

Grade 6 Science Quarter 2 Unit 2.1

Biodiversity and Evolution

Overview

Number of instructional days: 15 (1 day = 45 minutes)

Content to be learned

- Follow a taxonomic key to identify an organism.
- Research possible causes for the extinction of a plant or animal.
- Explain how populations' or species' traits affect an organism's ability to survive over time.

Science processes to be integrated

- Use a taxonomic key.
- Make comparisons.
- Conduct research and communicate findings.
- Cite scientific evidence.
- Make connections between form and function.
- Identify patterns of change.
- Use scientific models.

Essential questions

- How can a taxonomic key be used to identify an organism?
- How do certain traits of organisms provide a survival advantage in a specific environment?
- What are some possible causes for the extinction of a plant or animal?

Written Curriculum

Grade Span Expectations

LS3 - Groups of organisms show evidence of change over time (structures, behaviors, and biochemistry).

LS3 (5-8) MAS+FAF – 8

Use a model, classification system, or dichotomous key to illustrate, compare, or interpret possible relationships among groups of organisms (e.g., internal and external structures, anatomical features).

LS3 (5-6) – 8 Students demonstrate an understanding of classification of organisms by ...

8b following a taxonomic key to identify a given organism (e.g. flowering and non-flowering plants).

LS3 (5-8) POC-9

Cite examples supporting the concept that certain traits of organisms may provide a survival advantage in a specific environment and therefore, an increased likelihood to produce offspring.

LS3 (5-6) -9 Students demonstrate an understanding of Natural Selection/evolution by ...

9a explaining how a population's or species' traits affect their ability to survive over time.

9b researching or reporting on possible causes for the extinction of an animal or plant.

Clarifying the Standards

In grade K–2, students identified and sorted organisms based on a similar or different external features and identified the specific functions of the physical structures of a plant or animal. Students sorted and classified living things using similar and different characteristics and described why organisms belonging to a group are alike or different.

In grades 3–4, students explained what plants or animals might do if their environment changed and explained how the balance of an ecosystem can be disturbed, for example, how overpopulation of a species affects the rest of the ecosystem. Students also showed connections between external and internal body structures and how they help humans survive. Students have cited evidence to distinguish between living and nonliving things. They also identified, sorted, and compared organisms based on similar and different external features, recording and analyzing observations about external features within a grouping.

Current Learning

Instruction for this unit of study will be presented at a developmental level. While using a taxonomic key is developmental at this stage, students should be familiar with classifying organisms using their own categories. Having this background information in classifying organisms should aid in the understanding of following a specific key to pinpoint a certain organism. The developmental level of instruction is also appropriate when students are learning about natural selection, how traits affect a populations' survival, and the extinction of an organism. Students will get into the finer points of these concepts once they enter 7th grade.

Concepts and specific ideas that will be taught in this unit of study are an introduction to taxonomy (classification of organisms), natural selection, and evolution. Students demonstrate an understanding of classification of organisms by following a taxonomic key to identify an organism. At this level, students are not expected to create their own key, however teachers should provide keys for students to utilize. Students demonstrate an understanding of natural selection and evolution by researching and reporting on the causes for the extinction of an organism(s), presenting their findings in a logical argument. In this unit, students will also discuss how a populations' or species' traits affect an organism's ability to survive over time. An example could be that a population in a particular area gets flooded out and they lose their source of food, therefore if they have features that help them survive in the altered environment (an adaptation), they will continue to survive.

The processes that students will need in order to master the content in this unit of study are embedded throughout the instruction. Students will actively work through a taxonomic key/ dichotomous key by tracing through the traits listed in the key. When using a taxonomic (dichotomous) key, students answer a series of questions that advance them to the next trait that eventually identifies a given organism. Students work actively to research and evaluate media sources relating to a specific cause for extinction of a specific organism. Here the teacher acts as a facilitator, whose role is to guide students and assist them in evaluating media sources to construct and communicate their findings.

Through inquiry activities, such as observing a plant or animal over a period of time, students could observe, question, and hypothesize about the traits that allow the organism to survive. Students create a change in the environment to observe, predict, and explain how the survival of this organism will be affected by this change.

Some of the following student behaviors are mandated by the standards and some are suggested. As an introduction, teachers should provide an opportunity for students to classify a set of objects. This classification activity and discussion will lead to the introduction of a taxonomic key. Teachers should present the steps and the components of the key. Use of the key will continue with the identification of a specific organism as modeled by the teacher. Students will then have their own opportunity to apply their learning by applying a key to a set of organisms.

It's a good idea to provide an inquiry activity to allow the observation of an organism's survival traits. This opportunity can be in the form of a living animal within the classroom, plants, and/or an Internet-based activity.

The extinction of an organism is going to be a research-based activity. Teachers should provide a list of reliable and valid resources including Internet sources.

The content of natural selection and evolution that the students will need to use in this unit are almost entirely new and different from anything that they have been required to use before. While students have been introduced to the idea of classification in the previous grades, they will now take the classification process to the use of a taxonomic key. Students are learning to draw conclusions and make inferences at this developmental level. The research activities should show students progress in their skills of analyzing data and presenting their conclusions.

Students from grade 7 to high school will begin to classify organisms based on internal structures. They will explain how species with similar evolutionary characteristics are classified more closely with one another than with species of dissimilar characteristics, and how natural selection leads to evolution. Students will need to recognize the classification system used in modern biology. They will describe scientists' understanding of the way species originate or become extinct through various changes.

Additional Research Findings

According to *Benchmarks for Science Literacy*, lower-elementary students sometimes form groups of different status—for example, organisms that are able to fly and organisms that fight each other. Upper-elementary students tend to identify a number of mutually exclusive groups rather than a hierarchy of groups. Some groups are based on observable features, others on concepts (p. 24).

The book also states that, in the beginning, children can focus on any attribute—such as size, color, number of limbs, fins, or wings—but they should gradually be guided to realize that, for the purpose of understanding relatedness among organisms, some characteristics are more significant than others (*Benchmarks*, p. 101).

According to the *Atlas of Science Literacy, Volume 1*, students' understanding of evolution is related to their general reasoning ability. Some students tend to retain non-scientific beliefs because they fail to examine hypotheses and their predicted consequences, and conflicting evidence. Students tend to believe their initial intuition or other students' misstatements (p. 80).

The book also states that students at all grade levels struggle with the various uses of the word *adaptation* and that elementary- and middle-school students tend to confuse non-inherited adaptations with inherited adaptive features (*Atlas, Vol. 1*, p. 82).

Grade 6 Science, Quarter 2, and Unit 2.2
Human Development

Overview

Number of instructional days: 10 (1 day = 45 minutes)

Content to be learned

- Identify the biotic factors that have an effect on human body systems.
- Identify the abiotic factors that have an effect on human body systems.
- Identify biotic and abiotic factors that cause disease and affect human health.

Science processes to be integrated

- Observe and use models.
- Collect and interpret data.
- Communicate findings.
- Make scientific comparisons.
- Identify cause and effect relationships.

Essential questions

- How are human body systems affected by internal and external biotic factors?
- What are some examples of biotic and abiotic factors that cause disease?
- What relationships exist between biotic factors, abiotic factors, and human health?

Written Curriculum

Grade Span Expectations

LS 4 - Humans are similar to other species in many ways, and yet are unique among Earth's life forms.

LS4 (5-8) INQ-10

Use data and observations to support the concept that environmental or biological factors affect human body systems (biotic & abiotic).

LS4 (5-6)-10 Students demonstrate an understanding of human body systems by ...

10a identifying the biotic factors (e.g., microbes, parasites, food availability, aging process) that have an effect on human body systems.

10b identifying the abiotic factors (e.g., drugs, altitude, weather, pollution) that have an effect on human body systems.

LS4 (5-6)-10 Students demonstrate an understanding patterns of human health/disease by ...

10c identifying the biotic (e.g., microbes, parasites, food availability, aging process) and abiotic (e.g., radiation, toxic materials, carcinogens) factors that cause disease and affect human health.

Clarifying the Standards

Prior Learning

In grades K–4, students learned to identify body parts and compare external features through observation. Students identified senses needed to survive and compared characteristics of humans and others animals. In grades 3–4, students identified that some behaviors are learned and some behaviors are instinctive, and they recognized traits inherited from a biological parent.

In grade 5, students demonstrated an understanding of classification of organisms by stating the reason for classification systems. Students also explored how fossil evidence could be used to understand the history of life on earth.

Current Learning

Portions of the content in this unit of study are presented at a developmental level, but are based on prior learning at the drill-and-practice level. Students identify biotic and abiotic factors of the environment that may influence the function of the human body. The vocabulary of *biotic* and *abiotic* are at the developmental level, however the concept of living and nonliving should be at the drill-and-practice stage. Applying these concepts of biotic and abiotic to the human body is still at the developmental level.

In the previous grade, students learned the characteristics of the human body. Students are extending on their knowledge of the human body systems by identifying the biotic/abiotic factors that affect their health and/or cause disease. It is important to note that some of these factors have positive impacts on the health and functioning of human body systems.

Students were exposed to the concept of living and nonliving in the quarter 1 unit on ecosystems. Students will need to be introduced to the terms biotic and abiotic as a way to describe living and nonliving factors and as part of their identification of the effects of these factors. Students will go on to identify the biotic and abiotic factors that have an effect on human body systems as well as human health and disease.

The processes mandated by the standards should be embedded throughout student learning. Students will observe a compilation of factors and analyze which factors are abiotic or biotic, determining which of these factors affect the human body.

To apply the concept of biotic/abiotic factors students could go to a specified location, such as the mall, the cafeteria, or outside, and identify the factors that affect human health, classifying them as biotic/abiotic.

Please note this should not be just a compiled list on a page within a notebook. The instruction for this unit of study should be inquiry based. Students need to present the factors in various ways that demonstrate that they are involved in activities that meet this requirement. For example, students could ask and answer questions about the various factors that impact the human body, perform investigations or research to collect information that can be used to answer the questions, then communicate their findings by creating a brochure of the different factors that affect the human body.

Future Learning

In grade 7, students will demonstrate their understanding of human body systems by predicting and explaining the effects of biotic and abiotic factors. Through research and reporting, students will also demonstrate their understanding of these factors and their effect on human health and disease.

In grades 9–12, students will continue to demonstrate an understanding of how humans are affected by environmental factors and/or heredity by researching the effects of radiation, chemicals, and other factors that can cause gene mutation or disease. Students will also provide examples of how humans impact the environment and other organisms. Computers will be used to simulate the effects of these human activities.

Additional Research Findings

According to the *Atlas of Science Literacy*, lower-elementary students understand that death is irreversible and inevitable. They usually think that death is caused by an external agent, but do not connect death with what happens within the body as a result of these external events. Around third or fourth grade, students sense that death means the cessation of bodily functions (Volume 1, p. 38).

Some students believe that traits are inherited from only one parent. Often they think that traits are inherited from the mother only since the mother bears the child. Other students believe that certain characteristics are always inherited from the mother, while other characteristics are always inherited from the father. It may not be until the end of grade 5 that students can formulate arguments based on observation and probability to predict the outcome of inherited characteristics (Volume 1, p. 68).

Early middle-school students can often explain only observable features, while later middle-school students may have a better understanding of internal features (Volume 1, p. 68).

According to *Making Sense of Secondary Science*, children showed some notion of pre-formation with suggestions that a human egg contains a structurally refined human (pp. 39–40). It is only as they get older, around age 13, that they understand the implication of any genetic principle (p. 51).

Benchmarks for Science Literacy states, when comparing the external features of students with their siblings, parents, and grandparents, the matter should be handled with great delicacy to ensure no students are embarrassed (p. 106).

Notes About Resources and Materials

On twins

- Science News. *ScienceNewsForKids*. Double Take.
<<http://www.sciencenewsforkids.org/articles/20081210/Feature1.asp>>

On genetics

- Utah State Office of Education. *Schools.Utah*. Reproduction and Heredity.
<<http://www.schools.utah.gov/curr/science/sciber00/7th/genetics/sciber/intro.htm>>
- American Association for the Advancement of Science. *ScienceNetLinks*. Gene Puzzles.
<<http://www.sciencenetlinks.com/lessons.php?DocID=96>>
- National Geographic Society. *NationalGeographic*. Xpeditions.
<<http://www.nationalgeographic.com/resources/ngo/education/xpeditions/lessons/08/g68/brainpopdna.html>>
<<http://www.nationalgeographic.com/xpeditions/lessons/15/g68/hazards.html>>

On the effect of drugs on human body

- National Institute on Drug Abuse. *NIDAForTeens*. Brain Games.
<<http://teens.drugabuse.gov/sarasquest/index.php>>
- Nemours Foundation. *KidsHealth*. Smoking Stinks.
<<http://kidshealth.org/kid/watch/house/smoking.html>>
- Chudler, E. *NeuroscienceForKids*. Alcohol and the Brain.
<<http://faculty.washington.edu/chudler/alco.html>>