

Lesson Plan for “Darwin’s Finches”

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Background

Charles Darwin published his theory of natural selection in 1838. He proposed that natural selection is the mechanism for evolution. Natural selection is the idea that favorable inheritable traits, such as stronger legs, wings, etc. become more common in successive generations of a population, while unfavorable ones, such as shortness, become less common. This slowly becomes adaptations for the organisms, such as the ability of a chameleon to change colors, or a snake to kill using venomous fangs. Natural selection is very important to the world we live in as it provides an understanding of why some species become extinct while others live for long times.

Objective

To fully understand the process of natural selection through a hands-on experiment.

Topic(s)

- Natural Selection: Favorable adaptations become more common in the species while unfavorable ones become less common and are eventually eliminated.
- Adaptations: A change in the organism that lets it live successfully in an environment.
- Evolution: The change of inheritable traits from one generation to the next.
- Heritable Trait: A trait or adaptation that can be passed from one generation to the next.
- Ecological Niche: How an organism uses its resources.

Introduction

Today we will be examining natural selection through similar analysis of what Darwin studied. Darwin studied finches, birds, on the Galapagos Islands. He noticed that the finches had different beaks. Our beaks for this experiment are different utensils. And of course beaks were used to collect food, which in our case are M&M’s. The task will be to collect/eat M&M’s, so you, as a bird can continue to live. If you don’t collect/eat enough M&M’s by the end of the day, a designated time period, you will die. But don’t worry, if you die, you will later come back as a new bird with a new beak. The twister mat on the floor represents our island where you will be collecting your food off.

Materials

- Utensils: Chopsticks, Forks, Spoons, and Knives (Chopsticks can be found at any Asian restaurant, while plastic utensils can be bought basically anywhere.) (\$5)
- Twister Board (Target, alternatively just need a colorful mat to place on the floor) (\$15)
- M&M’s, Large Bag (\$10)

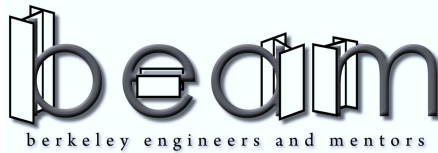
Procedure

Setup:

1. Lay the Twister Board flat on the floor, clear of anything around because there will be a lot of running
2. Scatter M&M’s all over the board

Goal of the Game:

To collect enough M&M’s with the given utensil to survive until the next day.



Rules:

1. You can only use the utensil you are given (knife, chopsticks, spoon, fork) to collect the M&M's. No hands!
2. You need to collect 1 M&M initially to survive for the next 'day'. Increase the amount by 1 every turn. Day 7 needs 7 M&M's.
3. Each day consists of a 30 second timeslot.
4. If you do not have 7 M&M's by the end of the 30 seconds, then you are out.
5. Each year consists of 4 days. After the end of the year, all out people can come back into the game as offspring.
6. When you come back into the game, you will switch your utensil. If you had chopsticks you will get a fork. Fork will get a spoon. Spoon will get a knife. And a knife will get chopsticks.
7. After the day ends, the mentor shall add an addition M&M for each M&M present on the field (i.e. if there are 4 M&M's then you should add another 4 more to make 8 in total).
8. When the new M&M's are added, the color of the new 'baby' M&M needs to correspond to the color of the parent M&M (add a red M&M if there is a red M&M on the field, yellow if there is yellow, etc.)

Note: All the numbers that I suggested are highly variable. These numbers are chosen as an initial starting point, but should be changed at the discretion of the instructor if the game is not going as planned. Game ends when the last person dies, but it is the result before when most of the people die that is the desired result.

Conclusion

The game should have these desired results. Those with knives and chopsticks should slowly 'die' out as they cannot collect the amount of M&M's fast enough. When these people come back, they should primarily have spoons and forks as these 'adaptations' are selected for. There should be very little people coming back as knives and chopsticks later because it is much harder for the fork and spoon people to 'die' because they can scoop the M&M's. Slowly the whole population will start consisting of spoons and forks.

The color of the M&M's demonstrates that the 'prey' is also evolving. On the twister map, the red M&M's should predominate on the red tiles, yellow on yellow, etc. because they blend in and camouflage. So it can slowly be seen that all the blue M&M's start collecting on the blue tiles and so on. These become specialized areas, so if for example an organism sees the color red better than all the other colors; it would focus in on the red tiles and the red M&M's.

It is important to note that for natural selection to occur, the adaptations that are being selected for have to be heritable. For example, if a guy works out every day and gets stronger, then he is able to survive better. But when he has kids, his kids will not be strong because he worked out and put in effort to be strong. So his strength is not passed onto his children. On the other hand if we had a tall person, then his kids would also be tall. His height is an inheritable trait and can be selected for in natural selection.

Another important note is that what if we weren't scooping the M&M's off the floor. If all the M&M's were stuck in little cracks, then of course the chopsticks would be the better utensil. So if M&M's were on the floor and in little cracks, then the chopstick holders would go after the ones in the cracks while the spoon people would collect them off the floor. This is the same in the birds, as they developed different beaks to eat insects off different places.

Special Notes

The M&M color rule is optional. It just provides another way for the students to see natural selection, but can be a lot of work to be putting down the correct M&M colors. The twister board will still show some of the natural selection for red on red even if randomly scattered but is also not necessary for this exercise. Alternatively, if the class is too big, the experiment can be done outside without the twister board. The twister board should only be used for smaller groups as that many students running out may have people getting their eyes poked out. Also, different kinds of beans can be used instead of M&M's.

Resources

http://en.wikipedia.org/wiki/Natural_selection

<http://en.wikipedia.org/wiki/Adaptation>