

ALIEN CLASSIFICATION

STEM Lesson



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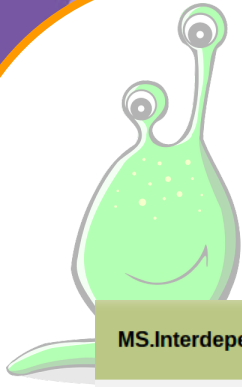
OVERVIEW & OBJECTIVES

Overview

Scientists use classification to sort living organisms into groups. The groups show the relationships between organisms, and provide a way to communicate information about organisms to scientists all around the world. The seven groups in biological classification are **kingdom, phylum, class, order, family, genus, and species.**

Objectives

- Students will understand how and why organisms are classified.
- Students will be able to classify fictional organisms according to visual traits.
- Students will communicate effectively using science language and reasoning.



STANDARDS

MS.Interdependent Relationships in Ecosystems

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Students who demonstrate understanding can:

MS-LS2-2. Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.
 [Clarification Statement: Emphasis is on predicting consistent patterns of interactions in different ecosystems in terms of the relationships among and between organisms and abiotic components of ecosystems. Examples of types of interactions could include competitive, predatory, and mutually beneficial.]

MS-LS2-5. Evaluate competing design solutions for maintaining biodiversity and ecosystem services.* [Clarification Statement: Examples of ecosystem services could include water purification, nutrient recycling, and prevention of soil erosion. Examples of design solution constraints could include scientific, economic, and social considerations.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p>Constructing Explanations and Designing Solutions</p> <p>Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.</p> <ul style="list-style-type: none"> Construct an explanation that includes qualitative or quantitative relationships between variables that predict phenomena. (MS-LS2-2) <p>Engaging in Argument from Evidence</p> <p>Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s).</p> <ul style="list-style-type: none"> Evaluate competing design solutions based on jointly developed and agreed-upon design criteria. (MS-LS2-5) 	<p>LS2.A: Interdependent Relationships in Ecosystems</p> <ul style="list-style-type: none"> Similarly, predatory interactions may reduce the number of organisms or eliminate whole populations of organisms. Mutually beneficial interactions, in contrast, may become so interdependent that each organism requires the other for survival. Although the species involved in these competitive, predatory, and mutually beneficial interactions vary across ecosystems, the patterns of interactions of organisms with their environments, both living and nonliving, are shared. (MS-LS2-2) <p>LS2.C: Ecosystem Dynamics, Functioning, and Resilience</p> <ul style="list-style-type: none"> Biodiversity describes the variety of species found in Earth’s terrestrial and oceanic ecosystems. The completeness or integrity of an ecosystem’s biodiversity is often used as a measure of its health. (MS-LS2-5) <p>LS4.D: Biodiversity and Humans</p> <ul style="list-style-type: none"> Changes in biodiversity can influence humans’ resources, such as food, energy, and medicines, as well as ecosystem services that humans rely on—for example, water purification and recycling. (secondary to MS-LS2-5) <p>ETS1.B: Developing Possible Solutions</p> <ul style="list-style-type: none"> There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (secondary to MS-LS2-5) 	<p>Patterns</p> <ul style="list-style-type: none"> Patterns can be used to identify cause and effect relationships. (MS-LS2-2) <p>Stability and Change</p> <ul style="list-style-type: none"> Small changes in one part of a system might cause large changes in another part. (MS-LS2-5) <p>-----</p> <p>Connections to Engineering, Technology, and Applications of Science</p> <p>Influence of Science, Engineering, and Technology on Society and the Natural World</p> <ul style="list-style-type: none"> The use of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus technology use varies from region to region and over time. (MS-LS2-5) <p>-----</p> <p>Connections to Nature of Science</p> <p>Science Addresses Questions About the Natural and Material World</p> <ul style="list-style-type: none"> Scientific knowledge can describe the consequences of actions but does not necessarily prescribe the decisions that society takes. (MS-LS2-5)

Connections to other DCIs in this grade-band:
MS.LS1.B (MS-LS2-2); **MS.ESS3.C** (MS-LS2-5)

Articulation of DCIs across grade-bands:

1.LS1.B (MS-LS2-2); **HS.LS2.A** (MS-LS2-2),(MS-LS2-5); **HS.LS2.B** (MS-LS2-2); **HS.LS2.C** (MS-LS2-5); **HS.LS2.D** (MS-LS2-2); **HS.LS4.D** (MS-LS2-5); **HS.ESS3.A** (MS-LS2-5); **HS.ESS3.C** (MS-LS2-5); **HS.ESS3.D** (MS-LS2-5)

Common Core State Standards Connections:

ELA/Literacy -

RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. (MS-LS2-2)

RST.6-8.8 Distinguish among facts, reasoned judgment based on research findings, and speculation in a text. (MS-LS2-5)

RI.8.8 Trace and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient to support the claims. (MS-LS2-5)

WHST.6-8.2 Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. (MS-LS2-2)

WHST.6-8.9 Draw evidence from literary or informational texts to support analysis, reflection, and research. (MS-LS2-2)

SL.8.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others’ ideas and expressing their own clearly. (MS-LS2-2)

SL.8.4 Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation. (MS-LS2-2)

Mathematics -

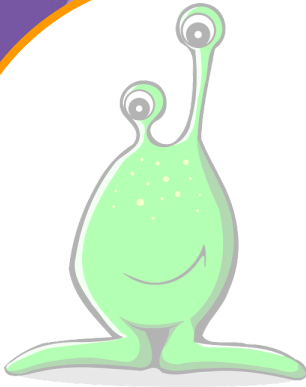
MP.4 Model with mathematics. (MS-LS2-5)

6.EE.A.2 Use ratios and rate reasoning to solve real-world and mathematical problems. (MS-LS2-5)

6.SP.B.5 Summarize numerical data sets in relation to their context. (MS-LS2-2)

* The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

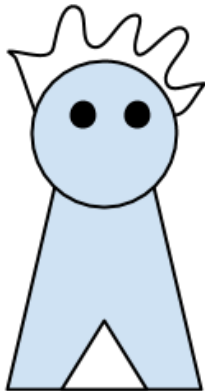
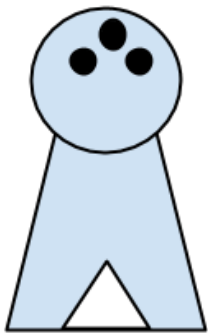
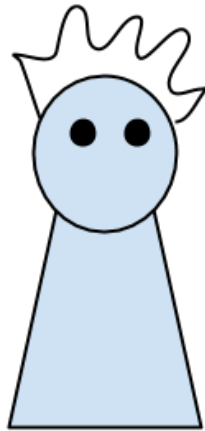
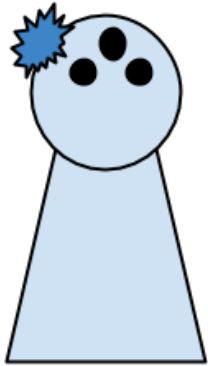
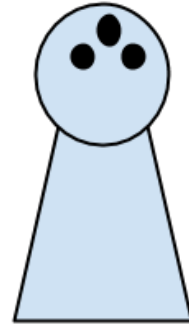
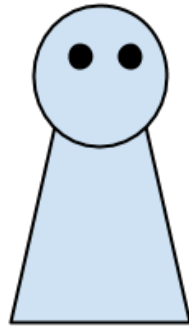
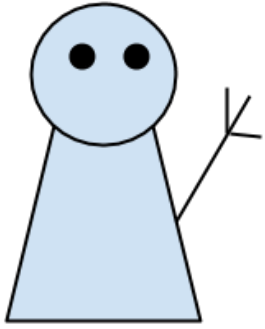
The section entitled “Disciplinary Core Ideas” is reproduced verbatim from *A Framework for K-12 Science Education: Practices, Cross-Cutting Concepts, and Core Ideas*. Integrated and reprinted with permission from the National Academy of Sciences.

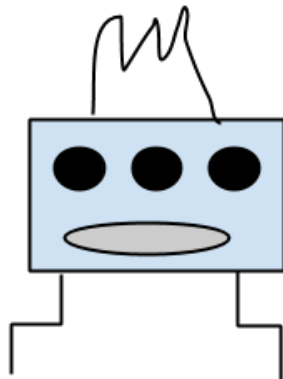
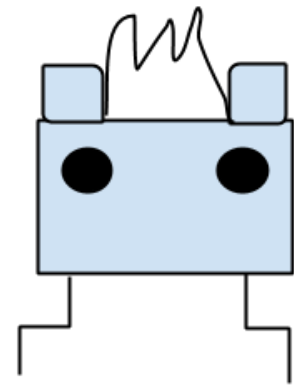
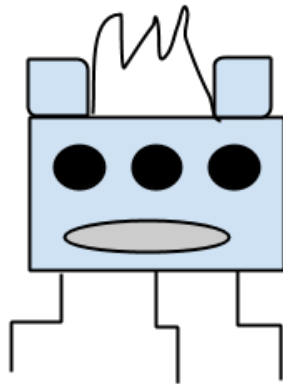
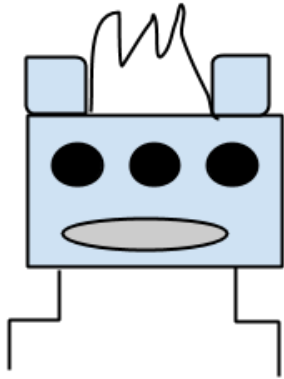
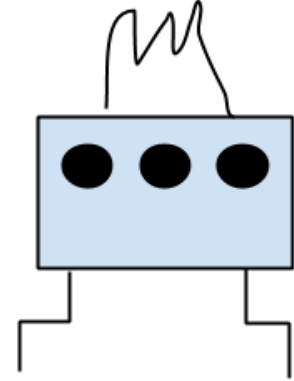
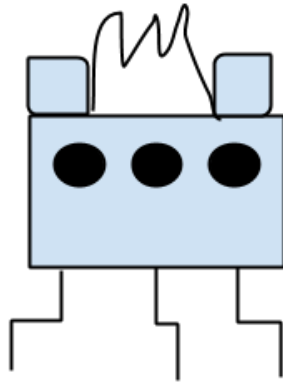
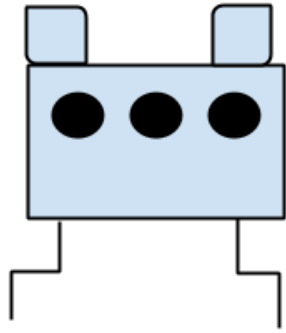
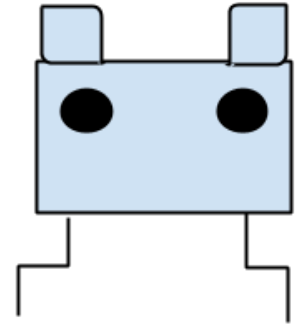
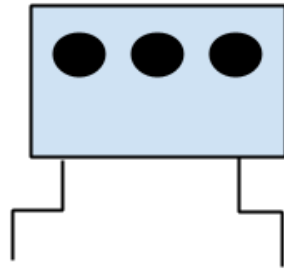
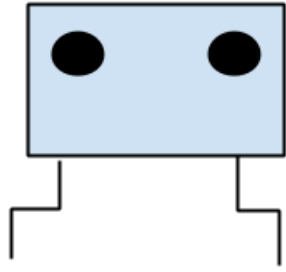


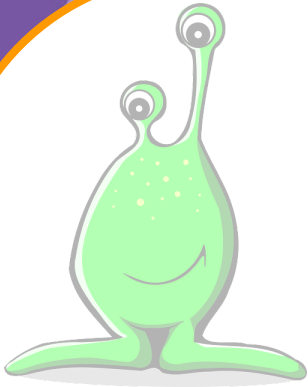
MATERIALS

- Introduction video: Classifying Animals by Brainpop - <http://youtu.be/dCm5CcQhU-c>
- Alien Cards - One set of twenty for each group
- Classification Worksheet









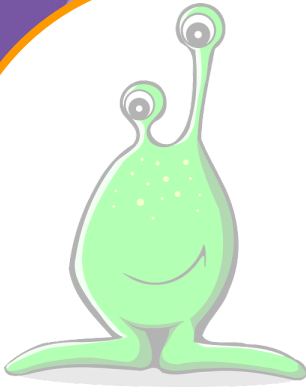
LESSON

Introduction

Explain to students that scientists use classification to place living things in groups based on their relationships to each other. Play the Classifying Animals video by Brainpop: <http://youtu.be/dCm5CcQhU-c>.

Overview / Vocabulary

Tell students that they are going to be scientists today and develop a classification system for alien species. They will be using the following terms to classify their aliens: **kingdom, phylum, class, order, family, genus,** and **species.**



CLASSIFY YOUR ALIENS

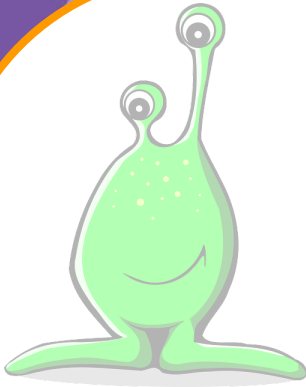
Part 1 - Kingdoms:

- Make sure you have 20 aliens.
- Place them in two groups, based on criteria you and your partners decide. The two groups do not need to be equal.
- Give each group an appropriate kingdom name based on your criteria.

1. What is the name of Group 1?

2. What is the name of Group 2?

3. What criteria did you use to sort them?



CLASSIFY YOUR ALIENS

Part 1A - Phyla:

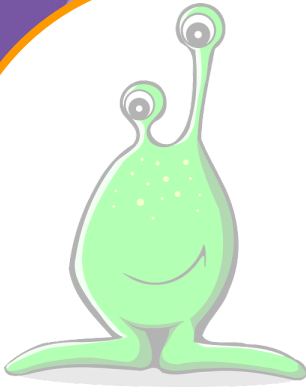
- Place your aliens in Group 2 aside for now, and use only the aliens in Group 1.
- Regroup your aliens into two new groups, 1A and 1B. They do not need to have equal numbers.

1. What is the name of Group 1A?

2. What is the name of Group 1B?

3. What criteria did you use to sort them?

4. Are all organisms in both phyla also grouped into the same kingdom? _____



CLASSIFY YOUR ALIENS

Part 1B - Forming Classes:

- Aliens in each phylum can be separated even further into classes. Each phylum may have several classes.
- Take the aliens from Phylum 1A and separate them into two classes, Class 1A1 and Class 1A2.

1. What is the name of Group 1A1?

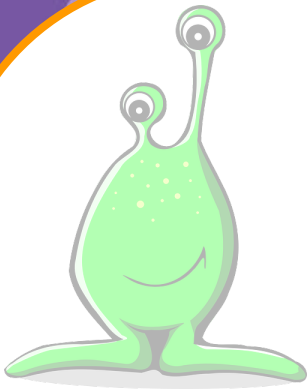
2. What is the name of Group 1A2?

3. Fill in the following information for your aliens in Class 1A1 using the names you chose:

a. Kingdom -----

b. Phylum -----

c. Class -----



CLASSIFY YOUR ALIENS

4. Fill in the following information for your aliens in Class 1A1 using the names you chose:

Kingdom _____

Phylum _____

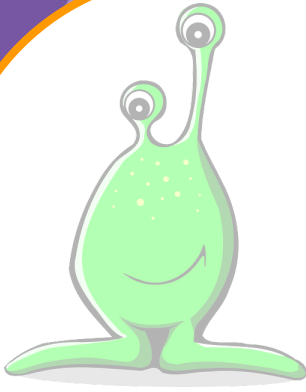
Class _____

5. Must all objects in the same class also belong to the same phylum?

6. Must all objects in the same phylum also belong to the same class?

Part 2:

- You will now repeat these steps for your second kingdom.



CLASSIFY YOUR ALIENS

Part 2A - Phyla:

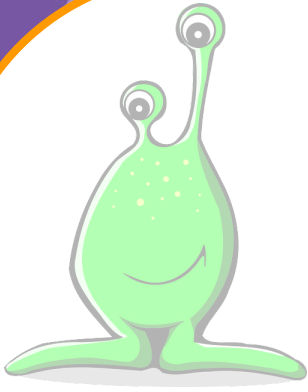
- Use only the aliens in Group 2.
- Regroup your aliens into two new groups, 2A and 2B. They do not need to have equal numbers.

1. What is the name of Group 2A?

2. What is the name of Group 2B?

3. What criteria did you use to sort them?

4. Are all organisms in both phyla also grouped into the same kingdom? _____



CLASSIFY YOUR ALIENS

Part 2B - Forming Classes:

- Aliens in each phylum can be separated even further into classes. Each phylum may have several classes.
- Take the aliens from Phylum 2A and separate them into two classes, Class 2A1 and Class 2A2.

1. What is the name of Group 2A1?

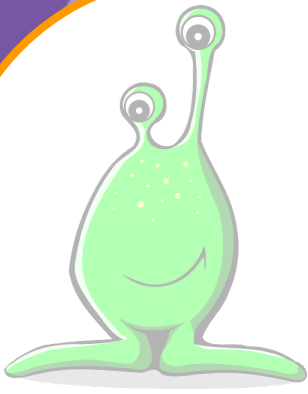
2. What is the name of Group 2A2?

3. Fill in the following information for your aliens in Class 2A1 using the names you chose:

a. Kingdom -----

b. Phylum -----

c. Class -----



CLASSIFY YOUR ALIENS

4. Fill in the following information for your aliens in Class 2A2 using the names you chose:

Kingdom _____

Phylum _____

Class _____

Analysis:

1. Why do scientists classify living organisms. Explain.

2. List the first three group names used in classification from largest to smallest. (The real group names, not your made up ones)



EXTENSIONS / MODIFICATIONS

- Students can continue to classify their aliens down to order, family, genus, and species.
- Have students use arts and crafts materials to design their own aliens. As a class separate all of the aliens into kingdom, phylum, and class.
- Design zoo signs for the aliens that include a picture, their kingdom, phylum, and class, and also a paragraph or two describing the alien's habitat, diet, etc.

