

Session 2

Classifying Living Things

Our Earth hosts an astonishing diversity of life forms. We can find plants, animals, and other types of organisms in almost every habitat that we encounter. In Session 1, characteristics shared by all life forms were introduced as features that unify the living world. Session 2 focuses on how life's diversity arises from variation on these same unifying features. A closer look at cells, in particular, introduces fundamental differences among life forms that have become one basis for biological classification.

The Video

How do we answer the question: What is it? Just what makes a plant a plant, or an animal an animal? Sally Goetz Shuler, representing Science and Technology for Children (STC), highlights questions like these as she introduces us to activities in the Organisms unit. The children in the Science Studio give us insight into how second and third graders define plants and animals, as well as their awareness of other life forms.

Stephanie Selznick's first graders in Dorchester, Massachusetts use Venn diagrams to determine how plants and animals are alike and different. Their early ideas are based on observations of class terrariums and aquariums, where they've observed these life forms over time.

Dr. Paul Williams returns to share what's going on in Bottle Biology—an ongoing Web site-based activity designed to apply session topics and to serve as a K–6 resource as well. We hear from Dr. Colleen Cavanaugh as she takes us to the deepest parts of the ocean to introduce us to her favorite group of living things—life forms that aren't classified as plants or animals. Finally, we see how a system for biological classification is used to classify all life forms into broad groups.

Learning Goals

During this session, you will have an opportunity to build understandings to help you:

- Distinguish between plants, animals, and other life forms based on cell features
- Classify different life forms into broad biological groups

On-Site Activities

Getting Ready (60 minutes)

Activity One—Problem Set and Reading Discussion (20 minutes)

Work in small groups.

1. Begin the session by reviewing questions 1–4 from the problem set for Session 1. For each question, select a single group member’s response and discuss. Use this as an opportunity to clarify understandings of content.
2. Each group member should share several children’s ideas identified from the reading for this discussion. Make a list of the questions formed about the content and cite the evidence you are using to support your answers.

Activity Two—Classifying Living Things (30 minutes)

1. In preparation for this session, you were asked to collect specimens that represent a diverse group of living things. Combine your specimens with those of a partner. As you look at the specimens, discuss three different ways that you might classify them. What might be the purpose(s) of classifying each way?
2. With your partner, classify your specimens into broad groups that you think represent fundamentally different life forms. As you classify, generate a list of characteristics that you think are most useful in forming these groups. Give names to your groups.
3. Share your classification scheme with the whole group. Make a combined list of all the groups formed, without arguing their merits. You’ll revisit this later.

Activity Three—Venn Diagrams (10 minutes)

Working alone, draw a Venn diagram that compares plants with animals. List only characteristics that are easily observed. Draw a second Venn diagram, this time based on cell characteristics. How do you think plant cells compare with animal cells? You’ll revisit these diagrams after you watch the video.

Watch the Video (60 minutes)

As you view the video, think about the following focus questions:

1. What features of cells can be used to classify living things?
2. In the Science Studio, the children don’t always agree on the characteristics that are common only to plants or only to animals. Listen for their ideas, and note which ideas raise questions in your mind.
3. In the featured classroom, Stephanie Selznick’s first graders are beginning to learn how to classify living things by using descriptive terms. As you watch, identify one or more instances where the descriptive terms are particularly “human-centered.” **Note:** This also occurs in the Science Studio.

On-Site Activities, cont'd.

Going Further (60 minutes)

1. Rejoin your partner. Share your Venn diagrams comparing plants with animals. Draw a new Venn diagram that reflects any revisions you have for easily observed characteristics. Draw another one that reflects revisions you have for cell characteristics. Be sure to include what you now understand about the need each group has for air. Which characteristics for classifying these groups are new or surprising to you?
2. One goal for this course is to give you a sense of the organization of life into hierarchical levels, and to help you make connections between these levels. As a whole group, generate a single Venn diagram that combines the information from the two Venn diagrams above. Looking at the Venn diagram, identify those features that are macroscopic (e.g., organismal level), microscopic (e.g., cell level), and molecular (e.g., the level of molecules or atoms). Which features can be connected to one another? For example, which features can be connected to photosynthesis? As a teacher, how does understanding something about life at each of these levels help inform your teaching?
3. Identify examples in the video or from your own experience where children have used “human-centered” descriptive terms as they classified plants and animals. As a whole group, discuss the pros and cons of allowing these sorts of descriptions to stand. How might ideas that are inaccurate in this way be used to help form accurate understandings? Pick specific examples if you can.
4. A strategy for classifying all living things into broad groups was introduced in the video. There are three domains: Bacteria, Archaea, and Eukarya. Within the Eukarya, there are four kingdoms: plants, animals, fungi, and protists. Gather all of your specimens. Using tables, the floor, or some other surface, place them into the appropriate groups.
 - What are the defining features of each group?
 - Which groups are underrepresented?
 - What characteristics make these groups easy or difficult to introduce to your students?

Note: See the *Life Science* Web site to learn more about these groups, and for ideas for introducing them to K–6 students (A Closer Look: Classifying Living Things, Teaching Tools):

<http://www.learner.org/channel/courses/essential/life/session2/>

5. Revisit the questions generated from the reading assignment and check for remaining content issues.

Between Sessions

Homework (* = required)

Reading Assignment*

Driver, R., et al. (1992). *Life and Living Processes*. Leeds National Curriculum Support Project, Part 2. Leeds City Council and the University of Leeds, UK.

Research Summary: Children's Ideas About Reproduction and Inheritance (pp. 1–4: Reproduction as a criterion for life; human reproduction; continuity of life; biology of reproduction in organisms)

As you read:

1. Identify several children's ideas that compare to your own, represent some uncertainty to you, or are particularly prevalent among your students.
2. For each idea, form a question about the content involved and try to answer it.
3. Note what evidence you are using to support your answers.

Life Science Problem Set*

(Suggested answers are listed in the Appendix.)

1. In Session 2, you were introduced to a system for classifying life into broad groups based on cell features. Describe the details of this system. Which feature(s), if any, seem most useful in classifying living things? Explain your answer.
2. Most life scientists would agree that a biological classification system that represents evolutionary relationships among life forms is the most useful. In such a scheme, the more characteristics shared by two groups, the more closely related they are and the closer they are to a common ancestor. Develop an argument that supports the claim that fungi are more closely related to plants than they are to animals. Develop the opposite argument. Which argument do you favor? **Note:** We will consider classification again in Session 6.
3. Imagine that you can see life at different levels of organization: macroscopic (organismal level), microscopic (cell level), and molecular (the level of molecules and atoms). At the molecular level inside a plant cell, what might you see? At the microscopic level? At the macroscopic level? How would this compare to an animal?
4. In the video, you saw life thriving in some of the deepest parts of the ocean. Which domains do you expect to find represented in this environment? Which kingdoms? Explain your reasoning.

Ongoing Concept Mapping*

Develop a concept map starting with "Classifying Living Things." Be sure to include what you've learned about cell features in your map, as well as the domains and kingdoms highlighted in the video. Then, try to make connections between the concept maps for Session 1 and Session 2. **Note:** You might add to each map, or try to combine maps. You may even find it useful to begin a large concept map (mural size), to keep making connections throughout the course.

Guided Journal Entry

Session 1 focused upon characteristics that define life. During Session 2, one of these characteristics—cells—was used as a way of classifying living things into groups representing fundamentally different life forms. In your journal entry, choose another characteristic of life: a life span (a living beginning, growth, development, reproduction, death), a constant need for matter and energy, the ability to respond to environment, or the hereditary information contained in DNA. Try to use this characteristic to distinguish between plants and animals. Do you agree that life's diversity stems from variation in its unifying features? Explain your answer.

Between Sessions, cont'd.

Guided Channel-TalkLife Posting

During this session, you were introduced to three domains within which all life forms are currently classified: Bacteria, Archaea, and Eukarya. You were also introduced to the kingdoms currently used to classify life forms in the domain Eukarya: plants, animals, fungi, and protists. Life forms in some of these groups are typically not introduced at the K–6 level. In your Channel-TalkLife posting, discuss how these groups might be introduced in ways appropriate to elementary school students. Be sure to share your experiences with your colleagues.

Textbook Reading Suggestions

- levels of organization
- taxonomy
- prokaryotes
- plant cells
- domains
- archaea
- protists
- plants
- classification
- cells
- eukaryotes
- animal cells
- kingdoms
- bacteria
- fungi
- animal

Preparing for the Next Session*

For “Getting Ready”

In the next session, we will be exploring animal life cycles. Choose two animal specimens from the group’s collection. And, choose another type of animal—something uncommon, unusual, and likely to be less familiar to the group. Consider your specimens to be adults. For each specimen, ask and answer the question “What was it before?” Record your answers, and keep track of the point(s) at which this question becomes challenging.

Materials Needed for Next Time

- Your specimens and recorded answers

Facilitators: The specimens in the group’s collection will be used in several future sessions. Gather and save the specimens—other than those that are alive and need special care or those that participants choose for the For “Getting Ready” assignment above.

Between Sessions, cont'd.

Ongoing Activities

Bottle Biology

By the end of the second week in this course, you should have a Bottle Biology system up and running. Be sure to share your experiences with your colleagues as you go.

You can also track the progress of systems set up by *Life Science* as a way of comparing your observations with ours, or checking out what can be done with other systems. See Bottle Biology Spotlights for relevant suggestions for each session.

Bottle Biology Spotlights: Session 2

System	Activity
TerrAqua Column	What Is It?

Graduate Credit Activities

Continue your work on the annotated bibliography and action research.