

Natural selection and change

In your group, discuss the following questions:

1. What does an organism need to survive and reproduce? How do inherited traits impact survival?
2. Predict which beak type and food source will be the most successful (survive to the next generation).

Part 1: Survival of the fittest simulation

1. Each group will need to collect the following items:
 - 1 plastic cup (stomach) and 1 beak type (mouth) per person
 - 1 cup of food
 - 1 student worksheet
2. You will use your beak to pick up the available food and drop it into your stomach in rounds of 60 seconds each. The amount of food that you eat will then be counted to determine the most successful trait (inherited trait) of your population. You will use the same beak for the entire simulation. *It is important that you pick up the food with your beak and drop it into your stomach (no scooping into your stomach allowed).*
 - **Round 1:** Count or weigh each food type in your group cup and record in data table 1. Each group is given one minute to practice feeding with their beak by picking one item up at a time and dropping them into their stomach. * You may not roll it into your stomach! Record your data in table 1 when your round is up and empty your stomach contents into the community cup so that those beans may be removed from the ecosystem.
 - **Round 2:** Members of the group compete with one another at the same time as each student tries to eat as much food as possible in 60 seconds. Remember each item must be picked up individually! Record your data in table 1 when your round is up and empty your stomach contents in the community cup so that those beans may be removed from the ecosystem.
 - **Round 3:** Only the top 3 members of your group have survived to the third round! The remaining 3 group members compete with one another to eat as much food as possible in 60 seconds. Record your data in table 1 when your round is up and empty your stomach contents in the community cup so that those beans may be removed from the ecosystem.
3. Share your group data from rounds 1, 2, and 3 with the class to calculate the Simpson's Index of Diversity changes within your ecosystem.

Part 2: Simpson's Index of Diversity

Simpson's Index of Diversity is a tool used to measure the level of biodiversity present in each sample. It measures both the species richness (number of species per sample) and the species evenness (relative abundance of each individual species per sample) in a community. A community dominated by one or two species is considered to be less diverse than one in which several species have a similar abundance. The Simpson's Index of Diversity value (D) ranges between 0 and 1. In Simpson's Index of Diversity, "1" represents infinite diversity and "0", no diversity.

$$D = 1 - \frac{\sum n(n-1)}{N(N-1)}$$

Simpson's Index of Diversity

n = the total number of organisms of a particular species
N = the total number of organisms of all species

DATA TABLE 1: INITIAL BIODIVERSITY

Species	Number (n)	n(n-1)	Observations
Pipe cleaner			
Forceps			
Chopsticks			
Plastic spoon			
Paperclip			
Lentils			
Split peas			
Navy beans			
Pinto beans			
Black-eyed peas			
Total	N =	$\Sigma n(n-1) =$	

4. Calculate the biodiversity of the class ecosystem in two different time events, before round 1 begins and at the end of round 3, using data tables 2 and 3 below.

DATA TABLE 2: SURVIVAL OF THE FITTEST SIMULATION

Species	Initial population	Round 1	Round 2	Round 3	Total population
Pipe cleaner					
Forceps					
Chopsticks					
Plastic spoon					
Paperclip					
Lentils					
Split peas					
Navy beans					
Pinto beans					
Black-eyed peas					

DATA TABLE 3: FINAL BIODIVERSITY

Species	Number (n)	$n(n-1)$	Observations
Pipe cleaner			
Forceps			
Chopsticks			
Plastic spoon			
Paperclip			
Lentils			
Split peas			
Navy beans			
Pinto beans			
Black-eyed peas			
Total	N =	$\Sigma n(n-1) =$	

5. How did the species evenness and species richness change in your sample from data table 2 to data table 3?