

5E Integrated STEM Lesson Plan.

Lesson Title: Build a Beak

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Topic: This lessons covers how environmental changes can cause an animal's body to change, or adapt, so they can survive.

Targeted Grade Level: Third Grade

Time Needed: 2 hours. This lesson could be split into two days. Day 1 would be building background knowledge on different bird beaks and how they help the birds survive. Day 2 would be building their own bird beak and writing about how it helps them gather food.

Subject Integration:

This lesson includes Science and Engineering STEM practices. The third grade science practices are adaptations, and the engineering practice will be students building their own bird beak. It also includes Literacy practices through reading about different bird beaks and how those birds adapted, and writing a paragraph during their exit ticket when they have to make an animal adaptation to a certain environmental change.

Justification: For this lesson, I have decided to integrate science, engineering, reading and writing into this lesson. The students will start with reading an article about bird beaks in order to build back ground knowledge about different types of birds, beaks and how they are used. To support their comprehension, students will be doing a jigsaw and answering text dependent questions. Furthermore, they will be looking for the cause and effect relationship between the beaks and the bird's survival as they are reading. Within the reading, the science standards will be incorporated through the subject they are reading about the questions they are answering. From there, science and engineering will be integrated through building their own beaks. This integration will show how well students understand how beaks have adapted to help birds eat through constructing their own beak. This will allow students creative freedom to build, but also build something based in scientific understanding. Science and writing is integrated at the end in the form of the summative assessment. Students will be using their scientific understanding of how the environment impacts an animal's body and causes it to

adapt. They will write a paragraph explaining why the animal would have to adapt and what changes its body would have to endure. The clear integration of reading and writing will allow students to build background knowledge about bird beaks, as well as clearly explain how animals would need to adapt to demonstrate their understanding of the science standards. Using engineering will allow students to demonstrate their understanding of bird beaks and how they need to adapt to catch certain food due to the environment the bird lives in.

Standards:

Common Core Reading:

Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in a technical procedures in a text, using language that pertains to time, sequence, and cause/effect. (CCSS: ELA-Literacy.RI.3.3)

Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. (CCSS.ELA-Literacy.RI.3.1)

- To gain background knowledge on different types of birds and bird beaks, students will begin by reading about different types of beaks and how they help the birds survive. They will be answering text dependent questions about the beaks, and determining the cause and effect relationships between the beaks, the habitat and the survival of the bird.

Common Core Writing:

Write informative/explanatory texts to examine a topic and convey ideas and information clearly. (CCSS.ELA-Literacy.W.3.2).

- This standard will be met as part of their exit ticket. Students will have to pick a change in the environment of an animal they pick and they will need to write a paragraph about how the animal will have to adapt to survive.

NGSS:

Use evidence to support the explanation that traits can be influence by the environment (3-LS3-2).

- This standard will be addressed throughout the lesson

Colorado Academic Standards:

Different organisms vary in how they look and function because they have different inherited information; the environment also affects the traits that an organism develops (SC.3.2.3)

- This standard will be addressed throughout the lesson

NGSS Performance Expectations

NGSS: *Use evidence to support the explanation that traits can be influenced by the environment (3-LS3-2)*

Colorado Prepared Graduates: Students can use a full range of science and engineering practices to make sense of natural phenomena and solve problems that require understanding how genetic and environmental factors influence variation of organisms across generations (SC.3.2.3)

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts:
<p><i>Constructing Explanations and Designing Solutions</i></p> <p>Students will examine bird beak adaptations and design a beak.</p>	<p><i>Heredity is the Inheritance and Variation of traits</i></p> <p>Students will examine the variations in birds based on their traits, namely their beaks.</p>	<p><i>Cause and Effect</i></p> <p>Students will discuss how a change in the environment can cause a change in the animal, which will affect their bodies and beaks.</p>

Common Core State Standards:

Common Core State Standards:

ELA:

Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in a technical procedures in a text, using language that pertains to time, sequence, and cause/effect. (CCSS: ELA-Literacy.RI.3.3)

Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. (CCSS.ELA-Literacy.RI.3.1)

Write informative/explanatory texts to examine a topic and convey ideas and information clearly. (CCSS.ELA-Literacy.W.3.2)

ITEEA Standards *(If applicable)*

Other Standards *(as needed)*

Measurable Student Learning Objectives:

Students will be able to express that a change in an environment can cause a variation in the shape of a birds' beak.

Students will be able to design and build a beak for a specific food source

Students will be able to explain why adaptations are important for an animal to survive in their habitat

Nature of STEM:

In this lesson, students will mainly be learning about and engaging in the nature of science instruction. Students will see that their beak constructions will change, and animals will have to continually adapt, in light of new evidence and that

there is not just one way to adapt. This will teach students that scientific knowledge is always changing when new evidence, or in this lesson when new environmental changes happen, occurs. Students will also be learning about how scientific knowledge and understanding can be derived from observations of the world. Students will do this by reading about birds and their beaks. Furthermore, students will be engaging in the creative nature of science through the design of their own bird beaks and changing an animal's body at the end of the lesson to demonstrate their understanding of the impact environmental factors have on an animal's body. Throughout this lesson, students will learn that science is based on inferences based on observations and information, that new evidence can alter scientific understandings, and that scientists can use creativity when faced with a scientific question.

Engaging Context/Phenomena:

To engage students in the lesson, they will be using chopsticks as a beak to pick up birdseed. This will mimic how birds use their beaks to gather food. From there, the birdseed will go away and students will have to determine what other foods their beaks could grab. This will lead them to having to build a beak that is properly adapted to eat the food their group as picked. To build background knowledge of beaks, students will be doing a jigsaw about a variety of different birds and beaks to share with the class. This will provide students with knowledge about different beaks and hopefully give them ideas they can use when they build their own beak.

Data Integration: Students will be collecting data based on their beak designs. They will be designing a beak and then testing to see if that beak can pick up food effectively. Based on the data, gathered through trial and observation, students will modify their beaks to make them more effective.

Differentiation of Instruction:

- ELL Students: in order to engage with this lesson, ELL students will be given sentence frames, a vocabulary word bank and time to orally share ideas before writing or creating. Students who are performing at a lower reading level will be put into groups with a student who is at a higher reading level. They will also be given a recording of the article so they can listen to it.
- Students will be working in small groups of 3-4 people based on their reading and communication abilities. Lower reading students will be paired with students who are reading at grade level so they can still interact with the content.

- IEP students: all accommodations for instruction in a student's IEP such as small group, chunked instruction, extended time or modified work will be met in this lesson.

Real-life Connection: The students can connect to this lesson by understanding that in order to survive or make it through changes, we have to adapt. While their bodies won't change, students can learn that they will have to change how they do things when they are faced with an obstacle. In addition, this lesson provides a lot of opportunities for group work, team collaboration and communication that the students need in their daily lives.

Is there a real-life connection to this lesson? If so, what is it? How have you considered culturally responsive teaching practices? How will students connect to the lesson in their everyday lives?

Possible Misconceptions:

- What traits, inheritance, and adaptations are
- What examples of environmental changes could be
- Why animals have to adapt and that animals haven't always looked the way they do now
- How to use sentence frames in a paragraph

Lesson Procedure:

5E Model	5E Objectives
<p>Engage</p> <p><i>Introduce the lesson with an anchoring phenomenon. Facilitate student questions, discussion, etc. as appropriate. Learn about</i></p>	<p>Procedure:</p> <ul style="list-style-type: none"> • Start lesson by having students do a KWL on birds and their beaks. Students can share what they know and their questions by doing a Rally Robin with their partner. During this KWL, teacher will show photos of different beaks from https://www.globe.gov/globe-community/blogs/community-blogs/-/blogs/17604575/maximized • Students will make observations about the beaks and try to determine what type of food each

what students already know and want to know.

beak is used for

- Put students into groups and give them each a page from *Beaks!* By Sneed B. Collard III. Have students read and do a jigsaw by answering the questions: “What is the bird?” “What is their habitat?” “How does their beak help them survive?” “Why do you think their beak has to be the shape it is?”
- When students are done with the jigsaw, have them share their information about the bird and beak they read about. The teacher can create an anchor chart with the different beaks and birds.
- Class discussion on the question “*Does your food and environment affect your body’s shape?*” – 5 minutes. Students can do a turn and talk or stand up hand up pair up.
- Activity: Every student gets a pair of chop sticks and a plate of birdseed. Tell the students this is their beak. Have students start picking up the food on the plate. Then yell loudly “*Oh no! There has been a natural disaster and there is no more birdseed! What else can you eat with your beak?*” Have the students do an all write round robin where each student shares one thing they think the bird can eat and all of the students write it down together.
- Have the students share out in groups what they think the birds can eat. Then, have each group pick the food they want their bird to eat and have that be their team name.

Modifications: For the discussions and writing, students will be given sentence frames to help them communicate effectively. All sentence frames will be determined the WIDA levels of the ELL students and will vary depending on language level. When students are doing the jigsaw, low readers will be paired with higher readers so they can still interact with the text. All students will be able to highlight or annotate their text in order to gather information.

Standards Addressed

Use evidence to support the explanation that traits can be influence by the environment (3-LS3-2).

Different organisms vary in how they look and function because they have different inherited information; the environment also affects the traits that an organism develops (SC.3.2.3)

Formative/Summative Assessments: The formative assessment will be based on student answers and participation during the class and group discussions. I will also be assessing how they

	<p>understood their text during the jigsaw by their ability to answer the text dependent questions about their bird and beak. The data will be gathered through student work and teacher observation.</p> <p>Resources:</p> <p>Sticky notes for KWL</p> <p><i>Beaks!</i> By: Sneed B Collard III</p> <p>Beak photos from https://www.globe.gov/globe-community/blogs/community-blogs/-/blogs/17604575/maximized</p> <p>Pages from the text on hummingbirds, herons, woodpeckers, seed eaters, flamingoes, and warblers.</p> <p>Pencils</p> <p>Anchor chart for teacher to record information</p> <p>Bird seed</p> <p>Chop sticks</p> <p>Plates</p>
<p>Explore</p> <p><i>Plan for students to engage in hands-on activities that are designed to facilitate conceptual change.</i></p>	<p>Procedure:</p> <ul style="list-style-type: none">• Review the learning targets: “I can describe how a change in an environment can cause a variation in the shape of a birds’ beak. I can design and build a beak for a specific food source. I can explain why adaptations are important for an animal to survive in their habitat”• Each group will be given a design sheet. On the sheet students will draw and label their beak design. Students will be given jobs such as designer, supplier, builders, and testers. Once they have designed their beak, the supply gatherer will bring the necessary supplies over to

the table for students to construct their beaks.

- While students are building the teacher can hand out food sources to the groups.
- Food Sources: nectar = graduated cylinder/tall cup with water, small animals – puff balls hidden, bugs=plastic bugs in a bowl of sand, fish = sponge in a bucket of water, fruit =gelatin beads (orbies)
- Once the beaks are constructed have students use the beak to pick up their designated food. Once they have used the beak, allow them a few minutes to revise their design to make it more effective.

Modifications: Students will be given jobs based on their interests and abilities so they can all have equal participation in the building of the beaks. For the design sheet, there will be a word bank students can use for key vocabulary.

Standards Addressed

Use evidence to support the explanation that traits can be influence by the environment (3-LS3-2).

Different organisms vary in how they look and function because they have different inherited information; the environment also affects the traits that an organism develops (SC.3.2.3)

Formative/Summative Assessments: The formative assessment will be based on their beak design, group participation, knowledge of adaptations, and the understanding of cause and effect. It will be gathered through student work, design sheet and teacher observation.

Resources:

- Build a Beak design sheet
- Beak supplies: chopsticks, rulers, plastic cups and cutlery, socks, straws, cardboard, tape, rubber bands, tape
- Food supplies: graduated cylinder/tall cup, cotton balls, string, plastic bugs, bowl of sand/soil,

	sponge, bucket, floral beads (orbies)
<p><u>Explain</u></p> <p><i>Facilitate opportunities for students to explain their understanding of concepts and processes and make sense of new concepts.</i></p>	<p>Procedure:</p> <ul style="list-style-type: none">• Each team will have a turn presenting their beak to the class. They will explain the design and adaptations of their beak, then they will demonstrate how the beak helps them eat food• Once all teams are done sharing, everyone will test the beaks to see if they work. Students will have to leave a compliment or question at each beak to provide feedback to their peers. <p>Modifications: There will be sentence frames and phrases available for students to use to help them give feedback and compliments on other beak designs.</p> <p>Standards Addressed</p> <p><i>Use evidence to support the explanation that traits can be influence by the environment (3-LS3-2).</i></p> <p><i>Different organisms vary in how they look and function because they have different inherited information; the environment also affects the traits that an organism develops (SC.3.2.3)</i></p> <p>Formative/Summative Assessments: I will be conducting one of the summative assessments on their finished beak design. This will be graded based on a rubric. The formative assessment will be conducted based on their understanding of cause and effect, knowledge of adaptations, and design during their group presentation. This knowledge will also be assessed based on the feedback they give other beak designs. The formative assessment data will be collected by teacher observation and student work.</p> <p>Resources:</p> <ul style="list-style-type: none">• Sticky notes• Pencils

<p><u>Elaborate</u></p> <p><i>Provide applications of concepts and opportunities to challenge and deep ideas; build on or extend understanding and skills.</i></p>	<p>Procedure:</p> <ul style="list-style-type: none">• Based on feedback and their presentation, allow students about 5 minutes to revise their beak one last time to ensure it is as effective as possible.• Have a class discussion with the following guiding questions: “<i>What would adapting to different food sources, look like for other animals? What other changes in an creatures environment could cause it’s body to change?</i>” Have students do a stand up, hand up, pair up and share their thoughts with a partner.• Provide three examples of animals (giraffe, polar bear, and tree frog) and have the students practice answering these guiding questions with the animals. Students can write their responses on a white board and share with a partner.• Teacher should list all possible environmental changes on an anchor chart for student reference. <p>Modifications: Pictures of animals in their own habitats will be shown to students so they can have a visual of how the animal looks. Students will be given sentence frames to guide their discussions.</p> <p>Standards Addressed</p> <p><i>Use evidence to support the explanation that traits can be influence by the environment (3-LS3-2).</i></p> <p><i>Different organisms vary in how they look and function because they have different inherited information; the environment also affects the traits that an organism develops (SC.3.2.3)</i></p> <p>Formative/Summative Assessments: The formative assessment will be based on student responses and participation in the group discussions. The teacher will be looking for their understanding of cause and effect, and adaptations. This will be collected through teacher observation.</p>
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	<p>Resources:</p> <p>Photos of a giraffe, tree frog, and polar bear</p> <p>White boards and markers</p> <p>Sentence frames</p> <p>Anchor chart</p>
<p><u>Evaluate</u></p> <p><i>Assess students knowledge, skills and abilities.</i></p>	<p>Procedure:</p> <ul style="list-style-type: none">• Teacher will hand out the adaptation work sheet• Students will pick any creature, except for humans, and an environmental change and draw a picture of how the animal's body will have to change. They will label the adaptations and write a paragraph explaining how the animal will have to change. <p>Modifications: Students who struggle with writing will be given sight word cause and effect sentence frames such as “_____ so _____” to write their adaptations, and they will be able to label their drawing. All students will be given higher level cause and effect sentence frames to use in their paragraphs.</p> <p>Standards Addressed</p> <p><i>Write informative/explanatory texts to examine a topic and convey ideas and information clearly. (CCSS.ELA-Literacy.W.3.2).</i></p> <p><i>Use evidence to support the explanation that traits can be influenced by the environment (3-LS3-2).</i></p> <p><i>Different organisms vary in how they look and function because they have different inherited information; the environment also affects the traits that an organism develops (SC.3.2.3)</i></p>

Formative/Summative Assessments: The summative assessment will be given to students and they will have to pick an animal and an environmental change and draw a picture of how the animal will have to adapt to survive. After that, students will write a paragraph explaining how their animal's body will have to change due to the environmental change. This assessment will be graded using a rubric. I will give a formative assessment to each student to complete individually about how they feel they worked in a group and how their group worked together, as well as on their understanding of adaptations.

Resources:

- Adaptation Summative assessment
- Student reflection sheet
- pencils

Teacher Background: In order to teach this lesson, teachers need to have a clear understanding of the NGSS and CCSS standards they need to meet. From there, teachers need to understand the concepts being taught in the lesson like the cause and effect relationship between adaptations and environmental changes. Finally, teachers need to have an understanding of their class dynamics. They need to know which students can work together, which groups are best, as well as the academic levels of their students for supportive groupings. Teachers should know the language levels of their students and their academic needs so they can properly differentiate and modify to meet all student needs.

Grading rubric for the discussions and participation				
	Success Criteria	2pts	1pts	0pts
Preforms the role they are assigned for building the beak	Students perform their role in the group project to help the group succeed		Students somewhat preform their role but other students have to do part of their job	Student does not fulfill their role in the group project
Students will participate productively and positively in a group	Students are respectful of the opinions of others, focused and on task during the group		Students are either respectful of opinions of others, or focused on the	Student does not participate productively or positively

	work and the discussions	task but not both	
Students contribute ideas	Students contribute new ideas that are on topic and push the thinking of others	Students contribute a few ideas but they do not challenge thinking	Student does not contribute any ideas or new information

Grading rubric for the finished beak					
Success Criteria	4pts	3 pts	2pts	1pts	0pts
Properly adapted	Beak is successfully adapted to “eat” food after 2 trails and many changes were made	Beak is mostly adapted after 2 trails and a few changes	Beak is somewhat adapted after 2 trails but some changes were made	Beak is hardly adapted after 2 trails but almost no changes were made	The beak is the chop sticks from the beginning of the lesson and has not been adapted. After 2 trails, the beak was not changed
Beak is able to pick up food	The beak is able to	The beak picks	The beak picks	The beak picks	The beak is unable to

	pick up food successfully	up most food	up some food	up 1-2 pieces of food	pick up any food
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Grading rubric for the adaptations worksheet					
Success Criteria	4 pts	3 pts	2pts	1pts	0pts
Appropriate environmental change	An environmental change is selected that would be highly realistic in the animal's habitat	An environmental change is selected that would be mostly realistic in the animal's habitat	An environmental change is selected that is somewhat realistic for that animal's habitat	The environmental change is not selected OR does not fit in the habitat	No environmental change is selected
Animal is adapted to meet the change	Animal has appropriately been adapted and all adaptations are labeled.	The animal has been mostly adapted and most adaptations are labeled.	The animal has been somewhat adapted to the environmental change and some adaptations are labeled.	The animal has only 1 adaptation that is labeled	Animal has not been adapted to the environmental change
Explanation of change	Strong explanation is given with 3-4 examples of how the animal needs to change. A clear explanation of why they would need to adapt is given.	A mostly clear explanation of adaptations, has 2-3 examples that mostly explain why the animal would need those adaptations.	A somewhat clear explanation of adaptations, 1-2 examples that somewhat explain why the animal would need those adaptations.	Explanation of the adaptations is not clear, only 1 example of why the animals need those adaptations is provided, and example is not	No explanation or examples are given

				explained.	
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BUILD A BEAK

Jobs for group members:

Suppliers:

Food Source:

Designers:

Builders:

Testers:

Plan #1:

Test results:

Plan #2:

Test results:

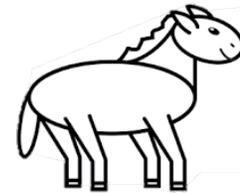
Adaptations

Name:

Creature:

Change in the environment:

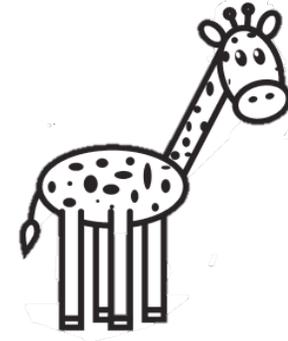
Original Creature:
Example:



How it changes:

Adapted creature:

Example:



Why:

SELF ASSESSMENT

Name _____

Date _____

I am frustrated



I'm confused



I feel confident



I could teach this



How I feel about cause and effect.	
How I feel about animal adaptations.	
How I feel about design and engineering.	
How I feel about our class	

Group mates: _____

How I feel about my groupmates' work.	
How I feel about my group's discussion.	
How I feel about my group work today.	

discussions.			
How I feel about the world today.		How I feel about the independent work I did today.	
Other notes or questions:			

Work Cited for Resources

Collard, S. B. (2002). *Beaks!* Reed Business Information, INC.

Malmberg, J. (2016, May 4). *Bird Beaks and What They Eat*. The Globe Program. Retrieved from <https://www.globe.gov/globe-community/blogs/community-blogs/-/blogs/17604575/maximized>.