

Teacher Attitudes Towards STEM Integration in Early Childhood Education

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Action Research in the STEM Classroom

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Abstract

Many researchers argue that a lack of Science, Technology, Engineering, and Math (STEM) integration into early childhood curriculums has more to do with policies and support than it does teacher interest. This study will be conducted with four Kindergarten teachers at a Title I school in suburban Maryland. The participants will teach a series of STEM integrated lessons during a one-week period. Prior to beginning the lessons, participants will complete a survey about their attitudes towards STEM integration. At the end of the lessons, another survey will be given to determine if and how their attitudes have changed. The survey will use questions to help the researcher determine how the participants feel about STEM integration, as well as what supports they believe would help them to be able to integrate STEM lessons on a consistent basis.

Teacher Attitudes Towards STEM Integration in Early Childhood Education

There have been few studies conducted on the benefits of integrating a science, technology, engineering, and mathematics (STEM) curriculum into early childhood education. The majority of the studies conducted focus on middle school and high school students, with little mention of our nation's youngest learners- students in pre-kindergarten to second grade (Carr, 2019; Duncan, et al. 2007; Ginsburg, et al. 2008; McClure et al. 2017). The reasons behind the lack of STEM integration in early childhood education are not simple. McClure et al. (2017) claims that this is "not due to a lack of interest or enthusiasm on the part of children, teachers, or parents" but instead, it is much more "complex, subtle, and pervasive than decision makers currently realize" (p. 44). Educators surveyed in December 2013 by the National Science Foundation (NSF) and the Smithsonian Institution stated that they felt "too constrained by current school policies [. . .] and an under-prepared workforce" (McClure, et al. 2017, p. 44).

Statement of the Problem

Brenneman et al. (2018) states that "educators around the world have increasingly focused on the positive benefits of high-quality early childhood education on children's ongoing development" (p.15) These same educators are also hesitant towards integrating STEM into the early childhood curriculum. This is a significant issue, because as Haney et al. (2002, as cited in Jamil et al. 2017) argues, "the success and failure [. . .] is largely dependent on teacher buy-in and uptake of new pedagogies" (p. 410). This study seeks to answer whether teacher attitudes towards STEM integration change before and after a fully integrated unit is taught.

Purpose of Study

Many teachers have voiced concerns about their ability to implement STEM lessons into their classrooms, despite knowing the benefits. Linder et al. (2016) interviewed three elementary school teachers, and each voiced the same concerns- a lack of time for planning and execution of STEM lessons, as well as a lack of educational preparation during undergraduate studies.

The purpose of this study is to determine how teachers view STEM integration before and after participating in a fully integrated unit. This study will provide insight as to how participants' views change once after they participate in the unit. The researcher will analyze the pre and post surveys of four Kindergarten teachers to determine how their views regarding integrating STEM into the early childhood curriculum changes.

Research Question(s)

This study will be guided by the main research question and one subsequent question:

How do teachers perceive STEM education in early childhood?

Does this change after completing a STEM integrated unit?

Literature Review

There is a wide array of research that discusses teacher's understandings and concerns towards STEM integration (Linder et al. 2016; Tippet & Milford, 2017; Simoncini & Lasen, 2018). The Australian Government Department of Education, Employment and Workplace Relations (2009) surveyed educators and noted that the majority are aware of what disciplines STEM comprises and made "explicit reference to 'play-based' and/or 'hands-on' learning experiences in their definitions of STEM" (p. 365). While most educators understand what STEM is, there are a vast number that are concerned with how to implement it into existing

curriculums. Tippet and Milford (2017) noted that during interviews with educators, many referred to STEM in a positive manner despite the researchers “repeatedly ask[ing] about challenges and negative instances” (p. 81). They also argue that early childhood educators who already have a positive view of STEM integration were able to have a “richer discussion with broader implications” (Tippet & Milford, 2017, p.82).

Linder et al. (2016) interviewed three elementary school teachers, and each voiced the same concerns- a lack of time for planning and execution of STEM lessons, as well as a lack of educational preparation during undergraduate studies (p. 88). Many educators made note that they do not feel their undergraduate studies prepared them for STEM integration. Instead, many programs prepared educators to instruct content areas separately and do not offer strategies to integrate a variety of content areas (Linder et al., 2016) Many early educators also believe that they have inadequate skills to teach a particular content area and so they may spend less time focusing on it in their classrooms (Greenfield et al. 2009; Tschannen-Moran et al. 1998). While studies note the reservations teachers have about teaching STEM, there is also substantial research that argues that many early childhood educators agree on the importance of exposing students to STEM concepts as early as preschool (Simoncini & Lasen, 2018). On the other hand, Ginsburg et al. (2008) argues that some teachers “believe that math is not as important in literacy in preschool” (p. 16). Instead these educators believe that they need to focus on literacy and social-emotional learning leading them to not incorporate STEM into their classrooms (Brenneman et al., 2018).

STEM integration is not a fad that will soon disappear, but an ideal for educating students, both young and old, regardless of what career fields they may be interested in. Linder et al.

(2016) argues that “Regardless of the profile you most identify with you are helping your young students by promoting dispositions and understandings that are essential in 21st century education (p. 90).

Methodology

The proposed study will use a qualitative methodology to interpret participant responses after participating in a STEM integrated unit. Qualitative research is defined by Creswell and Creswell (2018) as a “means for exploring the meaning individuals or groups ascribe to a social or human problem” (p. 250). This study will provide the qualitative data necessary for policy makers and administrators to make informed decisions regarding how to help support administrators, teachers, and students transitioning to a STEM integrated curriculum.

The proposed study will be conducted with four kindergarten teachers at a Title I school in suburban Maryland. The study will be performed during the one-hour mathematics block over the course of one week. The participants will complete a survey (Appendix A) prior to beginning the study to describe what they know about STEM integration, how they feel about it, and what supports they think they will need to be able to successfully complete the provided lessons. The participants will then teach five integrated STEM lessons to their Kindergarten students. These lessons will be provided to them by the researcher (see Appendix B). Once all the lessons have been taught, the participants will again be surveyed about what they now know about STEM integration, how they feel about it, and what supports they think they will need to be able to create and integrate lessons on their own (Appendix C).

Population

The school is composed of 50.9% male students and 49.1% female students. There are no

demographics for students that identify as non-binary or gender neutral. 95.5% of the school's population identifies as Hispanic or Latinx. 2.9% identify as Black or African American. The remaining 1.2% identify as either White, Multiracial, Native American, Asian, or Hawaiian/Pacific Islander. 67.5% of students have Limited English Proficiency (LEP). 92.6 % of students qualify for Free or Reduced Meals (FARMs). 4.7% of students have an Individualized Education Plan (IEP) (Anne Arundel County Public Schools, 2018).

Teacher A is a White female who currently holds a Bachelor of Science in Early Childhood Education from Towson University located northeast of Baltimore, Maryland. She is currently pursuing her masters degree in at-risk and diverse learners from Goucher College. Teacher A has been teaching Kindergarten for three years, all of which have been at the research site.

Teacher B is a White female who holds a Bachelor of Science in Elementary and Special Education from Grand Canyon University, located in Phoenix, Arizona. Teacher B has taught Kindergarten for six years in Virginia and Maryland.

Teacher C is a White female who holds a Bachelor and a Master of Science in Early Childhood Education from the Towson University. Teacher C has been teaching for 23 years at various schools in suburban Maryland.

Teacher D is a White female who holds a Bachelor of Science in Early Childhood Education from the University of Maryland in College Park, Maryland. Teacher D also holds a Master of Science in Early Childhood Education from Towson University. She has taught at various schools in suburban and rural Maryland for the last 23 years.

Data Collection Tools

A pre- and post-survey (Appendix A & B, respectively) will be administered to each

participant. The participants will then execute a fully integrated STEM lesson (Appendix C) that was developed by the researcher. The researcher and her classroom will not be participating in this research study to avoid any biases towards STEM integration.

Data Analysis

Methodology

After the unit, the researcher will have participants complete the post-survey (Appendix B). The researcher will then analyze the data to determine if there is any change in attitudes towards integrating STEM into the early childhood curriculum.

This data will be able to answer the research question being proposed by interpreting the feedback of the participants and determining how their attitudes towards STEM have changed and what supports they feel are necessary to be able to transition to a fully integrated curriculum. For example, question one on the pre-unit survey asks participants to describe what STEM currently looks like in their classroom. In the post-unit survey, participants are asked to describe what changes they would like to make to their classrooms. This will help the researcher to understand if using a STEM integrated lesson provided teachers with new ideas for integration. Question two in both the pre- and post- unit survey asks participants their opinions about the importance of STEM education. The researcher will analyze the responses to see if their attitude towards the value of STEM education has changed. Question three asks participants to describe how comfortable they feel integrating STEM lessons before and after participating in the study and Question four seeks to understand what supports teachers feel they need in order to be able to successfully integrate a STEM curriculum in their classrooms.

Pre-Unit Interview Findings

The pre-unit interview consisted of six open ended questions. Participants were first asked about their opinion regarding the importance of STEM in early childhood. All the participants agreed that STEM education is important. Teacher C stated “I think it is a critical piece of education not only because STEM provides more opportunities for collaboration and productive struggle.” While they all agreed STEM was important, they all also noted that they do not feel they have enough time to teach STEM lessons using the provided curriculum.

Next, participants were asked to share their views on integrating STEM into the early childhood curriculum. Again, all participants believed that STEM should be a part of the curriculum in early childhood. “It allows for much more hands on and they will be able to remember what they are learning better” (Teacher D). Teacher A believed that introducing STEM into different subject areas such as reading and math could be a way to begin integrating STEM into the existing curriculum, however Teacher B stated that “It is difficult if we don’t have the right supplies and no lessons to help guide us.”

When asked if they believed there is value in introducing STEM as early as age three participants all agreed that it was valuable so long as concepts were introduced in a developmentally appropriate way. This is because STEM is known to be a more hands-on approach to learning and “hands-on is always best. Children learn by building and doing. It allows them to remember things” (Teacher D). Teacher A said she believes that along with instruction, students can be exposed to STEM through the use of exploration centers to allow students to make connections without adult help.

Participants were then asked to describe in detail what STEM looks like in their classroom during a typical school year. Teacher A stated that she tries to create hands-on extension activities for students during science lessons, wishes there could be more of it with reading and writing. Teacher B stated STEM is “non-existent.” She believes the curriculum provides some good units in science but without materials being provided it does not feel accessible to her students. Teacher C noted that STEM was happening little to none of the time right now due to COVID-19 restrictions and hybrid learning. She was able to describe how she has used STEM in the past at her previous school. She said that the principal required teachers to teach at least one STEM integrated lesson a week and it had to involve problem solving. Instead of just STEM they focused on STEAM, which integrates art as well. Teacher D stated that she is able to incorporate STEM concepts using exploration centers. “I have a lot of bins available to them. I have magnets and blocks. We use playdough to build landforms. In literacy centers there are a lot of hands-on activities to build letters and sight words. In math we use manipulatives” (Teacher D).

Next, participants were asked if they felt comfortable integrating STEM lessons into the existing curriculum and to explain. The two teachers with less than 10 years experience (Teachers A and B) stated they were comfortable as long as it did not throw-off the pacing of the curriculum and they did not have to write the lessons themselves. The remaining two teachers with over 20 years experience stated that once COVID restrictions are lifted and we are able to return for in-person learning they would like to collaborate as a team to create STEM lessons that work with the existing curriculum. Teacher C also noted that Kindergarten offers more flexibility than do the other grade levels because we have a lot of independent learning time built into our

day already. “The county is also big on problem solving and critical thinking right now, so I think it would be easy to justify any changes I make to a lesson” (Teacher C).

Lastly, participants were asked about what supports they feel they might need to be able to integrate STEM lessons. Ideas and resources were the two main supports participants felt would be most beneficial to them.

Post-Unit Interview Findings

After the completion of the STEM integrated unit, participants were interviewed again. The post-unit interview consisted of five open ended questions. First, participants were asked if they needed to make any changes to the lesson for their students. Participants noted that because the content was all new to the students there was a lot of repetition of vocabulary. This may have also been due to the high ESOL population in the school.

The second question asked participants to describe in detail what changes, if any, they would like to make to their classrooms after participating in the study. All the participants stated that they would like to begin incorporating STEM more once in-person learning begins again. Teachers A and D were interested in finding websites that would help students engage with the content as well as using tools like Ozmo. Teacher B said that she enjoyed “ how you made a game of it like Simon Says. The same way you were able to incorporate STEM into our everyday lives I think I could do that too. Using big words and bringing it down their level. Not holding back from teaching those big words with little kids.”

Next, participants were asked if their opinion of the value of STEM in early childhood has changed. Teachers A and B stated that the study has increased their awareness of the importance of STEM and that it is never too early to expose students to STEM concepts.

Teachers C and D noted that their opinions did not change, they are still strong advocates for STEM integration and enjoyed being able to teach STEM concepts, despite having to do it virtually.

Question four asked participants if they felt more comfortable integrating STEM lessons now that they have tried it. Teacher B said that the lesson showed that “there are ways to make difficult concepts kid friendly. Teacher C said she feels comfortable but would still like to collaborate with her team because she is still navigating the kindergarten curriculum. She believed teaching STEM lessons was a little easier in the older grades. I asked her to elaborate more on why. She stated that “They are able to read and complete checklists. There was less prep work because students are already used to working in groups. In kinder we are working on how working with other people looks like.” Teacher D stated that while she enjoyed teaching it, she believes that the problem is still more to do with timing than anything else; “Teachers still have to try to “sneak it in” (Teacher D).

Lastly, participants were asked about what supports they felt they needed to be able to integrate STEM lessons. The responses all pointed to timing and needing ideas. All of the participants felt that the curriculum needed to make room for integration so that STEM did not become another part of the day, but instead helped to shape the day. They also felt that they needed ideas from either the curriculum department or other sources to be able to create engaging, fully integrated lessons that would be meaningful to their students.

Action Steps

Based on the findings of the research, there are several steps I can take to support my team and other educators that find themselves in a similar position. First, I can address the need

and want for co-planning integrated STEM lessons. Initially our team could start small with a goal of one integrated unit per month and work our way to a full integration at a pace that feels manageable for all.

On-going teacher training will be a crucial part of the process. For this I or a team of my colleagues could help take the need for resources into our own hands and try to develop a website or other accessible resource with links to completely integrated units, ideas for how to get started, or where to access professional development for those that want to learn more at their own pace.

Lastly, it is important that myself and others continue advocating for STEM integration into the early childhood curriculum. This research has shown me that teachers want to be able to integrate lessons but just are not sure how to go about it due to time constraints and limited resources. Continuing to push for curriculum reform to help address those issues will be a large part of my action steps.

Ethical Considerations

Ethical considerations for this study are limited, but nonetheless important. The researcher will need the consent of the teacher participants (Appendix D) acknowledging the differences in curriculum, student outcomes, and that their responses will be recorded and analyzed for the purposes of the study.

To protect the identity of the participants, the name of the school as well as the names of the participants will not be used in the study. Teachers will be referred to as Teacher A, Teacher B, Teacher C, and Teacher D.

Timeline

December submit IRB application

January consent and assent forms distributed/collected

Early February research participants complete Pre-Unit Survey

Mid-February research participants teach STEM integrated lesson

Late February research participants complete Post-Unit Survey

Mid-April Capstone submitted for approval

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Appendix A

Pre-Unit Survey Questions

1. Describe in detail what STEM in your classroom looks like now.
2. What is your opinion about the importance of STEM in early childhood education?
3. Do you feel comfortable integrating STEM lessons into your existing curriculum? Why or why not?
4. What supports do you feel you need to be able to integrate STEM lessons?

Appendix B

STEM Unit Plan

Grade Level: Kindergarten

Topic or Content Area: Mathematics- Shapes

Please list the Big Idea or Ideas: I can identify, describe, and compose 2D and 3D shapes.

Stage 1- Desired Results		
<p style="text-align: center;"><u>ESTABLISHED GOALS</u></p> <p>Common Core Math Standards</p> <p>Identify and describe shapes</p> <ul style="list-style-type: none"> ● K.G.A.2- Correctly name shapes regardless of their orientations or overall size. ● K.G.A.3- Identify shapes as two-dimensional (lying in a plane, "flat") or three-dimensional ("solid"). <p>Analyze, compare, create, and compose shapes</p> <ul style="list-style-type: none"> ● K.G.B.4- Analyze and compare two- and three-dimensional shapes, in different sizes and orientations, using informal language to describe their similarities, differences, parts (e.g., number of sides and vertices/"corners") and other attributes (e.g., having sides of equal length). ● K.G.B.5- Model shapes in the world by building shapes from components (e.g., sticks and clay balls) and drawing shapes. 	<i>Transfer</i>	
	<p><i>Students will be able to independently use their learning to...</i></p> <p>identify, describe, and compose 2D and 3D shapes.</p>	
	<i>Meaning</i>	
	<p><u>UNDERSTANDINGS</u></p> <p><i>Students will understand that...</i></p> <ol style="list-style-type: none"> 1. 2D shapes are flat. 2. 3D shapes are solid. 3. 2D shapes have sides and vertices. 4. 3D shapes have sides, vertices, edges, and faces. 	<p><u>ESSENTIAL QUESTIONS</u></p> <p>How can I use shapes to build a house?</p>
	<i>Acquisition</i>	
<p><i>Students will know...</i></p> <ol style="list-style-type: none"> 1. The names and traits of 2D shapes. 2. The names and traits of 3D shapes. 	<p><i>Students will be skilled at...</i></p> <ol style="list-style-type: none"> 1. Drawing and composing 2D and 3D shapes using a variety of materials. 	

<ul style="list-style-type: none"> ● K.G.B.6- Compose simple shapes to form larger shapes. <i>For example, "Can you join these two triangles with full sides touching to make a rectangle?"</i> 		
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Stage 2- Evidence	
<i>Evaluative Criteria</i>	<i>Assessment Evidence</i>
<ol style="list-style-type: none"> 1. Students will incorporate two (2) 3D shapes into their build. <ol style="list-style-type: none"> a. Students will be able to identify the shapes used with 100% accuracy. b. Students will be able to describe the attributes of the shapes with 80% accuracy. 2. Students will complete the 2D shapes formative assessment with 80% accuracy. 3. Students will complete the 3D shapes formative assessment with 80% accuracy. 4. Students will complete the 2D shapes summative assessment with 80% accuracy. 5. Students will complete the 3D shapes summative assessment with 80% accuracy. 	<p data-bbox="812 735 1096 787"><i>Performance Task(s)</i></p> <ol style="list-style-type: none"> 1. Students will design and build a 3D house using 2D shapes. 2. Students will complete a formative assessment on 2D shapes. 3. Students will complete a formative assessment on 3D shapes. 4. Students will complete a summative assessment on 2D shapes. 5. Students will complete a summative assessment on 3D shapes. <p data-bbox="1031 1270 1250 1323" style="text-align: center;"><i>Other Evidence</i></p> <ol style="list-style-type: none"> 1. Students will complete a recording sheet during the 2D shape investigation. 2. Students will complete a recording sheet during the 3D shape investigation. 3. Students will complete an investigation journal throughout their design and build process.

Stage 3- Learning Plan

ENGAGE: Pique student interest and get them personally involved in lesson while pre-assessing prior understanding.

Lesson 1

Prior to beginning the first lesson, students will complete a pre-assessment of the concepts to be covered throughout the unit (see Appendix C). This first lesson allows students to explore engineering (E) and technology (T) concepts in STEM. Students will be expected to create shapes using materials and tools provided. It is important to note that technology does not always mean computers. Technology in STEM incorporates any tools necessary to complete an investigation.

The lesson begins with students gathering around the carpet for a game of “What’s In The Bag?” During the game a bag filled with 2D shapes is passed around the circle. Each student will have a turn to put their hand into the bag and feel the shapes inside. They will then describe one of the shapes to their peers and try to name it. The shapes in the bag will include: triangles, squares, rectangles, circles, rhombuses, ovals, pentagons, hexagons, and octagons.

(Lesson 1 is continued in the “Explore” section.)

Lesson 2

This second lesson allows students to again explore engineering and technology concepts. The lesson begins similarly to the first with students gathering around the carpet for a game of “What’s In The Bag?” This time the bag is filled with 3D shapes. Each student will have a turn to put their hand into the bag and feel the shapes inside, describe it to their peers and try to name it.

The shapes in the bag will include: spheres, cylinders, cones, cubes, pyramids, triangular prisms, and rectangular prisms.

(Lesson 2 is continued in the “Explore” section.)

EXPLORE: Get students involved in the topic; providing them with a chance to build their own understanding.

Lesson 1 (cont.)

Once all students have had a turn, students will return to their seats where a pre-filled bag containing toothpicks, marshmallows, and yarn awaits them. Students will also be provided with a recording sheet to record shapes and their traits. The teacher will then hold up a large card with a shape on it. The teacher will ask the whole class to identify the shape. Once answered correctly, the teacher will then tell students they have two minutes to recreate the shape using the materials provided in the bag. The shape card should remain in view to assist students in constructing the correct shape. During this independent time, the teacher will be walking around to monitor student progress and offer support as needed. Once the two minutes have passed the teacher will invite three students to share their shape. As a whole group, students will then draw and label their shape, as well as list the traits of the shape on their individual recording sheets. This same process will be repeated for each shape. Students will be encouraged to note similarities and differences between shapes throughout the lesson.

This lesson will take approximately 45 minutes to complete. At the end of the lesson, students will be given a formative assessment on 2D shapes (see Appendix D).

(Lesson 2 begins in the “Engage” section).

Lesson 2 (cont.)

Once all students have had a turn, students will return to their seats where they will find a bucket filled with magnetic 2D shapes. The teacher will then hold up a large card with a 3D shape on it. The teacher will ask the whole class to identify the shape. Once answered correctly, the teacher will then tell students they have two minutes to recreate the shape using the materials provided in the bucket. The shape card should remain in view to assist students in constructing the correct shape. During this independent time, the teacher will be walking around to monitor student progress and offer support as needed.

Once the two minutes have passed the teacher will invite three students to share their shape. As a whole group, students will then circle and label their shape, as well as list the traits of the shape on their individual recording sheets (see Appendix D). This same process will be repeated for each shape. Students will be encouraged to note similarities and differences between shapes throughout the lesson.

This lesson will take approximately 45 minutes to complete. At the end of the lesson, students will be given a formative assessment on 3D shapes (see Appendix C).

EXPLAIN: Provide students with an opportunity to communicate what they have learned so far and figure out what it means.

Lesson 3

For the third lesson, students will gather around the carpet for an interactive read aloud of “The Three Little Pigs.” Throughout the reading the teacher will pose questions about each of the houses the pigs have built, focusing on the shape and materials of the houses.

At the end of the story there will be a teacher-created letter from the pigs' sister, Peggy. She writes that she would like to move closer to her brothers, but that she is afraid of the wolf. She would like for the students to design and build a house that will be strong enough to withstand the blow of the wolf.

The teacher will then tell students how they will carry out the challenge of building a house for Peggy Pig. Students will be given a challenge journal to keep their drawings and notes in. The teacher will tell students that they have approximately 10 minutes to draw a house for Peggy Pig. During this time, the teacher will pull students in small groups of two to three students to discuss student drawings. Most, if not all children, will draw a house using 2D shapes. The group should discuss why this could be a problem when they try to build the house and what they can do to solve it.

Once all students have had the opportunity to meet with the teacher in a small group, students will then be given 2D and 3D shapes to try and build their designs. The teacher will walk around to monitor student progress, pose questions about designs, and support students as needed. The lesson will close with the students returning to the carpet to discuss what they learned about that day and what they want to keep investigating the next day. The teacher should reinforce the concept that it is necessary to use 3D shapes in their house design, asking students why, so that students understand their importance in building a house.

This lesson will take approximately 45 minutes to complete.

ELABORATE/EXTEND: Allow students to use their new knowledge and continue to explore its implications.

Lesson 4

For this lesson, students will begin on the carpet to discuss what they remember from the previous lesson. The teacher should again reinforce that houses require 3D shapes.

Students will be given a variety of recyclable materials with which they will be able to construct their designs. The materials could include cardboard cut into a variety of shapes, toilet paper rolls, glue sticks, and masking tape. Students will also be introduced to the amount of wind they will need to withstand. The teacher will provide a standard hairdryer and demonstrate it for the students.

Students will be given the duration of the class period to construct, test, and redesign their houses. The teacher should encourage students to test their designs several times to make sure that it will be able to withstand the force of the hair dryer.

EVALUATE- Both students and teachers determine how much learning and understanding has taken place.

Lesson 5

For the final lesson, students will each present their houses and tell their peers what shapes they used to construct them. Once all students have presented, the teacher will then use the hair dryer to try to blow the houses apart.

Once the final test is over, the whole class will discuss what happened. The teacher should be sure that students understand that houses are made with both 2D and 3D shapes. Students will then return to their seats and complete the post-test assessment (see Appendix B).

Appendix C

Post-Unit Survey

1. Describe in detail what changes, if any, you would like to make to your classroom after participating in this study.
2. Has your opinion of the importance of STEM in early childhood education changed? Explain.
3. Do you feel more comfortable integrating STEM lessons into your existing curriculum? Why or why not?
4. What supports do you feel you need to be able to integrate STEM lessons?

Appendix D

Participant Consent Form

Participant Consent to Conduct Research Study

The proposed study will focus on whether teachers' attitudes towards STEM education changes through the use of STEM integrated lessons. The proposed study will be conducted with four Kindergarten teachers, yourself included, during the scheduled mathematics block over a five (5) day period. The proposed unit will meet the same Common Core Math Standards as the district developed unit for geometry through the use of a variety of lessons.

A pre- and post-survey will be administered to each participant in the study. The participants responses will be able to answer the research question being proposed by analyzing how they change after participating in the STEM integrative unit.

The researcher, Brandy Bermudez, requests your permission to participate in the study. Your consent will allow the researcher to analyze and report your responses.

To protect the identity of the participants, the name of the school as well as the names of participating teachers will not be used in the study. Teachers will be referred to as Teacher A and Teacher B, Teacher C, and Teacher D.

Name of Participant

Participant signature

Date