TCU INSTITUTIONAL REVIEW BOARD
Review Cover Sheet

Date: 9/6/15

Principal Investigator: Dr. Bauml (TCU faculty who is supervising the research)

Project Title: Early Childhood Science Instruction

Multi-Year Project: Yes ☐ No ☒

Proposed Participants:

- ☐ TCU students, faculty, or staff
- ☒ Non-TCU Participants
- ☒ Special populations (e.g. children)—specify

If requesting an exemption or expedition, please state reason: Two teachers and their 4-6 year-old students will be invited to participate in this study.

I am requesting that the study be expedited because there are minimal risks associated with this study, and the intervention will be part of normal classroom procedures.

INSTITUTIONAL REVIEW BOARD

STUDENT PROTOCOL REVIEW REQUEST

The TCU Institutional Review Board (IRB) is responsible for protecting the welfare and rights of the individuals who are participants of any research conducted by faculty, staff, or students at TCU. Approval by the IRB must be obtained prior to initiation of a project, whether conducted on-campus or off-campus. While student research is encouraged at both the undergraduate and graduate level, only TCU faculty or staff may serve as Principal Investigator and submit a protocol for review.

Please submit this protocol to the appropriate Departmental Review Board for recommendation and submission to the IRB. DRBs will submit to the IRB electronically at IRB.StudentSubmit (pdf preferred). Include the Protocol Approval Form as a word document with highlighted sections filled in. Also submit a consent document, HIPAA form if applicable, Protecting Human Research Participants Training certificates, recruitment materials, and any questionnaires or other documents to be utilized in data collection. A template for the consent document and HIPAA form, instructions on how to complete the consent, and a web link for the Protecting Human Research Participants Training are available on the TCU IRB webpage at www.research.tcu.edu. Submission deadline for protocols is the 15th of the month prior to the IRB Committee meeting.

1. **Date:** 9/6/15

2. **Study Title:** Early Childhood Science Instruction

3. **Principal Investigator (must be a TCU faculty or staff):** Dr. Michelle Bauml

4. **Department:** College of Education

5. **Other Investigators: List all faculty, staff, and students conducting the study including those not affiliated with TCU.**
   Susie Student, TCU student

6. **Project Period:** January 1, 2016 through May 31, 2016

7. **If you *have* external funding for this project –**
   Funding Agency: N/A **Project #:** N/A **Date for Funding:** N/A

8. **If you *intend to seek/are seeking* external funding for this project –**
   Funding Agency: N/A **Amount Requested From Funding Agency:** N/A
   Due Date for Funding Proposal: N/A

9. <u>Purpose:</u> Describe the objectives and hypotheses of the study and what you expect to learn or demonstrate:

The purpose of this study is to explore the sequential order of an Early Childhood science lesson. Teaching scientific concepts to children in elementary school can be an incredible feat. Some of the foundational concepts of science such as earth and space concepts are introduced to students as young as four, five, and six years old. The state curriculum, the Texas Essential Knowledge and Skills (TEKS), identifies complex topics such as Earth and Space within the science subject. Subcategories of the Earth and Space topics include observing changes in the seasons as well as identifying different objects such as clouds, stars, moon and the sun. Because of the nature of the TEKS, it is important for students to grasp these concepts before entering into the next level of schooling.

In addition to focusing on the concepts that are taught in these grades, it is equally important, if not more so, to examine how these concepts are taught. Rather than creating an entirely new instructional model, the aim of this study is to examine two different ways in which science can be taught. One teacher will teach using the traditional lesson cycle in which experimentation (science activities) follow lecture. The other teacher will teach the same lesson, but lecture will follow experimentation.

The research question for this study is: Does the positioning of exploration during science instruction affect students' learning of scientific concepts? It is important to value both the use of exploration and explanation while teaching science, but the student researcher (henceforth to be referred to as "the researcher") wonders how these experiences can best be ordered to promote learning for 4-6 year old students. The researcher's hypothesis is that 4-6 year old students will better learn scientific concepts when they are exposed to lecture before experimental activities.

10. <u>Background:</u> Describe the theory or data supporting the objectives of the study and include a bibliography of key references as applicable.

Science instruction is a popular topic in not only U.S. research, but in other countries as well. Since the launch of Sputnik in 1957, the United States has been working towards discovering the best way to teach science at all different school levels. In addition to the competition aspect, the general American public has been rather naïve with scientific concepts. An example of this naivety in action is the DDT ban in the 1970's. The ban was put into place after the media dramatized its effects, which took advantage of the American public (Birdsall, 2013). These issues in history bring attention to the educational system currently in place. Rather than focusing on what should be taught during science lessons to improve instruction, the focus of this study is how the instruction should be implemented. Instructional models describe the sequence of science instructional experiences in the classroom. A recent, popular instructional model is the 5E Model (Bybee et al., 2006). The five E's are as follows: Engagement, Exploration, Explanation, Elaboration, and Evaluation. There is a question when it comes to the sequence of

these lesson components. Is this order conducive to all grade levels or are there modifications that need to be made for younger grade levels?

The existing research on science in early childhood education lays the groundwork for this study. Researchers in the field point out the importance of including science in early childhood (pre-kindergarten and kindergarten classrooms). For example, one study demonstrated the benefits of including science experiments in the preschool classroom through a program known as ScienceStart! (French, 2004). This program took into account the fact that that although these students may be young (three-to-five years of age), they come to preschool with a wealth of knowledge that they have gathered through observation.

In another study, researchers observed 48 kindergarten students learning science in a museum setting (Tenenbaum, Rappolt-Schlichtmann & Zanger, 2004). The museum instructors, who were in charge of teaching the scientific concepts, utilized inquiry-based teaching methods that allowed children explore independently rather than being explicitly told how to connect ideas from the lesson. At the conclusion of this study, the researchers suggested that the students may have learned the material better if they had been taught more explicitly. This inquiry inspired the student researcher's curiosity about the sequencing of science lessons to promote young children's learning.

References

Birdsall, S. (2013). Reconstructing the relationship between science and education for sustainability: A proposed framework of learning. *International Journal of Environmental and Science Education, 8*(3), 451-478.

Bybee, R. W., Taylor, J. A., Gardner, A., Van Scotter, P., Powell, J. C., Westbrook, A., & Landes, N. (2006). The BSCS 5E instructional model: Origins and effectiveness. Colorado Springs, CO: BSCS.

French, L. (2004). Science as the center of a coherent, integrated early childhood curriculum. *Early Childhood Research Quarterly, 19*(1), 138-149.

Tenenbaum, H. R., Rappolt-Schlichtmann, G., & Zanger, V. V. (2004). Children's learning about water in a museum and in the classroom. *Early Childhood Research Quarterly, 19*(1), 40-58.

11. <u>Subject Population:</u> Describe the characteristics of the participant population including the inclusion and exclusion criteria and the number of participants you plan to recruit:

Participants will be selected based on their status as Early Childhood teachers (Prekindergarten, Kindergarten, or first grade) and students in a school where science instruction is taught regularly. Two separate Early Childhood classes will be observed at an

elementary or pre-school in North Texas. Each class is expected to have 20-22 students, making the total potential population of the study 40-44 students. The students in these classes will range from 4-6 years old. The two Early Childhood teachers of the classes will also be subjects in the study.

12. **<u>Recruitment Procedure:</u> Describe your recruitment strategies including how the potential participants will be approached and precautions that will be taken to minimize the possibility of undue influence or coercion. Include copies of the recruitment letters, leaflets, etc. in your submission.**

    In order to recruit teachers to participate in this study, a convenience sample will be solicited. The student researcher will email Early Childhood teachers with an invitation to participate in the study (see Appendix A). This email will include a brief overview of the purpose of the study, along with the extent to which they will be involved if they choose to participate in the study.

    Early Childhood students of the teachers who agree to participate will be invited to join the study via a parent letter, which will be sent home to all students in each participating teacher's class (see Appendix B). A parent consent document will accompany the parent letter (see Appendix C).

    Coercion of students will be minimized because the science lessons involved in this study will be part of the teachers' regular curriculum. Therefore, whether or not students' parents/guardians consent to allow their children to take part in the study, students will still take part in the science lessons featured in this study. However, should parental consent be denied, no data will be collected by the researchers for data analysis, and these students' work will be excluded from the study.

13. **<u>Consenting Procedure:</u> Describe the consenting procedure, whether participation is completely voluntary, whether the participants can withdraw at any time without penalty, the procedures for withdrawing, and whether an incentive (describe it) will be offered for participation. If students are used as participants, indicate an alternative in lieu of participation if course credit is provided for participation. If a vulnerable population is recruited, describe the measures that will be taken to obtain surrogate consent (e.g., cognitively impaired participants) or assent from minors and permission from parents of minors.**

Permission for teacher participation will be obtained using a consent document (see Appendix D). Teachers will be informed that their involvement is strictly voluntary, and if they wish to withdrawal at any point of the study, they may do so freely by notifying the student researcher.

Permission for student participation will be sought from parents/guardians at home via a letter and consent document, mentioned above. The consent document will explain that they may withdraw their child from the study at any time without penalty by contacting the classroom

teacher or the student researcher and that participation is voluntary. Classroom teachers will send these documents home after they have been approved by the IRB. Parents will be given approximately one week (5 school days) to return the consent document to school.

Because the lessons involved in this study are part of the regular curriculum and normal classroom procedures, child assent will not be solicited. This will minimize disruption of the classroom routine.

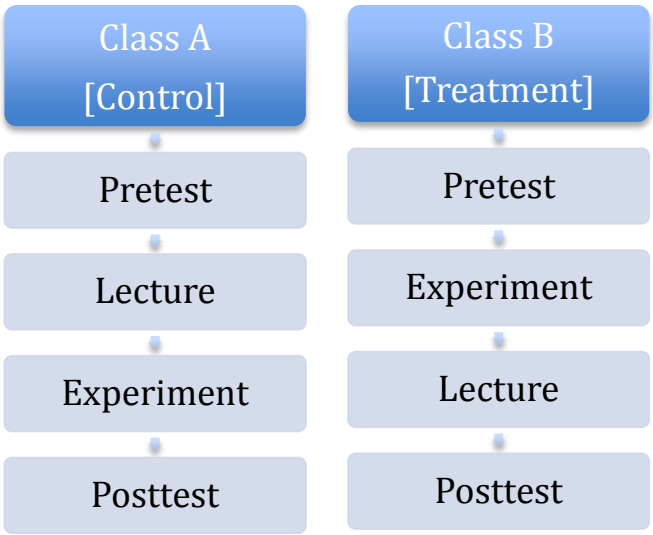
No incentives are being offered for participating in this study.

14. <u>Study Procedures:</u> Provide a chronological description of the procedures, tests, and interventions that will be implemented during the course of the study. Indicate the number of visits, length of each visit, and the time it would take to undergo the various tests, procedures, and interventions. If blood or tissue is to be collected, indicate exactly how much in simple terms. Flow diagrams may be used to clarify complex projects.

This study will use a quasi-experimental pretest posttest control group design. Both quantitative (student assessments) and qualitative (teacher interviews, analytic memos, and lesson field notes) data will be collected.

The teachers of the two classrooms will determine the lesson's content for this study. The student researcher will work closely with the teachers in order to determine the specific lessons to be used in the study.

The control group will be defined as the group that received the lecture prior to the experiment phase because of the fact that this format tends to be traditional in elementary classrooms. The treatment group will experience experiments prior to the lecture.



Lesson Procedures:

Pretest: Each class will receive a pretest containing 5-10 questions covering teacher-selected content from the lesson. As is typical practice for Early Childhood instruction, these questions will be read aloud to students by the classroom teacher whilst the researcher observers. A working copy of the assessment can be found in Appendix E; however, the assessment may change depending on the specific lesson the teachers decide to use for the study.

Lecture: This stage will involve the teachers introducing students to the explicit scientific terms that are involved in the science lessons. The teachers in each classroom will be in charge of leading this portion. During this time, teachers might access prior knowledge, engage the students in the information that is being taught, and record some of the vocabulary words on a white board, smart board, or large piece of chart paper for the students to see. *

Experiment: This portion of the lesson will be hands-on and will require the students to engage in the lesson by creating and/or exploring with materials. Students may receive instruction on what to do during this time, but the goal is for the activity to be led by the students rather than the teacher. The teacher may talk with the students during the experiment to support them, but they will not answer any questions related to scientific concepts directly. Also, the treatment group will be free from any introduction of vocabulary related to the topic at this time. Teachers will be asked to refrain from introducing these terms and concepts until the lecture portion has begun.*

*Teachers in both classrooms will be instructed by the researcher on how to work through these portions of the lesson and how the lecture and experiment sections should look for the reliability of the study. Both lessons will also be observed by the researcher to ensure that the instructors are following the correct order, and instructional model format.

Posttest: This test, identical to the pretest, will be administered after the lesson is complete. The same administration procedures will be used for the posttest as for the pretest. These assessments will be observed by the student researcher.**

**Researcher's observations will be accompanied with field notes. Analytic Memos will be made from field notes from the lesson and teacher interviews.

Teacher Interviews:

Once the lessons have been completed, each teacher will be interviewed once for approximately 10-15 minutes to obtain a further understanding of her ideas about teaching science using the traditional or intervention method. The interview questions can be found in Appendix F. These interviews will be audio recorded and manually transcribed.

15. Data Analyses: Describe how you will analyze your data to answer the study question.

Descriptive statistics will be used to analyze and compare the pretests and posttests. A T-test will be completed to determine the degree of significant differences between the two classes. Qualitative data will be analyzed with a process of open coding (Creswell, 2009) as secondary data sources in order to help the researcher make sense of the quantitative data. Both interview transcripts will be read multiple times in order to get a sense of the whole, and then they will be coded in a search for patterns and themes. Field notes and analytic memos will be used to help the researcher draw nuanced conclusions about differences between the treatment and control groups' test scores.

16. **<u>Potential Risks and Precautions to Reduce Risk:</u> Indicate any physical, psychological, social, or privacy risk which the subject may incur. <u>Risk(s) must be specified</u>. Also describe what measures have been or will be taken to prevent and minimize each of the risks identified. If any deception is to be used, describe it in detail and the plans for debriefing.**

This study presents minimal risks due to the fact that the students in these classrooms would be taught these lessons and assessed in some way with or without the presence of the study. The following are possible risks for students and teachers:

1. The first potential risk of this study is that one group of students might not learn the material as well as the other group. This may be revealed if there is a significant statistical difference between the control and treatment group suggesting that one instructional model may be more beneficial than the other. To minimize this risk, the pre and posttest results from each class will be accessible to both teachers so that they may see the difference between the two classes and reteach specific content as needed.

2. Students may feel uncomfortable with the presence of an observer in the classroom. To reduce this risk, the teachers will talk with the children about why an observer will be in the classroom. Furthermore, the student researcher will sit in an area of the classroom where she is least likely to disrupt the class.

3. Teachers might feel the pressure of presenting their students in a favorable light, by assisting them on their assessments, or deviating from the format of the lesson to try and give their students a leg up on the assessments. To minimize this risk, both the lesson and the assessments will be observed by the student researcher. Teachers will also be given the opportunity to withdrawal from the study at any time if they find that they are not able to keep within the parameters of the study.

17. **<u>Procedures to Maintain Confidentiality:</u> Describe how the data will be collected, de-identified, stored, used, and disposed to protect confidentiality. If protected health information is to be re-identified at a later date, describe the procedure for doing so. All signed consents and hard data must be stored for a minimum of 3 years in a locked filing cabinet (and locked room) in the principal investigator's office, lab, or storage closet at**

TCU. Your professional society may recommend keeping the materials for a longer period of time.

To maintain confidentiality among the students that have had their parents/guardian consent to use the assessment, each student will be assigned a number. No identifiable information will be used for the study. After recording numerical test results for the pretest and the posttests, the researcher will return the tests to the classroom teachers since they are part of normal classroom procedures.

For the teacher interviews, each teacher will be given a pseudonym to protect his or her identity. The name of the school will be left out from the study to protect the school's identity as well. Audio recordings will be deleted after the interviews have been transcribed; interview transcripts will be stored with password protection on the researcher's computer until data analysis is complete.

All consent documents will be kept in a locked file drawer in the Principal Investigator's office on the TCU campus for a minimum of three years.

18. <u>Potential Benefits:</u> Describe the potential benefits of the research to the participants, to others with similar problems, and to society.

One potential benefit of this study is that it may provide insights as to how kindergarten students best learn science. Although the findings will not be generalizable, the teachers in the study, as well as the student researcher, may learn valuable information about effective science instruction as a result of participating in the study. Teachers and caretakers of children may learn from this study to discover how their children and/or students can learn in a way that will help them in the higher grades. By focusing on a specific age group, this study will also challenge the idea that elementary level students should all learn science the same way.

A potential benefit for students participating in this study is the opportunity for hands-on experience during the lesson. Both control and experimental groups will be exposed to interactive, hands-on learning activities.

19. **<u>Training for Protecting Human Research Participants:</u> Submit training certificates for all the study investigators. The training link is available on the TCU IRB webpage at www.research.tcu.edu.**

Susie Student's Certificate of Completion of Protection of Human Participants Training

Certificate of Completion

The National Institutes of Health (NIH) Office of Extramural Research certifies that **Michelle Bauml** successfully completed the NIH Web-based training course "Protecting Human Research Participants".

Date of completion: 09/08/2010

Certification Number: 494831

20. <u>Check List for the Items That Need to be Submitted:</u> Please combine all the files into one pdf document before submitting the materials electronically to the IRB. To prevent any delay in the approval of your protocol, use the most recent template for the protocol, consent document, and HIPAA form by downloading them from www.research.tcu.edu each time you prepare your materials.

a. Protocol ☒
b. Consent document ☒
c. HIPAA form if applicable ☐
d. Protecting Human Research Participants Training certificate for each investigator ☒
e. Recruitment fliers, letters, ads, etc. ☒
f. Questionnaires or other documents utilized in screening and data collection ☒

Appendix A

Sample Teacher Email

To Whom It May Concern,

My name is Susie Student, and I am a graduate student at TCU studying elementary education. As part of my graduate work, I would like to conduct a small study in the realm of early childhood science education. Specifically, I'd like to explore how a lesson can best be constructed to encourage student understanding.

My study does not ask teachers to change any content that is being taught in the classroom, but rather I hope to learn how the sequence of events in a lesson can affect student understanding. In fact, I hope the teachers in the study will select what lesson to use for the study.

This study would take place in February or March of 2016. It would involve having two teachers teach the same science lesson in different ways and having the teachers give a very short pre-test and post-test about the content. I plan to be as unobtrusive as possible and simply observe the learning process and compare the test scores. Also, the names of students, teachers, and the school will be omitted from the study's report to maintain confidentiality.

Please let me know if this is something that you would be interested in. Thank you so much!

Susie Student
Texas Christian University
Masters of Elementary Education '16
(817) 999-9999

Appendix B
Parent Letter

[DATE]

Dear parent,

My name is Susie Student, and I am conducting a small research study about science instruction as part of the degree requirements for my master's degree at TCU. Both [School principal] and [Classroom teacher] have given permission for me to do my study in your child's classroom. Your child is invited to participate in my study about how early childhood students best learn scientific concepts.

Inside this envelope, you will find two copies of a parent permission document containing detailed information about this study. I am asking your permission to use your son or daughter's science worksheet answers for one science lesson that will taught in the classroom soon. I will simply observe these lessons as they happen while your child's teacher teaches the lesson.

If you wish to give permission for your child to participate, please sign one of the permission documents and return it to your child's teacher by Friday, February ___. You may keep the extra copy of the permission document for your records.

If you do not wish to give permission for your child to participate, please return the unsigned permission forms. Feel free to contact me if you have any questions.

Sincerely,

Susie Student
M.Ed. Candidate
s.student@tcu.edu
817-999-9999

Appendix C

Parent Permission Form

Texas Christian University
Fort Worth, Texas

PARENT'S PERMISSION TO PARTICIPATE IN RESEARCH

Title of Research: Early Childhood Science Instruction

Funding Agency/Sponsor: N/A

Study Investigators: Susie Student, supervised by Dr. Michelle Bauml

What is the purpose of the research? The purpose of this research is to explore the order of experiences in science lessons in the Early Childhood classroom.

How many children will take part in this study? 40-44 4-6 year old students and two teachers

What is my and my child's involvement for taking part in this study? Your child will participate in a science lesson taught by the classroom teacher and answer a few questions on a short worksheet before and after this lesson to see how well they learned the information. At the end of the lesson, the researcher, Susie Student, will use the worksheet answers to see what type of instruction seems to work best.

For how long is my child expected to be in this study, and how much of my child's time is required? This study does not require any extra time from your child, and it does not take away learning time from the class. The only time that is required of your child is the regular time of a science lesson, and the time it takes to answer a few short questions about the science topic before and after the lesson. It should take the students 5-10 minutes to complete each assessment.

What are the risks of taking part in this study and how will they be minimized?
Although the risks associated with this study are minimal, there are some potential risks. First, since both classrooms will teach the same lesson but in a different order, the first group of students may not learn the information as well as the second group. Because there is a small shift in the design plan of the lessons, it may be that one lesson proves to work better than another. To minimize this risk, the teachers will be well aware of this risk, and they will see the test scores so they can decide if students need more instruction on the topic. A second risk is that the students may feel uncomfortable with an observer in the classroom. To minimize this risk, I will sit in an area of the classroom that does not distract students from the lesson.

What are the benefits for taking part in the study? A possible benefit for taking part in this study is children's improved understanding of science concepts and familiarity with science vocabulary terms.

Will I be compensated for taking part in the study? No.

What is an alternate procedure(s) that I can choose instead of having my child take part in this study? Your child will still participate in the science lesson, but their worksheet answers will not be used for the study.

How will my child's confidentiality be protected? All information obtained in connection with this study will remain confidential (just like your child's school records). When sharing the study's findings, the researcher will use fake names for participants and the school.

Is my child's participation voluntary? Yes.

Can my child stop taking part in this research? Yes.

What are the procedures for withdrawal? You may contact me.
Susie Student, s.student@tcu.edu, 817-999-9999

Will I be given a copy of the permission document to keep? Yes.

Who should I contact if I have questions regarding the study? Susie Student; s.student@tcu.edu; 817-999-9999, or Dr. Michelle Bauml, m.bauml@tcu.edu, 817-257-6117

Who should I contact if I have concerns regarding my child's rights as a study participant?
Dr. Ann Petursdottir, Chair, TCU Institutional Review Board, Phone 817 257-6436.
Dr. Tim Barth, Co-chair, TCU Institutional Review Board, Phone 817-257-4320.

Your signature below indicates that you have read or been read the information provided above, you have received answers to all of your questions and have been told who to call if you have any more questions, you have freely allowed your child to participate in this research, and you understand that you are not giving up any of your legal rights.

Child's Name (please print): _____ Date of birth: _____

Parent's Name (please print): _____

Parent's Signature: _____ Date: _____

Investigator's Signature: _____ Date:_____

Appendix D
Teacher Consent Form

Texas Christian University
Fort Worth, Texas

CONSENT TO PARTICIPATE IN RESEARCH

Title of Research: Early Childhood Science Instruction

Funding Agency/Sponsor: None.

Study Investigators: Susie Student, supervised by Dr. Michelle Bauml

What is the purpose of the research? The purpose of this research is to explore the order of experiences in science lessons in the Early Childhood classroom.

How many people will participate in this study? 40-44 4-6 year old students and two teachers

What is my involvement for participating in this study Your involvement in this study includes teaching a science lesson that you have already planned on teaching during the month of February or March, 2015. This study may require the sequencing of your lesson to slightly shift. The assessment method that would normally come at the end of a lesson, students will need to be assessed prior to the lesson as well, to monitor how the lesson has taught the concepts. This study will also include a short interview (10-15 minutes) about your views on teaching science.

How long am I expected to be in this study for and how much of my time is required? The interview should take 10-15 minutes. The lesson should take no longer than other science lessons that happen during your normal class time. The assessment for students will contain 5-10 simple questions that should take the students no longer than 5-10 minutes to complete. You will be helping them during the assessments by reading the questions for them as needed.

What are the risks of participating in this study and how will they be minimized? The risks of this study are minimal, but should be noted to give full disclosure of the possibilities. Between the two classes, the sequencing of the lessons will differ, which means that one particular lesson might be more successful than the other. To minimize this risk, the results of the assessments from students will be shared with both of the teachers. Another possible risk is

that, as a teacher, you may feel pressure to present your students in the best light possible, which may affect the way you teach the lessons. My goal is to help you keep the classroom as natural as possible. The third and final possible risk is that students may feel slightly uncomfortable with the presence of an observer. To minimize this risk, I will ask you to explain who I am and why I am there to help the students feel more at ease. In addition, I will ask for your guidance about where to sit during lessons to minimize having my presence be a distraction to your students.

What are the benefits for participating in this study The benefit of this study is that we may find a way that students best understand scientific concepts. In addition, you will have pretests and posttest data to help you determine the effects of your lesson on students' knowledge of science.

Will I be compensated for participating in this study? No.

What is an alternate procedure(s) that I can choose instead of participating in this study? You may resume your normal science procedures in the classroom if you wish to not participate in the study.

How will my confidentiality be protected? You will be given a pseudonym to protect your identity. The name of your school will also be left out of the study to maintain confidentiality.

Is my participation voluntary? Yes.

Can I stop taking part in this research? Yes.

What are the procedures for withdrawal? You may contact me to withdrawal from this study. Susie Student, s.student@tcu.edu, 817-999-9999

Will I be given a copy of the consent document to keep? Yes.

Who should I contact if I have questions regarding the study? Susie Student; s.student@tcu.edu; 817-999-9999, or Dr. Michelle Bauml; m.bauml@tcu.edu; 817-257-6117

Who should I contact if I have concerns regarding my rights as a study participant?
Dr. Anna Petursdottir, Co-chair, TCU Institutional Review Board, Phone 817 257-6436.
Dr. Tim Barth, Co-chair, TCU Institutional Review Board, Phone 817-257-4320.

Your signature below indicates that you have read or been read the information provided above, you have received answers to all of your questions and have been told who to call if you have any more questions, you have freely decided to participate in this research, and you understand that you are not giving up any of your legal rights.

Participant Name (please print): _____

Participant Signature: _____ Date:_____

Investigator Name (please print):_____ Date:_____

Investigator Signature: _____ Date:_____

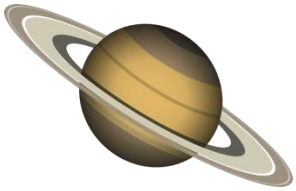
Appendix E

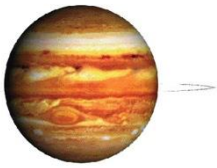
Sample Pre and Post test

1. Circle the picture of the moon




2. Circle the picture of the earth






3) Draw a Picture of a cloud

4) What is the weather like in the summer?

_____

5) How many seasons are there? Circle the number.

2 3 4 5

Appendix F

Teacher Interview Questions

1. How long have you been teaching science for this grade level and how comfortable are you teaching science in your class?
2. How do you typically plan a science lesson?
3. How do you generally teach science? How do you order the lesson components?
4. How do you usually assess science? Can you describe or show me an example of a science assessment you used recently?
5. What has been the most difficult science lesson or concept you've had to teach at the Early Childhood level?
6. How would you describe good science teaching? What does this look like in the classroom?
7. How would you describe poor science teaching? What does this look like in the classroom?
8. Is there anything you would like to add, either about the lesson you taught for this study or about science teaching?

Appendix G

Principal Permission Form

To the TCU Institutional Review Board:

Susie Student at Texas Christian University has our permission to conduct the study [TITLE] at [School] in [DISTRICT]. We will work with the researcher to minimize disruption to our and the children's routine. All researchers who visit the school must have criminal background checks.

This permission is contingent on continued approval of the study by the TCU Institutional Review Board. In addition, we may withdraw this permission at any time. The participation of each child is also contingent upon parent permission, which may be withdrawn at any time by the parent.

_____

Printed name of principal

_____ _____

Signature of the principal Date