

Lesson Plan: Copy Cat

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Target Grade: 1st

Teacher Prep Time: 20 minutes (if you have all the materials)

Lesson Time: 3 hour 20 minutes (We recommend doing this lesson over four days.)

- Part 1:
 - 15 min – Beginning Thoughts
 - 20 min – Class Debate
 - 25 min – Writing Exercise
- Part 2:
 - 25 min – Class Discussion
 - 10 min – Explain Experiment
 - 25 min – Experiment
- Part 3:
 - 15 min – Results Analysis
 - 15 min – Writing Exercise
 - 15 min – Class Debate
 - 15 min – Build the “Best” Jacket
- Part 4:
 - 20 min – Review Questions

Lesson Overview:

In this lesson, students will explore external parts (adaptations) that help animals survive, grow, and meet their needs for the environment. Students are challenged to think about external features that plants and animals have that humans have copied to improve our lives. Students then apply their engineering skills to designing a jacket using external features from animals that help to keep the animal warm. In addition, this activity introduces students to scientific argumentation and allows students multiple opportunities to practice these skills.

Learning Objectives:

- Students will know that humans mimic properties/traits of plants and animals to improve our lives.
- Students will engage in argument from evidence to come to a class consensus.

NGSS:

1-LS1-1: 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.*

K-2-ETS1-1: Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

- **Science and Engineering Practice**
 - #6 Construct Explanations and Design Solutions
 - Constructing explanations and designing solutions in K-2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence based accounts of natural phenomena and designing solution.

- Use tools and/or materials to design and/or build a device that solves a specific problem or a solution to a specific problem.
 - Generate and/or compare multiple solution to a problem.
 - #7 Engaging in Argument from Evidence
 - Engaging in argument from evidence in K-2 builds on prior experiences and progresses to comparing ideas and representations about the natural and designed world(s).
 - Listen actively to arguments to indicate agreement or disagreement based on evidence, and/or to retell the main points of the argument.
 - Construct an argument with evidence to support a claim.
 - Make a claim about the effectiveness of an object, tool, or solution that is supported by relevant evidence.
- **Disciplinary Core Ideas**
 - LS1.A Structure of Function
 - All organisms have external parts that they use to perform daily functions.
- **Cross Cutting Concepts**
 - #6 Structure and Function
 - In grades K-2 students observe the shape and stability of structures of natural and designed object are relate to their function.

Common Core State Standard:

SL-1-b: Participate in collaborative conversation with diverse partners about grade 1 topics and texts with peers and adults in small and large groups.

- Build on others' talk in conversations by responding to the comments of others through multiple exchanges.

Where this lesson fits in:

Before this activity students should review kindergarten performance expectation (K-LS1-1) which requires them to determine what living things need to survive. They should then expand on these ideas by observing both plants and animals and identify their external parts (example: birds -wings). In addition, they should identify how these external parts allow the plants/animals to survive, meet their needs, and grow in their native habitats. An example of an external feature that animals have that allows them to grow is a mouth which is used for eating and for gas exchange. Roots are leaves are examples of external features that plants have that allow them to grow. Roots are used for absorbing water, and leaves are used to absorb sunlight and CO₂. This lesson provides a great ending activity to performance expectation 1-LS1-1. If desired, a similar design activity can be included that focuses on features that humans take from plants.

Materials Needed:

- Student worksheet (one per student)
- Copy cat picture packet
- Chart for recording class data (It is best to write the class results on chart paper because student will need it during multiple days of the activity.)
- Plant/animal/human cards (1 set per 3 students)
- Craft feathers (large)
- Cotton (Synthetic Down) (get from a pillow)
- Chammy pieces cut to ~6 in squares
- Thick Felt cut to ~6 in squares
- Thin Felt cut to ~6 in squares
- Ziploc baggies with Crisco

- Ziploc baggies
- Masking tape (1 role per 3 students)
- Thermometers **Note:** It is best to use a digital thermometer for this activity. Glass thermometers can be used but you must be careful that students do not break them. The glass thermometers should not be used on its own without being attached to a metal piece (knife)
- Butter knife or piece of metal about the size of a butter knife with a smiley face sticker on the handle (this helps students understand that these devices are mimicking metal people)
- 800 mL beakers with hot water (~80°C)
- Timer

Teacher Prep:

- Print out and cut up enough plant/animal/human cards so each group (~3 students) can have a set.
- Tape the thermometers to the butter knives as seen in the picture on the right. Make sure that the tape does not cover the 40°C mark.
 - It is helpful to put a smiley face sticker on the knives to help students understand that the knife/thermometer is a “metal person.”
- Put each of the animal materials (cotton, craft feathers, fat, chammy thick felt, thin felt) into bowls and set centrally on a table.
- Set out 1 bag, 1 role of masking tape, and 1 timer for each group.
- Heat water up (~80°). Make sure that the water is hot but not boiling (this ensures that students will not burn themselves if they touch the water).



Lesson Sequence:

*For this activity we recommend that students work in groups of three. Do not have more than seven groups.

Part 1:	
15 minutes	<p>Beginning Thoughts</p> <ul style="list-style-type: none"> • Have students seated in groups of 3. • Show students one of the plant/animal/human cards and ask them to describe the picture. Then, tape the card to the front board and write one of the following word(s) next to the card: bird, fish, lily pad, raft, plane, elephant, roots, shower, scuba gear, or straw. Repeat the process until you have gone through all of the cards. • Pass out one set of plant/animal/human cards to each group and the Copy Cat worksheet to each student. • Tell students that they need to take the cards and match them into pairs. Each card must only be matched to one other card and they must be able to explain why the two cards match together. Once they have decided on their matches they should draw lines between the pictures in question 1 of the worksheet. • Each student in the group should pick one pair, that no other student in the group is doing, and fill out the sentence frame (question 2) for it: The picture of the ___ goes with the picture of the ___ because they both have ___.
20 minutes	<p>Class Debate</p> <ul style="list-style-type: none"> • Put page 1 of the picture packet under a document camera (below left). Tell students that they will now discuss what pictures form pairs using the sentence frames. Show students how to use the sentence frames and how to respond to each other. Tell students to pay attention to the groups that they agree/disagree with so that they will be able to record this at the end of the

debate. Then allow students to debate the pairs. It is helpful to keep notes for students on the board so that they can refer back to them. As groups suggest a pair, record their suggested pair as well as why they think the pair go together (example below right).

Use the Following Sentence Frames to Discuss Which Pictures Make A Pair



Use the following words to help you.

Pictures

Bird	Elephant	Fish
Lily Pad	Plane	Raft
Roots	Scuba Gear	Shower
Straw		

Starting a discussion of a pair
 I think the picture of the _____ goes with the picture of the _____ because _____.

Responding to a discussion of a pair
 Group _____ said _____ and I agree with them because _____.

Or

Group _____ said _____ and I respectfully disagree with them because _____.

Group	Suggested Pair	Why
1	lily pad/raft elephant/shower	float spray water
2	plane/ bird raft/ lily pad	fly float
3	fish/ scuba gear shower/elephant	breath underwater spray water
4	roots/ lily pad fish/ scuba gear	plants breath underwater
5	fish/ lily pad plane/ bird	in water fly
6	elephant/ bird straw/roots	animals suck up water

- By the end of the conversation make sure that students have matched the cards so that each human card has either a plant or animal card matched with them, that students can explain what the plant/animal is doing that humans cannot, and what we have done to copy them.
 - ESR (expected student response):
 - root/straw: ability to take in liquid to drink
 - fish/scuba gear: ability to breathe underwater
 - elephant/ shower: ability to clean ourselves
 - bird/ plane: ability to fly
 - lily pad/ raft: ability to float on water

25 minutes

Writing Exercise

- Have students turn to page 2 of the worksheet and fill in questions 3 and 4 about groups that they agreed/disagreed with and why. Students should fill this out on their own.

Part 2:

25 minutes

Class Discussion

- Put page 2 of the picture pack (below) under the document camera. As a class fill out the sentence frames.

What have we learned from animals?

Birds have wings
that allow them to fly
but humans cannot do this without a plane

Elephants have trunks
that allow them to spray water
but humans cannot do this without a shower

Fish have gills
that allow them to beath underwater
but humans cannot do this without scuba gear

What have we learned from plants?

Lily Pads have flat bottoms
that allow them to float
but humans cannot do this without a raft

Roots have many small tubes
that allow them to suck up water
but humans cannot do this without a straw

- Show students the picture of the penguins (below). Ask students if a human could survive in this environment without any external help. Students should realize that humans would not be able to survive in the cold without external help. Ask students what external parts (adaptations) penguins have that help them to survive in a cold environment. Students should point out the penguins' feathers help keep them warm. Then have them fill out the question 5.
 - Penguins have **feathers** that allow them to **keep warm in the cold** humans cannot do this without a **jacket**.



- Ask students if there are other animals that survive in cold environments and if feathers are the only external parts (adaptations) that allow animals to survive in these environments. Students might suggest: polar bears (or other mammals)/fur and whales/blubber.
- Tell students that engineers are people who design solutions to problems. Many times engineers look at things in nature to give them ideas to solve problems. Tell students that today they will be an engineer and try to solve the problem of how to stay warm in the cold. Therefore, they are going to design a jacket to keep a metal person warm.

- Put up page 4 of the picture packet (seen below) go over what adaptations animals have and how people have mimicked these adaptations.

 have outer feathers which keeps it warm
 we can mimic this with craft feathers 

 have inner feathers which keeps it warm
 we can mimic this with cotton 

 have long fur which keeps it warm
 we can mimic this with thick felt 

 have short fur which keeps it warm
 we can mimic this with thin felt 

 have blubber which keeps it warm
 we can mimic this with fat 

 have hide which keeps it warm
 we can mimic this with a chammy 

10 minutes

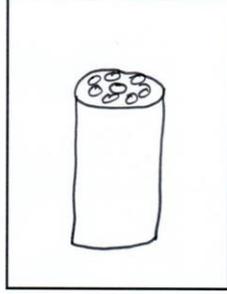
Explain Experiment

- Have students turn to page 3 of the worksheet.
- Read/go over the procedure at the top of page 3.
- Show student page 5 of the picture packet that shows them how to draw pictures of the outside and inside of their jackets.

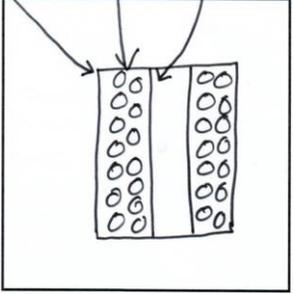
Results

Materials Used: Plastic Styrofoam Paper

Draw a picture of the outside of your jacket.



If you cut your jacket in half, draw what you would see. Make sure to draw lines between your different materials and where they are in your jacket.



- Tell students that they will get 15 minutes to design a jacket that goes over their metal person. The jacket that they make must be removable. They can use any three of the above materials.

25 minutes

Experiment

Note: If student have not used timers or thermometers before you need to go over how to use these before they do their experiment.

- Have students make their jackets.
- Once they have completed their jacket, have them remove their jacket from their metal person and place it in a beaker of hot water (~80°C).
- While waiting for the butter knives to warm up (~10 minutes) have students list the materials used and draw a picture of the jacket on the worksheet.

Then have each group explain their designs and why they think their jackets will be effective. Record the materials on the class results (seen below). It is helpful to have the class results on a poster paper that you can bring out for day 3 of this activity.

- Tell students that the next step needs to be done fast. Give each group a metal person and have them insert it into their jacket and start their timer. Students should stop the timer when the temperature gets to 40°C. They will then record the time on their worksheet.
- Have each group tell how much time it took for the jacket to get to 40°C and record it on the class results along with any notes that they have.

Class Results			
Group	Materials	Time	Notes
1	Craft Feathers Fat Thin Felt	3 min 7 sec	temp dropped fast at first
2	Cotton Thick Felt Chammy	6 min 23 sec	
3	Craft Feathers Thick Felt Thin Felt	7 min 2 sec	longest time
4	Cotton Craft Feathers Chammy	4 min 22 sec	
5	Craft Feathers Thick Felt Fat	2 min 47 sec	temp dropped fast at first
6	Cotton Chammy Fat	1 min 59 sec	temp dropped fast at first shortest time
7	Craft Feathers Chammy Thin Felt	5 min 53 sec	

Part 3:

15
minutes

Results Analysis

- Have students turn to page 4 of the worksheet.
- Put the class results on the board. Help students discuss patterns that they see in the results.

15
minutes

Writing Exercise

- Put page 4 of the picture packet under the document camera to remind students of the materials that they used and what they were mimicking.
- Have students fill in questions 6 and 7 about what materials that they think worked the “best” and “worst” on their own.

15
minutes

Class Debate

- Put page 6 of the picture packet under a document camera (below). Tell students that they will now discuss what materials worked “best” or “worst” to make a jack from. Show students how to use the sentence frames and how to respond to each other.

Example Student Work:

Name: Darby

Copy Cat

Part 1:
Beginning Thoughts

1) Draw lines between the pictures that you think form a pair.

2) The picture of the plane goes with the picture of the birds because they both can fly

Class Debate

Discussion Sentence Frames

You don't need to write in this box.

Starting a discussion of a pair
I think the picture of the goes with the picture of the because they both have Picture 1 Picture 2

Responding to a discussion of a pair
Group said and I agree with group them because
Number Or
Group said and I respectfully disagree with them because
Number

1

Writing Exercise

3) I agreed with group 1 when they argued the picture of the lily pad goes with the picture of the raft because they both float

4) I disagreed with group 4 when they argued the picture of the roots goes with the picture of the lily pad because they are both plants

Instead I think the picture of the roots goes with the picture of the straw because they both suck up water.

Part 2:
Class Discussion

*Have a class discussion and fill out the class sentence frames about what structures plants and animals have that humans have copied.

Fill out the following sentence frame for the picture that your teacher shows.

5) Penguins have feathers that allow them to keep warm in the cold but humans cannot do this without jacket

2

Explain Experiment

Procedure

1. Make a "jacket" using up to three materials. The jacket must be one piece and removable.
2. Record the materials that you used and draw a picture of your jacket.
3. Pull the metal person/thermometer out of the hot water and put your jacket on them.
4. Time how long it takes the thermometer to get to 40°C. You are not allowed to touch your jacket while the temperature is dropping.

Experiment

Results
Materials Used: thin felt chammy craft feathers

Draw a picture of the outside of your jacket.

If you cut your jacket in half, draw what you would see. Make sure to draw lines between your different materials and where they are in your jacket.

Time it took the thermometer to get to 40°C: 5 min 53 s

3

Part 3:
Class Discussion

As a class, look at the data from the experiment and discuss what this means for using each material in a jacket.

Writing Exercise

6) I think thick felt which mimicked thick fur worked the best as jacket material because groups 2 and 3 both used thick felt and their jackets stayed warm the longest.

7) I think fat which mimicked blubber worked the worst as jacket materials because groups 1, 5, and 6 used fat and their jackets cooled down the fastest.

Class Debate

Discussion Sentence Frames

You do not need to write in this box.

Starting a discussion of a pair
I think the which mimicked worked the best/worst because Material Animal Structure

Responding to a discussion of a pair
Group said and I agree with them because
Number Or
Group said and I respectfully disagree with them because
Number

4

Build the "Best" Jacket

- 8) The "best" jacket would be made out of (circle 3):
Chammy Thick Felt Fat Craft Feathers Thin Felt Cotton
- 9) The time for the "best jacket" to reach 40° was: 7 min 38 sec

Part 4:

Review Questions

- 10) Do humans do everything better than plants and animals? Yes No

If not, list one thing that a plant or animal can do better than a human and list a plant or animal is able to do that thing?

Go without water cactus

- 11) What is one feature of an animal that you mimicked in your jacket?

Fur

- 12) What is one animal that has this feature besides penguins?

polar bear

- 13) What is something else humans mimic from plants or animals?

Dog thick pads on feet shoe
Plant or Animal we are Mimicking Trait we are Copying Invention

- 15) Why do scientists argue?

So that they can reach the best answer.

