Allele Cards:

1. You will receive two index cards, one of each color. These cards represent genes for an unknown trait. The white card is the allele “A” and the blue card is the allele “a”.

* What would the genotype for this trait be called?

2. Pair up with another student. Hold your gene cards behind their back, shuffle them, count to three, and then put one card in front of you. Pretend that each card is a gamete, and together the two cards shown represent a possible genotype of the first offspring of parents with these alleles. Write down the genotype of this offspring in the space below. Then repeat this process until they have determined and written down the possible genotypes for a total of four offspring in this family.

Video Clip: One Wrong Letter (Tay-Saches disease)

* How can a mutation in a single DNA base affect the production of normal proteins, as it does for Tay-Sachs disease?
* How can mutations be passed on to offspring?
* What does it mean to be a "carrier" of a disease?
* Assume that the "a" allele in your gene cards was a gene for Tay-Sachs disease. How many of your offspring would have the disease?
* How does the proportion of each kind of genotype in the offspring compare for different pairs of students? What is responsible for this difference?
* How is this exercise different from or similar to what occurs in a real population?
* How would the frequency of the Tay-Sachs recessive gene in the general population compare to that in the population of Ashkenazi Jews (Jews with ancestors from Central and Eastern Europe)?

Video Clip: A Mutation Story (Sickle Cell Anemia)

* What if the recessive gene in your imaginary family of four were a gene for sickle cell anemia? How many of these offspring would have the disease? How many would be protected against malaria?
* How is this pattern of inheritance similar to and different from that of Tay-Sachs disease?
* What influences the ability of this gene to survive in the gene pool of the population?
* Would you expect the frequency of this gene to vary in different areas of the world? Why?