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EDU 497
Interdisciplinary Lesson Plan

Title: Snake Eyes

Grade Level: 7

Time Required: 50 minute class period the first day and 20-30 minutes the following session for discussion.

Objective:
Understand that probability is the number of ways to achieve success divided by the number of total possible outcomes.
Understand how dice can be used to simulate dominant and recessive genes.

Standards:

Montana Standards
1) Statistics and Probability:
-Use random sampling to draw inferences about a population.
-Investigate chance processes and develop, use, and evaluate probability models.

NCTM
1) Process
-Students are expected to effectively communicate their mathematical thinking verbally to one another and to the teacher on paper.
2) Connections
-Students are expected to apply their mathematical knowledge to the concept of Punnett squares and the probability questions they produce.
3) Probability
-Students should understand the basic properties and concepts of probability such as the sample space, mutually exclusive events, and calculating the likelihood of events.

Materials:
Whiteboard or Smartboard to conduct the introduction to the activity.
Enough dice for 2 dice per two-person group.
Worksheet for each student.

Assessment:
The questions that go along with the worksheet test the students' understanding of the topic.

Lesson Layout

It is expected the students just recently learned that probability is the number of ways to achieve success divided by the number of possible outcomes. They have studied the most basic cases, such as the probability of getting 2 successive heads when you flip a coin and the probability of drawing a red ball out of a bin that has 8 reds, 2 blues and 5 yellows. Begin with the introduction.

0-15 Introduction

To motivate students for this activity, you will begin by discussing the basic idea of dominant and recessive genes as well as a 2x2 Punnett square. You can start with, "Has anyone ever noticed that they have green eyes while both of their parents have brown eyes?" or "Have you noticed that everyone in your family has blue eyes?" Ask the students to formulate any conjectures. After they have thrown around ideas, lead them into the concept that each person has 2 genes, one from their father and one from their mother. However, all genes are not equal as some will dominate over others. For example, brown, denoted R, is a dominant eye color. Therefore if you have one brown gene and one green recessive gene (Rg) you will have brown eyes. Brown is the most common eye color so for our case we will assume brown dominates over blue and green, while blue, denoted B, dominates over green, denoted g. So if your mom has two blue genes call them (BB) and your father has two green genes, green being recessive, (gg), if we make a table of the possible outcomes we see the four outcomes all come out Bg, blue eyes. This table would look like the one below and we call it a Punnett square. Note the dominant gene is capitalized.

	B	B
g	Bg	Bg
g	Bg	Bg

As a quick example, ask the students to construct the Punnett square for a father with brown eyes who has the genes Rg and a mother who has green eyes, gg. Ask them what the probability is that the child has green eyes.

We see that there is a 50% chance the child has green eyes. Now that we understand the basics of dominant and recessive genes let's investigate how math and probability relate to these scientific topics.

	g	g
R	Rg	Rg
g	gg	gg

Pair them up however you would like and have them work through the investigation in the worksheet the rest of the class period. Inform them that you will discuss some of the questions as well as their findings in class tomorrow.

SNAKE EYES

You and your partner have just been assigned a very special task. The International Science Committee is looking to do a new study on a population of 50 snakes, but these snakes are special because the scientists will be creating them in the lab. The scientists have chosen you and your partner as the subcommittee that will determine the eye color of each snake. The rules are simple: each of you will roll a die and then multiply the two numbers that appear on the dice. Here's how you will assign eye color.

If the product is an **even** number, that snake will have **black** eyes.
If the product is an **odd** number (**except 1**), that snake will have **green** eyes.
If the product is **1**, that snake will have **red** eyes.

Roll the pair of dice 50 times and put a tally for each eye color you receive. Once you've rolled 50 times count your tallies.

Color	Tally Marks	Total
Black		
Green		
Red		

After counting all of your tally marks, fill out the following multiplication table. Then with a colored pencil, fill in the boxes with the appropriate snake eye color.

	1	2	3	4	5	6
1						
2						
3						
4						
5						
6						

Using the multiplication table, what is the theoretical probability that any random snake has

1) black eyes?

2) green eyes?

3) red eyes?

How do the theoretical probabilities fit the actual results you obtained?

Why aren't they exactly the same?

If a snake had black eyes, what's the probability that one of the numbers rolled to determine his eye color was even? Explain.

If a snake had black eyes, what's the probability that one of the numbers rolled to determine his eye color was odd? Explain.

If a snake had green eyes, what's the probability that one of the numbers rolled to determine his eye color was even? Explain.

If a snake had green eyes, what's the probability that one of the numbers rolled to determine his eye color was odd? Explain.

If a snake had green eyes, what's the probability that one of the numbers rolled to determine his eye color was a 5? Explain.

If a snake had green eyes, what's the probability that one of the numbers rolled to determine his eye color was a 1? Explain.

If a 1 is rolled on the first die, what's the probability the snake will have red eyes?

If a 6 is rolled on the first die, what's the probability the snake will have black eyes?

Analysis

In our Snake Eyes model, what is the "dominant gene"? Explain.

In our Snake Eyes model, what is/are the "recessive gene(s)? If there are two, what is the most "recessive gene"? Explain.

In what ways is our model similar and/or different to the real-life eye color traits we discussed at the beginning of class?