**Science Shoebox Activity By: Tosha Cook** 

**Title: Plastic Heart Genetics**

**Grade 5 Heredity**

**Content Standard** 4 – Heredity

**Grade Level Expectation: 0507.4.1** Describe how genetic information is passed from parents to offspring during reproduction.

**Performance Indicators State:**

**SPI 0507.4.1** Recognize that information is passed from parent to offspring during reproduction.

**Task Objectives:** Students will evaluate what traits they and their parents have. Students will use this information to determine their own alleles. Students will then use Punnett squares to predict the offspring between their alleles and those of the plastic hearts.

**Materials (Plastic Hearts)**

12 plastic heart containers, 12 sets of 7 genotype codes (a set of 2 alleles for each represented characteristic or phenotype)

**Materials for Observations**

An Inventory of My Traits chart, An Inventory of My Parents’ Traits chart, Punnett Squares, key for dominant and recessive genotype codes, pencil with eraser, Activity Log (Direction Sheet), Folder to leave completed work (will be used to asses students work)

**Background Knowledge for Teachers**

“Physical traits are observable characteristics determined by specific segments of DNA called genes. Every cell (except eggs and sperm) in an individual’s body contains two copies of each gene. This is due to the fact that both mother and father contribute a copy at the time of conception. This original genetic material is copied each time a cell divides so that all cells contain the same DNA. Genes store the information needed for the cell to assemble proteins, which eventually yield specific physical traits.

Most genes have two or more variations, called alleles. For example, the gene for hairline shape has two alleles – widow’s peak or straight. An individual may inherit two identical or two different alleles from their parents. When two different alleles are present they interact in specific ways. For the traits included in this activity, the alleles interact in what is called a dominant or a recessive manner. The traits due to dominant alleles are always observed, even when a recessive allele is present. Traits due to recessive alleles are only observed when two recessive alleles are present. For example, the allele for widow’s peak is dominant and the allele for straight hairline is recessive.”

**This background knowledge was downloaded from:** <http://learn.genetics.utah.edu/teachers> - Inherited Human Traits: A Quick Reference

If an individual inherits:

* Two widow’s peak alleles (both dominant), their hairline will have a peak and they will be homozygous  dominant
* One widow’s peak allele (dominant) and one straight hairline allele (recessive), they will have a widow’s peak and be heterozygous dominant
* Two straight hairline alleles (recessive), their hairline will be straight and be homozygous recessive

**Across the Curriculum**

**Math**

Students will use Punnett squares to help evaluate how probability can be used to predict possible genotypes in offspring. By using fractions or ratios, students can also determine the likelihood of having a child of a specified genotype when given examples of two parent genotypes.

SPI 0506.5.1 Depict data using various representations, including decimal and/or fractional data

**Social Studies**

Discuss and compare the similarities and differences of the class’ traits with those of another racial and ethnic group. If you have a multicultural classroom, the students can discuss and compare the similarities and differences among each other.

5.6.tpi.10. Identify the similarities and differences within and among selected racial, ethnic, and religious groups in the United States.

**Language Arts**

Students will use information from charts provided and graphs made to locate information during this activity.

SPI 0501.6.3Locate information using available text features (e.g., maps, charts, graphics)

**References**

* Topics to be covered - bugbabies.pdf
* Vocabulary Graphic Organizer – GO\_4squarevocab\_genetics.pdf
* Background Information for Teacher – reference guide.pdf (**This activity was downloaded from:** <http://learn.genetics.utah.edu/teachers>)
* Idea to use plastic hearts and Punnett Squares – geneticplasticeggs.pdf
* Additional ideas – traits.pdf

**Plastic Heart Genetics Student Instructions**

1. Complete the “*An Inventory of My Traits – Data Table”*

* Write “Yes” if you have the mentioned trait
* Leave the space blank if you do not have the trait
* *NOTE: If you mark a yes (stating that you have the trait), at least one parent must also have the trait*

|  |  |
| --- | --- |
| **Trait** | **You** |
| **Tongue Rolling** |  |
| **Freckles** |  |
| **Widow’s Peak** |  |
| **Free Hanging Earlobes** |  |
| **Cleft Chin** |  |
| **Hitchhiker’s Thumb** |  |
| **Dimples** |  |

1. Complete the “An *Inventory of Your Parents’ Traits – Data Table”*

* *Mark “Yes” for each trait your dad has*
* *Mark “Yes” for each trait your mom has*
* Leave the space blank if they do not have the trait

|  |  |  |
| --- | --- | --- |
| **Trait** | **Your Dad** | **Your Mom** |
| **Tongue**  **Rolling** |  |  |
| **Freckles** |  |  |
| **Widow’s**  **Peak** |  |  |
| **Earlobes** |  |  |
| **Cleft**  **Chin** |  |  |
| **Hitchhiker’s Thump** |  |  |
| **Dimples** |  |  |

1. For every trait you mark a yes for (represent the dominant trait), you may make an educated guess to determine if you are homozygous or heterozygous dominate.

* Ex. You and your parents all represent a dominant specific trait. Your father could be RR while your mother could be Rr, meaning it is possible for you to be RR or Rr.
* To determine if you are homozygous or heterozygous dominant you will have to use the “An *Inventory of My Parents’ Traits – Data Table” to make your educated guess*

Key for Dominant and Recessive Genotype Codes

|  |  |  |
| --- | --- | --- |
| **Trait** | **Dominant** | **Recessive** |
| **Tongue Rolling** | Can Roll  (RR or Rr) | Can’t Roll  (rr) |
| **Freckles** | Have Freckles  (FF of Ff) | No Freckles  (ff) |
| **Widow’s Peak** | Widow’s Peak  (WW or Ww) | Straight Hairline  (ww) |
| **Earlobes** | Free Hanging  (AA or Aa) | Attached  (aa) |
| **Cleft Chin** | Have Cleft  (CC or Cc) | No Cleft  (cc) |
| **Hitchhiker’s Thumb** | Hitchhiker’s  (HH or Hh) | Straight  (hh) |
| **Dimples** | Have Dimples  (DD or Dd) | Do Not Have Dimples  (dd) |

1. For every trait you indicate that you do NOT have, you are automatically homozygous recessive.

* Note: Remember, this means you have two recessive (lower case) alleles.

1. Be sure you have verified your genotype (alleles) for each phenotype (characteristic).
2. You will now each select at least 2 plastic hearts and only open one heart at a time (per person).

* Be sure to place all contents back into the heart, close, and place back into the box before opening your next.
* Each heart contains the alleles (genotypes) of the 7 characteristics (phenotypes) you have determined for yourself.

1. You will now evaluate the possible offspring when combining your alleles with the alleles in the heart using a Punnett Square.

* Example of how to fill out a Punnett Square.

D

D

DD

DD

D

Phenotype:

Heart represents ½: DD

I represent ½: Dd

Genotype:

( D D ) X ( D d )

Dd

Dd

d

You will use 7 Punnett squares per plastic heart. Write your two alleles in the two side underlined boxes. Write the two alleles from the heart in the two underlined top boxes. You are now ready to evaluate the offspring. Remember one Punnett square represents the outcome of one (SAME) characteristic.

Freckles

Tongue Rolling

 

Earlobes

Widow’s Peak

 

Dimples

Cleft Chin

 

Hitchhiker’s Thumb

Hitchhiker’s Thumb

 

Freckles

Tongue Rolling

 

Earlobes

Widow’s Peak

 

Dimples

Cleft Chin

 

1. Please take a few moments and jot down what was the most difficult or confusing part of this activity (for you).

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Clean Up

* Be sure there are seven genotype codes per heart
* Be sure each heart contains the same shape, color, and paper type
* Place all hearts back into the box
* Leave your completed activity log (direction sheet) in the finished work folder
* Remember to place the folder back into the box
* Please leave the box as neat and tidy as you found it

**FACT Preparation**

**#36: Muddiest Point**

**Description:**

“*Muddiest Point* is a commonly used, quick monitoring technique in which students are asked to take a few minutes to jot down what the most confusing or difficult part of a lesson was for them (Angelo & Cross, 1993).

Promotes Student Learning:

This FACT allows students to think about their own learning and what they found easy or difficult to understand. This is especially helpful for shy students who typically do not speak up when they do not understand or need help.

Informs Instruction:

This FACT is a monitoring strategy that provides immediate feedback from students to assist teachers in making needed instructional adjustments. Teachers can use this information to prepare strategies and activities to assist student learning.

Reflection:

This FACT seems very easy to use and is not very time consuming. A teacher could use the Muddiest Point for any subject lesson and homework. Unfortunately, this FACT tends to only point out the negative and should be varied with POMS- Point Of Most Significance to allow students to point out the positive and most understood parts of a lesson or activity. I chose to incorporate this FACT into my Science Shoebox, because students will be taking part in the activity with little to no teacher supervision to determine students’ understanding or difficulty.

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_

Plastic Heart Genetics 

Directions:

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|  |  |  |
| --- | --- | --- |
| **Trait** | **You** | **Your Genotype**  **(complete with steps 3-5)** |
| **Tongue Rolling** |  |  |
| **Freckles** |  |  |
| **Widow’s Peak** |  |  |
| **Free Hanging Earlobes** |  |  |
| **Cleft Chin** |  |  |
| **Hitchhiker’s Thumb** |  |  |
| **Dimples** |  |  |

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| **Freckles** |  |  |
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1. Be sure you have verified your genotype (alleles) for each phenotype (characteristic).

* Return to the chart located on step 1 and enter your genotype

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