**8Th Grade Launch Unit**

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| **Unit Topic: Classification**  **Estimated Time: 2 weeks**  **This unit is designed to address a possible learning gap between 7th Grade Science and 8th Grade Science.** | | | | |
| **Standards** | | | | |
| **S7L1 Obtain, evaluate, and communicate information to investigate the diversity of organisms and how they can be compared scientifically.**  a. Develop and defend a model that categorizes organisms based on common characteristics.  b. Evaluate historical models of how organisms were classified based on physical characteristics and how that led to the six kingdom system.  [Click here to see the Taxonomy Learning Progression – Appendix A](#_Appendix_A:_Disciplinary_1)  **Transition to Physical Science (Assessed Standard/Element):**  **S8P1. Obtain, evaluate, and communicate information about the structure and properties of matter.**  a. Develop and use a model to compare and contrast pure substances (elements and compounds) and mixtures. (Clarification statement: Include heterogeneous and homogeneous mixtures. Types of bonds and compounds will be addressed in high school physical science.) | | | | |
| **Science and Engineering Practices and Cross Cutting Concepts –** [**Appendix B**](#_Appendix_B:_Science) | | | | |
| **Teacher Background Knowledge** | | | | |
| Cross Cutting Concept – Patterns:  Patterns exist everywhere—in regularly occurring shapes or structures and in repeating events and relationships. For example, patterns are discernible in the symmetry of flowers and snowflakes, the cycling of the seasons, and the repeated base pairs of DNA. Noticing patterns is often a first step to organizing and asking scientific questions about why and how the patterns occur.  One major use of pattern recognition is in classification, which depends on careful observation of similarities and differences; objects can be classified into groups on the basis of similarities of visible or microscopic features or on the basis of similarities of function. Such classification is useful in codifying relationships and organizing a multitude of objects or processes into a limited number of groups. Patterns of similarity and difference and the resulting classifications may change, depending on the scale at which a phenomenon is being observed. For example, isotopes of a given element are different—they contain different numbers of neutrons—but from the perspective of chemistry they can be classified as equivalent because they have identical patterns of chemical interaction. Once patterns and variations have been noted, they lead to questions; scientists seek explanations for observed patterns and for the similarity and diversity within them. Engineers often look for and analyze patterns, too. For example, they may diagnose patterns of failure of a designed system under test in order to improve the design, or they may analyze patterns of daily and seasonal use of power to design a system that can meet the fluctuating needs.  *Progression*  Human beings are good at recognizing patterns; indeed, young children begin to recognize patterns in their own lives well before coming to school. They observe, for example, that the sun and the moon follow different patterns of appearance in the sky. Once they are students, it is important for them to develop ways to recognize, classify, and record patterns in the phenomena they observe. For example, elementary students can describe and predict the patterns in the seasons of the year; they can observe and record patterns in the similarities and differences between parents and their offspring. Similarly, they can investigate the characteristics that allow classification of animal types (e.g., mammals, fish, insects), of plants (e.g., trees, shrubs, grasses), or of materials (e.g., wood, rock, metal, plastic).  These classifications will become more detailed and closer to scientific classifications in the upper elementary grades, when students should also begin to analyze patterns in rates of change—for example, the growth rates of plants under different conditions. By middle school, students can begin to relate patterns to the nature of microscopic and atomic-level structure—for example, they may note that chemical molecules contain particular ratios of different atoms. By high school, students should recognize that different patterns may be observed at each of the scales at which a system is studied. Thus, classifications used at one scale may fail or need revision when information from smaller or larger scales is introduced (e.g., classifications based on DNA comparisons versus those based on visible characteristics).  Source: "4 Dimension 2: Crosscutting Concepts." National Research Council. 2012. A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas. Washington, DC: The National Academies Press. doi: 10.17226/13165.  Introduction to Life Science Disciplinary Core Ideas  The life sciences focus on patterns, processes, and relationships of living organisms. Life is self-contained, self-sustaining, self-replicating, and evolving, operating according to laws of the physical world, as well as genetic programming. Life scientists use observations, experiments, hypotheses, tests, models, theory, and technology to explore how life works. The study of life ranges over scales from single molecules, through organisms and ecosystems, to the entire biosphere, that is all life on Earth. It examines processes that occur on time scales from the blink of an eye to those that happen over billions of years. Living systems are interconnected and interacting. Although living organisms respond to the physical environment or geosphere, they have also fundamentally changed Earth over evolutionary time. Rapid advances in life sciences are helping to provide biological solutions to societal problems related to food, energy, health, and environment.  From viruses and bacteria to plants to fungi to animals, the diversity of the millions of life forms on Earth is astonishing. Without unifying principles, it would be difficult to make sense of the living world and apply those understandings to solving problems. A core principle of the life sciences is that all organisms are related by evolution and that evolutionary processes have led to the tremendous diversity of the biosphere. There is diversity within species as well as between species. Yet what is learned about the function of a gene or a cell or a process in one organism is relevant to other organisms because of their ecological interactions and evolutionary relatedness. Evolution and its underlying genetic mechanisms of inheritance and variability are key to understanding both the unity and the diversity of life on Earth.  Source: "6 Dimension 3: Disciplinary Core Ideas - Life Sciences." National Research Council. 2012. A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas. Washington, DC: The National Academies Press. doi: 10.17226/13165. | | | | |
| **Big Ideas/Enduring Understandings** | | | **Essential Questions** | |
| * Taxonomy is a broad term to identify a developing and changing science of classification. * New technologies, discoveries, etc. can lead to new or different understandings that adjust/modify classification systems. * Scientists in different disciplines use classification systems to organize things based on patterns of shared characteristics including properties, structure and function, responses to matter and energy, etc. | | | How would you classify the blob?  How would you classify the matter? | |
| **Vocabulary**  Taxonomy Properties/Characteristics Six Kingdoms (Archaea, Bacteria, Protist, Fungi,  Classification Structure Function Plant, Animal)  Pure Substance Element Compound  Mixture (Heterogeneous, Homogeneous) | | | | |
| **Literature Connections** | | **STEM Career Connections** | | |
| **Materials and Safety Considerations** | | **Distance Learning Options** | | |
| **Lesson Components** | | | | |
| **Phenomena** | | | | |
| “The blob, a brainless mystery organism that can solve mazes, makes its public debut” By Alex Horton, Washington Post, adapted by Newsela staff  Published:10/25/2019 Word Count:602  Image of the Blob (*Physarum polycephalum*) | | | | |
| **ENGAGE** | | | | |
| Students evaluate the photo and its caption from the [NewsELA](https://newsela.com/read/le-blob/id/2000000730/?search_id=dbe45a2c-4637-4461-b46f-3498720a530f) article (or [Washington Post](https://www.washingtonpost.com/science/2019/10/17/blob-brainless-mystery-organism-that-can-solve-mazes-makes-its-public-debut/) article):    Image 1. It is called the blob. Physarum polycephalum is a unicellular organism neither plant, mushroom nor animal and capable of learning despite its lack of a brain and nervous system. It is pictured at the Paris Zoological Park in France in October 2019. Photo: Stephane De Sakutin/AFP/Getty Images  Students write everything they know about the kingdoms of organisms mentioned in the caption.   |  |  |  | | --- | --- | --- | | Fungi | Plant | Animal | |  |  |  |   Students asked to consider the usefulness of categorizing living things into kingdoms.  (*Teacher Hint: Allow students time in the alone zone, and then to talk with partners. Allow volunteers to make their thinking visible. Use this as an opportunity to model expectations for listening/contributing. For example, one student volunteer may say, “Categorizing makes it easier to figure out what you’re talking about.” You may want to ask them to elaborate on what they mean. Another student may raise their hand to contribute; but try to respect the necessary time it may take for the original student to express themselves. Make this explicit to the students as well.)*  Students asked to remember and include additional kingdoms with lists of those organisms’ characteristics they may have learned about in the previous year.  As you see students listing accurate kingdoms and those organisms’ characteristics, begin to walk around asking students to post on their shared screen space (e.g. board, Padlet) either the names of additional kingdoms or specific characteristics. Sample responses:   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Archaea | Bacteria | Protist | Fungi | Plant | Animal | | Unicellular  Extreme conditions | Unicellular  Often named based on their shape | Unicellular  Usually in water | Uni- or Multi-cellular  Decomposers | Multicellular  Autotrophs | Multicellular  Heterotrophs |   *The blob will be categorized as a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ because \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.*  Students then re-visit the image of the blob from the [NewsELA](https://newsela.com/read/le-blob/id/2000000730?search_id=dbe45a2c-4637-4461-b46f-3498720a530f) article to make a prediction as to how the scientists will decide to classify the new organism.  (*Teacher Hint: Ask students to use a pen to circle the kingdom they think the blob will most likely be categorized. Below their table of characteristics students should also explain why they think the blob will be categorized as \_\_\_\_\_\_\_.)* | | | | |
| **EXPLORE** | | | | |
| Students obtain and communicate a more complete set of patterns in characteristics that are used to classify organisms into one of the six kingdoms, as well as, explore the history of developing the modern six kingdom classification system. Students add to the table created in the engage phase as they obtain additional information.  Resource: [HMH Online Textbook Unit 1, Lesson 5](https://www.hmhco.com/content/science/hmhscience/ga/gr7/ese_9781328931627_/#page0060/)  *Teacher Hint: To meet part of the expectations of the standards it is also important for student comprehension of information obtained in Lesson 5 to be assessed/re-taught as needed based on student responses to various checkpoints built within the textbook lesson.*  Students then read the [NewsELA](https://newsela.com/read/le-blob/id/2000000730?search_id=dbe45a2c-4637-4461-b46f-3498720a530f) article in its entirety. Students highlight characteristics of the blob that can help them make a decision about the best fit for its kingdom. Students then organize these characteristics under each kingdom. For example:     |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Archaea | Bacteria | Protist | Fungi | Plant | Animal | | Unicellular | Unicellular | Unicellular | Can be Uni |  | Has a memory  Can work mazes |   Students then decide if they have enough information to make an informed decision/claim.  (*Teacher Hint: Students will most likely decide that they do not have enough information.)*  Make explicit to students that their objective is to make a claim as to the best kingdom for classification of this blob based on obtained textual/video evidence. Preview the format for students’ claims:  Students provided time to obtain additional information about the blob (graphic organizer from explore used when reading NewsELA article ) and then organize their thinking in order to make a claim about its classification:  Video: [WIRED](https://www.bing.com/videos/search?view=detail&mid=5301819C86FA7275F2B35301819C86FA7275F2B3&shtp=GetUrl&shid=fb90460b-9edc-4167-9c95-d5b0e5b8e988&shtk=SG93IFRoaXMgQmxvYiBTb2x2ZXMgTWF6ZXMgfCBXSVJFRA%3D%3D&shdk=UGh5c2FydW0gcG9seWNlcGhhbHVtIGlzIGEgc2luZ2xlLWNlbGxlZCwgYnJhaW5sZXNzIG9yZ2FuaXNtIHRoYXQgY2FuIG1ha2Ug4oCcZGVjaXNpb25zLOKAnSBhbmQgc29sdmUgbWF6ZXMuIEFubmUgUHJpbmdsZSwgd2hvIGlzIGEgbXljb2xvZ2lzdCBhdCB0aGUgVW5pdmVyc2l0eSBvZiBXaXNjb25zaW4tTWFkaXNvbiwgZXhwbGFpbnMgZXZlcnl0aGluZyB5b3UgbmVlZCB0byBrbm93IGFib3V0IHdoYXQgdGhlc2Ugc2xpbWUgbW9sZHMgYXJlIGFuZCBob3cgdGhleSBmaXQgaW50byBvdXIgZWNvc3lzdGVtLiBTdGlsbCBoYXZlbuKAmXQgc3Vic2NyaWJlZCB0byBXSVJFRCBvbiBZb3VUdWJlPyBodHRwIC4uLg%3D%3D&shhk=aP8UP0HrPEU06eJf%2BfymLWfAXK96%2FFN18Tt3yI7KrL4%3D&form=VDSHOT&shth=OSH.zqczWps3jJeQBI%252BCH2lQ1A)  Audio: [NPR](https://www.npr.org/2019/10/20/771285312/the-blob-a-smart-yet-brainless-organism-fit-for-sci-fi-gets-its-own-exhibit)  Additional Text Resources: [*Slime Mold Express*](https://www.sciencemag.org/news/2010/01/ride-slime-mold-express)*,* [*The Blob: Slime Molds*](https://herbarium.usu.edu/fun-with-fungi/slime-molds) | | | | |
| **EXPLAIN** | | | | |
| Students make their thinking visible to partners. Based on conversations, students edit (in pen) their CER organizer to add to/take away evidence and/or reasons.  (*Teacher Hint: Before students begin partner discussions, review and/or set the expectations for productive discourse.*  *Background* *Resources:*  [*Science Talk*](https://www.exploratorium.edu/education/ifi/inquiry-and-eld/educators-guide/science-talk)  (Suggested guidelines created by students provided within the article/video.)  *[Taking Science to School:](https://www.nap.edu/read/11625/chapter/9)**[Chapter 7](https://www.nap.edu/read/11625/chapter/9)*  "7 Participation in Scientific Practices and Discourse." National Research Council. 2007. Taking Science to School: Learning and Teaching Science in Grades K-8. Washington, DC: The National Academies Press. doi: 10.17226/11625.  As a follow up, students take a thinking poll to show where their thinking about how the blob should be classified. Students discuss how the data informs them of the alternate/counter claim.  *(Teacher Hint: Thinking polls can be posted in the classroom on large scale using sticky notes on a graphic organizer like the one students used to explore or digital through* <https://www.polleverywhere.com/>)  Students finalize their thinking by constructing an argument about the best category for the blob. Students must align their argument using patterns in characteristics like other organisms in that kingdom. Students must also present evidence as to how a counter claim for a different kingdom could be argued, but also present why this counter claim is insufficient based on the known structures and functions of the blob.  *(Teacher Hint: Prior to writing consider providing students with a writing rubric****.*** *In addition, depending on students’ experiences with CER/writing in science you may need to make explicit how to read the rubric. Provide examples of exemplary writing as needed.)* | | | | |
| **EXPAND** | | | | |
| Students transition from life to physical sciences via the EQ “How would you classify the matter?”  Students collect, interpret, and analyze information in order to classify them into a cladogram via the PBS Nova classroom activity, “[The Missing Link](https://www.pbs.org/wgbh/nova/education/activities/2905_link.html#procedure).”  After completing the cladogram, students then transition into the study of physical sciences by interpreting and analyzing images/descriptions (physical and chemical properties, structure/function) of different types of matter (e.g. pure substances, mixtures). Students follow the same general procedures provided in “The Missing Link” to classify the different types of matter into a cladogram.   |  |  |  | | --- | --- | --- | | particles evenly distributed | different types of particles, connected or bonded | same types of particles, connected or bonded | | particles unevenly distributed | only one type of particle | cannot be broken down by physical or chemical mean | | different types of particles sharing space, but disconnected | same type of particles sharing space, but disconnected | can only be broken down by chemical means | | can be broken down by either physical or chemical means | unique set of properties | connected, or bonded, properties are *different from* the unique set of properties of the individual particles | | properties stay the same of the different types of particles that are sharing space | share space | set, or constant, ratio of different types of particles |   Images to Correspond with Above Descriptions:    Additional Resources:  <https://www.chem.purdue.edu/gchelp/atoms/elements.html>  [HMH Online Textbook: Unit 1, Lesson 4 pp 60 - 72](https://www.hmhco.com/content/science/hmhscience/ga/gr8/ese_9781328931634_/#page0060/) | | | | |
| **ADDITIONAL RESOURCES** | | | | |
| **STEM Challenges** | **Science Probes** | **Picture Perfect Sci** | | **Mystery Science** |
|  | [Is it a Plant?](http://cobbcounty.nsta.patron.eb20.com/ISBN/9781933531731/PageNumber/93) |  | |  |
| **ASSESSMENT** | | | | |
| Sample Assessment Item from [GMAS Study/Resource Guide for Parents/Students Grade 8](https://www.rockdaleschools.org/UserFiles/Servers/Server_136304/File/Academics%20and%20Support/GA%20Milestones/2019%20Milestones%20Study%20Guides%20Practice/EOG%20End%20of%20Grade/GR08_Study_Guide_11.13.18.pdf): | | | | |

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# **Appendix A: Disciplinary Core Idea: Life Science Learning Progression**

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| **K & 1st** | **2nd** | **5th** | **7th** | | **High School** |
| **SKL1. Obtain, evaluate, and communicate information about how organisms (alive and not alive) and non-living objects are grouped.**  a. Construct an explanation based on observations to recognize the differences between organisms and nonliving objects.  b. Develop a model to represent how a set of organisms and nonliving objects are sorted into groups based on their attributes.  **SKL2. Obtain, evaluate, and communicate information to compare the similarities and differences in groups of organisms.**  a. Construct an argument supported by evidence for how animals can be grouped according to their features.  b. Construct an argument supported by evidence for how plants can be grouped according to their features.  c. Ask questions and make observations to identify the similarities and differences of offspring to their parents and to other members of the same species.  **First Grade:**  **S1L1. Obtain, evaluate, and communicate information about the basic needs of plants and animals.**  a. Develop models to identify the parts of a plant—root, stem, leaf, and flower.  b. Ask questions to compare and contrast the basic needs of plants (air, water, light, and nutrients) and animals (air, water, food, and shelter).  c. Design a solution to ensure that a plant or animal has all of its needs met. | **S2L1. Obtain, evaluate, and communicate information about the life cycles of different living organisms.**  a. Ask questions to determine the sequence of the life cycle of common animals in your area: a mammal such as a cat, dog or classroom pet, a bird such as a chicken, an amphibian such as a frog, and an insect such as a butterfly.  b. Plan and carry out an investigation of the life cycle of a plant by growing a plant from a seed and by recording changes over a period of time.  c. Construct an explanation of an animal’s role in dispersing seeds or in the pollination of plants.  d. Develop models to illustrate the unique and diverse life cycles of organisms other than humans. | **S5L1. Obtain, evaluate, and communicate information to group organisms using scientific classification procedures.**  a. Develop a model that illustrates how animals are sorted into groups (vertebrate and invertebrate) and how vertebrates are sorted into groups (fish, amphibian, reptile, bird, and mammal) using data from multiple sources.  b. Develop a model that illustrates how plants are sorted into groups (seed producers, non-seed producers) using data from multiple sources. | **S7L1. Obtain, evaluate, and communicate information to investigate the diversity of living organisms and how they can be compared scientifically.**  a. Develop and defend a model that categorizes organisms based on common characteristics.  b. Evaluate historical models of how organisms were classified based on physical characteristics and how that led to the six kingdom system (currently archaea, bacteria, protists, fungi, plants, and animals).  *(Clarification statement: This includes common examples and characteristics such as, but not limited to, prokaryotic, eukaryotic, unicellular, multicellular, asexual reproduction, sexual reproduction, autotroph, heterotroph, and unique cell structures. Modern classification will be addressed in high school.)* | **SB4. Obtain, evaluate, and communicate information to illustrate the organization of interacting systems within single-celled and multi-celled organisms.**  a. Construct an argument supported by scientific information to explain patterns in structures and function among clades of organisms, including the origin of eukaryotes by endosymbiosis. Clades should include:   * archaea * bacteria * eukaryotes * fungi * plants * animals   *(Clarification statement: This is reflective of 21st century classification schemes and nested hierarchy of clades and is intended to develop a foundation for comparing major groups of organisms. The term 'protists' is useful in describing those eukaryotes that are not within the animal, fungal or plant clades but the term does not describe a well-defined clade or a natural taxonomic group.)*  b. Analyze and interpret data to develop models (i.e., cladograms and phylogenetic trees) based on patterns of common ancestry and the theory of evolution to determine relationships among major groups of organisms.  c. Construct an argument using valid and reliable sources to support the claim that evidence from comparative morphology (analogous vs. homologous structures), embryology, biochemistry (protein sequence) and genetics support the theory that all living organisms are related by way of common descent.  d. Develop and use mathematical models to support explanations of how undirected genetic changes in natural selection and genetic drift have led to changes in populations of organisms.  *(Clarification statement: Element is intended to focus on basic statistical and graphic analysis. Hardy Weinberg would be an optional application to address this element.)*  e. Develop a model to explain the role natural selection plays in causing biological resistance (e.g., pesticides, antibiotic resistance, and influenza vaccines). | |

# **Appendix B: Science and Engineering Practices Gap Analysis:**

# Based on the fourth quarter standards, there may be a gap in the understanding of the following Science and Engineering Practices:

# **Obtaining, Evaluating, and Communicating Information:** Scientists and engineers must be able to communicate clearly and persuasively the ideas and methods they generate. Critiquing and communicating ideas individually and in groups is a critical professional activity. Communicating information and ideas can be done in multiple ways: using tables, diagrams, graphs, models, and equations as well as orally, in writing, and through extended discussions. Scientists and engineers employ multiple sources to obtain information that is used to evaluate the merit and validity of claims, methods, and designs.



**Cross-Cutting Concepts Gap Analysis:**

