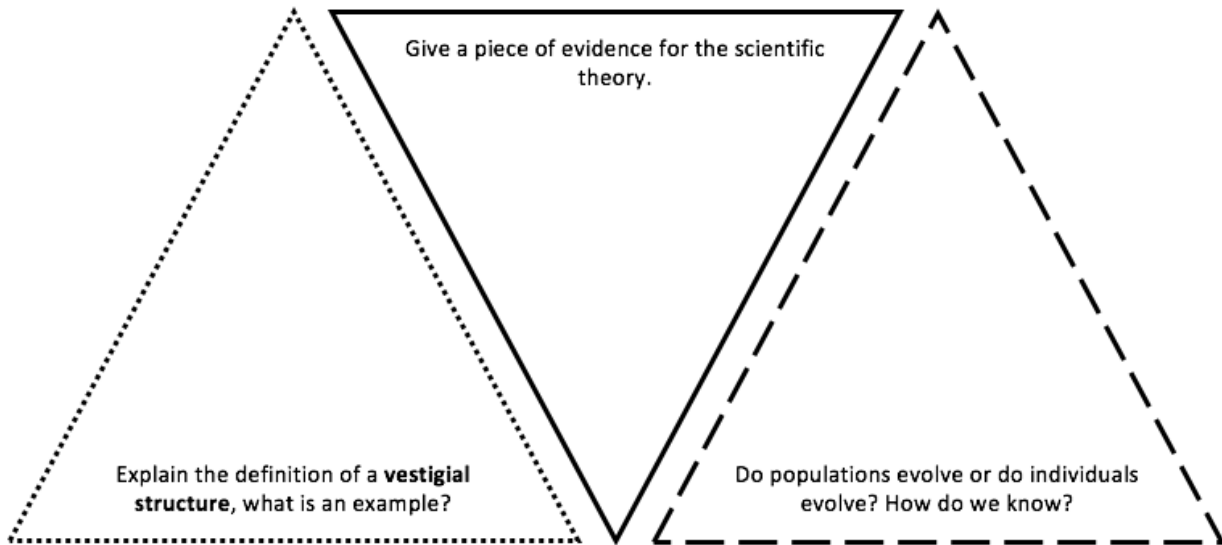| School:	Richmond Heights Middle School	Subject:	Natural Selection	Teacher:	Ebonie Battle-Williams	Lesson Plan Date:	2/21/17

<table>
<tr><td rowspan="10">PRE-PLANNING</td><td colspan="2">OBJECTIVE
What will your students be able to learn?</td><td>BENCHMARK:</td></tr>
<tr>
<td colspan="2">

Meaning of natural selection
Conditions for natural selection
How survival of the fittest plays a role for natural selection
Not all adaptions are necessarily "good"
Various species will thrive and survive in different locations around the world due to the resources available

</td>
<td>SC.7.L.15.2 – Explore the scientific theory of evolution by recognizing and explaining ways in which genetic variation and environmental factors contribute to evolution by natural selection and diversity of organisms.
SC.7.L.15.3 – Explore the scientific theory of evolution by relating how the inability of a species to adapt within a changing environment may contribute to the extinction of that species.
SC.7.N.3.1 – Recognize and explain the difference between theories and laws and give several examples of scientific theories and the evidence that supports them.</td>
</tr>
</table>

ASSESSMENT *"Begin with the End in Mind"*
How will you know whether your students have made progress toward the objective?   How and when will you assess mastery?

The activity for this lesson is group based and an artificial representation of natural selection. Students will work with their tables to create an optimal tool for picking up their designated candy. They will have the opportunity to "re-design" their tool to improve the amount of pieces they can pick up. Understanding will come from the idea that natural selection occurs and species develop adaptations to better fit their environment.

ESSENTIAL QUESTION
A higher order question that is directly derived from the benchmark, introduced at the beginning of the lesson, discussed throughout the lesson, and answered by students at the end of the lesson to show understanding of the concepts taught.

How does natural selection allow for some organisms to survive and others to perish?

HIGHER ORDER QUESTIONS (3-5)
What questions will be answered to provoke higher order thinking and include Moderate to High FCAT Complexity Levels? What would the ideal student response be for each question?

1. How can animals survive if their main source of food is either extinct or no longer available in the area which the particular species resides?
   o The animal will start to prey on a secondary species, possibly changing the chance of survival for the new prey since they didn't used to have to worry about the new predator.
2. In which ways do populations evolve (and not individuals)?
   o New traits are brought about with each individual. The traits can be good or bad and either help an individual survive or not. However, the individual does not change overtime, but rather the different traits are selected for so that they are passed on and the population survives.
3. Why are some new traits that arise in populations "bad" traits?
   o Not every organism can survive, there are more organisms born than can live in the world, therefore there will always be "lesser" traits that are less favorable than others. This results in some organisms thriving and reproducing while others die off. However, with time, new "bad" traits will present themselves and the cycle will continue.

	BELLRINGER Follow the Focus Calendar to provide reinforcement of previously taught skills.	**TIME** Approximate
LESSON	"Find someone who…" Students will work to find the answers to the evolution questions. The purpose of this type of bellringer is to encourage students to explain verbally the various definitions and to think about	*10 min*

how it makes sense in their own words.

Evolution Bellringer: Find Someone Who…

Give a piece of evidence for the scientific theory.

Explain the definition of a **vestigial structure**, what is an example?

Do populations evolve or do individuals evolve? How do we know?

INTRODUCTION
Brief part of the lesson when students learn the objective/essential question and how mastering the objective leads to achieving the bigger goal of the course.
- Provide a hook to motivate students and link to prior knowledge in order to introduce a new concept.
- Explain the relevance of lesson and the importance of learning the concept.
- Introduce important vocabulary using the word wall as an interactive learning tool.

A powerpoint on natural selection and guided notes will be presented to the students. See notes below.

MODELING *"I DO"*
Component of the lesson when teacher explicitly models to students exactly what they are expected to do during guided practice and eventually during independent work.
- Conduct a think aloud while modeling the steps to completing an activity or solving a problem.
- Model the use of a graphic organizer.
- Use questioning techniques such as re-directing, wait-time and prompting.

Explain common examples of natural selection. Particularly, go over the peppered moth industrial example and show how a change in the environment allowed for the dark-peppered moths to be selected for against the light colored moths because of camouflage.

25-30 min

GUIDED PRACTICE *"WE DO"*
Guide students to independent practice by providing an opportunity to work in small groups and practice what was taught during the modeled portion of the lesson.
- Incorporate the use of a collaborative strategy in small groups.
- Encourage student accountable talk during group discussion.
- Perform checks for understanding.

See documents below. Explain the natural selection tool experiment the students will be completing. This activity allows students to engineer their own tool to be used to pick up a certain type of food.

COLLABORATIVE PRACTICE *"THEY DO"*
Guide students to independent practice by providing an opportunity to work in small groups and practice what was taught during the shared portion of the lesson.
- Incorporate the use of a collaborative strategy in small groups.
- Circulate throughout the room and provide guidance to each group as needed.

With their groups, students will create a tool using the materials provided (see attached sheet) to pick up their designated food. After running 6 trials, students will have to re-design their tool in order for it to be better adapted for the food it is picking up. Students will then run 6 more trials with the new tool.	
INDEPENDENT PRACTICE *"YOU DO"* Differentiate your instruction to reach the diversity of learners in your classroom. • Assign students independent work that is directly aligned with the "I Do" and "We Do" portions of the lesson. • Conduct Center Rotations • Circulate around the room to provide individual support. • Pull small groups or individuals for more intensive support.	
Provide students with the activity question sheet. These questions will ask students to look at their data and see if the new tool was better or worse than the old tool for picking up food. (see attached sheet)	
CLOSURE Wrap up the lesson and help students organize the information learned into a meaningful context. • Have students reflect on or answer the Essential Question. • Help students connect today's learning to their bigger goal in the course.	*5 min*
Reflect and share the tools students made and how they were improved.	
HOME-LEARNING How will students practice what they learned? How will opportunities be provided for students to maintain mastery of previously mastered skills/concepts?	
N/A	

Natural Selection Notes

Natural Selection
- Organisms that are _____ to an environment survive and reproduce more than others

Darwin's Theory of Natural Selection
- Overproduction
- Variation
- Competition
- Selection

Overproduction
- Each species produces _____ than can survive

Variation
- Each individual has a combination of _____
  - _____: an inherited trait that increases an organism's chance of survival
- Why is variation important?
  - Environment _____
  - The more variation _____ a species, the more likely it will survive
  - The more variation of _____ in a habitat, the more likely at least some will survive

Competition
- Individuals compete for a _____ of resources
  - Food, water, space, mates
- Natural selection occurs through _____
  - Fitness = ability to survive and reproduce
- Not all individuals survive to adulthood

Selection
- The individuals with the _____ will survive and have the opportunity to pass on its traits to offspring
- Natural selection acts on the _____ appearance of organisms
- Individuals with traits that are not well suited die or leave few offspring

Summary: Evolution occurs when good traits build up in a population over many generations and bad traits are eliminated by the death of individuals.

Design Your Own Tool: Natural Selection Experiment

Directions:
Your instructor will assign you a food. With your group of 4-6 students, design a tool, using at least three of the materials distributed to you, that you believe will be optimal for picking up your designated food. After designing, you and your group must work together to build the tool, this is your "prototype". Place a pile of the food on your table and set a timer for 10 seconds. When the timer starts, use your tool to pick up as many pieces of food as possible and place it into a cup on the center of the table. Record your answer. Repeat for 6 total trials.

After you have completed with the 6 trials, think about with your group ways that your tool may have been more efficient. Think of a new design. Switching out one of the materials create a new tool, this is your "re-design". Using your new tool, repeat the procedure from above: use your tool to pick up as many pieces of food in 10 seconds, repeat the experiment 6 times.

Food options:
Marshmallows
Mini penne pasta / ditalini pasta
Macaroni pasta
Gummy bears
beans
rice

Materials for tool:
Tape
Modified fork / spoon OR Popsicle stick
straw / modified straw
String
Tin foil

Additional materials for experiment:
Cup

Prototype

Materials used: _____

Draw your design:

Data collection:

Trial Number	Time (seconds)	Number Collected
1	10	
2	10	
3	10	
4	10	
5	10	
6	10	

Re-Design

Materials used: _____

Draw your design:

Data collection:

Trial Number	Time (seconds)	Number Collected
1	10	
2	10	
3	10	
4	10	
5	10	
6	10	

1. How did your data differ for you prototype and re-design?

2. If this tool were actually the beak of a species in nature, would the redesign be a helpful or harmful adaptation?

3. Why are all traits not selected for (AKA why are not all adaptations "good" adaptations)?

4. In which ways does natural selection pick traits for organisms to survive?

NATURAL SELECTION

2.21.17

Natural Selection

- Natural Selection: Organisms that are **best adapted** to an environment survive and reproduce more than others

Darwin's Theory of Natural Selection

- Occurs in four steps
  - *Overproduction*
  - *Variation*
  - *Competition*
  - *Selection*

1. Overproduction

■ Each species produces **more offspring** than can survive

2. Variation

■ Each individual has a combination of <u>inherited traits</u>

   – *<u>Adaptation</u>: an inherited trait that increases an organism's chance of survival*

Adaptations

Why is variation important?

■ Environment <u>changes with time</u>

■ The more variation <u>within</u> a species, the more likely it will survive

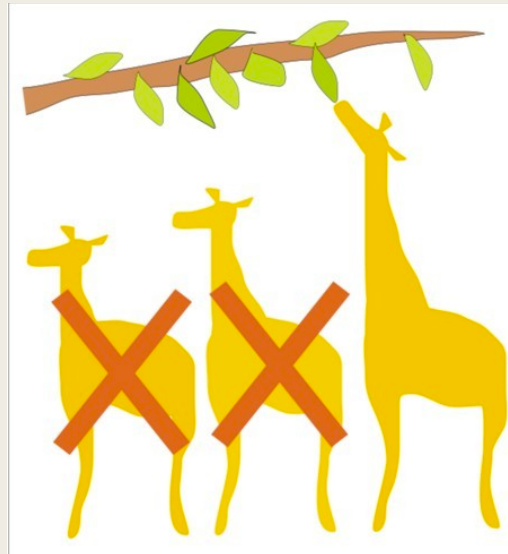■ The more variation of <u>types of species</u> in a habitat, the more likely at least some will survive

3. Competition

- Individuals compete for a <u>limited amount</u> of resources
  - *Food, water, space, mates*
- Natural selection occurs through <u>"survival of the fittest"</u>
  - *Fitness = ability to survive and reproduce*
- Not all individuals survive to adulthood

4. Selection

- The individuals with the <u>best traits</u> will survive and have the opportunity to pass on its traits to offspring

- Natural selection acts on the <u>outward/physical</u> appearance of organisms

- Individuals with traits that are not well suited die or leave few offspring

Evolution occurs when good traits build up in a population over many generations and bad traits are eliminated by the death of individuals.