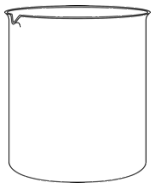
Modeling Genetic Drift

In this activity you will demonstrate the changes in allele frequencies that can occur due to random chance. This is random selection.

Initial Set-Up



Initial population in Beaker
10 of one colour,
10 of a different colour

Tray or space to place individuals of the next generation.

Plenty of spares (you only need two colours)

Images: pixabay.com

Step One - Prepare your initial population

- You need a population of 20 individuals. 10 individuals have one allele, and 10 have another. For example, you can represent this with 10 green Skittles and 10 red Skittles.
- Put your population into a cup or beaker.
- Keep plenty of spares – you will need them for the new generation.

Step Two – Create a new generation

- Randomly select one individual from the cup without looking.
- If you select a red one, assume that it produces two red offspring. From your spare pot, take two red Skittles and add them to the new generation.
- Return your red Skittle to the initial population.

Now you have a new generation of 2 individuals, and a parent population that still has 10 green and 10 red Skittles.

- Select another random Skittle from the initial population, and, based on its colour, add two offspring of that colour to the new generation, and return the Skittle you selected back to the initial population.
- Continue until you have a new generation with 20 individuals.
- Note down the data in a table like this:

Generation	Number of Alleles		Ratio
	Red	Green	
Initial	10	10	1:1
1st			
2nd			
3rd			
4th			
5th			

Step Three – Create the next generation

- Empty the cup with your initial population (you can return these to your spare Skittles pile).
- Fill the cup with the 20 individuals from the new generation (which will possibly have new allele frequencies).
- Repeat the exercise, randomly selecting from the cup, adding new offspring to the new generation.
- Repeat this whole process for several generations – see how many it takes to reach an allele frequency of 1 (i.e. 20 of one allele and 0 of the other).

Questions

1. Evaluate the model:

In what way does this model accurately represent inheritance of alleles?

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What are the limitations of this model?

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2. Outline how the results would be different if you started with 5000 of each Skittle colour (5000 of each allele in the population).

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Teacher Guidance

- When evaluating students should reflect on the idea that this model, like any model, is a simplified representation of reality.
- The model doesn't take into account the fact that individuals can carry more than one allele for each gene (this is a limitation of the model).
- In this model, a single organism produces two clones of itself, which is more comparable to asexual reproduction. It should be emphasized that the principle still holds true for sexual reproduction within a small population.