

ACTIVITY 1

HYPOTHESIS TESTING - NATURAL SELECTION

Background Information

Charles Darwin based his theory of evolution by natural selection on a number of ideas, two of which are described below:

* The offspring of organisms of the same species show a great deal of variation.

* Of the large number of offspring produced by organisms of the same species, not all survive.

1. Consider the two ideas given above as hypotheses. Design a single investigation to test whether these hypotheses are correct or not. (HINT: germinate seeds of plants).

2. Your design must consider the method/s and materials you are going to use, how data will be collected, recorded and analysed, the kind of results which will indicate that your hypotheses are correct and the kind of results which will make you reject your hypothesis.

3. Carry out your investigation, collect your data and analyze it to show what conclusions you arrive at.

4. Write up your report as follows:

- # Background information on Darwin's theory of evolution by natural selection
- # List the two hypotheses being tested
- # State the dependent variable and independent variable for each hypothesis
- # State which variable/s you would control
- # The design of your investigation
 - o Materials used
 - o Method/s used
 - o How data was collected
 - o How the data was recorded
 - o Analysis of the data
- # Conclusions to indicate whether the hypotheses are accepted or rejected
- # List any shortcomings in your investigation

ACTIVITY 2

SIMULATION OF NATURAL SELECTION

Materials Required

- 3 bags of beans
- 10 trays
- 10 pegs
- 10 plastic spoons
- 10 tweezers
- 10 dissecting needles

Introduction

On a distant planet there exists 4 species of a creature called a *beansie* (pegs-beansie, spoon-beansie, tweezer-beansie and needle-beansie). The different species of *beansie* are similar except that there is some variation in their type of mouth. All *beansies* eat beans. Some *beansies* have a peg mouth (demonstrate how to use the pegs to pick up beans). Some *beansies* have a tweezer mouth (demonstrate), some have a needle mouth (demonstrate). One year a new species of *beansie* was discovered, this *beansie* was called the spoon-mouth *beansie* (demonstrate). Each of you will play the part of a *beansie* on this planet.

Procedure

1. Your teacher will allocate you into groups of 7 or more.
2. In each group, only one person can be a spoon-beansie since this species is rare. The other 6 persons can be two of each of the other types of beansies
3. Collect from your teacher, a tray of beans for your group and a utensil (needle, tweezer etc.) for each member according to the type of *beansie* they represent.
4. You should not cheat with your utensil. Please use your utensil in the way they were intended to be used (as demonstrated).
5. For a period of 1 minute, members of your group must use their utensil to capture as many beans from the tray as they can.
6. At the end of this minute the species that obtains the smallest number of beans in the

The following rubric may be used to assess this activity:

CRITERIA	MARKS			COMMENT
	0	1	2	
Description of Darwin's theory	Not described	Described but with gaps in description	Described fully	
Hypotheses stated	None stated	One stated	Both stated	
Identification of independent variable	Not identified	Identified correctly for one hypothesis only	Identified correctly for both hypotheses	
Identification of dependent variable	Not identified	Identified correctly for one hypothesis only	Identified correctly for both hypotheses	
Control of variables	None stated	One variable to be controlled mentioned	Two variables to be controlled mentioned	
Materials used	None stated	Incomplete list of materials provided	Complete list of materials provided	
Method of investigation	None stated	Method given but not in a logical sequence	Method clearly stated in a step-wise fashion	
Data collection	Information to be collected not mentioned	Information collected mentioned but information does not relate to the hypotheses	Information collected mentioned and information relates to the hypotheses	
Recording of data	Not recorded	Recorded, but not in an organised manner	Recorded in an organised manner	
Analysis of data	Not analysed	Analysis does not correlate with the data	Analysis correlates with the data	
Conclusions made	Not stated	Conclusion correctly stated for one hypothesis only	Conclusion correctly stated for both hypotheses	
Shortcomings identified	Not stated	One shortcoming listed	Two shortcomings listed	

stipulated time is thereafter considered to be dead.

7. When a *beansie* dies, that learner can play the offspring of any of the surviving *beansies* in the next trial. This person needs to acquire a new utensil (according to the species) for the next trial.

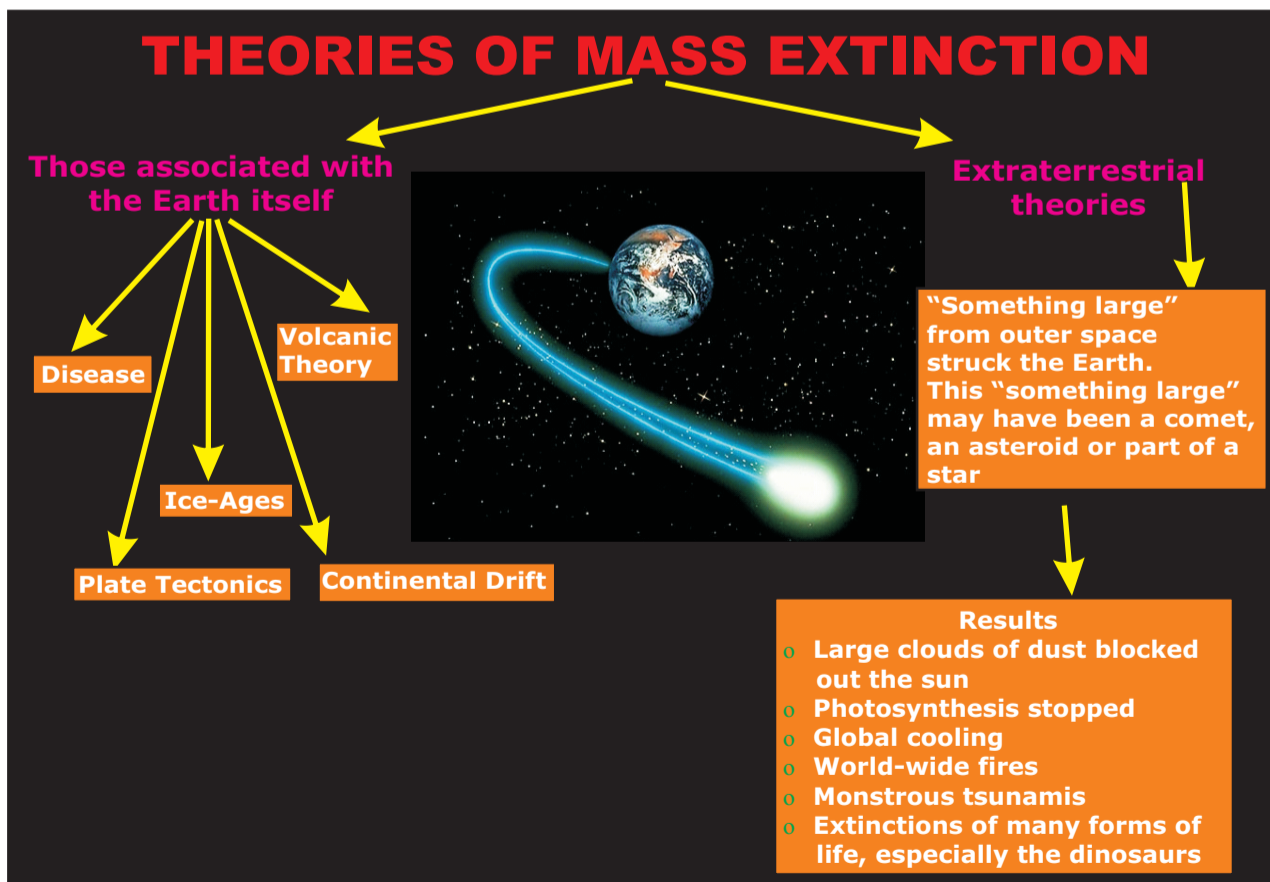
8. In the next trial reduce the time to 45 seconds, then 30 seconds, then 15 seconds.

9. The number of each of the species surviving at the end of each trial should be recorded in the form of a table.

10. Draw a bar graph indicating the number of each species surviving at the end of each trial.

Discussion Questions:

1. Explain why this simulation is a good representation of natural selection.
2. Explain what trends can be observed from the data represented on the bar graphs?
3. What happens to animals that cannot compete as well with other animals in the wild?
4. List any ONE real-life example of the *beansie*, where one species has a definite advantage over another?
5. Sometimes animals that are introduced into an area that they never lived in before, out-compete and endanger resident species, why do you think this happens?
6. How do you think diseases can affect natural selection?



- The dominant feature of evolution is extinction not success.
- Only a few species seemed to be successful for long periods (300-400 million years) on the geological time scale.
- These live in the depths of the sea where conditions do not change much.
- Most species live for a few hundred to a few million years, and then disappear.
- According to some estimates, 99.9% of all species that lived in the past have become extinct!
- The fossil record shows that much extinction occurred before humans arrived on Earth.