sing the name of the shape and allow time for students to repeat what the shape is. The students were dancing to the beat of the music and were repeating each shape as it was said. Student 17 was the least engaged during this video. This student sat and watched without movement, but said the shape names with the other students. This lead student 8 to stop moving to beat and just participate in saying the shape name as well. After the video, we discussed the properties of polygons. Student 18 answered the question, "what makes a shape a polygon?" This student stated, "it has to be closed, can't have turns, and can't cross." We then discussed how turns meant the shape had to have straight sides.

On day three, Group 2 looked at shapes and wrote the name of each shape on their individual whiteboard. Student 12 was absent this day. These are the observation notes that I took:

> At the beginning of this activity, the students were very talkative. Student 1 was very unfocused and had to be given reminders to control their body and stay focused. When I showed the students a rhombus, student 13 was trying to look at other students' whiteboards. I had to remind them to hide their whiteboards after they wrote their answer. This student took a while to think of the shape name. I prompted this student with the term, "squished square." Student 13 then wrote down the correct answer. I showed the group a heptagon, but it was not a regular heptagon. The students observed the shape and I asked, "what can you do to help name this shape?" Student 6 started counting the sides of the shape aloud. The other students then realized this and joined in. Student 15 redrew

the shape on the whiteboard and drew lines on the shape as they counted the each line. I reminded them to think about the number of sides and what word meant that number. I said, "what word means 8?" This seemed to help the students remember the names of the shapes.

On day five, I took notes while Group 2 played a teacher created game on identifying shapes. Student 6 was absent. Below is what I observed during this activity.

The students were playing a game that is familiar to them; therefore they were excited to play. They had not played this version before though. I removed all 3D cards from the deck because they had not yet been introduced to them. During this activity, the students had partners. Students 1 and 15 worked together and students 12 and 13 worked together. I handed out the cards to each group as needed, While I was observing students 12 and 13, I could tell they were more engaged in the activity because one student would show the card to the other and ask them the question on the card. For example, student 13 asked, "(Student 12's name), what shape is shown on this card?" Student 12 responded with, "oval." I then told student 13 to ask another question about the shape. This student asked, "does this shape have sides?" Student 12 responded with a simple, "no." Students 1 and 15 were excited to keep track of how many cards they had answered correctly. I did observe them counting the sides of an octagon together. This helped them remember the name of this shape.

The final notes I took were on day 8 when Group 1 was watching the YouTube video on 3-dimensional shapes. Student 17 was absent this day. The notes I took were as follows.

The students were excited for this video, as it was similar to the 2-dimensional shapes video. Right away they were focused and ready to listen to the 3D shapes. Student 18

started beating along with the song right away. Student 8 joined in shortly after. They all danced again during this song. When the song prompted them to repeat the shape name, the students did. At the end of the video, student 5 asked if we could watch it again. I played the video for them again because repetition is great for them. After watching the video a second time, I introduced the words face, base, and vertices. I simply told them a definition of each word and said we would discuss them more the next day.

Verbal Engagement

During all the activities, the students were very vocal. At times, this showed their level of engagement during a given activity. On the other hand, it was more off-task conversations. The table below shows the comments from students during certain activities. This helped me, as the researcher, determine if they were engaged or if they were bored and off-task during the lesson.

Table 4.1

Student Comment Observations

Date	Group	Activity	Student	Comments
02/06/2018	1	IXL – identifying 2D shapes	17	"This is pretty easy."
02/06/2018	1	IXL – identifying 2D shapes	14	"Oopsy! I did that one wrong!"
				"Yay! I am on the challenge zone."
02/06/2018	1	IXL – identifying 2D shapes	5 to 17	"On a rectangle I answered square. It was kind of funny."
02/06/2018	2	Students draw shape on whiteboard	13 to 1	"A hexagon is really hard. How do you draw it?"
02/06/2018	2	Students draw shape on whiteboard	1 back to 13	"Just do your best. Do you remember what hex means?"
02/06/2018	2	Students draw shape on whiteboard	15	"You hit a bee with that!"
				"The top of a fly swatter is a square."

Both groups had a high level of engagement and focus. The students in Group 1 were more focused on the computer-based activities. When the students were working on IXL and identifying shape names, student 17 realized right away that this activity would be simple for them. This student was focused the whole time and scored 28/28 in one minute on this activity. When they finished, they did the challenge zone and then chose to do the level again. During this same activity, student 14 self-reflected and was able to realize they made a mistake and then read the following explanation to better understand where their mistake was made. When student 5 mentioned their mistake to student 17, I did notice that this student was looking at student 17's computer. When student 5 spoke to student 17, student 17 responded with, "remember that a rectangle has two longer sides and a square's are the same." It was encouraging to see the communication between students and that they were seeking and offering help to one another. Student 5 went right back to their computer and continued working after this interaction.

The students in Group 2 were more off-task because there was a lot of wait time between the researcher asking questions and waiting for responses. Student 15's comment when drawing the square was an example of this. This student was finished drawing a square on their whiteboard, but was impatiently waiting for the other students to finish. This was this student's way of helping. The other students then became off-task due to confusion because they had not clue what this student meant. That is when the student responded with, "the top of a fly swatter is a square." Student 6 responded negatively to this because they were not finished drawing a square. The short conversation between students 1 and 13 was not disengagement, but was simply one student seeking help of another. Student 1 responded in a correct way and did not give the answer, but tried to help student 13 think through the process of drawing a hexagon.

Conclusion

During this study I was able to observe students during different activities. I focused on their level of engagement and focus as well as their level of knowledge on both two- and three-dimensional shapes. The pre- and post- assessments helped determine that instruction with technology does seem to help increase a student's knowledge on a given concept. Keeping observation notes also helped me concentrate on how engaged students were during activities.

Every student in the study showed overall growth. While Group 2 showed more of an increase overall, students in Group 1 showed results of higher scores. When the assessments were broken down, students in Group 1 showed higher scores of knowledge in both two- and three-dimensional shapes. The notes that were kept also helped show that technology is beneficial to students because of increased focus and more conversations with themselves and one another. While I was taking notes, I tried to not respond to the students in any way. I let them focus on the task at hand and communicate with one another. The students in Group 1 were more engaged, therefore their conversations were more on the given topic. Group 2 seemed to have more off-topic conversations.

This study helped me, as the researcher; focus on student behavior and response to different activities. Concentrating on this helped me relate their responses to their success on the given concept. Students in Group 1 had direct engagement with materials involving technology, which kept them focused during the lessons. This helped the students in Group 1 receive higher scores on their post-assessment following the study.

Chapter Four

Action Plan

After seeing and reviewing the results of my study, I have come to realize that technology resources, when utilized properly, are beneficial to students. Before the study, I incorporated different technology tools into my teaching and I saw that the students enjoyed it. After completing the study, I realized that technology needs to be implemented in a structured manner with an adequate amount of planning beforehand. The data I obtained shows that technology can help increase the focus and knowledge gained from the given material. Technology used also complimented my teaching style to help my students stay engaged in learning.

I will continue using technology during my daily instruction of math and other subjects as well. I will work more on planning which tools and websites I will use. Making sure to choose appropriate and valuable resources is important when planning lessons. I will share my ideas and resources with my colleagues and be open to other suggestions they might have. I do believe that there are other tools that do not involve technology that can be used to help students learn the material as well. There are educational games, interactive notebooks, and other hands-on tools that I can incorporate into my teaching.

I feel that a good balance of both types of tools will have the most benefit for my students. I feel that a variety of resources will keep students more engaged. There are times that I have observed students becoming bored of an activity if it has been overused. I will make sure to rotate between different activities to help manage the students' engagement. After taking time each year to observe how each student learns best, I plan to incorporate different technological and non-technological resources for their individual learning styles.

Chapter Five

Plan for Sharing

The use of technology as a teaching tool for various math concepts has benefited the scores and engagement of my students during lessons. With the correct instructional practices and resources, teachers of all grade levels can incorporate technology into their own classrooms. I am willing to share the ideas I have for utilizing different resources that involve technology with my colleagues. We have the opportunity to share ideas we have found with one another at our school's staff meetings. This way if I were to find a resource that I thought would benefit other students, in other grade levels, I could present and explain it to all of the teachers.

My grade level team works closely together, so I plan to share my experiences and ideas involving the multiple tools I have used. We meet weekly as a team and during these meetings I can bring these ideas to my team members. As many of the resources I have used are accessible on a tablet or a computer, I will share these interactive websites with parents and guardians of my students as well. I plan to share this information with them in a weekly newsletter that I send home at the end of the week. If I come across something I want to share with them right away, I will send them a link to the website through email. This way, the students can continue to work on numerous skills at home.

I will continue to share any information I find useful with my colleagues and parents or guardians of students I interact with in my future years of teaching.

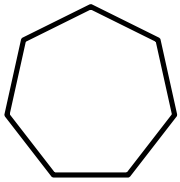
Appendix A

Draw the given shape:

Rhombus Oval

Name the following shapes, using the word bank.

cone	triangular pyramid	octagon	cylinder	cube
heptagon	sphere	rectangular prism		



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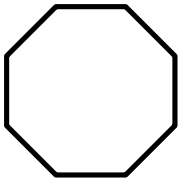

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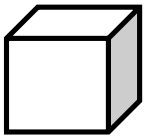
I am shaped like a party hat. What shape am I? _____

I am shaped like a baseball. What shape am I? _____

I am shaped like a pop can. What shape am I? _____



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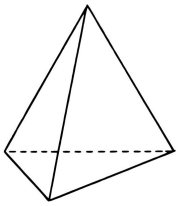

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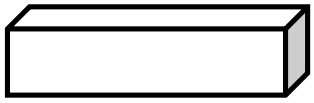

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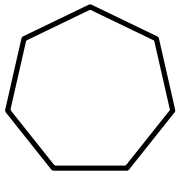
Appendix B

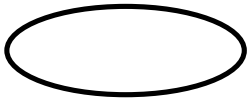
Draw the given shape:

Rhombus Heptagon

Name the following shapes, using the word bank.

cone	triangular pyramid	octagon	cylinder	cube
oval	heptagon	sphere	rectangular prism	





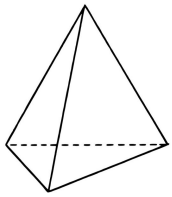
_____ _____

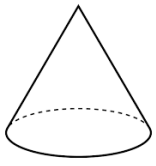
I am shaped like a dice. What shape am I? _____

I am shaped like a beach ball. What shape am I? _____

I am shaped like a stop sign. What shape am I? _____

I am shaped like a refrigerator. What shape am I? _____





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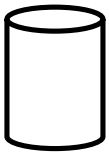

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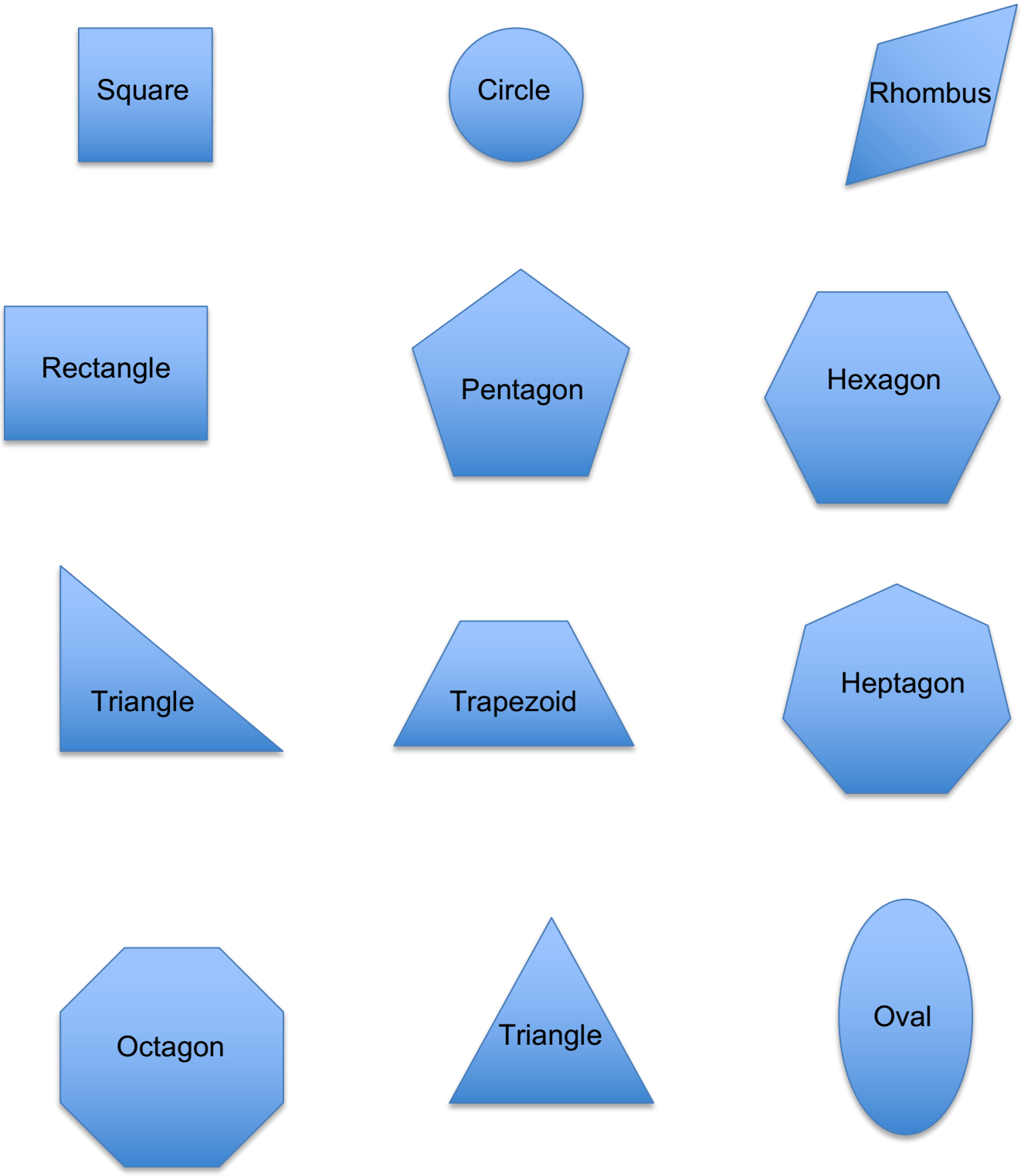
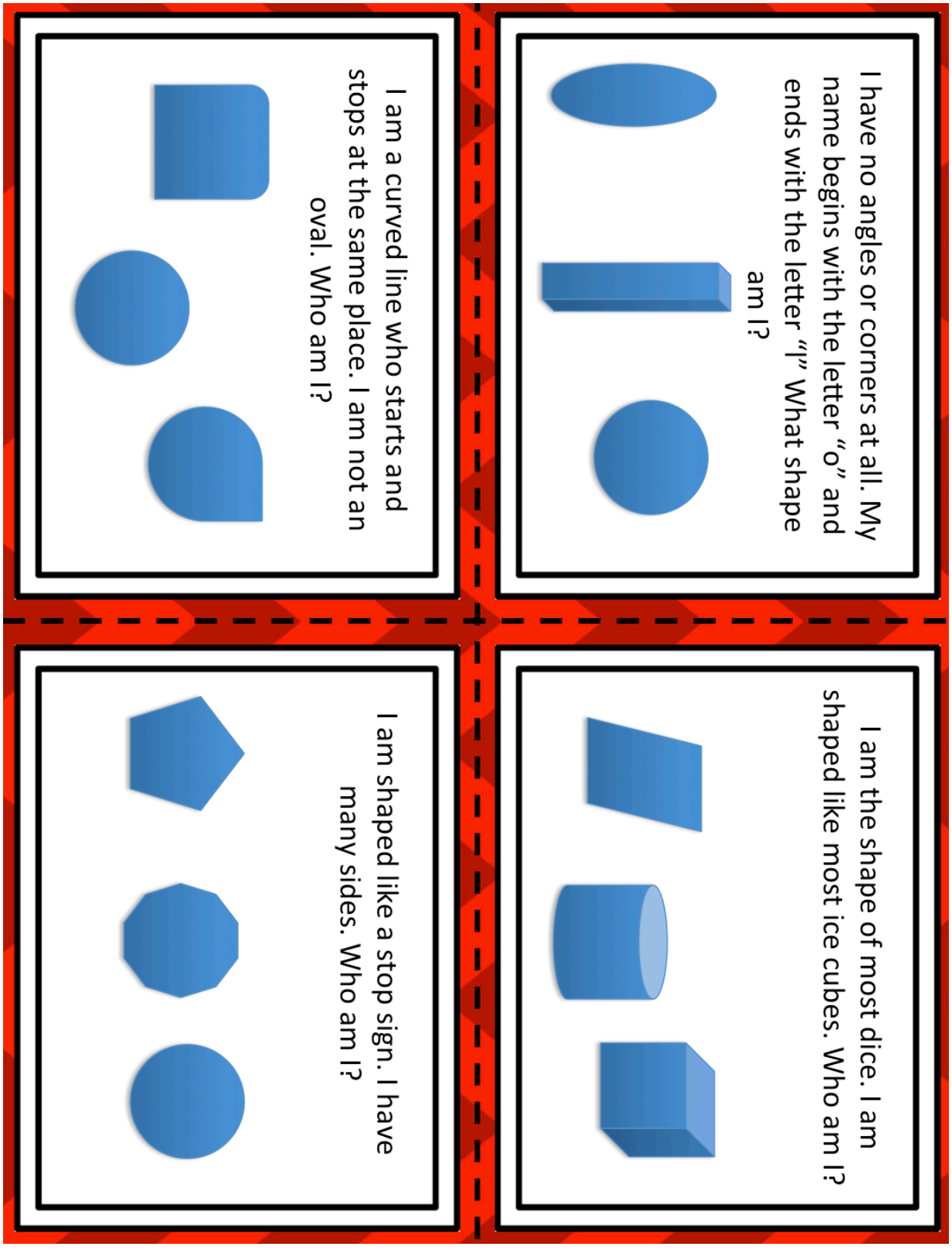
Appendix C

2 dimensional shapes

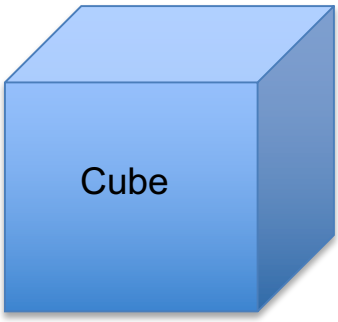


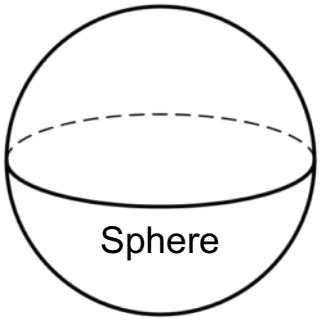
Appendix D

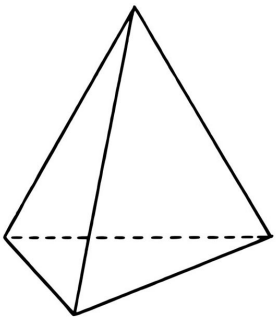

I have no angles or corners at all. My name begins with the letter "o" and ends with the letter "l" What shape am I?
I am the shape of most dice. I am shaped like most ice cubes. Who am I?
I am a curved line who starts and stops at the same place. I am not an oval. Who am I?
I am shaped like a stop sign. I have many sides. Who am I?

Appendix E

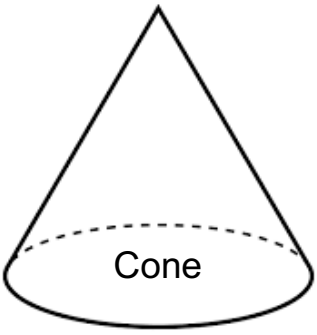
3 dimensional shapes







Triangular
Pyramid



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