ND EPSCoR Lesson Plan

Lesson Title: Strawberry DNA Extraction

Lesson Overview: Individuals of the same kind of plant or animal are recognizable as similar but can also vary in many ways. Students will use strawberries of varying shapes, sizes and colors and extract the DNA to compare the similarities and differences of the observable variations of traits that exist among similar organisms.

Topic(s): Life Science, Heredity: Inheritance and Variation of Traits

Grade or Grade Band: Third Grade

Lesson Objectives:

Collect data and record the variations in traits among a group of similar organisms
Use evidence to support an explanation
Analyze data to make sense of phenomena

Next Generation Science Standards:

LS3.A: Inheritance of Traits
Many characteristics of organisms are inherited from their parents.
LS3.B: Variation of Traits
Different organisms vary in how they look and function because they have different inherited information.

North Dakota Standards: Performance Standard 3-LS3-1 Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms

Time Needed (estimate): 2- 30 minute sessions

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Preparation/Materials

Background knowledge students must have to be successful:
Students should have the basic understanding that just like people, animals and plant can inherit certain traits from their parents.

Differentiation and accommodation to support learning for all students:

- Provide students with step-by-step picture instruction
- Allow students to work in groups
- Allow students to support explanations verbally or by using pictures.

Essential terminology:

- Traits- the characteristics of a plant that make it look the way it does such as color, size, weight, shape, number of seeds.
- Inherit-the characteristics of an organism passed down from a parent to its offspring
- Variation-the difference in characteristics that makes one organism distinct from another
- Organism-an individual animal, plant or single-celled life form

Resources:

Websites: https://youtu.be/C2fIN-TCUpw

Materials needed: each group will need

- **Rulers**
- **Small scale**
- **Resealable plastic bags**
- **Strawberries of varying shapes, sizes and colors (remove the green leaves)**
- **2 tsp Dish soap**
- **½ cup water**
- **Coffee filter or cheesecloth**
- **½ cup cold rubbing alcohol**
- **Wooden skewer or stick**

Attachments – PowerPoint, worksheets, etc. included at the end as separate attachments

Procedure/Activities

Lesson sequence:

Engage: Show students the picture of the white and red strawberries. Ask students if they have ever seen a white strawberry. Explain to students these white strawberries were created through breeding strawberries with specific traits.

Source: Meth-Wick Community: https://methwick.org/2020/03/dietitian-tips-exploring-hybrid-fruit/

Explore:

Day 1: Arrange students in small groups. Give each group a strawberry and the "Strawberry Traits" recording sheet. Assist students as they complete all of the observations and measurements of their strawberry. Once the recording sheet is complete, combine two groups together and have them use the "Strawberry Comparisons" graphic organizer to record how the strawberries are alike and different.

Day 2: Allow students time to discuss the similarities and differences of their strawberries. Explain to students that we will do an activity to pull the DNA out of the strawberries. DNA is the material inside strawberry cells that gives the fruit the information about how it will look.
Follow along with the Strawberry DNA Extraction video: https://youtu.be/C2fIN-TCUpw
or use the Strawberry DNA Extraction "Activity Directions"

After extracting the DNA, have students compare the DNA they extracted with other groups. Do some groups have more? Why? Does the DNA all look the same? Why?

Explain:

Explain to students that all living organisms have DNA. DNA is the material that carries information about how living things will look. You got your DNA from your parents and this is why you might have the same color hair, eyes or skin as your parents. What are other traits did you get from your parents?

Extensions for learning more about this topic:

DNA extraction can also be done with bananas, kiwis, raspberries and onions.

Consider having students compare the traits within their own family or use pictures of popular dog breeds and their offspring to compare the traits within the animal families.

Evaluation:

Ask students to write about the two topics below

1. What traits did the parents of your original strawberry likely have?
2. Do some groups have more? Why? Does the DNA all look the same? Why?

Additional Lesson Resources / Materials

Additional Materials:
Strawberry Traits Recording Sheet
Strawberry Comparisons Graphic Organizer
Shades of Red Chart
Strawberry DNA Extraction Activity Directions

References:

"Color Chart." *IColor Palette*, https://icolorpalette.com/color/dark-red. Accessed 1 June 2022.

"Dietitian Tips: Exploring Hybrid Fruit - Meth-Wick Community." *Meth-Wick Community*, 21 Dec. 2020, https://methwick.org/2020/03/dietitian-tips-exploring-hybrid-fruit/.

Strawberry DNA Extraction

Activity Directions

1. Place 3-4 strawberries in a Ziplock bag.
2. Push all the air out of the Ziplock bag and smash the strawberries. Make sure to break down all the big chunks. It should look like a smoothie
3. In a small cup mix 2 teaspoons of dish detergent, 1 teaspoon of salt and ½ cup of water.
4. Add 4 tablespoons of the solution to the strawberry mash
5. Push all the air out again and mix the mash with the solution. Be gentle as not to get to many bubbles. The soap and the salt in the solution help break down the cells to easily extract the DNA.
6. Prepare the cup and cheesecloth or coffee filter for straining. Put the cheesecloth over the cup and create an indent. Then put a rubber band around the cup to secure the cloth.
7. Pour the strawberry mash into the indent of the cheesecloth and allow the liquid to strain to the bottom. The cloth will collect all the bits of strawberry. The liquid draining to the bottom will hold the DNA.
8. Once the solution has drained through the cheesecloth, carefully remover the cloth and rubber band. Make sure not to lose any of the strawberry chunks. Discard the cloth and strawberry chunks in the Ziplock bag.
9. Pour the strawberry solution into the test tube about 1/3 full. If you do not have access to test tubes, leave the solution in the cup.
10. Use pipettes to add ice cold isopropyl alcohol to the strawberry solution.
11. Watch as bubbles leave the strawberry solution and go into the alcohol. The bubbles will have white stringy mucus attached. This is the DNA being pulled up into the alcohol
12. Use a skewer to pull the DNA out of your test tube or cup. Strawberries have 8 copies of DNA making it easy to extract DNA. Humans only have 2 copies.

Name: _____

Strawberry Traits Recording Sheet

Observe, measure, and record the following characteristics of your strawberry.

Describe the shape: _____

Weight: _____

Height: _____

Width: _____

Color: _____

Use the color chart from the last page

Firmness: Very Hard Hard Medium Soft Mushy

Texture: Wrinkly Fuzzy Lumpy Prickly Smooth Bumpy

Seed Color:

Name: _____

Strawberry Comparisons

Group 1 Member Names

Group 2 Member Names

Describe in as much detail as possible how the **strawberries are alike** in shape, size (weight, height, width), color, firmness, texture, defects, seed color.

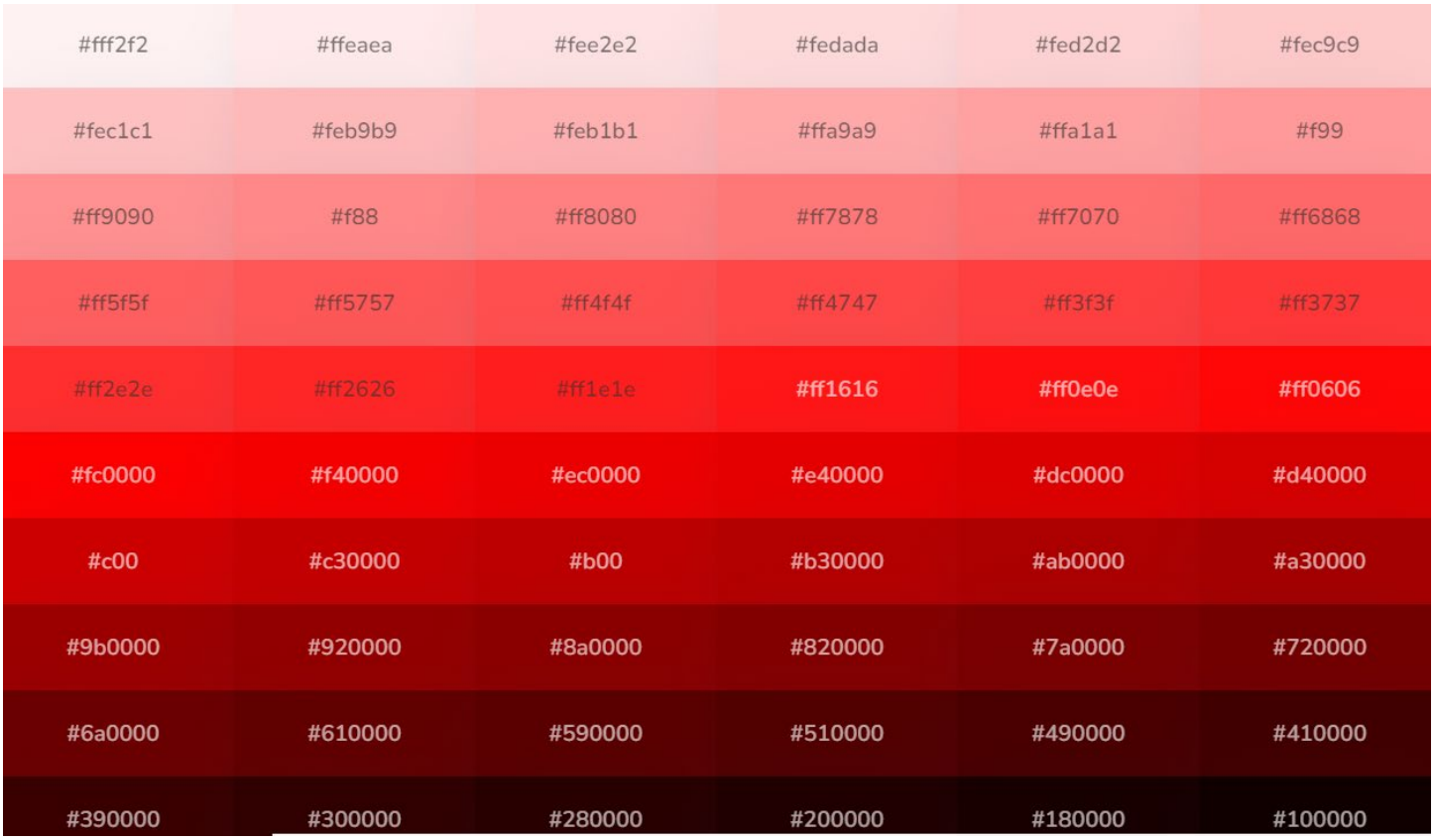
List the characteristics of two strawberries that are different.

Group 1 Strawberry

Group 2 Strawberry

Name: _____

Shades of Red Chart



https://icolorpalette.com/color/dark-red