Grade Level	4	**Content Area**	Science
Course Title (grades 9-12 Only)	NA		
Expected Prior Knowledge *The knowledge/skills mastered earlier in the year foundational to the mastery of the required Standard in the current sample.*	The students identified different species of animals and plants from differing environments. They identified differing structural traits and adaptations that aide in an organism's survival for its specific environment, region, climate, and habitat. (i.e. ecosystem or biome). The students discussed the consequences of organisms that do not adapt to their environments in nature. They identified environmental factors that affect an organism's needs and ability to adapt to its surroundings (i.e. temperature, environment, predators, and prey). The students have used various scientific method skills to perform investigations (i.e. observations, predictions, collecting data, communicating results, and drawing conclusions).		
Alignment to Program of Instruction *Briefly outline methods of instruction found in this sequence of lessons that align to the Program of Instruction described in A.3.*	Students become active learners of the scientific method, practicing applications of learning by engaging in experiments, active learning and presentations. They will learn to solve problems through observations, formulating predictions, and creating and testing hypotheses. Students apply the scientific process to a self designed, controlled experiment as well as display and analyze data from these experiments on lab reports. Hands-on, inquiry based science projects and units are enhanced and integrated with reading content area texts.		
Standard Number and Description *List the Number* and full description for the Required Standard or Science Performance Objective listed in section A.6.*	**4.4.4.1** Recognize that successful characteristics of populations are inherited traits that are favorable in a particular environment.		
Materials/Resources Needed	Lesson 1: materials box (1 per group), Bird Beaks Adaptations exploration packet, 2 copies of data sheet, shallow pan, water, plastic wrap, 4 different tools (suggested tools: needle nosed pliers, tweezers, pair of chopsticks, pair of plastic knives, pair of plastic forks, medicine dropper, student scissors, and clothespin), 4 different objects (suggested objects: pebble or small stone, coin, paper clip, 12 Sunflower seeds in shells, 12 toasted oat circles cereal pieces, toothpicks, rubber eraser) Lesson 2: Science A-Z Book *Adaptation*, KWL worksheet, Adaptation Vocabulary Cards, Definition Cards, and Image Cards, computer, Smart Board. Lesson 3: Computer, Smart Board, Discovery Education video: "Challenges of Life", Discovery Education Video Questions, and Writing Prompt. Lesson 4: Science A-Z Book *Adaptations*, 4 Discussion Questions per group, composition book, Game Show Box, Quick Read Worksheet, computer, and Smart Board.		

* ***Standard Number****: For English Language Arts (Reading and Writing), use Grade, Strand, Standard (e.g., 3.RI.2). For K-8 Math, use Grade, Domain, Standard (e.g., 6.EE.7). For HS Math, use Conceptual Category-Domain, Standard (e.g., A-REI.6). For Science, use Grade, Strand, Concept, PO (e.g., 4.1.3.1).*

Lesson (add as needed)	Instructional Strategies The teacher will:	Student Activities The students will:
1	**Before the Lesson**: Students will be assigned to groups of 3-4. **Review**: Students will be prompted to think about the different types of tools that are used on a day to day basis to perform differing tasks. Discuss how and why these tools are used to perform the tasks. **Vocabulary**: Identify key terms to be used throughout the activity: observe, predict, data, communicate, conclusion, adaptations. **Introduction**: Students will be introduced to the materials that are provided to them by the teacher. Model safe techniques for using tools and objects during the investigation. Utilizing the inquiry model, explain that the purpose of the investigation is to model the function of various bird beak adaptations by exploring how well different tools manipulate various objects. Provide groups with the Bird Beak Adaptations exploration packet. The packet includes Purpose, Process Skills, Background Information, Procedure List, Data Tables, Data Analysis Questions, and Drawing Conclusion sections. **Warm Up**: Use a pair of needle nosed pliers and a clothespin to demonstrate how easy or difficult it is to pick up different materials (i.e. toothpick, piece of cereal, and coin). Teacher will ask students to identify which objects were easier to pick up with pliers versus the clothespin and how they came up with their conclusions. **Demonstration**: Show students how to set up their materials to complete the exploration. Select four tools to test and compare. Write the name of the tool above each data table. Select four different objects to compare. Be sure the objects differ in size and shape (with at least one object that can be crushed). List the same four objects on each of the four tables. Demonstrate the three other tests to be performed in addition to the Pickup Test. **Pickup Test:** Demonstrated in the warm up. **Scoop Test**: Fill a shallow pan halfway with water. Conduct a test to observe how well the tools can scoop objects out of the water. Provide sample responses for data table. **Puncture Test:** Stretch plastic wrap tightly over shallow pan. Demonstrate attempting to gently puncture plastic wrap using tools. Provide sample responses for data table. **Crush Test:** Observe how well each tool can crush each object. Provide sample responses for data table.	**Review**: Provide examples and respond with how and why the tools are used for a specific task. **Vocabulary**: Recall and discuss terms used in previous explorations. **Introduction**: Observe the teacher modeling safety and use of tools during the investigation. Ask relevant questions. Preview the Exploration Packet, while the instructor explains each section. **Warm Up**: Respond to questions. **Demonstration**: Students observe the teacher while the materials are set up. Students are encouraged to question and clarify the procedures for exploration setup.

	Interaction: Tell students that it is time to perform their investigations. Distribute required materials for each group. Roam the classroom during the activity providing assistance when needed for setup, tests, observations, or documentation of results. **Analyze Data**: Prompt students to analyze their data. In the exploration packet, students will find the analysis section. The groups are asked to respond to 5 analysis questions. 1.) Which tool worked well for the most tests? Why do you think this was so? 2.) Which tool worked well for the fewest tests? Why? 3.) Which tool would be best for pecking a hole in a tree? Why? 4.) Which tool would be best for catching a fish? Why? 5.) Would you expect a fish eating bird in Africa to have the same kind of beak as a fish eating bird in North America? Why or why not? **Wrap up**: Ask students to share and compare results with other groups in the class. Then allow students to draw conclusions about which tools worked best for each type of test. Relate the experiment to birds and their differing beak designs. Discuss why different types of birds need differing beak designs to be favorable for their needs in their individual environments. For instance, what kind of beak might be found on birds that eat small water animals? What type of beak is designed for eating seeds? What are some important characteristics of a successfully adapted bird beak? Collect Exploration Packets at the end of the lesson.	**Interaction**: Receive materials to perform the investigations. Receive tools and objects to compare. Use their packets to follow directions and procedures to complete the investigation. **Analyze Data**: Discuss as a group the analysis of the data collected, answer the five analysis question, document finding in exploration packets. **Wrap Up**: Groups will compare results with other groups. After comparing results with other groups in the class, they will draw conclusions about which tools worked best for each type of test. Write conclusions in Exploration Packets. Discuss why different types of birds need differing beak designs to be favorable for their needs in their individual environments. **Formative Assessment/Independent Practice**: Answer the inquiry question. Some birds have to pick seeds out of an area of pebbles. Which tool would be the best for accomplishing this task? Why? Responses should be written in complete sentences, and both parts of the question must be answered.
2	**Before the Lesson**: Display the Adaptations Word Splash document on the Smart Board. The Word Splash has all of the vocabulary words that will be used throughout the unit, scrambled throughout the document. Ask students if they know the definitions or can provide examples for any of the vocabulary words. The students will go to the Smart Board and highlight the term being defined. **Review**: Pass out a KWL chart to each student. Students have used a KWL chart in the past. The chart allows students to write what they	**Before the Lesson:** Volunteer to go to the Smart Board to share their understanding of the vocabulary words that they highlight.

	Know, **W**ant to know, and what they **L**earned throughout the unit. After student completes the **K and W** portions. Collect and save until the end of the unit, when it will be redistributed for students to complete after they have completed the summative assessment. **Vocabulary**: Explain that organisms have inherited traits from their parents that are favorable to their environment. These are combinations of structural, behavioral, and instinctual adaptations, and have been passed down for generations. Other vocabulary words include the following: characteristic, extinct, habitat, predator, prey, and population. **Introduction**: Pass out the Science A-Z book, *Adaptations*, book to each student. Instruct students to turn to the table of contents section of the book. Preview with students the book title, table of contents, pictures, special features, and glossary. Invite students to predict what the book is about. **Interaction**: Put students in groups of 3-4. Pass out a set of definition, vocabulary, and image cards to each group. The groups will use prior knowledge to match the vocabulary word with its definition and image cards.	**Review**: Describe at least three things that they know about adaptations. Write at least 3 things that they would like to know about adaptation. Turn in their incomplete **KWL** chart the **K** and **W** portions are complete. **Vocabulary**: Repeat vocabulary words aloud with the teacher to master pronunciation. **Introduction**: Follow along in their books as the teacher highlights sections of importance and emphasis. Predict what they think the book will be about, and what they will learn. **Interaction**: Participate in matching game. Group participation and cooperative Formative assessment. **Independent Practice**: Read the *Adaptations* book for homework. Students have two days to complete reading the book.
3	**Before the Lesson**: Ask students how much they have read of the *Adaptations* book. Answer any questions or concerns the students might have. **Review**: Ask students to recall how differing bird beaks are favorable for different environments. **Introduction**: Let students know that they will watch the Discovery Life video "Challenges of Life." Have students write the video questions: 1.) Explain how the Venus fly trap captured its food. 2.) What does the ibex calf do to protect itself against the red fox? 3.) What adaptations have flying fish acquired to escape predators? 4.) How does the panther chameleon gain an advantage to capture its prey? Name at least 2 adaptations that are favorable to its particular environment. Play the portions of the video that were chosen to identify successful traits of the	**Before the Lesson**: Share any parts of the reading presenting difficulty. **Review**: Share their experiences from the investigation in Lesson 1 to identify beak traits that are favorable to certain birds in their environments. **Introduction:** Write the video questions in their composition books to reference while viewing the "Challenges of Life" video. Use short answers, in complete sentences to identify successful characteristics of the Venus fly trap, ibex, flying fish, and panther chameleon in their different environments.

	Venus fly trap, ibex, flying fish, and panther chameleon. Discuss questions and answers as a class after the video. **Wrap up:** Introduce and assign an expository writing prompt titled "Booby Trap." The instructor will encourage students to reflect on the Venus fly trap's strategy of capturing its prey with bait and its hair-like triggers that, when touched 20 seconds apart, spring closed to trap its prey. Students will use their knowledge to create their own "booby traps" to capture their food, then explain and provide instructions for how it works.	**Wrap up/Formative Assessment:** Students will complete a 3 paragraph response to the expository writing prompt Titled "Booby Trap."
4	**Review**: Ask students to explain why inherited adaptations and traits are necessary for a species to survive in a particular environment. Ask them what might happen if the inherited traits were not passed on to the next generation. Write the responses on the board. Review why inherited traits are crucial to the survival of a species. **Interaction**: Assign students to groups of 3-4. Each group will receive one discussion question and an example of an organism of a population that has inherited traits that are favorable in its environment. **Wrap Up**: Introduce the review game show. Use a game box with a button and light similar to the Family Feud set up. This game show is used to study before the summative assessment. Before the game is played, inform the students that the review questions are beneficial to all students even if a team loses. The purpose of the game is to review for the test. Separate students into two teams. Each team has a student come	**Review**: Participate in class discussion. **Interaction**: Members of each group will record responses on paper. Each group will rotate through different stations until each group has visited each station. The teacher will allow 1 student per group to present to the class their groups responses to the discussion questions and assess the accuracy of the groups' responses. Discussion questions: 1.) What do you think would happen to a saguaro cactus if you planted it in the rainforest? Why? 2.) What might happen to flying fish if they didn't inherit the ability to escape their prey by flying or "gliding" out of the water? Why? 3.) What might happen if the panther chameleon lost its ability to camouflage in the rainforest? Why? 4.) How has a camel's transparent eyelid allowed it to find food, travel through dust storms in the Saharan desert, and avoid predators? How did the camel acquire this trait?

	to the front of the class to answer a question. If the student gets the question right, the team gets a point. If the student misses the question, they lose a point and the other team gets a chance to steal the point by answering the question right. The teacher may offer rewards for participation, winning teams, good sports, etc. Ask questions that have been covered throughout the lessons.	**Wrap Up**: Participate in the review game. Each student is expected to answer a question. Ask any addition questions that arise due to answers that were not fully understood. **Independent Practice**: Read and complete the Quick Read Worksheet: "The Oh-So Adaptable Cactus." Use a diagram to identify 3 or more successful traits in one population of organisms. The species identified is the saguaro cactus. It is native to our state and has been discussed throughout the reading materials. Identify at least three traits that are inherited and passed on from generation to generation.

Summative Assessment Items:

1. True or false? The koala bear's ability to climb trees is due to a learned behavior acquired by the koala's ability watch other animals climb.
2. The ability of the flying fish to escape its predators by flying is an adaptation that was acquired by _____.
   A. watching its parents
   B. playing with its friends
   C. inheriting from its parents
   D. all of the above
3. What traits did the panther chameleon inherit from its parents?
   A. the abilities to swim and jump
   B. the abilities to crawl and slither
   C. the abilities to fight and use poison to scare off predators
   D. the abilities to camouflage and use its long tongue to catch prey
4. What does inherit mean?

A. to adapt to an environment
B. to acquire traits from parents
C. to respond to surrounding
D. to learn behavior from parent

5. Which characteristic would not be beneficial to a saguaro cactus in the Sonoran desert?
   A. the ability to absorb water quickly through its shallow roots, due to the lack of rain
   B. the spines on the cactus that allow dew to trickle down its spines to help roots absorb water
   C. flowers that bloom during the scorching daytime temperatures
   D. the ability to store water over long periods of time

Answer Key: Each correct answer is awarded one point, and no partial credit is available. A score of 4/5 demonstrates mastery.

1. False
2. C
3. D
4. B
5. C