Alien Planet Fitness

Contributors

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Intended Audience

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Photo courtesy of: http://www.123rf.com/photo_12331972_illustration-of-a-green-alien-isolated-on-a-white-background.html
Introduction

Description

In this activity, students are asked to think critically about the phenotypic traits which would be best suited to survive on an alien planet. Students will be creating animals with characteristics which will be beneficial for survival on a hypothetical planet.

Abstract

In order for an organism to succeed in its environment, it must have certain traits that will allow it to survive. This same concept is true for introduced species as well. When an introduction occurs, the organism must have traits that will allow it to establish itself and colonize the local area. This activity is meant to have students think critically about the certain phenotypic traits that would be necessary to survive on an alien planet. In doing so, students will build on the knowledge base of how species are best suited to reproduce and adapt to their surroundings and pass on those traits.

Core Themes Addressed

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<th>Microbial Cell Biology</th>
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<td>Microbial Genetics</td>
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Keywords

Adaptation, Fitness, Traits

Learning Objectives

At completion of this activity, students will be able to:

1) Recognize traits necessary for an organism to survive in its environment.
2) Describe the concepts of natural selection and adaptation.
3) Identify factors which influence an organism’s overall fitness.
National Science Education Standards Addressed

Teaching Standard A: Science as inquiry
- Abilities necessary to do scientific inquiry
- Understandings about scientific inquiry

Teaching Standard C: Life Science
- Biological Evolution
- Interdependence of organisms
- Behavior of organisms

Teaching Standard F: Science in personal and social perspectives
- Natural Resources
- Environmental Quality
- Natural and human induced hazards
- Science and technology in local, national, and global challenges
Student Prior Knowledge
Students should have the following knowledge prior to completing this activity.
- Introduction to natural selection and adaptation.
- Definition of evolution.
- Basic understanding of phenotype and genotype.
- Definition of fitness.
- Understanding how certain traits are best suited for an environment and how this allows them to be passed on.

Teacher Background Information
In order for a species to survive in its environment, it must have certain traits or characteristics that allow it to survive. The measure of an organism’s ability to survive and reproduce is called its “fitness.” When an organism has fur or a claw this is its phenotypic trait. When this organism survives to pass on its traits to future generations and then the majority of the population expresses these traits this is called “evolution.”

Class Time
50 minutes

Teacher Preparation Time
15-20 minutes

Materials and Equipment
Have the following for each individual:
- One planet sheet
- Markers or colored pencils

Safety Precautions
N/A

Teacher Preparations
- Prepare the Alien Planet Profile Sheets
- Each student should be distinct from the others
- Each student should have his/her individual sheet
Methods

*Introduction to activity:*

1) Provide the students information regarding adaptation, selection, and evolution
2) Pass out a planet sheet to each student
3) Pass out markers or colored pencils
4) Have the students read planet’s profile and have them develop an organism with characteristics that could survive on their planet.

**Suggestions for Assessment**

- Have each individual student introduce its organism to the class.
  - 5 planets are provided so that students’ organisms will be variable
- During this introduction have the students describe the traits that will allow their organism to survive.
- Individually, have each student describe the difference between adaptation and evolution and how this drives species diversity in an ecosystem.

Example Drawing:

![Example Drawing](http://www.my-how-to-draw.com/how-to-draw-monsters.html)
Evolution on an Alien Planet

Introduction:

______________________ is the process of biological change over time by which descendants come to differ from their ancestors. Remember that _____________________ are traces of organisms that existed in the past. Look around the classroom; you and your classmates are all Homo sapiens yet you all look different. This is called ___________________. Roughly a hundred years ago a man named ___________________ ____________________ took a trip to the ___________________ _______________________ where he noticed that some species on one island looked completely different from those on another island. He noticed that each of these species had ______________________ to their particular island which allows them to better survive in its environment. These adaptations can lead to genetic change in a population over time resulting in ___________________________.

Key Terms:

Population:

Fitness:

Descent with Modification:

Lab Activity:

1) Read your planet’s description on the following page.
2) Answer the questions regarding a possible organism which could inhabit your planet.
3) Draw the organism in the space provided.
4) Fill in the description of your organism and how it has evolved to survive on your planet.
Planet #1

This planet is in orbit with another planet which blocks light from the sun. It is in darkness all the time so it has no plant life. Habitat is comprised of rocky substrate and these rocks are covered with patches of fungus which are highly nutritious. Large predatory insects have taken over the terrain and regulate smaller insect populations who graze on the fungus, yet they are slow and sluggish. The air is made up of toxic cyanide gas and there is a heavier gravitational pull as compared to the one on earth.

Questions:

1) Think about the size of your organism. What size advantage does your organism need in order to survive?

2) What defense mechanisms does your organism possess? (Fast, poisonous, claws, teeth, horns, etc.)

3) Where or in what does your organism live?

4) What does your organism eat? This can be anything you can think of as long as it is available on your planet.

5) How many offspring does your organism reproduce to ensure its survival on your planet?

6) What vital organs does your organism possess that allows for its survival on your planet?
7) In your own words, describe what is meant by adaptation and what is meant by natural selection. Give an example of an adaptation needed by organisms for survival on your planet.

8) What factors on your planet affected the fitness of your organisms?
Planet #2

This planet is in sunlight all the time and is extremely hot. It is covered in mostly desert and water is very scarce. Large cacti are very abundant and small birdlike creatures have taken over the skies. Large rodents burrow underground to escape the heat and come out only to feed. The air is made of poisonous gas.

Questions:

1) Think about the size of your organism. What size advantage does your organism need in order to survive?

2) What defense mechanisms does your organism possess? (Fast, poisonous, claws, teeth, horns, etc.)

3) Where or in what does your organism live?

4) What does your organism eat? This can be anything you can think of as long as it is available on your planet.

5) How many offspring does your organism reproduce to ensure its survival on your planet?

6) What vital organs does your organism possess that allows for its survival on your planet?
7) In your own words, describe what is meant by adaptation and and what is meant by natural selection. Give an example of an adaptation needed by organisms for survival on your planet.

8) What factors on your planet affected the fitness of your organisms?
Planet #3

This planet is covered in salt water. There is no land and the only plant life grows in the shallower areas. Large fishlike creatures live in the deeper areas and feed on anything they can catch. Small shrimp are very abundant but are very hard to catch.

Questions:

1) Think about the size of your organism. What size advantage does your organism need in order to survive?

2) What defense mechanisms does your organism possess? (Fast, poisonous, claws, teeth, horns, etc.)

3) Where or in what does your organism live?

4) What does your organism eat? This can be anything you can think of as long as it is available on your planet.

5) How many offspring does your organism reproduce to ensure its survival on your planet?

6) What vital organs does your organism possess that allows for its survival on your planet?
7) In your own words, describe what is meant by adaptation and what is meant by natural selection. Give an example of an adaptation needed by organisms for survival on your planet.

8) What factors on your planet affected the fitness of your organisms?
Planet #4

This planet is very hot and humid. It is covered in tropical plants and very large trees. Fruit is very abundant and water can be collected relatively easily. There are large, slow, apelike creatures who have taken the understory of the forest and they feed on pretty much anything. Poisonous insects live in the trees so be careful not to touch them.

Questions:

1) Think about the size of your organism. What size advantage does your organism need in order to survive?

2) What defense mechanisms does your organism possess? (Fast, poisonous, claws, teeth, horns, etc.)

3) Where or in what does your organism live?

4) What does your organism eat? This can be anything you can think of as long as it is available on your planet.

5) How many offspring does your organism reproduce to ensure its survival on your planet?

6) What vital organs does your organism possess that allows for its survival on your planet?
7) In your own words, describe what is meant by adaptation and what is meant by natural selection. Give an example of an adaptation needed by organisms for survival on your planet.

8) What factors on your planet affected the fitness of your organisms?
Planet #5

This planet is so far away from its nearest sun that it is completely covered in ice. There are large and very fast predatory insects that roam freely. The only liquid water is under many feet of ice and small crab like creatures live there too. Ice caves are very abundant and there are huge birdlike creatures that come out at night so be careful.

Questions:

1) Think about the size of your organism. What size advantage does your organism need in order to survive?

2) What defense mechanisms does your organism possess? (Fast, poisonous, claws, teeth, horns, etc.)

3) Where or in what does your organism live?

4) What does your organism eat? This can be anything you can think of as long as it is available on your planet.

5) How many offspring does your organism reproduce to ensure its survival on your planet?

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