MAKE YOUR OWN SUPER HERO!

A Project Based Lesson

The Probability of Genetics | Kelly Powers

Purpose:

Students will utilize probability to determine genetic characteristics of Superheros. Students will further this understanding by manipulating the genetics, to engineer offspring with desired characteristics.

Standards Addressed:

Mathematics (Arizona 2008 Mathematic Standards) –

- M06-S2-C2-PO2 - Use theoretical probability to:
    - predict experimental outcomes,
    - compare the outcome of the experiment to the prediction,
    - replicate the experiment and compare results.

- M06-S2-C2-PO3 - Determine all possible outcomes (sample space) of a given situation using a systematic approach.

Science (Arizona 2004 Science Standards) –

- S08-S4-C2-PO2 -   Explain the basic principles of heredity using the human examples of:
    - eye color
    - widow's peak
    - blood type

- S08-S4-C2-PO3 - Distinguish between the nature of dominant and recessive traits in humans.

Language Arts (Arizona 2004 English Language Arts Standards) –

- W06-S3-C2-PO2 - Write a summary based on the information gathered that include(s):
    - o a topic sentence
    - o supporting details
    - o relevant information

- W06-S3-C2-PO3 - Write a **process essay** that includes:
    - o a **thesis statement**
    - o supporting details
    - o introductory, body, and concluding paragraphs

Art (Arizona 2006 Art Standards)

- A-S1-C1-PO401- Develop and revise plans, (e.g., sketches, models, and notes) for his or her own artwork and select the best option.

- A-S1-C1-PO402 - Create a body of his or her own artwork .

- A-S1-C4 - PO201 - Explain purposeful use of subject matter, **symbols,** and/or **themes** in his or her own artwork .

Key Skills Assessed

- Student's correct use of Punnett hereditary squares.

- Determining the best gene combination to increase probability of a desired result.

- Writing a news article provides a thesis and three supporting details on the nature of the superhero.

Habits of Mind

- Persistence
    o Staying focused on a difficult problem

- Managing impulsivity
    o Spending time to find the correct solution, which is not necessarily the first

Goal:

Students will be able to answer: "How does probability affect both our genetic makeup but also our outward appearance?"

Day 1:

Objective: Students will be able to identify dominant and recessive genes and complete a Punnett Square correctly.

Lesson: Students are instructed on how probability and Punnett Squares identify the genetic code of each person and how this affects the outward appearance.

Vocabulary: Dominant gene, Recessive gene, Punnett Square, Hereditary.

Materials: Punnett Square worksheet

Day 2:

Objective: Students will be introduced to the superhero "genetics" that are similar to humans, but include more genes due to mutation.

Lesson: Students are instructed on how probability and Punnett Squares identify the genetic code of each superhero and how this affects the outward appearance.

Vocabulary: Dominant gene, Recessive gene, "Mutated" gene, Punnett Square, Hereditary.

Materials: Super hero Punnett Square worksheet

Day 3:

Objective: Students will be able to complete a Super Hero Punnett square and determine the characteristics of the offspring.

Lesson: Students compete a super hero punnett square and determine the outward characteristics, powers, and genetic makeup of the offspring.

Materials: Super hero Punnett Square worksheet

Product: Students will complete a final picture of their superhero, including a name.

Day 4:

Objective: Students will complete a brainstorm activity and begin a rough draft of a news article detailing out the nature, good vs. evil, of the produced superhero with three events supporting the determination.

Lesson: Students complete a web detailing the genetic makeup of their hero and what events occur allowing the use of these characteristics. A rough draft is started as brainstorming is completed.

Materials: Brainstorm web

Product: Students will complete the writing process on a news article detailing three events that lead to a conclusion on the superhero's nature, good vs. evil.

Day 5:

Objective: Students will be able determine a suggested spouse for their superhero, focusing on increasing the probability of certain genetic characteristics.

Lesson: Students have been approached by a "group" who wants to increase the genetic likely hood of certain characteristics. Determine what genetic makeup a spouse must have to increase the offsprings chances of exhibiting the requested characteristics.

Vocabulary: Genetic Engineering

Materials: Super hero Punnett Square worksheet, "Group" request form

Product: Students will complete the request form detailing the genetic needs of a spouse to increase the probability of the desired characteristic, as well as the correctly calculated increase of probability.

Day 6:

Objective: Students will be editing the rough draft and completing necessary revisions/editing.

Lesson: Students to provide their newspaper editor the completed rough draft of their story for the *Power City Daily Paper.*

Materials: Newspaper story layout

Day 7:

Objective: Students will present their superheros, explain the "group" characteristic they were tasked with and the probability statistics.

Lesson: Students will present the genetic makeup of their superhero and how the suggested spouse will ensure a greater probability of a desired characterisitic.

Materials: Super hero picture, final copy of news article

Assessment:

Product: News Article

Criteria:

1. Standard English formatting, indentation, capitalization, and punctuation are used correctly.
2. Sentence structure is complete and varied.
3. A thesis sentence is present.
4. Three supporting details of the thesis statement are present and developed.

Product: News Article			
KNOWLEDGE AND SKILLS NEEDED	**ALREADY HAVE LEARNED**	**TAUGHT BEFORE THE PROJECT**	**TAUGHT DURING THE PROJECT**
1. The writing process	X		
2. Development of a Thesis statement	X		
3. Three supporting details/events	X		

Product: Drawing of Superhero

Criteria:

1. Characteristics derived from the Punnett Square are all evident through artistic representation or symbols.
2. An appropriate name is given to the offspring.

Product: Superhero Representation			
KNOWLEDGE AND SKILLS NEEDED	**ALREADY HAVE LEARNED**	**TAUGHT BEFORE THE PROJECT**	**TAUGHT DURING THE PROJECT**
1. Genetic Characteristics evident through representation or symbolism			X

Product: Spouse Genetics

Criteria:

1. Desired characteristic is defined.
2. Suggested spouse genetic makeup is fully presented.
3. A completed Punnett Square showing the increased probability of the desired characteristic resulting from the union.
4. Correct probability calculations for the desired characteristic resulting from the proposed union.

Product: Spouse Genetics			
KNOWLEDGE AND SKILLS NEEDED	**ALREADY HAVE LEARNED**	**TAUGHT BEFORE THE PROJECT**	**TAUGHT DURING THE PROJECT**
1. Punnett Square process			X
2. Theoretical probability calculation	X		
3. Recessive and Dominant Gene identification			X