# The Effects of Incorporating Classroom Pets into the Fourth Grade Science Curriculum

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Chapter 1

## Problem Statement

There is an abundant amount of research that portrays a strong correlation between student achievement and student engagement, but teachers often have difficulties creating opportunities that maintain a high level of participation and interest (e.g., Doppelt, Mehalik, Schunn, Silk, & Krysinki, 2008; Sackes, Trundle, Bell, & O'Connell, 2011). Recently, there has been an influx of research about increasing engagement in science through the creation of hands-on learning experiences (Aschbacher & Alonzo, 2006; Baxter, Bass, & Glaser; 2001; Doppelt et al., 2008; Paige et al., 2010; Sackes et al., 2001). The findings of these studies suggest that engagement and, therefore, achievement are increased when students become active participants in concrete learning experiences. Design-based learning models, outdoor education, experiment-based science notebooks, and student interaction with manipulatives are just a few of the teaching strategies and methods that are successfully being employed in science classrooms to increase student engagement (Aschbacher & Alonzo, 2006; Baxter et al., 2001; Doppelt et al., 2010; Paige et al., 2010; Prokop, Prokop, & Tunnicliffe, 2008)

Theorists often focus on the importance of engagement in regard to student learning. Dewey (1903) stressed that education must be child-centered, and this can be done if care is taken to create curriculum that interests the students. Piaget (1972) believed that children in upper elementary are most often in the concrete operational stage of development. This stage is marked by the need for continuous real-world experiences and open-ended activities.

There is growing evidence that allowing students to learn through observations of classroom animals can aid students in taking the learned concepts and applying them in a real-world setting. This enables the students to have a richer, more valuable educational experience

because they are able to create and build their own understanding, leading to better retainment of the content and increasing overall achievement (Doppelt et al., 2008; Prokop, et al., 2008).

Recently, research has been conducted that builds upon the ideas of Piaget and Dewey regarding the importance of quality experiences within the realm of science teaching, especially in the upper elementary grades (Aschbacher & Alonzo, 2006; Baxter et al., 2001; Paige et al., 2010). Of particular note is the research that indicates that the quality of science education received by students in the early years of their education is a predictor of their science achievement in middle school and high school (Sackes et al., 2011).

## Context Assessment

I believe that having more concrete lessons that include real-life objects, animals, and tasks will help to improve student science scores on unit assessments, student engagement in science lessons, and also improve student perceptions of animals in the classroom. Science education achievement at the upper elementary level has been shown to be a significant problem in the north Texas area. For example, fourth grade assessment scores for a large urban district in the southwest United States in the 2011 school year showed that more than 50% of fourth grade students were unable to meet grade level science expectations (National Center for Elementary Schools, 2011). Many fourth grade teachers stress that there is a lack of time for science curriculum due to the pressure for student curriculum to focus on mathematics and reading. Most fourth graders enjoy the hands-on aspects of science, but are unable to connect the activities performed in the classroom with related scientific content. For instance, during an introductory class discussion on mixtures and solutions, the students in my fourth grade class were asked to recall what they did in a science lab the day before. The students were able to correctly recall the completed activity, but were unable to relate this activity to concepts of mixtures and solutions.

If students are only able to remember the actions they complete in science, why is our science curriculum often centered on textbooks and abstract concepts?

In my own fourth grade classroom, I have also experienced situations where students have difficulties following instructions and staying on-task during science activities and lessons. During several of our science lessons, the students seemed to be paying attention during the explanation of the lesson. They were quiet and are looking toward the teacher, which suggested that they were engaged, but when it was time for them to complete their assignment they frequently asked questions regarding the procedure. This supports the idea that the students are not engaged and interested in the science lessons. These data are then reflected in the low achievement scores on their daily lessons and unit assessments (Payne, 2012).

Incorporating live animals into the science curriculum could be a way to improve student assessment data by allowing students to participate meaningfully in the lessons being taught because they cater to students own interests and needs. More research is needed to determine the relationship between the incorporation of live animals into the science curriculum as a way to promote student engagement and therefore achievement in an elementary school science classroom. This action research study hopes to promote a better understanding of successful teaching techniques that incorporate classroom pets into the science curriculum in order to significantly influence student engagement, achievement, and perceptions of animals.

## Definitions

Student engagement is defined as a high level of student participation within the lesson, activity, or discussion. Examples of student engagement include nonverbal communication such as nodding, eye contact with the speaker, and lack of movement. High engagement can also by shown by verbal examples including quality questioning, thoughtful responses, and active

participation in classroom and group discussions. Student work can also show a high level of engagement through thoughtful journaling, detailed responses, and quality drawings and explanations.

Student achievement is defined as the academic knowledge a student gains throughout the course of a lesson, activity, or unit. This can be shown through an increase in correct answers from a pre- to post-assessment, or the ability to thoughtfully and accurately answer a question verbally and or nonverbally.

Student outcomes are themes that arise from the classroom data. This data includes student actions, class and group discussions and student work throughout a lesson, activity, or unit. These outcomes can occur individually, within groups, or as a whole class depending on the data and obtained information.

Chapter 2

# Literature Review

Science education research associated with the prevalence of animals in the classroom is limited and diverse. Gillmor, Elementary, and Others (1970) stressed the importance of having animals in the science classroom as a way to spur student interest in science. In recent years, there have been studies conducted that show the importance of having animals in the classroom to promote better understanding of content, and improvement of student perceptions and empathy towards atypical classroom pets (Birkholz & Theran, 2000; Daly &Suggs, 2010; Endreny, 2006; Fonseca, et al., 2011; Gillmor et al., 1970; Prokop et al., 2008; Wagler, 2010).

## Content

Current research involving the incorporation of live animals into the educational setting tends to focus on the effects this non-curricular inclusion has on student achievement. Research suggests that direct interaction with live animals helps to promote student knowledge, understanding, and empathy (Daly & Suggs, 2010; Endreny, 2006; Fonseca et al., 2011; Hummel & Randler, 2012; Prokop et al. 2008). Prokop et al. (2008) found that children gain greater factual and conceptual knowledge of organisms when they are able to directly interact with these animals. This study of 100 third grade students suggests that students who interacted with invertebrate organisms have a better conceptual understanding of the animal's internal organs than those who have few invertebrate interactions. A study conducted by Randler, Ilg, and Kern (2005) found that elementary students who participated in an outdoor program that taught amphibian conservation techniques showed higher learning than students in the control group who were taught the same curriculum using informational booklets in an indoor setting. According to Endreny (2006), simple animal observation is not enough to spur a gain in

knowledge; enriching and well-planned lessons are needed to increase student understanding of animal processes. Hummel and Randler (2012) found that students who were taught the same curriculum with the inclusion of live animals significantly outscored those who were taught the science lesson using traditional methods. Similarly, an action research study conducted by Paige et al (2010) found that fifth grade science students who directly interacted with live avian organisms had improved descriptive explanations, observational skills, and overall interest in the academic content. This suggests that direct interaction with animals leads to higher motivation and participation, which in turn affects achievement.

**Empathy**

Recent research has shown that student perceptions of and empathy towards animals improves with increased student-animal interactions, and this can continue on through adulthood. Fonseca et al., (2011) found that fourth grade students tended to be more sympathetic to organisms that were perceived as favorable, such as dogs and mammals, than invertebrate organisms and reptiles, which were perceived as unfavorable. Greater interaction with those negatively perceived organisms could be a way to promote more favorable opinions.

Daly and Suggs (2010) polled 75 elementary classroom teachers and found that the majority of teachers felt that the inclusion of classroom pets positively increased student empathy and socio-emotional development. Student perceptions of animals have been found to persist throughout childhood and into adulthood. Wagler (2010) found that pre-service teachers who had negative opinions of particular animals were less likely to include these animals in their classroom and curriculum. These opinions were most likely developed over the course of their primary school career. Inexperience or negative experiences with atypical classroom animals such as reptiles, insects, and arachnids can often lead to negative opinions about these animals.

Incorporating animals such as these in elementary school could be a way to promote positive student and possibly adult perceptions of these organisms.

**Correct use in classrooms**

Research has begun to focus on the correct way to incorporate animals into the elementary classroom. A guide created by Birkholz and Theran (2000) states that classroom pets can not only help to teach habitats and animal needs, but also promote better observational and listening skills, and be a positive catalyst for lessons in mathematics, science, language, and history. Several studies stress the importance of incorporating animals into the classroom in such a way that students feel unthreatened and comfortable around the animals. This familiarity will allow the students to feel free to explore their curiosities in ways that help to apply and extend the classroom curriculum (Gillmore et al., 1970; Tomasek & Matthews, 2008). Care must be taken to ensure that no harm will come to the animals or students within the classroom through consistent procedures (National Science Teachers Association, 2008).

Research on the importance of animals in the educational setting has been prevalent since the 1970s. While these studies show the importance of the inclusion of live animals in education and increased gain in student learning and achievement, few studies focus solely on the teaching strategies that aid in the incorporation of live classroom animals within the curriculum (Endreny, 2006; Paige et al., 2012). Therefore, the purpose of this study is to determine if incorporating live animals in the elementary science curriculum could aid in the creation of engaging lessons and activities that improve student assessment data.

Chapter 3

## Participants and Setting

My fourth grade classroom is in a public elementary school in a suburban area in the southwest United States. The school has a student population of 850 students with very diverse backgrounds. Many of the students come from lower- to middle-income homes, with about 37% of the student population qualifying as economically disadvantaged, and another 35% being considered at risk. The demographic makeup of the school is 61% Caucasian, 23% Hispanic, 9% African American, 3% Asian, and 4% composed of two or more races.

In this elementary school, the fourth grade is divided into three teams with each team consisting of two teachers. In each team, one educator teaches mathematics and science, and the other teaches reading, writing, and social studies. As a first-year teacher, I am the least experienced teacher for the grade level. The other fourth grade team members are also fairly new to education, each having between two to seven years of experience. The students within my classroom are somewhat similar to the school population with 76% of my students being Caucasian, 10% Hispanic, and 14% African American. My class consists of 9 females and 12 males, one of whom transferred in the middle of the research, leading to the exclusion of his data. Many of my students have attended this elementary school for the entirety of their education. About three-quarters of my students come from two-parent households; the majority of these have younger siblings who also attend the school.

Our school has several different science curriculum advancements including a science lab, science supply room, and science lab kits, which help to enhance the science curriculum. My classroom also contains several different class pets: Madagascar cockroaches, a corn snake, a veiled chameleon, leopard geckos, fire-bellied toads, and a variety of fish. These animals are all housed in twenty-gallon terrariums, except for the fish housed in an aquarium, with mesh covers

that are padlocked at all times. These animals were chosen because they require minimal care, and are least likely to cause allergic reactions to the students or myself. The classroom animals are a part of the classroom environment from the beginning of the school year, which allows the students to become familiar with the animals and the procedures related to the animals, such as feeding and handling, related to the animals. This also allows the parents to become comfortable with the classroom pets.

My class has science every day from 11:00-11:55. We visit the science lab a few times every month depending on the daily lesson. Our science curriculum currently focuses on teaching science through science experiments and activities that focus on the state standards. The fourth grade team plans the weekly lessons together, which ensures that the students are all receiving the same curriculum. Currently, there are no live animals used within any part of our science curriculum, although animal interactions and adaptations, food webs, and life cycles are all included within the fourth grade curriculum.

## Methodology and Data

Action research was used to complete this study because I wanted to answer a question regarding my own classroom practice. In particular, I reflected on my practice, made necessary changes, and continued the cycle until I felt that I had addressed the question and successfully integrated the animals into the science curriculum. Conducting this research within my own classroom permitted me to better my own teaching in science by allowing me to practice and implement new teaching strategies with which I may have not already been familiar. This research method required me to analyze data as it became available. The analyzed data then helped me to determine where the students were having difficulties and adapt my teaching based upon this information.

My main research questions were, ""How can live animals be integrated into science lessons/curricula?" and "How do the teacher and students experience the integration of live animals into the science curriculum?" I created a unit based upon the applicable state standards that related to ecosystems, plant and animal adaptations, and learned and inherited traits. This unit focused on one main concept composed of several sub-standards.

1. Organisms undergo similar life processes and have structures that help them survive within their environment.
    a. Plant and animal adaptations enable organisms to survive in their environments.
    b. Organisms have characteristics that help them to survive.
        i. Inherited traits are characteristics that are passed from parent to offspring.
        ii. Learned behaviors are behaviors that are developed by watching other animals or being taught.

My data sources included student pre- and post-unit assessments, my research journal, pre- and post-unit student interview animal surveys, a parent animal survey, field notes, lesson plans, and student work which included completed activities, journals, and drawings. All students were given pseudonyms to protect confidentiality.

## Procedure & Data Collection

Prior to the start of the study, I had a parent meeting afterschool in my classroom, during which the proposed research plan was discussed and the parent consent and student assent packets including the Parent Animal Survey were sent home. The parents were asked to send the completed packet back within two weeks if they and their child both agreed to participate in the study.

All students were given the animal survey interview, and the pre- and post-assessment, but only the responses of those who had given both parent consent and student assent were included within the data. The interview (Appendix A) was audio recorded and transcribed. The pre/post-assessment consisted of ten questions: two multiple-choice questions, a sorting question, five short-answer questions, and two diagramming questions (Appendix A).

To conduct the individual animal survey interviews, I had a substitute teacher for the first half of the day within my classroom. The substitute teacher taught the regular lessons, which enabled me to interview the students individually in a quiet environment away from distractions and other students. This allowed me to obtain the most accurate student data.

At the beginning of the study, the students were given an opportunity to choose one additional animal to be included within our classroom and also within the study as a class pet. This was a learning exercise as well as a fun activity that engaged the students in the upcoming unit. The students focused on the needs, feasibility, practicality, and expense of the suggested animals before voting and coming to an agreement on the new class pet. This was a group activity where each group of four to five students were given a pet that the class has chosen as a finalist and were required to research and present on why this pet was most appropriate as the final classroom animal. Examples of student presentation visuals are given in Appendix B. After the presentations, the students voted for their favorite animal based on the new information given. The students ultimately made the decision to add a hairless rat to our classroom. Several reasons for choosing this pet given aloud in the class discussion included that the rat was “a warm blooded creature”, “we could actually hold this one”, and that “they’re cute” (field notes, 01/09/2013). Unfortunately, upon trying to purchase our new pet, I found out that hairless rats are no longer sold in the area, and the class had to choose our runner-up pet, the Fire-bellied

Toad. The students were greatly disappointed, as shown by several complaints by Kyle who expressed that "we were going to actually get to have a pet we could hold." This activity acted as a catalyst for the unit, which allowed me to discuss the unit topic and a brief synopsis of the content that we would be studying. More importantly, this lesson allowed the students to feel ownership over a part of the science curriculum as evidenced by the students' journal entries. Several students expressed the novelty of choosing the classroom pet, such as Paul, who wrote, "I have never gotten to pick a class pet before. This is cool."

Because the other animals had been in the classroom since the beginning of the year and the students had completed extensive research on the needs of the fire-bellied toads, the students already knew the procedures in regard to interacting and caring for each of the animals.

This unit included twenty whole-class lessons and activities that taught animal interactions and adaptations, plant adaptations, plant ecosystem adaptations, and inherited and learned traits. The daily lessons focused on observations of the various animal habitats and required the students to complete activities that assessed the concept being learned for that day (Table 1 in Appendix C). For formative assessment data, the students were required to complete journals, drawings, and activities that were centered on student observation of the animals. Due to the dependence of student formative assessment on observation, many of my teaching strategies involved modeling the correct completion of activities, observations and responses, and inferencing. These teaching techniques varied depending upon the lesson being taught and current student needs. By completing activities as the students would, I was able to model the type of learning application I wanted the students to do. For example, during a lesson on animal adaptations, Fay came to me and complained that she was having difficulties giving examples of the adaptations of our classroom pets. I chose to scaffold Fay's learning by going to the cage of

the Madagascar Roaches and voicing my observations aloud and then connecting these observations to learned and inherited traits. I then asked Fay to observe the snake in its habitat and describe its appearances and actions aloud. She spoke of the snake's white skin, long body and how she was climbing up the side of the cage to get to the top. She then gave an exaggerated "oh" and quickly went to her desk to begin writing. Modeling the actions I wanted Fay to replicate allowed her to not only better understand what I was looking for, but also helped her to more easily connect her observations to the academic content. Due to the variability regarding students' needs, the implemented teaching strategies were altered and/or removed as the research cycle progressed. These changes were documented in my field notes, research journal, and lesson plans.

## Research Cycle

The first action research cycle centered on the incorporation of the classroom animals within the science lessons and activities. The first science concept within the unit focused on the idea that organisms have characteristics that help them to survive such as learned and inherited traits. Lesson 2(B) in Table 1 (Appendix C) began by reviewing the learned and inherited traits definitions and having the class give examples of each. The students were asked to participate in a charades game where an individual student was given a human trait that they had to act out in front of the class. The rest of the class then had to choose if they thought the trait was learned or inherited and vote using their fingers to show a letter L or I. After the completion of this activity, the students completed a journal activity where they created a t-chart separating different traits as learned or inherited. Several forms of data were collected including student journals and researcher field notes regarding student behavior and actions. These data were analyzed in regard to student behavior, the quality of the student work, and the involvement of the classroom

animals in order to determine how appropriate the strategy was and how and whether it enabled the students to produce quality applications of their observations. Analyzing the data helped me to see that while the students had successfully understood how to apply their observations to the science content it did not incorporate the classroom animals. The lack of animal examples within the lesson could lead to student misconceptions that learned and inherited traits did not apply to animals as well as humans. Seeing that the incorporation of the classroom animals would not happen naturally spurred me to explicitly create a lesson that incorporated the animals. This first occurred in lesson 5 (Table 1, Appendix C) where the students were given one of the five classroom animals and required to work together in a group to list five learned and inherited traits. Upon completion of this activity, the students were given an individual worksheet where they were given several different animal trait examples and required to categorize them as learned or inherited. This data was then analyzed and used to refine the content activities until the classroom animals were being incorporated within the science lessons easily and naturally.

Proposed teaching strategies included the ease of incorporating the animals within the lessons as well as areas in which the students needed improvement. These included various forms of modeling, working in cooperative groups, active learning methods, connecting and extending science learning, and discussion strategies. Within this research plan, I had several small action research cycles concerning each of the different teaching strategies occurring often simultaneously within the larger encompassing action research cycle regarding the inclusion of animals within the science curriculum. The action research cycles continued in this way until the students were producing quality work that showed evidence of high student understanding and incorporated the classroom animals within the science lessons.

The post-assessment and animal survey interviews were given individually to the students at the completion of the unit. I also had a substitute teacher within my classroom on this day so that I could interview students without a complete disruption and derailment of the normal schedule. The study was conducted over a two-month period.

I analyzed the various forms of data as the data were collected using the Constant Comparative Method as described by Glaser and Strauss (1967). This method uses four stages: data coding, combining events and their properties, theory definition, and writing theory. These stages enabled me to analyze the data in order to make any modifications to the lessons and my teaching. The constant comparative method was used to categorize the data into themes that arose from my data sources. The action research plan, the research journal, and field notes were used to understand the action research process. Student work samples, surveys, student interviews, and field notes were used to assess student understanding of content and perceptions of the classroom animals. The research journal and field notes were used to evaluate the teacher development in the action research process. I began the data coding stage by reading over the data and making summarizing comments on the sides of the page using the comment section of word processing computer program. I then used these comments to continue on to the combining events and their properties stages. I met with my critical friend where we wrote out each code, which we then cut a part into separate strips. These individual codes were grouped into similar sections, allowing larger categories to arise from the data. These encompassing categories then enabled me to reanalyze and recode the data using the categories I had created to ensure that I was not missing any other codes or themes. After thoroughly analyzing the data several themes emerged including outcomes relating to student work, student growth and achievement, and pedagogical decisions regarding the animals.

Chapter 4

# Results and Analysis

The purpose of the action research was to promote a better understanding of successful teaching techniques that incorporate classroom pets into the science curriculum. The results of this study are broken down into three main themes: pedagogical decisions involving the animals, student outcomes due to animal inclusion, and student growth. These three themes became apparent early on in the research and continued on throughout the course of the science unit.

## Pedagogical Decisions Linking to Animals

The inclusion of animals within the science curriculum created both challenges and opportunities for increased student learning and quality instruction. Three major outcomes appeared throughout the data in regard to educator decisions linked to the animals: ease of pedagogical decisions over time, spontaneous activities involving the animals, and the use of the animals to provide concrete connections to the academic content.

### Ease of Pedagogical Decisions over Time

In the beginning of the unit, creating lessons that addressed the science content, but also incorporated the classroom pets was very challenging. During week one of the unit, I wrote in my research journal, “It is taking me awhile to come up with lessons. While the lessons themselves I’ve already planned, many of the ideas I have don’t involve the animals, and I’m having to go back and redo things to include them” (research journal, 01/23/2013). This was also shown in my lesson development (Table 1, Appendix C). During the first six lessons, I had difficulty creating lessons and activities that included the animals, and therefore focused most of the concrete connections on human examples. In the beginning, I would often find that ways I could have incorporated the animals came to me much more easily after I had conducted the

lesson and was writing the field notes. For example, while speaking on learned and inherited traits during lesson 2B, I mostly discussed examples of traits that humans had such as playing baseball, winking, hair color, and height. When looking over the field notes from that week, I noted in my journal that this lesson would have been a good opportunity to include animal traits that the students were already familiar with such as our snake trying to escape by climbing to the top of the cage.

As the unit progressed, including the animals within the lessons came much more easily. During a meeting with my critical friend during week three I wrote, "Surprise! I have naturally changed my lessons to include the animals more" (field notes from critical friend discussion, 01/28/2013). As I gained experience in involving the animals, incorporating them into the lesson when addressing particular concepts or ideas became easier. In the beginning, incorporating the animals required explicit planning on my part. For example, lesson five required the students to utilize the classroom pets to apply their knowledge of learned and inherited traits by working in groups (Table 1, Appendix C). I thoroughly and meticulously designed this lesson to ensure that it proceeded smoothly and addressed the science concepts being taught that day while incorporating the animals. As the unit progressed, it became much more natural to create lessons that involved the animals. This was shown in my lesson development and critical friend conversations. In Table 1 in Appendix C, I first used the animals within lesson 4(B). That this lesson was spontaneous and created such a high level of student interest only spurred me to create more lessons that included the animals. After this activity, I was able to include animals in eleven out of the remaining seventeen lessons. During the weekly discussion with my critical friend for week five, a five-minute conversation on the disconnect the students were having between plant and animal adaptations spurred me to create lesson eighteen for which the students

created a plant that would live in one of our pets' natural environments. This ability to create memorable lessons that connected concepts and involved the animals had become second nature and now took little planning.

**Spontaneous Events**

Having live animals in the classroom brought both challenges and opportunities. Some of the biggest surprises were the non-content related experiences that occurred throughout the year. Three months into the school year, our chameleon, Delilah, began to get sick. Her arm started to turn grey and she stopped using it. The students were extremely concerned, as Jessica, Simon, and Paul would check on her each morning when they arrived to school, and would often ask: "Has she eaten today?" About a month after Delilah got sick, she died over the weekend. The students were very upset, and Jason decided to organize a funeral for our pet chameleon during recess where several students spoke of their fondest memories of Delilah. Colton talked about how she loved to stick her tongue out to eat crickets, and April spoke of when the chameleon would hiss if the class became too loud. This spontaneous event allowed me to discuss death and sadness. Likewise, during the study, spontaneous events occurred. During lesson 4(B), while the leopard gecko was shedding, I explained to the class that the geckoes stored their fat in their tails and the importance of handling them carefully because if they lost their tails they would lose a lot of their stored food within their bodies. This seemed to be a memorable fact as the students would often ask if the geckoes had been fed lately as "their tails were looking skinny" (field notes, 02/01/2013). This care and consideration for the animals is not necessarily something covered on the state standards, but is a life lesson that is still considered highly valuable.

Opportunities for scientific discovery occurred often when having classroom animals. For example, lesson 4(B) (Table 1, Appendix C) would not have occurred had the leopard gecko not

happened to shed its skin at this moment. We had finished science for the day and had just gotten back from lunch and recess when several students informed me that one of our leopard geckoes had begun to shed. Seeing this as a unique teaching opportunity, I allowed the students to individually observe the animals within the cage while we discussed the importance of the animal shedding and then eating its skin. This was a wonderful occurrence that allowed the students to see something that they may know something about, but had probably never seen in real life. Several of the students spoke of how exciting, gross, and novel this experience had been in their journal responses to the question, "Tell me about the leopard gecko shedding its skin." For example, Edith wrote, "I'm also glad I learned something new, I didn't know they ate their skin" (journal response, 01/14/2013). This opportunity enabled the class to discuss why geckoes eat their skin, and the importance of this which many students, such as April, spoke in their journals,

> Ms. Admire also told me that the geckos don't want to lose their skin because their skin has [nutrients] and like I said. 'They don't want to lose their skin.' The geckos need the [nutrients] in their skin like the [nutrients] in our skin.

This event allowed me to create a lesson that enabled the students to experience a new phenomenon. While unplanned, taking advantage of the spontaneous event was a wonderful opportunity to increase student animal knowledge.

**Concrete Connections**

The direct contact with the classroom animals enabled me to always have a concrete example to relate not only to the science concepts, but also classroom dynamics and lessons involving peer relations. For example, I created lesson 11 to address the student difficulties, such as lack of respect for peers, with working in groups. During the course of the lesson, the students

were giving appropriate and meaningful answers regarding characteristics of a good group member, but were having difficulties giving examples of how a good group member would respond to other members within their group. Seeing the need for a concrete scenario, I decided to give an example of wanting to create a new habitat for our leopard geckos, and one student suggesting an aquarium full of water. The students then discussed how to appropriately address this student without devaluing his opinion. By having a concrete idea to work with, the students were able to come up with many different ideas, such as Joey's idea: "What if we put in an island so the geckos don't die" (field notes, 01/31/2013). The discussion ended by the class pledging to be productive and kind group members. By using the animals, the students were able to take this abstract notion of a *good group member* and apply it to a concrete scenario based on a classroom pet. Having the pets in the classroom allowed me to extend the students' learning beyond the academic content, and towards other social issues that were occurring.

Within the actual science content, many of the students struggled with the analysis and understanding of plant adaptations. While the students seemed to know that certain plants grew in certain areas, they had difficulties explaining why. To help, I created lesson nineteen during which the students had to create a plant that would interact with a classroom animal in the wild (Table 1, Appendix C). This caused the students to take their abstract content knowledge about plant adaptations based upon their needs and environments and apply it to our concrete animals. The students spent several days working on this project and created detailed pictures and descriptions of their plants (Appendix B). This gave the students an opportunity to thoroughly explore the need for plant adaptations and their importance to the environment helping thereby to not only strengthen their understanding of plant adaptations, but also make real-life connections about the relationships between species.

## Student Outcomes Due to Animal Inclusion

As this science unit focused on new academic content, that the lessons provided new learning was not surprising. A larger and more unexpected revelation was the students' increased engagement with both the animals and the science content throughout the course of the unit. The student outcomes within this action research project centered on a high level of student engagement in two major areas: high engagement through class decision-making and choice investment, and increased student engagement in the classroom animals themselves.

### High Engagement through Class Decision-Making and Choice-Investment

At the beginning of the unit, the students were asked to complete a series of activities that culminated in them choosing the fifth classroom pet. For a detailed description of this process, see the Procedure and Data Collection section. These lessons enabled the students to obtain ownership of the unit and their own classroom. This creation of choice allowed the students to feel invested in the science unit and to be active participants in the lessons, rather than simply observers, as is so often the case in the general education classroom. Several students wrote about the novelty of being able to choose a classroom pet which then led to statements of excitement, joy, and enthusiasm in their science journals. For example Paul stated, "It will be fun to have a pet you enjoy" and Jessica said, "It will be awesome to get the pet we [really] want" (journal entries, Appendix B).

This high level of engagement led to several outcomes in student work and classroom presentations and discussions. During lessons one and two, the students were required to create research-based presentations about possible classroom animals and present these to the class (Table 1, Appendix C). These presentations portrayed a high level of student creativity and thorough preparation, leading to quality group presentations. For example, April and Caitlyn

from the Red-bellied toad group completed additional research at home and created a poster that they used to aid in their group presentation (student presentation data, Appendix B). This research was beyond the requirement and showed their investment in the activity and desire for their animal to be chosen as a classroom pet. During the presentations, the students were very motivated and asked questions such as, "How big does the bird get?", "How big of a cage would the tarantula need?", and "Does the tarantula need to live with another spider?" (field notes, 01/11/2013). I was surprised that the groups were so well prepared and willing to answer all of these questions, as this was not explicit in their research and something they had to further investigate to find the answers. This was shown in my field notes several times such as during the cockatiel group presentation when "the other groups had so many questions about the cockatiel and that the presenters were able to answer these questions so accurately." (field notes, 01/11/2013).

**Increased Engagement**

The students' increased engagement level during the unit was due in part to the incorporation of the classroom animals within the science lessons. This inclusion of the animals within the science unit led to a higher level of student interest and excitement in the lessons and also the animals themselves. During the course of this year, the students who had completed their assignments were often found observing the classroom pets at their cages. Because there were set procedures regarding when the students were allowed to visit the animals, this acted as an incentive to complete work on time rather than a distraction. Every student seemed equally interested in the animals with many students making dioramas and drawings of the class pets in their free time (student drawing, Appendix B).

Increased engagement and interest in the science content allowed the students to make connections between the classroom animals and real-world experiences and other organisms. Several times throughout the unit, the students were able to apply, extend, and connect science content about the classroom animals to other animals and experiences outside of the classroom. During a discussion on the leopard geckos' ability to lose its tail in order to escape a predator, Jim said, "I watched a bird try to get one but the tail came off and it got away" (field notes, 01/23/2013). The student was able to correctly connect the tail adaptation of one of the classroom animals to their own real-world experience with an animal outside of the classroom. During lesson 2(B) when the students observed the leopard geckos shedding their skin, Alyssa asked aloud, "How many layers of skin does a frog [Fire-bellied Toad] have?" (field notes, 01/14/2013). The student was using the information learned about how the leopard gecko sheds and was applying it to the other amphibians in the classroom. While introducing the adaptation of camouflage, April explained that, "Delilah [the pet chameleon] used camouflage by changing her colors in her cage depending on where she was sitting" (field notes, 01/23/2013). Though I had not explicitly taught camouflage yet and our Chameleon had died four months prior, the student was able to correctly connect a new concept to prior understanding. This level of high engagement extended throughout the animal section of the unit and into the plant adaptation lessons. Throughout the lessons on plant adaptations, the students relied on their previous knowledge of animal adaptations to apply and extend their learning towards plants. For example, when discussing seed adaptations during Lesson 11, Elizabeth asked if "plants use mimicry" (field notes, 02/04/2013). By asking this question, she was attempting to assimilate and relate the new plant adaptations material to her prior knowledge of animal adaptations.

## Student Growth and Learning

The attainment of knowledge was an expected outcome as this was new content and information with which the students had no prior experience. What was surprising was the way in which the students grew in their attainment of the new science curriculum content, which included student observations and application of animals to the real world and other living organisms, and the use of animal examples to demonstrate knowledge.

The most prevalent student growth occurred from the increase in correct responses from the pre to post-assessment. The pre-assessment was given in August of 2012 to ensure the validity of the test and also to lower the chances of a student remembering a question from the pre to post-assessment. The data in Table 2 show that only one student, Ralph, achieved a passing score on the pre-assessment. Most students were able to accurately answer between two to four questions. This shows that the students had some experience with the content, but not at the depth and breadth of the planned unit. The post-assessment was given on February 18, 2013 as a summative measurement of the student learning (Appendix A). The post-assessment scores are shown in Table 2. Every student in the class obtained a passing score, with three students answering every question correctly. The class had an average 49-point gain from the pre to post-assessment. As a whole, the class had the most difficulty with question six, with sixteen students answering the question, which asked the students to draw a food web (Table 3, Appendix C). Many students incorrectly drew a food chain that linked the grasshopper to the mouse rather than a food web where these two animals were not related. This data suggests that the students still had some confusion on the differences between food webs and food chains. Every student answered questions three, four, five, and nine correctly which focused on learned and inherited traits, consumers, and animal adaptations (Appendix A and Table 3, Appendix C).

Table 2
*Pre-Post Assessment Data*

| Student Name | Pre-Assessment Score | Post-Assessment Score | Point Change |
|---|---|---|---|
| Jim | 44 | 89 | + 45 |
| Caleb | 33 | 89 | + 51 |
| Scott | 11 | 100 | + 89 |
| Larry | 33 | 89 | + 56 |
| Caitlyn | 22 | 89 | + 67 |
| Zane | 33 | 89 | + 56 |
| Simon | 33 | 78 | + 45 |
| Jessica | 22 | 78 | + 56 |
| Adam | 44 | 100 | + 56 |
| April | 44 | 89 | + 45 |
| Elizabeth | 33 | 89 | + 51 |
| Paul | 44 | 78 | + 34 |
| Edith | 56 | 100 | + 44 |
| Colton | 44 | 78 | + 34 |
| Fay | 22 | 89 | + 67 |
| Joey | 56 | 78 | + 22 |
| Denise | 22 | 78 | + 56 |
| Ralph | 89 | 89 | + 0 |
| Alyssa | 44 | 78 | + 34 |
| Rachel | 11 | 89 | + 78 |

Table 3
*Assessment Data by Question*

| Question # | # Of Students Incorrect – Pre-Assessment | # Of Students Incorrect – Post-Assessment |
|---|---|---|
| 1 | 4 | 1 |
| 2 | 5 | 3 |
| 3 | 17 | 0 |
| 4 | 4 | 0 |
| 5 | 17 | 0 |
| 6 | 21 | 16 |
| 7 | 12 | 2 |
| 8 | 16 | 1 |
| 9 | 19 | 0 |

**Student Animal Observation and Application**

Throughout the unit, the student growth in quality animal observation improved greatly. The students have always enjoyed observing the animals, as shown by their actions when stopping to view the cages on their way to get a new pencil, grab a tissue, or use the restroom.

One of the favorite student pastimes after completing work was to observe the animals as the students were often found near the pets. This unit was the first time that the students were required to observe the animals for more than just recreation. During the pre-unit interview, when asked to talk about the class pets, many students, such as April, described them as "funny" or "cool", but would often not give specific observations or scientific information (student pre-unit interviews, 12/18/2013). This was also prevalent in the first lesson that required the students to individually observe and work with the animals in an educational context. During Lesson 6 (Table 1), the class was asked to write down an inherited and learned trait for each classroom animal. Colton and Fay came to ask for help because they were having difficulties coming up with traits for the fish and roaches. After having them share their observations for both animals aloud, they were able to write correct traits for each pet (field notes, 01/16/2013). As the students worked with the animals through critical observation their abilities to discuss the classroom pets scientifically greatly improved. For example, during the post-unit interview, Ralph spoke of the leopard geckos, "shedding their skin and eating it so they can keep the nutrients to keep their tails fat", and Scott stated: "Fire-bellied toads have red bellies so other things that want to eat them know they're poisonous" (post-unit interview, 02/19/2013).

**Student Knowledge Demonstration**

Incorporating animals in the science curriculum allowed the students to use the animals in their work and classroom discussions. The animals created a constant concrete example for the students to draw upon when completing science activities. Because these animals had been a part of the classroom from the beginning of the year, the students had a firm knowledge of their behaviors, attributes, and needs which allowed them to take new knowledge and apply it to the existing knowledge they had of the classroom pets. For example, though our pet chameleon had

died early on in the year, the class often used this animal to connect and explain science content. During an introductory class discussion on protective adaptations, Nathan was able to correctly define camouflage as "a covering an animal has that helps it to survive" along with connecting this knowledge to our pet chameleon's ability to change colors. This was information that had been briefly discussed in passing, but never taught formally (field notes, 01/28/2013). This outcome occurred frequently throughout the unit and into the post-assessment data. For instance, Simon spoke of Delilah when talking about camouflage, stating "Delilah used camouflage to get crickets so they wouldn't see her" (post-unit interview response to question one, 02/18/2013).

The direct contact with the classroom animals enabled the students to have a concrete basis to relate the science concepts. This most often occurred during the review portion at the beginning of each lesson when the class would briefly discuss what had been taught the previous day. For example, during a discussion on animal adaptations, the students were asked to give an example of a protection adaptation. Rachel stated "the leopard gecko loses its tail to get away from something trying to eat it", and Edith spoke of "a frog having webbed feet to move in the water" (field notes, 01/28/2013). This was content that the students had little experience with as it had been discussed only the previous day. During the original explanation of protection adaptations, we had also spoke of a moth with coloring that looked like eyes, and birds being able to puff their feathers to look larger, but only examples having to do with our classroom pets were given by the students. Another illustration of this occurred from the pre- to post-assessment on question five (Appendix A) where the students were asked to give the definition and example of a consumer. On the pre-assessment, only one student used an animal from the classroom within their answer whereas on the post-assessment five students, Colton, Jessica, Elizabeth, Simon, and April used a classroom animal to define and explain a consumer. These examples

help to support the idea that having constant concrete connections to rely and build upon allowed the students to extend and apply their new learning.

Chapter 5

# Discussion and Conclusion

The purpose of this study was to determine if the incorporation of live animals in the elementary science curriculum could aid in the creation of engaging lessons and activities that improved student assessment data. An action research study was created to obtain and analyze several forms of student and educator data including interviews, field notes, and assessments in order to determine the themes that arose when incorporating several different live animals in the elementary science education curriculum.

## Pedagogical Decisions Linking to Animals

While many studies stress the importance of animals in the science classroom as a way to increase student engagement and achievement, few studies focus on how to correctly incorporate animals into the curriculum in a way the promotes science learning (Daly & Suggs, 2010; Endreny, 2006; Fonseca et al., 2011; Hummel & Randler, 2012; Paige et al., 2012; Prokop et al. 2008). This study revealed several difficulties in creating content-based lessons that incorporated classroom pets. In the beginning, lessons required that incorporated the animals within the curriculum often required extensive planning. As time progressed, the data showed that the inclusion became much more natural and encompassing. These obstacles most likely occurred because of the novelty of this particular instructional approach and the lack of previous research regarding this topic. As with any new skill, the inclusion of the animals in the lesson planning decreased in difficulty over time, suggesting that as the teacher gained experience in involving the animals, this planning became much more natural.

The inclusion of live animals in this classroom created opportunities for spontaneous lessons both related and unrelated to the science content.

Because these were live animals, spontaneous events such as animal shedding and death occurred within the classroom during the course of the research and provided opportunities for student empathy development. Several studies suggest the promotion and development of student empathy can occur through the inclusion of animals within the classroom (Daly and Suggs, 2010; and Fonseca et al., 2011). Although this action research study was more focused on the strategies for incorporating live animals in lessons, examples of student empathy in regards to the animals were evident such as the students' concern of the pet chameleon and leopard geckoes. This data coincides with Daly and Suggs (2010) who suggested that students' socio-development increases with animal interaction within the classroom. Interestingly, the concern for the chameleon and leopard geckoes opposes with the findings of Fonseca et al (2011) who suggested that the students would not have a strong emotional attachment to these animals because they are reptiles and considered as "unfavorable." This empathy development suggests that classroom pets can educate children in a variety of ways that may not always be content related and that students develop empathy towards pets that may even be considered "unfavorable".

Concrete experiences are integral to student knowledge acquirement as shown by the extensive research on this topic (Doppelt et al., 2010; Paige et al., 2010; Prokop, Prokop, & Tunnicliffe, 2008). While many studies stress the importance of concrete experiences, few studies discuss the role of the educator in this learning. This action research study found that both the students and the educator relied on the animals to explain and make content more easily understandable. Because this was an action research study, as problems and difficulties arose in the students' knowledge attainment, the researcher was able to make changes to instruction in order to promote student learning. These changes almost always included using the animals as a

way to address any misunderstandings or misconceptions. Because of the animals constant prevalence in the classroom and the students' familiarity with the animals, the researcher was able to easily connect the content to the classroom pets.

**Student Outcomes Due to Animal Inclusion**

One of the most important characteristics of action research is the need for the research participants to be actively involved in the research process (Paige et al, 2010). For this research, the researcher chose to include the students as active participants by having them choose the fifth classroom pet. This activity acted as a catalyst for the entire curriculum and allowed the students to not only get excited about the upcoming unit, but also created a high level of engagement that continued throughout the course of the study as evidenced by their high participation, quality work, and increased achievement. Enabling the students to have a choice in their learning was a novel idea, as shown in several of the journal entries. This simple lesson helped the students to feel important and take ownership of their own learning and supports the theories of Piaget (1972) and Dewey (1903) who stress the importance of education being child-centered.

Several studies have found that high engagement is fostered when care is taken to create hands-on activities that promote concrete learning (Aschbacher & Alonzo, 2006; Baxter, Bass, & Glaser; 2001; Doppelt et al., 2008; Paige et al., 2010; Sackes et al., 2001). Similarly, in this study, the students were highly engaged throughout the unit. The students to applied and extended the curriculum to their own experiences both inside and outside of the classroom. The students often asked questions and were able to make connections that related new information to the animals, though these connections had not been discussed previously as evidenced by the ability to connect our geckoes losing their tails to other animals or our chameleon changing its color as camouflage. Because the incorporation of the animals within the classroom created an

interest and high engagement level, the students were very invested in the lessons and unit content.

**Student Growth and Learning**

The implementation of student interaction with the animals enabled the students to have quality learning experiences that often served as connections between concrete learning and more difficult abstract concepts. Within this research, the incorporation of animals in the lessons acted as a constant concrete connection between the content about the animals that the students already knew and understood to the more difficult and newly learned concepts within the unit. This was most prevalent during the lesson on animal adaptations when two of the students had difficulty listing the animal adaptations until they observed the animals in their cages. As the students became more adept at viewing the animals critically rather than just for entertainment purposes, they were able to rely on their current knowledge of the animals in order to understand the new concepts being taught. This idea became more apparent as the unit continued through their concept explanations during class discussion and on the post-unit assessment and interviews. The students would often use the animals in their explanations or examples of animal adaptations and traits, as well as in lessons not about animals because they were familiar with the animals and used them as a base upon which to build knowledge upon. These findings coincide with several other studies that suggested that concrete experiences with animals allow students to increase their understanding of the academic content (Daly & Suggs, 2010; Endreny, 2006; Fonseca et al., 2011; Hummel & Randler, 2012; Prokop et al. 2008).

**Limitations**

As this study was conducted in one small suburban fourth-grade classroom in the Southwest United States composed of a unique demographic, these results can only be applied to similar

educational settings. A larger study with more educators with varied years of experience and an increased number of student participants could increase the validity of the study and also support and extend the study's implications. However, a thick description of the setting, unit, and class will enable readers to determine if the findings are relevant to their setting. An increase in the amount and type of teacher participants could lead to a greater application of results. More research is needed to determine if the results found within this study can be applied to different educational environments.

Another limiting factor was that the animals used in the classroom never directly interacted with the children due to safety concerns. The inclusion of these animals in a more hands-on way could affect and extend the research outcomes. For future studies, allowing the participants to have direct contact with the animals could affect overall student growth. An increase in the amount and type of teacher participants could lead to a greater application of results. Future research could also examine the effects of animals in non-science areas of teaching, and the long-term effects of the incorporation of pets in the science classroom.

**Implications**

The results of this study show the value of incorporating animals into the science curriculum as a tool to construct an environment where students are highly motivated to participate in science activities. These activities allow the students to create, extend, and apply concrete connections both in science and towards real-world experiences. The animals were used to both generate interest in the science curriculum and also create concrete examples that the students used to construct and extend their learning.

Care should be taken when choosing to include animals in the general education setting in regard to both safety and quality implementation. It is important that the animals in the

classroom require minimal care and do not carry a risk of harming the students so as to create a safe environment where both the animals and students are protected. Definite animal procedures and quality lessons that connect and extend science concepts are integral to the success of the study. The goal of any educator interested in including animals in their educational curriculum should be to promote and increase student learning both about the animals and science content in general.

This research suggests that incorporating live animals into the elementary science classroom can be both challenging and rewarding. There is a learning curve for both students and teacher when involving live animals in the curriculum, but these obstacles can be overcome in order to create a quality educational experience.

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Appendix A
*Assessments*

Name: _____ Date: _____

**Animal Unit Pre- and Post-Assessment**

1. Which of these is NOT an inherited trait?
    a. Eye color
    b. Chewing with your mouth closed
    c. Height
    d. Shoe size

2. Which of these is NOT a need for a producer?
    a. Oxygen
    b. Sunlight
    c. Water
    d. Carbon dioxide

3. What is a learned trait? Give at least one example.

4. How does the color of the frog's skin (pictured) help it to survive?


5. What is a consumer? Give at least one example.

6. Draw a food web using the examples given (cricket, sun, fox, grass, and mouse)

7. How would a drought affect the food web in a forest?

8. Sort the organisms below into two categories: producers and consumers
   Oak Tree Owl Giraffe Algae Sunflower Turtle

9. Compare the two birds below. Which one would be most likely to survive if they only ate worms? Why?

## Student Animal Pre-Unit Survey Interview Questions

1. Tell me about our classroom pets (Snake, Cockroaches, Chameleon, and Fish)

2. How do you know that? (For each response for the various animals)

## Student Animal Post-Unit Survey Interview Questions

1. Tell me about our classroom pets (Snake, Cockroaches, Fish, & Chameleon).

2. How do you know that? (For each animal)

3. What did you like about our unit on animals? Why?

4. What did you not like about our unit on animals? Why?

## Parent Animal Survey

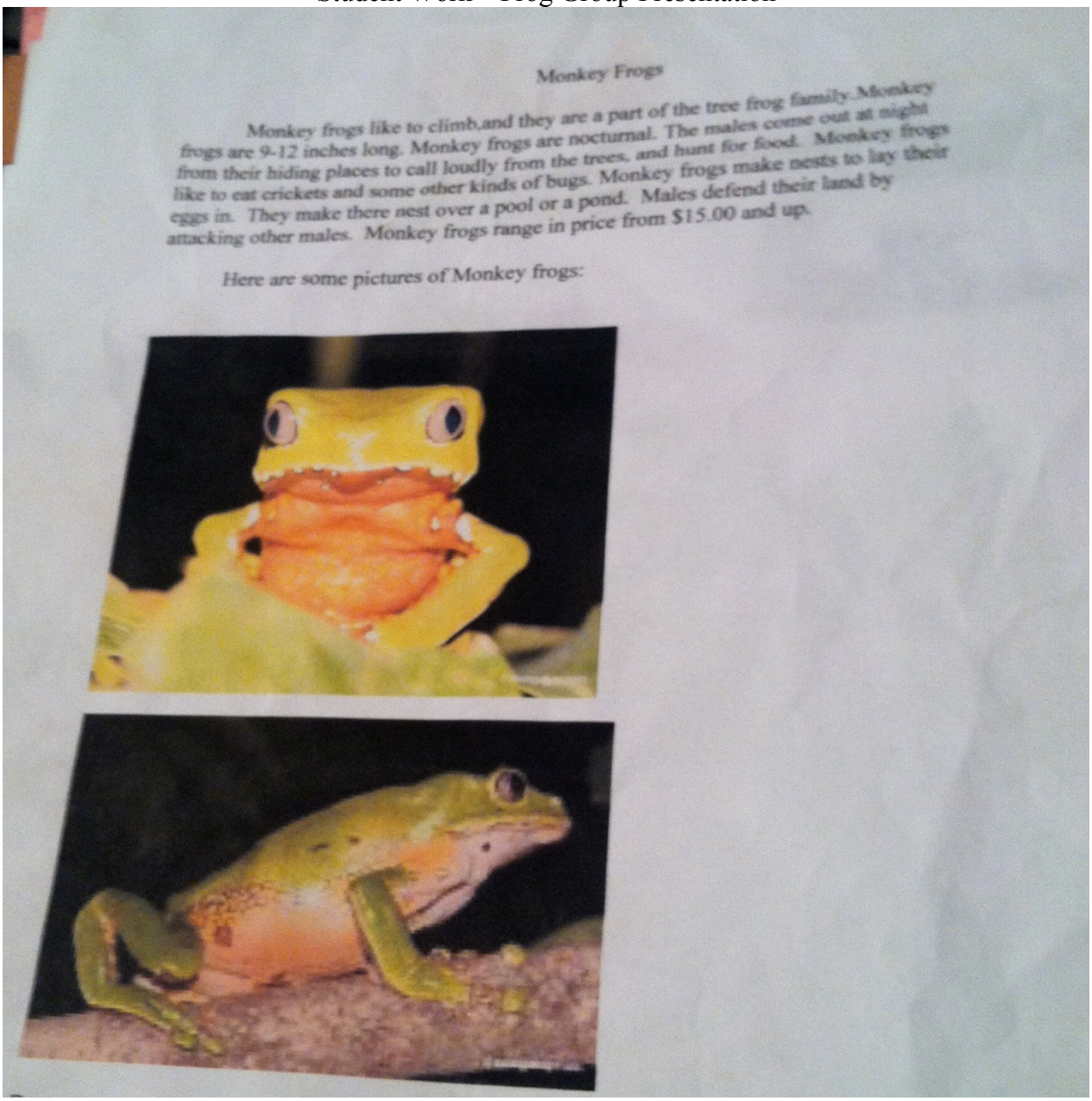
1. What is your opinion of having animals within your child's classroom?

2. Is there any information you can give that would be helpful to the teacher when your child is working with these animals?

3. What has your child told you about the classroom pets?

Appendix B
*Student Data*

Student Work – Frog Group Presentation

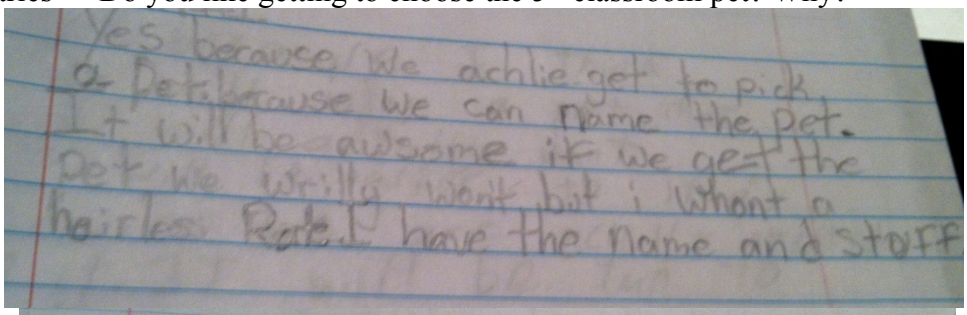


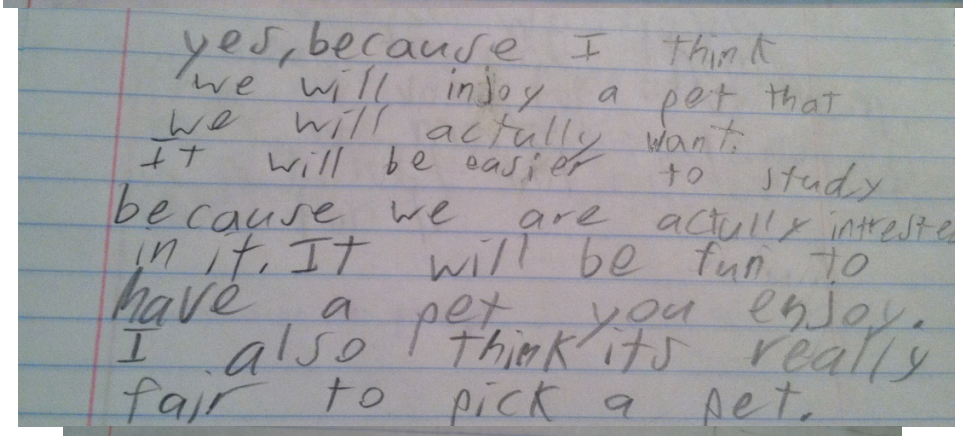
Monkey Frogs

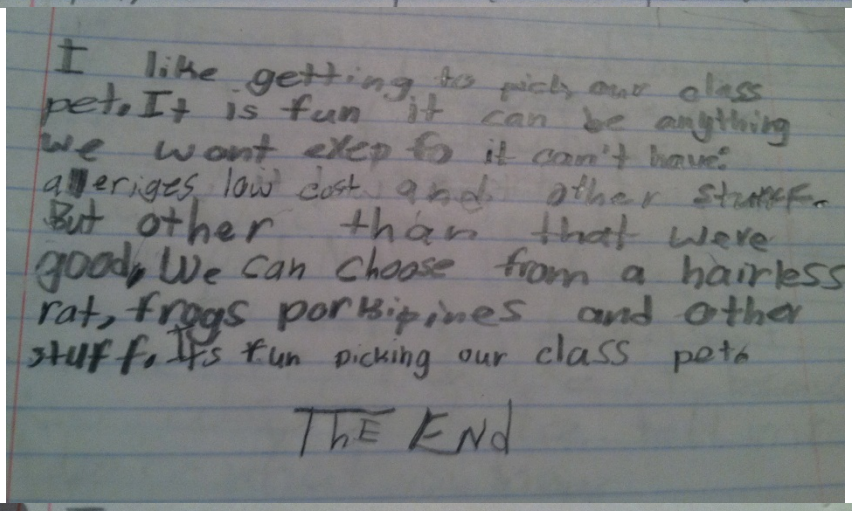
Monkey frogs like to climb,and they are a part of the tree frog family.Monkey frogs are 9-12 inches long. Monkey frogs are nocturnal. The males come out at night from their hiding places to call loudly from the trees, and hunt for food. Monkey frogs like to eat crickets and some other kinds of bugs. Monkey frogs make nests to lay their eggs in. They make there nest over a pool or a pond. Males defend their land by attacking other males. Monkey frogs range in price from $15.00 and up.

Here are some pictures of Monkey frogs:

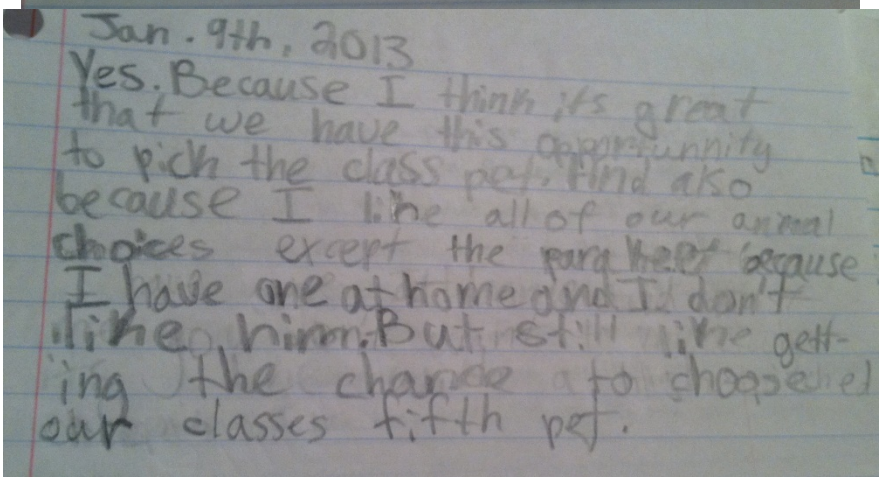
Journal Entries – "Do you like getting to choose the 5th classroom pet? Why?"


Yes because We achlie get to pick.
a Pet.because we can name the pet.
It will be awsome if we get the
Pet we Wrilly want but i whant a
hairless Rat. I have the name and stuff


yes, because I think
we will injoy a pet that
we will actully want.
It will be easier to study
because we are actully intrested
in it. It will be fun to
have a pet you enjoy.
I also think its really
fair to pick a pet.

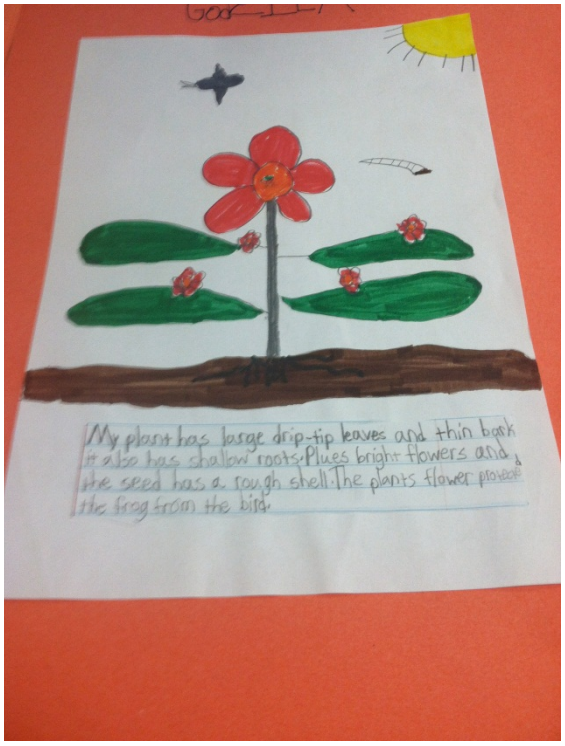

I like getting to pick our class
pet. It is fun it can be anything
we want exep it can't have:
alleriges low cost and other stuff.
But other than that were
good. We can choose from a hairless
rat, frogs porkipines and other
stuff. Its fun picking our class pets

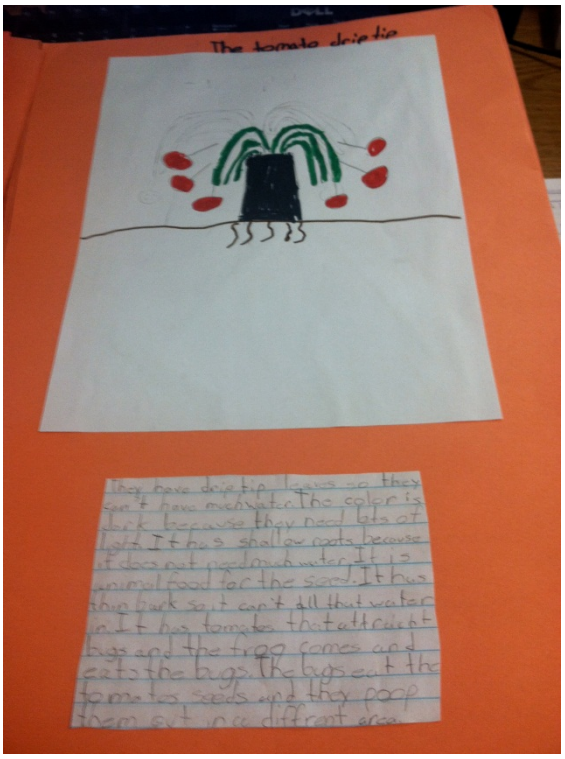
THE END

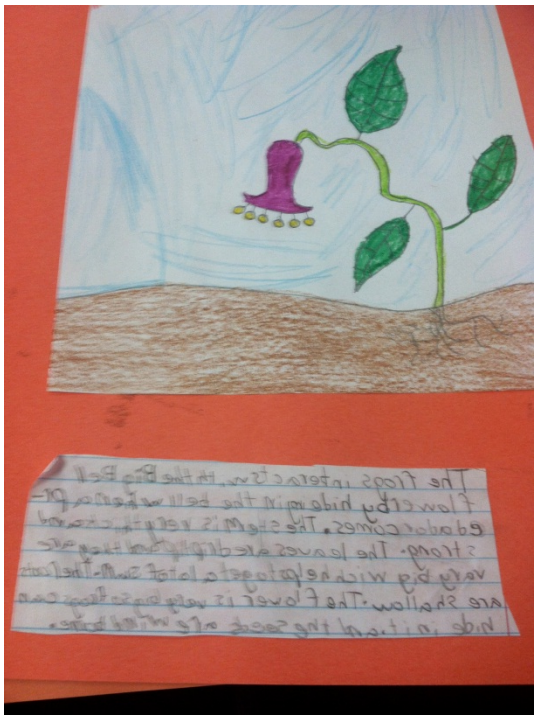

Jan. 9th, 2013
Yes. Because I think its great
that we have this opportunity
to pick the class pet. And also
because I like all of our animal
choices except the guinea pig because
I have one at home and I don't
like him. But still like getting
ing the chance to choose
our classes fifth pet.

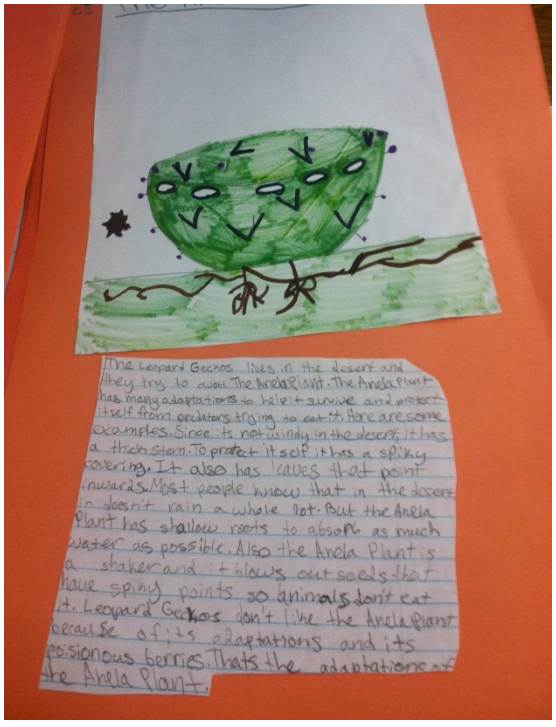
Student Artwork

Student Examples of Plant and Animal Connections
Lesson 18







# Appendix C
## *Curriculum Lesson Plans*

### Lesson Plans
Table 1

| Lesson No. | Activity Description | Data Obtained | Incorporation of Animals |
|---|---|---|---|
| 1(A) | Introduce choosing a fifth class pet by having a class discussion about what constitutes a good class pet and narrowing this down to seven main criteria; size, allergies, ease of care, cost, safety, habitat, and accessibility. The students then gave possible choices for the classroom pet. This list was narrowed down to seven possible animals; a turtle, parakeet, porcupine, hairless rat, tarantula, triops, and a frog. The students then picked their top five by voting and then worked individually to answer journal question, "Do you like getting to choose the fifth class pet? Why?" | Field Notes<br>Research journal<br>Student journal responses<br>Student voting slips<br>Pictures of board | Little use of animals. Mostly relied on to discuss criteria for choosing the fifth pet. |
| 1(B) | The teacher introduces learned versus inherited traits using a classroom discussion where the student discuss what they know about traits and give examples of each. | Field notes<br>Research Journal | No animals in lesson. |
| 2(A) | The students are broken up into table groups of 4-5 and given research on one of the top five animals that were chosen from the day before. They are required to use the seven criteria from yesterday to create a presentation that persuades the class to choose their pet. | Pictures of board and students working<br>Student research<br>Student presentation notes<br>Field notes<br>Research journal | No animals in lesson. |
| 2(B) | The class reviews learned versus inherited traits in a whole class discussion. The students then play Trait Charades where they are given a trait and must act it out in from of the class who must first identify the trait, then decided if it is learned or inherited. They then create a t-chart in their notebook and separate various traits as learned or inherited. | Field notes<br>Research journal<br>Student journals | No animals in lesson. |
| 3 | The student groups present their class pet presentations to the class. After the presentation, the teacher puts the choices on the projector that shows a picture of each animal along with its name and has each student vote on the animal they want as the fifth pet. | Field notes<br>Research journal<br>Student vote data | No animals in lesson. |
| 4(A) | The students answer a series of questions regarding their hair color, ability to whistle, eye color, shoe size, handedness, and so forth. They then create a glyph of themselves that shows these various traits before answering questions about these traits and how they are either learned or inherited. | Field notes<br>Research journal<br>Student assignment data | No animals in lesson. |
| 4(B) | Several students notice one of the leopard geckos shedding so we discuss why this happens and how this is an inherited trait. The students then are asked to observe the gecko before completing the journal response, "Tell me about the leopard gecko shedding its skin." | Field notes<br>Research journal<br>Student journal responses | Use of leopard geckoes in lesson. |
| 5 | The students are given examples of animal adaptations using our class pets and are asked to make a L with their hand for learned and an I for inherited. After completing several examples of each, the students are divided into table groups | Field notes<br>Research journal<br>Group assignment data<br>Individual student assignment data | Use of all five class pets to complete the group activity. |

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| | and are given one of the five class pets and asked to write down five examples of both inherited and learned traits. The students then work individually to complete a trait worksheet, which requires them to choose learned or inherited for several different examples. | | |
| 6 | The students were shown a PowerPoint that had several different inherited and learned traits and were asked to hold up an L or I depending upon the trait given. The students then were asked to give their own examples and the rest of the class chose learned or inherited. The students were asked to create a t-chart where they listed five inherited and five learned traits (one for each class pet) along with a drawing for each after the teacher modeled how to observe the pet and then choose a trait and explain it. | Field notes<br>Research journal<br>Individual student assignment data | Use of all five class pets to complete individual activity. |
| 7 | The class reviews the completed worksheet from lesson 5 to help prepare for the quiz. The students then complete the Learned and Inherited Traits Quiz individually, which includes 14 multiple choice and short answer questions. | Field notes<br>Research journal<br>Student assessment data | Use of animal examples to review for quiz. |
| 8 | The class begins by briefly discussion animal adaptations before working individually to answer the journal prompt, “What do I know about animal adaptations?”. The students then watch a video that defines, describes, and gives the importance and need for animal adaptations. | Field notes<br>Research journal<br>Student journal responses | No animals in the lesson. |
| 9 | The students discuss what animal adaptations are in their own words and give examples. The teacher then shows a PowerPoint that explains the different types of adaptations including migration, hibernation, camouflage, coloring, body covering, etc. The class then works in whole group to complete various online modules where they practice matching various feet to their correct habitat and creating an animal’s camouflage based on its environment. The lesson ended by having the students discuss and summarize what they had learned. | Field notes<br>Research journal | Use of animals in both teacher and student examples during discussion. |
| 10 | The students begin by defining each type of animal adaptation and giving examples of movement, climate, defense, and hunting adaptations. The students then work in their table groups where they must each complete a worksheet that requires them to match an animal’s adaptation to the correct type of adaptations. For example, a goose flying south for the winter would be an example of a movement adaptation. | Field notes<br>Research journal<br>Individual Student assignment data | Use of animals in student explanations during previous lesson review. |
| 11 | The students begin by making a list of attributes of a good group member and discussing these while the teacher places them on the board. The teacher then leads a discussion on being a good group member by giving the students a scenario of being required to design a new leopard gecko habitat where one student in the group suggests building a water habitat. The students discuss how to appropriately address this student without devaluing their opinions and end by pledging to be productive and kind group | Field notes<br>Research journal<br>Student writing responses | Use of animals in teacher example. |

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| 12 | The class reviewed animal adaptations by discussing the definitions and the four categories with examples of each. The students then individually complete an adaptation quiz where they are given an adaptation and have to decide if it is an example of movement, climate, predatation, or defense. | Field Notes<br>Research journal<br>Student assessment data | Use of animals in class discussion for quiz review. |
| 13 | The lesson began by the class discussing what plant adaptations are. The teacher then led the class by having the students view and take notes over a PowerPoint about plant adaptations that included adaptations of roots, leaves, stems, seeds, and flowers. The students then practice plant adaptations by listing the adaptations of an Aloe Vera plant. | Field Notes<br>Research journal<br>Student notes | No animals in the lesson. |
| 14 | The class reviews plant adaptations by going over the plant adaptation PowerPoint. The students then work individually to complete plant adaptation vocabulary cards, which they then put in their math and science notebooks. | Field Notes<br>Research journal<br>Student vocabulary cards | No animals in the lesson |
| 15 | The class began by answering the journal prompt, “Why does a plant need to be adapted to its’ environment?” We then view a PowerPoint over plant adaptations in different environments; tundra, pond, desert, savannah, and rainforest. After reviewing the PowerPoint in-depth, the students then create ecosystem adaptation vocabulary cards and put these in their math and science notebooks. The students then used the vocabulary cards to complete a plant adaptation worksheet where they must match the plant adaptation to the correct environment. | Field Notes<br>Research journal<br>Student journal responses<br>Completed student worksheets | Use of animals in teacher discussion to explain the importance of plant adaptations. |
| 16 | The class began by reviewing plant adaptations and the common adaptations for each of the five ecosystems. The students were then asked to work together in their table groups to match particular plant adaptations to their ecosystems by using flashcards and an adaptation worksheet. | Field Notes<br>Research journal<br>Complete student worksheets | No animals in the lesson. |
| 17 | The class begins by discussing seed adaptations and their importance. The students then work as a class to complete some website interactives that show how seed adaptations help with dispersal. The students then discuss how seed shape, size, and coating help with dispersal. The students then work in partners to view a variety of different seeds that they must identify as wind-borne, water-borne, animal catching, or animal spreading and then draw in their math and science notebooks. After this the students create and place the seed vocabulary cards in their math and science notebooks. | Field notes<br>Research journal<br>Student notebook drawings | No animals in the lesson. |
| 18 | The students begin the lesson by answering the | Field notes | Use of animals in both the |

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| 18 | The students begin the lesson by answering the journal prompt, "What do plant and animal adaptations have in common?" The students are then asked to choose one of the class pets in its' natural habitat (pond-fish, desert-leopard geckos, rainforest – Madagascar Cockroaches, and fire-bellied toads, and tundra-corn snake) and create a plant based upon the correct plant adaptations for that habitat. The students would work individually to draw their plant and write a paragraph that explains their plant and its adaptations along with how it interacts with our class pet. The students were required to complete a rough draft that was checked by the teacher before they could begin their final draft. | Field notes<br>Research journal<br>Complete student work | Use of animals in both the teacher explanation and example and also the student completion of the activity. |
| 19 | The students reviewed the animal adaptations, plant adaptations, and ecosystem adaptations before individually taking the Adaptations Test that was composed of multiple choice and short answer responses. | Field notes<br>Research journal<br>Student assessment data | Use of animals in review discussion. |
| 20 | The students were able to participate in a presentation where a wildlife expert came and spoke to them about animal adaptations using different animal pelts and skulls. She discussed how eye placement, teeth shape, and skull size helped determine whether an animal was prey or a predator. The students then were given skulls and asked to use the information they had learned to determine the animal it belonged to by completing their activity sheets. Once they correctly identified the animal, the students were able to examine its pelt. The class was then able to go around the room looking at the various | Field notes<br>Research journal<br>Student activity sheets | No use of classroom animals. |