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Teaching Animal and Plant Survival with Instructional and Assessment Strategies

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Table of Contents

Abstract

This capstone study explored the impact of instructional and assessment strategies on students' achievement in science. The study spanned 6 days, comprising 5 lessons. The students took a 6-item pre-assessment to assess prior knowledge, a 4-item post-assessment at the unit's conclusion, and a summative assessment to demonstrate their new knowledge.

Instructional strategies were adapted based on pre-assessment results. Analysis of student performance data revealed a marked increase in learning outcomes through the integration of differentiated instruction and assessment strategies. Following the review of the student work, it became evident that the integration of summarizing/note-taking and cooperative learning significantly enhanced post-instruction performance. The two assessment strategies, written responses and collaborative sharing, were found to positively influence student learning outcomes.

Background

I completed my clinical practice in Millard Public Schools at Neihardt Elementary School. Neihardt serves students from pre-k to fifth grade. There are 62 certified staff members and 26 classroom teachers. The school has a student-teacher ratio of 16:1. During my clinical practice experience I taught in a first-grade class of 17 students (10 boys and 7 girls). My cooperating teacher and I decided that for my capstone I would teach a seven-lesson science unit. She supervised my science lessons and provided me with her feedback on each lesson I taught and assessed.

Introduction

When it was determined that I would teach a unit on plant and animal survival, I reviewed the district science curriculum to increase my knowledge on animal and plant survival.

I reviewed objectives of the unit and then brainstormed and researched instructional and assessment strategies that I believed would engage the students in lessons. Before instruction, I administered a 6-item pre-assessment to determine the students' present level of knowledge of animal and plant survival. Following the administration of the pre-test, I analyzed the results and then chose two instructional strategies to embed in the unit: summarizing/note-taking and cooperative learning to increase opportunities for the students to learn the content.

Instructional Strategies

Summarizing and Note-Taking

I found research on two instructional strategies that were reported to increase student performance and engagement in lessons. Summarizing and notetaking was one of the instructional strategies I integrated into the unit. Popa (2014) conducted a study over three months of third and fourth grade students' ability to summarize ideas. A key part of the study was engaging the students in cooperative group activities. Following the study it was determined that in cooperative learning groups summarizing promoted active listening. Popa (2014) noted, "summarizing is one of the behaviours the pupils have to practice when they are communicating" (p.70). However, Popa also noted that summarizing needed to be consistent practice with the students to maintain results.

Pečjak and Pirc (2018) conducted a study over a five-month program that was used to teach fourth grade students how to summarize. Students completed a pre-test, post-test, and follow up test. Results from the study evidenced that students could develop summarizing skills if they were taught how to use their metacognitive knowledge and general reading competency (Pečjak & Pirc, 2018). Pečjak and Pirc (2018) concluded that the skill of summarizing is an important strategy to enhance reading comprehension.

Cooperative Learning

Cooperative learning was the second instructional strategy I implemented in my unit. Jakavonytė-Staškuvienė (2021b) conducted a study on 186 first to fourth grade students and the impact of integrating cooperative learning into units of study. Following the study Jakavonytė-Staškuvienė implemented a questionnaire assessing the students' thoughts on group cooperation. The survey results indicated that most students from 1st to 4th grade believed they could work in groups and collaborate with peers, because they were willing to listen to one another, help each other, and were interested in working together and learning new subjects (Jakavonytė-Staškuvienė, 2021b). Jakavonytė-Staškuvienė recommended cooperative learning in all content areas and lessons.

Erbil and Kocabaş (2018) conducted a study on a third grade life studies course. The cooperative learning method was integrated into the life students course with group one. The second group was taught with traditional teaching methods. Both the experimental and control groups took a pre-test and post-test to determine points of democratic attitude. Following analysis of their study Erbil and Kocabaş (2018) found that group one evidenced a significant positive difference in their post test scores as they engaged in cooperative learning (Erbil & Kocabaş, 2018). Results demonstrated the level of a student's democratic attitude was significantly raised by the cooperation training method. Research indicates that using the cooperative learning approach in elementary schools can yield noteworthy benefits in fostering a democratic society.

Assessment Strategies

Written Responses

I used two assessment strategies to guide my instruction and evaluate my students' learning. The first assessment strategy was written responses. Bulut (2017) conducted a study of fourth grade students and the influence of engaging them in writing activities. Bulut (2017) found that engaging students in writing increased their self-efficacy and attitude. Bulut (2017) noted that "When an individual is asked to perform tasks for which his/her motivation is low, the concept of self-efficacy comes to the fore as a critical concept. Writing is one of these tasks" (p.284). Bulut (2017) concluded that a students' attitude and self-efficacy were directly affected when they engaged in summary writing (Bulut, 2017).

Sigmon (2019) conducted a study that involved fourth grade students who used journals for written responses in social studies lessons. Sigmon (2019) analyzed how the journal writing affected students' motivation and interest in content-area classes. Sigmon found that written responses assisted students in thinking critically and personally about content-area texts. The study also found that student motivation and interest increased as a whole due to the journal writing (Sigmon, 2019).

Collaborative Sharing

The second assessment strategy I implemented into the unit was collaborative sharing. Jakavonytė-Staškuvienė (2021) held a study that included 8 teachers and 24 elementary school students. Jakavonytė-Staškuvienė (2021) investigated what students and teachers thought about cooperative learning from a language and cognitive perspective. They found that when there were numerous students in the classroom, each with a different set of demands, cooperative learning became more difficult (Jakavonytė-Staškuvienė, 2021). Therefore, they noted that it is important to be strategic with cooperative learning to maximize every student's learning.

Jakavonytė-Staškuvienė (2021) concluded that collaboration overall helped the students learn more quickly and effectively.

Moses et al. (2015) studied first grade students in a Title I school that engaged in meaningful discussion groups throughout the school year. Moses et al. (2015) stated, "Discussion groups allow teachers the opportunity to all students' voices" (p. 234). They found that when students take opportunities to participate in group discussions, they exercise their critical thinking skills. It was also noted that the first-grade students loved the discussions and participated in lessons in meaningful ways (Moses et al., 2015).

Goals and Objectives

Goals and Objectives of the Unit

The goal of the unit was for students to identify what animals and plants need to do to survive and how they do it. I wanted students to know at the end of the unit what three things plants and animals need to survive (water, air, and food) and how plants and animals survive without being eaten. In addition to the goal for the unit, I created three tasks to guide the planning and teaching of the unit:

Task 1: implement a pre-assessment to assess student knowledge of plants and animals survive,

Task 2: create lessons that were collaborative and engaging, and

Task 3: integrate differentiated instructional and assessment strategies to meet the students needs.

The unit consisted of five lessons. Each lesson had an objective. During lesson one the students completed a 6-item pre-assessment. In lesson two the students identified at least one similarity and one difference between tortoise and human structures when it came to eating. During lesson three the students identified one structure their given animal or plant used to

defend themselves. Throughout lesson four the students wrote 3 of the 4 things plants and animals need to survive (water, air, food, and how to not be eaten). During lesson five the students researched an animal of their choosing, drew a picture of the animal, and listed at least 2 structures that the animal used to survive.

The students demonstrated their knowledge and growth through the 6-item pre-assessment (lesson one), a formative assessment (lesson four), a summative assessment (lesson five and six), and multiple collaborative activities and discussions (lessons one through four).

Participants

The participants in this study were first-grade students at Neihardt Elementary. The class was composed of 7 girls and 10 boys. Three of the students had Individualized Education Plans (IEPs). One of the three students had a Tier 2 speech IEP. The second student had a Tier 3 speech IEP, and the third student had a Tier 3 fluency IEP.

Methods and Materials

The 6-day unit from Chapter 1 of 'Animal and Plant Defenses' was aligned with two Nebraska State Standards:

- SC.1.6.2.A Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs. Examples of human problems that can be solved by mimicking plant or animal solutions could include designing clothing or equipment to protect bicyclists by mimicking turtle shells, acorn shells, and animal scales; stabilizing structures by mimicking animal tails and roots on plants; keeping out intruders by mimicking thorns on branches and animal quills; and detecting intruders by mimicking eyes and ears.

- SC.1.6.2.B Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

Students completed a 6-item pre-assessment (Appendix A) the first day. This assessment was given to assess students' understanding of animal and plant survival. Students were asked to list three things a porcupine would need to survive and three things a plant would need to survive. Students completed the assessment independently and only received aid from me and my cooperating teacher when they needed help spelling a word. Students were advised to sound-out words to attempt spelling on their own. If I wasn't sure what a student's answers were, I met with the student the next morning to revisit their work and had a one-on-one conference with them. After analyzing student data, I noted that most of the students had a good understanding about what animals and plants need to survive. Following analysis of the data I noted none of the students mentioned that plants and animals need air to survive. I also noted two students had confusion between human and animal/plant needs. In response to this, I made sure to emphasize during each lesson that to survive, plants and animals need to get food, water, and air and to not be eaten.

The instructional strategies I chose to focus on for this 6-day science unit were summarizing/note-taking and cooperative learning and how these strategies might aid in student understanding. The lessons were taught with the one teach, one assist co-teaching method. I was primarily responsible for teaching while my cooperating teacher monitored the classroom and provided assistance when needed. The gradual release model was implemented in each lesson to give students support and guide them to their independent work. I utilized whole group, small group, and partner discussions throughout the unit to help students answer questions and think critically.

I utilized the district curriculum titled *Amplify Science Animal and Plant Defenses: Spikes, Shells, and Camouflage* to develop the lessons. I also used the *Amplify Science* unit slideshows that helped me to create the lesson presentations. I created multiple formative and summative assessments to align with the unit's goals and objectives.

On day one, students played a survival game (Appendix C) to see if their animal/plant in the game survived based on if they got all their needs met (water, air, and food). The class watched a video of a tortoise eating food and ate carrots after to compare human and tortoise structures for eating in small groups and whole class discussions for lesson two. For lesson three, students worked together in groups to identify one structure their given animal/plant, from the provided text, used to defend themselves and how. One student from each group volunteered to take notes and summarize information for the group on a sticky-note (Appendix D). Then, one or two students from each group shared their information to the rest of the class in order to learn from one another and maximize class time. Lesson four included the four-item post assessment (Appendix E) over plant and animal survival.

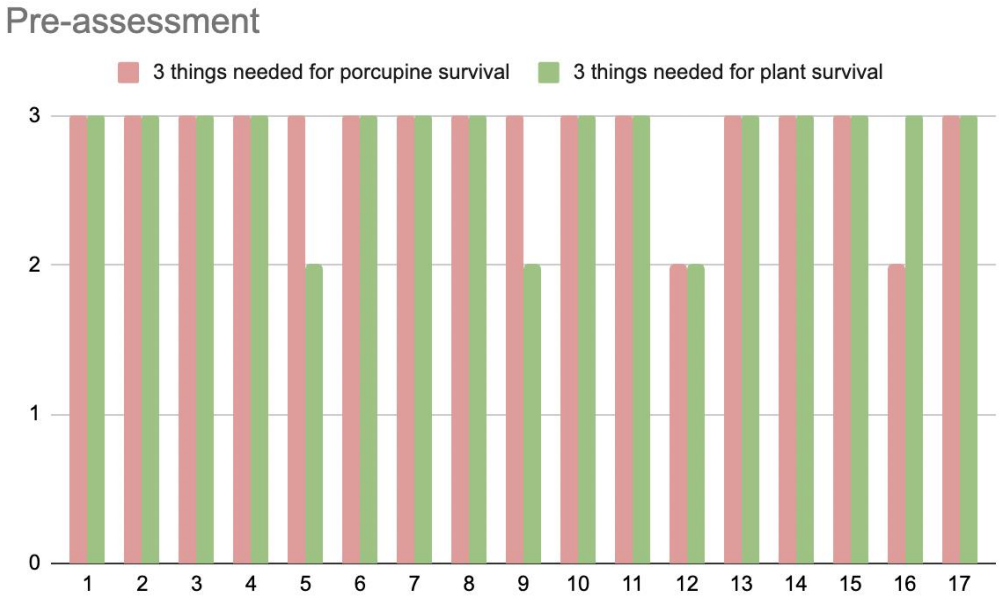
During lessons five and six, the students completed a summative assessment. The summative assessment was a poster about an animal the student chose to research. The research included the structures that animal has. For the summative assessment (Appendix H) the students were to draw a picture of their chosen animal and two structures that animal has (e.g., thick skin, webbed feet, spikes, long tongue). I provided students with an example (Appendix G) and explained their task before they began. Students used PebbleGo as a resource to research their animal for their summative assessment. PebbleGo is an app on the students' iPad that has nonfiction articles about multiple topics including animals. To accommodate various learning

styles the students could click on a speaker button to have the text read to them. PebbleGo also had videos that accompanied the articles.

Results

Figure 1

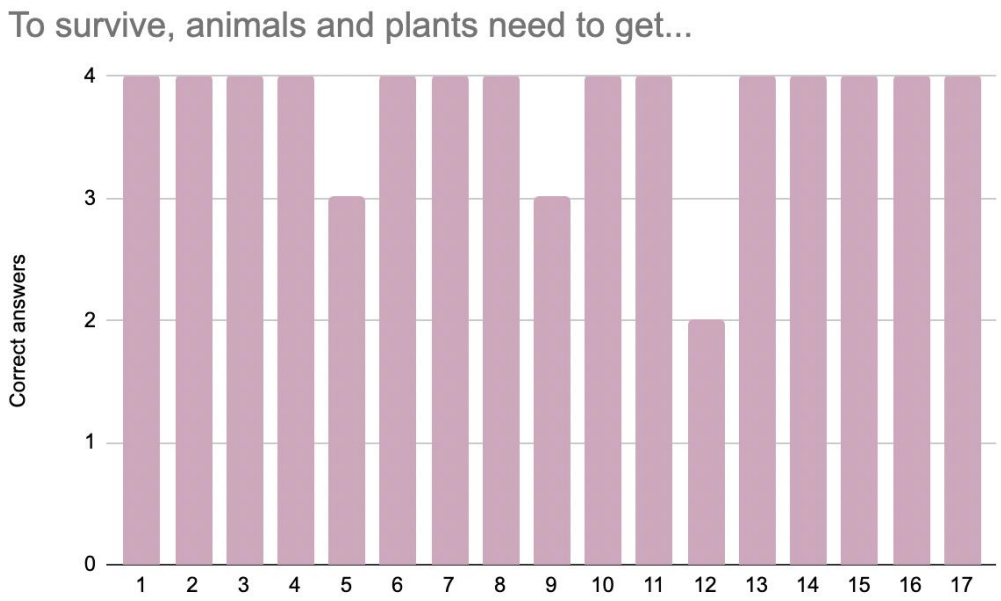
Pre-Assessment Scores



Note. This graph shows the number of points scored by each student.

Figure 2

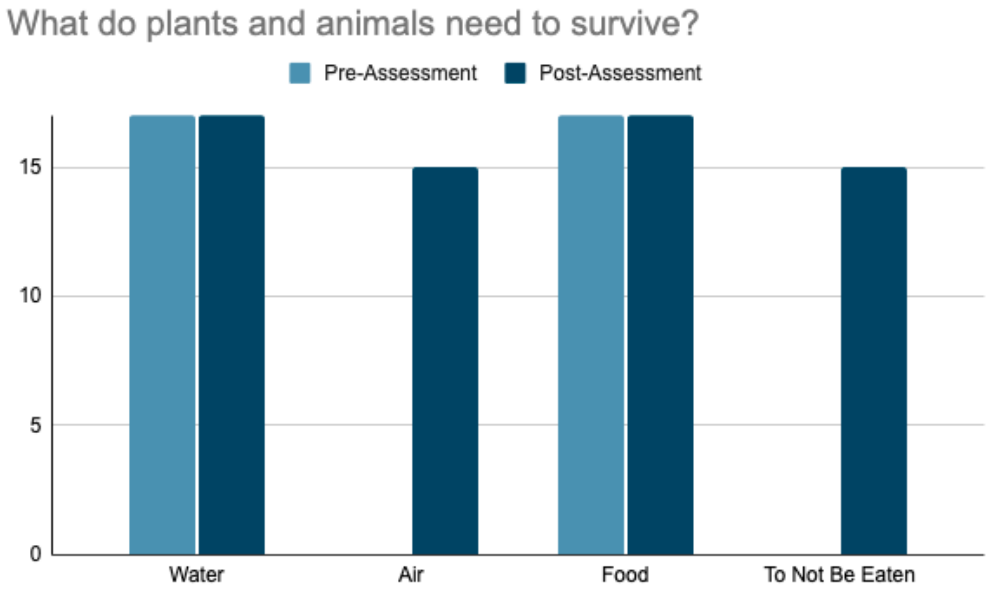
Post-Assessment Scores



Note. This graph shows the number of points scored by each student.

Figure 3

Comparison of Pre and Post Assessments



Note. This graph shows the number of students who included these answers within their pre and post assessments.

Data Analysis

Pre-Assessment

The pre-assessment indicated that 13 students (see Figure 1) had a good understanding of what plants or animals would need to survive. All students knew that a plant and porcupine needed food and water to survive.

Post-Assessment

Students made growth in their post assessments when it came to including air, food, water, and to not be eaten in plant and animal survival. Fourteen of the 17 students received a 100% on the post assessment. Two students answered 3 out of the 4 questions correctly, and one student scored 2 out of 4 questions correctly (see Figure 2). All students included water and food as answers for both the pre and post assessments. No student included air or to not be eaten in their pre-assessment. For the post-assessment, 15 students included air and to not be eaten.

Discussion and Conclusions

The purpose of this study was to see if the integration of instructional and assessment strategies in science lessons would aid in increasing student performance. The comparison between the pre and post-assessment revealed that student understanding increased as a whole. I believe that incorporating summarizing/note-taking, cooperative learning, written responses, and collaborative sharing aided in the increase of students' understanding of the unit objectives.. The majority of students got all the answers right on their post-assessment, except for three students. Two students gave 3 out of 4 correct answers, and one student gave 2 out of 4 correct answers. Unfortunately, these three students tended to miss the majority of science class due to being pulled from class for resource groups or breaks. I believe the lack of class participation in the lessons negatively impacted their scores. As I reviewed their scores I wish I could've made up some time the following day to discuss with these students what they may have missed from the

science lesson. In regards to the results of this capstone project, I will continue to implement the instructional and assessment strategies used in this unit in my future teaching. Instructional and assessment strategies greatly impact student understanding and performance. Therefore, I believe all teachers should be intentional about including a variety of strategies into their instruction.

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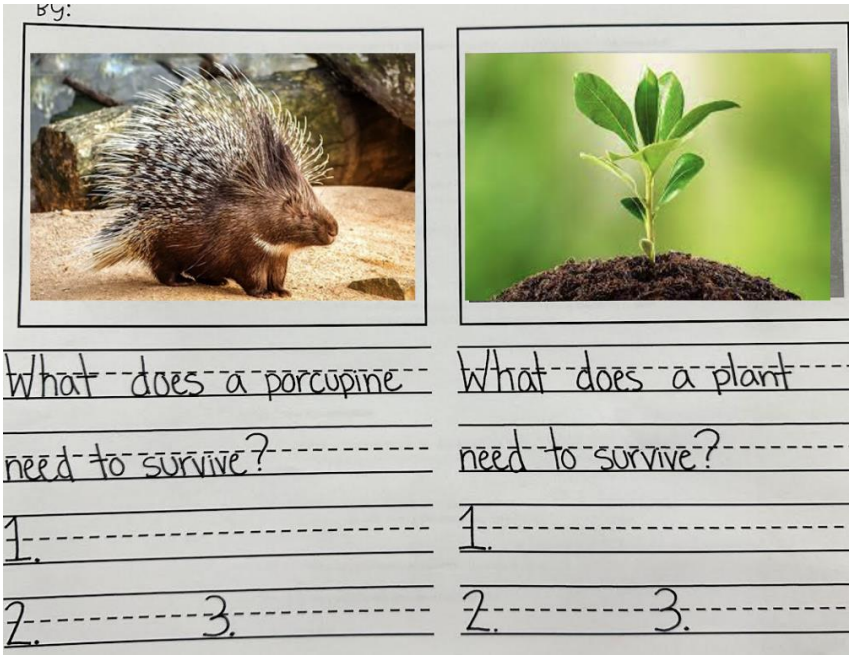
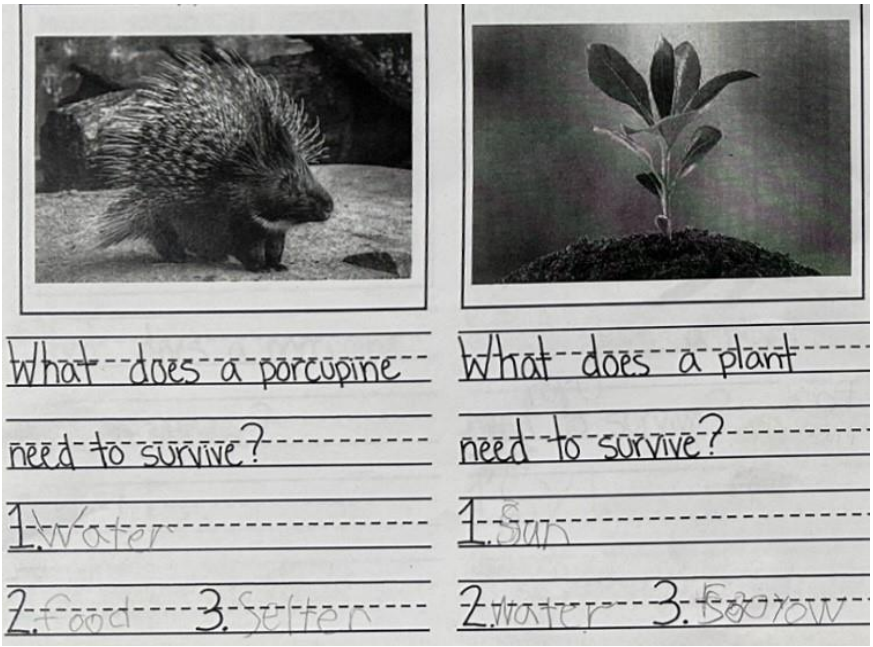
Appendix A

Pre-Assessment



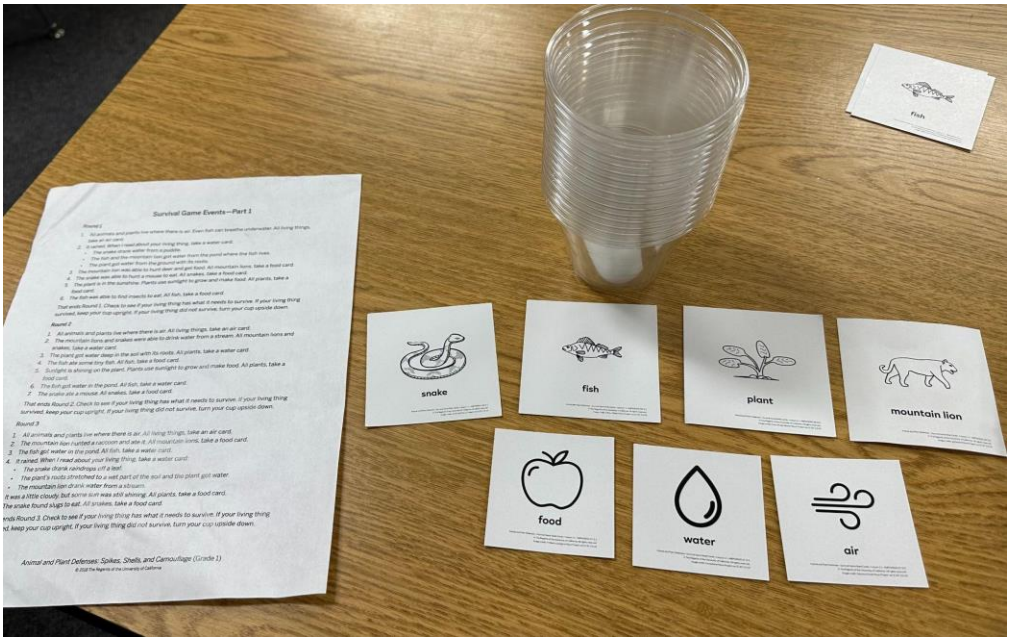
Appendix B

Pre-Assessment Student Example



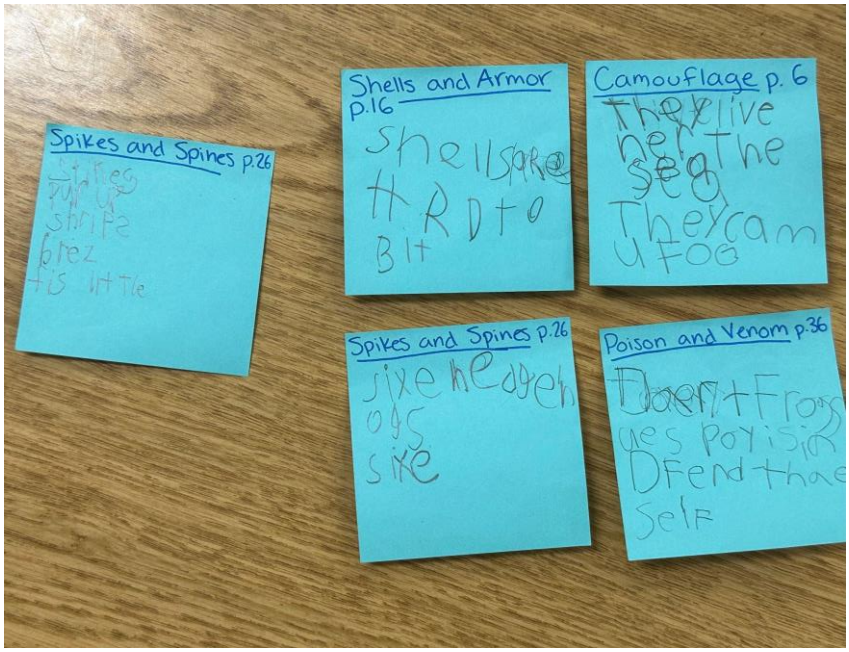
Appendix C

Survival Game Materials



Appendix D

Sticky-Notes Student Examples



Appendix E

Post-Assessment

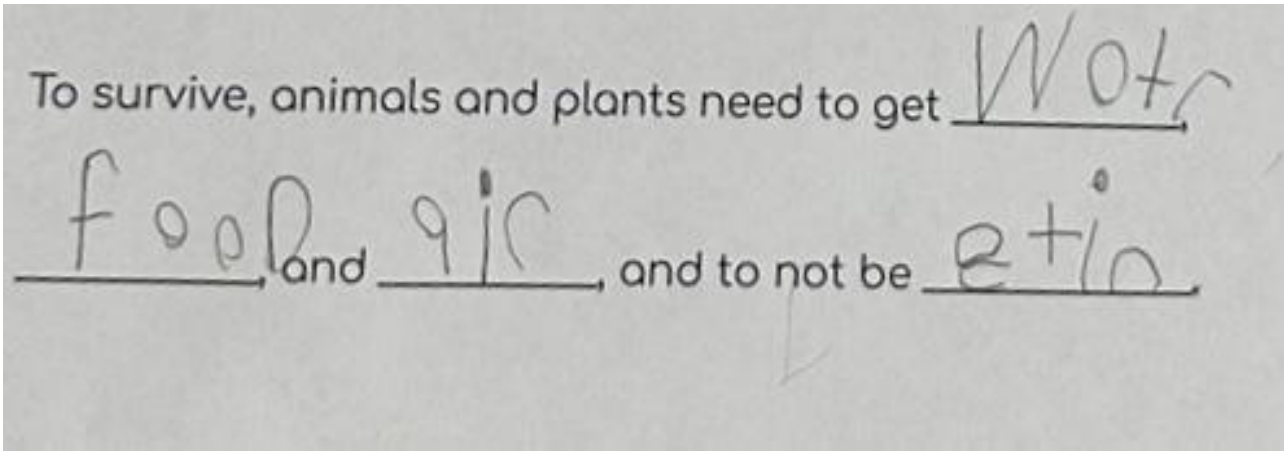
Name: _____

To survive, animals and plants need to get _____,

_____, and _____, and to not be _____.

Appendix F

Post-Assessment Student Example



Appendix G

Summative Assessment Teacher Example

Appendix H

Summative Assessment Student Examples