

Lesson Plan 1

Adaptations

CRITICAL OUTCOMES

CO #2: Work effectively with others as members of a team, group, organisation, community.

CO #3: Organise and manage oneself and one's activities responsibly and effectively.

CO #4: Collect, analyse, organise and critically evaluate information.

CO #5: Communicate effectively using visual, mathematical and/or language skills in the modes of oral and/or written presentation.

LEARNING OUTCOMES

LO#1: The learner will be able to act confidently on curiosity about natural phenomena, and to investigate relationships and solve problems in scientific, technological and environmental contexts.

Process Skills:

Observing, measuring, recording information, interpreting information

Predicting and hypothesizing, raising questions about a situation

Planning science investigations

Conducting investigations

Communicating science information

ASSESSMENT STANDARDS

Plans investigations: helps to clarify focus questions for investigation and describes the kind of information, which would be needed to answer the question.

Conducts investigations and collects data: Conducts simple tests or surveys and records observations or responses.

Evaluated data and communicates findings: Relates observations and responses to the focus question.

TEACHING THE LESSON

Using information in Grade Four Adaptation section found on page 13, review adaptation terminology, followed by a brief re-introduction to cheetah adaptations through the Built for Speed Activity.



ACTIVITY 1 - built for speed

Using the chart handout, ask students to fill in the blanks to show the relationships between structure, adaptation, and function.



ANSWER KEY - built for speed

Did you know?
The cheetah has a long, narrow tail for balance and steering.

STRUCTURE	ADAPTATION	FUNCTION
Tail	Long and narrow	Balance and steering
Body	Slender, long-legged, streamlined, light	Less wind resistance, and longer stride therefore increased speed
Paws	Semi-retractable claws Grooves in pad	Better traction for acceleration and faster movement
Spine	Flexible	Increases the stride by allowing the body to stretch out further
Heart	Enlarged	Increased oxygen supply to muscles





WORKSHEET - built for speed

Name: _____ Date: _____

Using the chart, fill in the blanks to show the relationships between structure, adaptation, and function.

STRUCTURE	ADAPTATION	FUNCTION
Tail		
Body		
Paws		
Spine		
Heart		

Adaptations of a Cheetah for Speed:

The cheetah is the fastest animal on land, with a maximum speed of 110-120 km per hour. Running is the cheetah's main form of defence, its speed allows it to hunt and escape from danger. The cheetah has many adaptations, which help it to run so fast. The cheetah has a very light skeleton and does not have a lot of muscles, allowing it to run fast as the heavier you are the slower you are. The cheetah's body is thin and streamlined. The leg bones are longer than other cats and cheetahs run on the tips of their toes giving them a bigger step. The cheetah's spine also can bend a lot more than other cats; this also allows them to increase the size of their steps by stretching their body out. Their hip bones can turn where they are attached to the rest of the skeleton, this allows them to stretch their hind legs out further. All these adaptations give the cheetah a stride of 8 meters while running at full speed. The cheetah's long, narrow tail helps him to keep his balance and steer around corners. The feet give them better grip on the ground to stop the cheetah from slipping while it is running. This grip is provided by grooves on the cushions of the feet as well as the claws which cannot be pulled into the paw completely (we say that they are semi-retractable). It takes a lot of energy for the cheetah to run that fast. It is the oxygen in our blood that provides that energy. The cheetah has a very big heart and lungs to make sure that they get enough oxygen to their muscles while running to keep up their energy.





ACTIVITY 2 - backyard adaptations (adapted from Critter Lab designed By Blake Sills and Melissa Gibbons)

Procedure:

In this activity, learners will investigate adaptations using a specimen from the school's backyard and apply the knowledge previously attained through the cheetah adaptations to give an informed opinion as to the purpose of these adaptations. The learners will also practice their skills at scientific drawing.

Select your insect or other invertebrate in advance to this lesson and research its traits and behaviors. This will become the answer key to the student worksheet.

Materials:

Enough insects (or other invertebrates) for the learners to investigate one each or in groups of two to three, collected from the pupils backyard or the schoolyard.

Container for the insect to be kept in for easy observation (A small Transparent bag, plastic container with a clear top, or a plastic petri dish)
One piece of white paper
A spoon and small paintbrush or stick
A metric ruler
A hand lens if available

The lesson can be easily adapted to use other equipment if any of the above are not available or simply make sure the learners collect large enough insects for easy observation by the naked eye. If time allows, it is encouraged that students spend many days on this activity, which will enable them to create a sound and beneficial experiment.





WORKSHEET - backyard adaptations

Name: _____ Date: _____

Introduction Activity:

In this activity, you will learn some important things about _____ anatomy and behavior. You will also learn how to handle _____ and that they will not harm you.

The knowledge and skills you acquire in this activity will be of help to you when you design and conduct your _____ investigation in the second part of this activity.

Procedure:

Using the spoon and the brush, place two or three _____ in the container. Work with these _____ in answering the following questions.

1. What is the length in millimeters of your shortest _____? _____ mm How long is your longest _____? _____ mm
2. How many pairs of legs does a _____ have? _____ Do all of the _____ have the same number of legs? _____
3. How many antennae does a _____ have? _____ What functions do you think the antennae may have? _____
4. How many eyes does a _____ have? _____ Are the eyes simple (with one lens on the outside) or compound (each eye is made of multiple sections of the lens)? _____
5. Does a _____ have wings? _____ If so, how many? _____





6. Draw a sketch of the _____ below. Label all of the parts you can clearly recognize.

7. Touch the back of the _____ to determine if it has an endoskeleton or an exoskeleton? If it seems hard and stiff, it has an exoskeleton; if it's soft and fleshy, it has an endoskeleton. Which type of skeleton does the _____ have?
?
8. Place a _____ on its back on the piece of paper. Describe how it turns over and what it does next. _____
Describe what the _____ does when it comes to an edge where there is a drop off? _____
9. Can a _____ climb on steep smooth surfaces like the edges of the petri dish or container? _____ Can a _____ climb up your arm or another steep rough surface? _____
10. How fast can a _____ run/walk? (To measure its speed do the following:
- a. Mark a small X in the center of your piece of paper.
 - b. Place a _____ on the X.
 - c. After releasing it, record the time it takes for the _____ to move off of the paper.
 - d. Place another X where it left the paper.
 - e. Measure the distance between the two X's in centimeters.
 - f. Calculate the speed of the _____ in centimeters per second (cm/sec) by dividing the distance traveled by the amount of time it took the _____ to travel.
 - g. The _____ traveled _____ cm/sec.





EXPERIMENT - backyard adaptations

Now that you have become familiar with a _____'s physical makeup, you are ready to design and perform a scientific investigation about the behavior of your specimen. Also, you will record and report any observations you make about its behavior.

1. Brainstorm with your partners about possible _____ behavior questions you would like to investigate. Least at least three such questions.

2. Select one of these questions to investigate and state it below. Make sure it is a question.

3. Write a hypothesis that relates to your problem question. Write your hypothesis in the form of an "if, then" statement. For example, "If pillbugs are placed in a box where they can choose between light and dark surfaces, they will choose dark surfaces."

4. Give your project a descriptive title and write it below.

5. Make a list of all of the variables that may influence your investigation.

6. Determine the variable that you will manipulate (it is the independent variable) and write it below. [Remember that you should manipulate only one independent variable at a time]. Also determine the variable that you will measure (the dependent variable), and the variables that will be consistent throughout the investigation (the controlled variables).

Independent variable: _____

Dependent variable: _____

Controlled variables: _____

NOTE: The information above should help you in completing the investigation write up. Organize this information according to your teacher's instructions.





7. Develop a series of step-by-step instructions that you will follow to test the question in your problem. The instructions will be the design of your experiment. [Make sure that the design of the experiment will really do what it is supposed to do] The design should include a way to answer the question in your problem.
8. Make a drawing to illustrate the design of your experiment.
9. Conduct the experiment that you designed.
10. Using a data table, record your data and summarize the results. Using the appropriate graph type (line or bar) supply a graph of your results. The graph should have a descriptive title and a label for each axis.
11. Write a paragraph that states your conclusions. It should include an answer to your problem question and state whether or not you confirmed your hypothesis and explain why? Also, discuss how the results of the experiment may relate to the ability of the _____ to survive in its own natural environment.

Things to consider:

When designing your experiment, make sure that you can answer the following questions. [If you don't understand any of these questions, make sure to seek guidance from your teacher.]

Have I identified all of the variables?
How will the variables be controlled?
How will variables be measured?
How will variables be manipulated?
What equipment and supplies do I need?
Does my experimental design really do what it is supposed to do?
Will my experiment answer my question?
How many organisms will I use in my investigation?
How many times will I repeat the investigation to ensure that the results are valid?





ASSESSMENT

Checklist:

Assessment Statement	Yes	No
Learner followed the instructions		
The learner could distinguish between a question and hypothesis		
The learner listed the variable effecting the experiment		
The experiment designed was appropriate to answering the question		
The learner conducted the experiment correctly		
The learner collected data relevant to the hypothesis		
The learner recorded the data in an appropriate form		
The learner could identify the trends in the data		
The learner drew logical conclusions from the data		
The learner could use the conclusions to logically prove/disprove the hypothesis		
The learner reported his findings clearly and concisely		

Rubric:

1	2	3	4
The learner was unable to design the hypothesis or experiment.	The learner's design of the experiment had only partial relevance to the hypothesis developed. The learner could collect the data although the data was not fully aligned to the questions and could not be used to prove/disprove the hypothesis.	The learner could design a hypothesis and experiment. The learner could conduct the experiment, collecting data relevant to the hypothesis. The learner was able to evaluate the data to prove/disprove the hypothesis. The learner could report the experiment and conclusions to the class.	The learner exceeded expectations, showing a deeper understanding of the design and implementation of the experiment. The learner understood the effect of the variables and suggested further steps to the experiment.

Language links:

LEARNING OUTCOME:	ASSESSMENT STANDARD
LO2: Speaking	Communicates experiences, more complex ideas and information in more challenging contexts.
	Applies interaction skills in group situations
LO4: Writing	Writes informational texts expressing ideas clearly and logically
	Develops and organizes ideas through a writing process
LO5: Thinking and Reasoning	Process information
	Uses language to think creatively

