The Genetics Challenge

Where do you get your genes from?

Have you ever wondered why your sister is tall, but you are small? Or why your brother has blue eyes and yours are green? It all has to do with your genes, which are passed on from your biological parents to you through a process called **heredity**. **Meet our Mixie Monsters**! In this activity you will investigate, with the help of our cute little monster family, how a random mix of genes from each parent combines to create a baby with its own unique characteristics. **Take a look!**

Genes carry the **DNA** code that determines your physical **traits**, like how tall you are, whether your hair is straight or curly, or the shape of your nose. They come in pairs like socks: You get one from your Mom and one from your Dad. But different from a pair of socks, the genes are not always identical. One sock might have red dots and the other might be plain green. These variations of the same gene are called **alleles** [uh-LEELS].

The resulting pair of alleles that the child inherits for a specific gene is its **genotype**. Different combinations of alleles will each result in a different **phenotype**, which is the way the genes are physically expressed in the offspring. For example, the baby in our sock family might inherit the green phenotype or the red-dot phenotype... or it might inherit a completely different color phenotype that was hidden as a recessive trait in both parents' genotypes!

If a sports car and a city bus were in a speed race, the sports car would win every time, right? It is built to be faster, so it is dominant when it comes to speed. Likewise, some genes are always more **dominant** than others. The non-dominant traits are called **recessive**. In reality, many of our physical traits are determined by more than just one gene (for example, human height is determined by over 400 genes distributed across the genome), but this fun exercise at least gives us a basic understanding of how heredity works.*

What you need:

- Printed heredity table
- Coin
- Glue, tape
- Scissors
- Printed craft sheet

What to do:

1. Take a look at the heredity table and the genotype of Mummy and Daddy Mixie. What does the genotype say about the look of the parents?

2. Now pass the parents' genes on to the next generation. Add one letter from each parent's genotype into the "Baby Genotype" column:

   A If the parent has two uppercase or two lowercase letters for any trait, that trait is passed down automatically to the child.

   B If the parent has an uppercase and a lowercase letter, flip a coin to determine whether the child will inherit the dominant allele (uppercase letter) or the recessive allele (lowercase letter).

   Heads: The dominant allele is passed on.
   Tails: The recessive allele is passed on.

3. Write down the phenotype (the trait that appears on the baby) in the "Baby Phenotype" column.

4. Create your baby Mixie by using the traits of the "Baby Phenotype" column. Cut out the matching features from the craft sheet and glue them together. What does the baby look like? Is it similar to its parents?

5. Create two more Mixie babies using the same method. How do all the siblings compare? Why do they look

Heredity table

Trait		Letter	Daddy Genotype	Mommy Genotype	Baby Genotype	Baby Phenotype
Body	oval	B	Bb	bb		
	rectangular	b				
Eyes	two	E	ee	Ee		
	one	e				
Ears	round	A	Aa	Aa		
	triangular	a				
Feet	two toes	F	ff	FF		
	five toes	f				

Review and summary

Through the process of heredity, biological parents pass one of their two copies of each of their genes to their offspring. Which gene each baby gets from which parent is totally random, like flipping a coin. Sometimes the dominant trait comes through (for example, Bb or BB) and sometimes the recessive one (for example, bb). Each of the parents' children ends up with a different combination of alleles that make up their genotype, which results in a different set of physical traits, or phenotype. That's why kids don't look exactly like their parents or their siblings.

*Disclaimer: Monsters are definitely not real and socks do not have genes (or babies)! These are simply storytelling tools that make it easier to relate to a big scientific topic.