

Fifth Grade Companion Document
5-Unit 3: Evolution and Traits of Organisms

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Introduction to the K-7 Companion Document An Instructional Framework

Overview

The Michigan K-7 Grade Level Content Expectations for Science establish what every student is expected to know and be able to do by the end of Grade Seven as mandated by the legislation in the State of Michigan. The Science Content Expectations Documents have raised the bar for our students, teachers and educational systems.

In an effort to support these standards and help our elementary and middle school teachers develop rigorous and relevant curricula to assist students in mastery, the Michigan Science Leadership Academy, in collaboration with the Michigan Mathematics and Science Center Network and the Michigan Science Teachers Association, worked in partnership with Michigan Department of Education to develop these companion documents. Our goal is for each student to master the science content expectations as outlined in each grade level of the K-7 Grade Level Content Expectations.

This instructional framework is an effort to clarify possible units within the K-7 Science Grade Level Content Expectations. The Instructional Framework provides descriptions of instructional activities that are appropriate for inquiry science in the classroom and meet the instructional goals. Included are brief descriptions of multiple activities that provide the learner with opportunities for exploration and observation, planning and conducting investigations, presenting findings and expanding thinking beyond the classroom.

These companion documents are an effort to clarify and support the K-7 Science Content Expectations. Each grade level has been organized into four teachable units- organized around the big ideas and conceptual themes in earth, life and physical science. . The document is similar in format to the Science Assessment and Item Specifications for the 2009 National Assessment for Education Progress (NAEP). The companion documents are intended to provide boundaries to the content expectations. These boundaries are presented as “notes to teachers”, not comprehensive descriptions of the full range of science content; they do not stand alone, but rather, work in conjunction with the content expectations. The boundaries use seven categories of parameters:

- a. **Clarifications** refer to the restatement of the “key idea” or specific intent or elaboration of the content statements. They are not intended to denote a sense of content priority. The clarifications guide assessment.
- b. **Vocabulary** refers to the vocabulary for use and application of the science topics and principles that appear in the content statements and expectations. The terms in this section along with those presented

within the standard, content statement and content expectation comprise the assessable vocabulary.

- c. **Instruments, Measurements and Representations** refer to the instruments students are expected to use and the level of precision expected to measure, classify and interpret phenomena or measurement. This section contains assessable information.
- d. **Inquiry Instructional Examples** presented to assist the student in becoming engaged in the study of science through their natural curiosity in the subject matter that is of high interest. Students explore and begin to form ideas and try to make sense of the world around them. Students are guided in the process of scientific inquiry through purposeful observations, investigations and demonstrating understanding through a variety of experiences. Students observe, classify, predict, measure and identify and control variables while doing "hands-on" activities.
- e. **Assessment Examples** are presented to help clarify how the teacher can conduct formative assessments in the classroom to assess student progress and understanding
- f. **Enrichment and Intervention** is instructional examples the stretch the thinking beyond the instructional examples and provides ideas for reinforcement of challenging concepts.
- g. **Examples, Observations, Phenomena** are included as exemplars of different modes of instruction appropriate to the unit in which they are listed. These examples include reflection, a link to real world application, and elaboration beyond the classroom. These examples are intended for instructional guidance only and are not assessable.
- h. **Curricular Connections and Integrations** are offered to assist the teacher and curriculum administrator in aligning the science curriculum with other areas of the school curriculum. Ideas are presented that will assist the classroom instructor in making appropriate connections of science with other aspects of the total curriculum.

This Instructional Framework is NOT a step-by-step instructional manual but a guide developed to help teachers and curriculum developers design their own lesson plans, select useful portions of text, and create assessments that are aligned with the grade level science curriculum for the State of Michigan. It is not intended to be a curriculum, but ideas and suggestions for generating and implementing high quality K-7 instruction and inquiry activities to assist the classroom teacher in implementing these science content expectations in the classroom.

5th Grade Unit 3: Evolution and Traits of Organisms

Content Statements and Expectations

Code	Statements & Expectations	Page
L.HE.M.1	Inherited and Acquired Traits – The characteristics of organisms are influenced by heredity and environment. For some characteristics, inheritance is more important; for other characteristics, interactions with the environment are more important.	1
L.HE.05.11	Explain that both the environment and the genetics of the individual influence the traits of an individual.	1
L.HE.05.12	Distinguish between inherited and acquired traits.	2
L.EV.M.1	Species Adaptation and Survival – Species with certain traits are more likely than others to survive and have offspring in particular environments. When an environment changes, the advantage or disadvantage of the species’ characteristics can change. Extinction of a species occurs when the environment changes and the characteristics of a species are insufficient to allow survival.	3
L.EV.05.11	Explain how behavioral characteristics (adaptation, instinct, learning, habit) of animals help them to survive in their environment.	3
L.EV.05.12	Describe the physical characteristics (traits) of organisms that help them to survive in their environment.	3
L.EV.05.13	Describe how fossils provide evidence about how living things and environmental conditions have changed.	4
L.EV.05.14	Analyze the relationship of environmental change and catastrophic events (for example: volcanic eruption, floods, asteroid impact, tsunami) to species extinctions.	4
L.EV.M.2	Relationships Among Organisms – Similarities among organisms are found in anatomical features, which can be used to infer the degree of relatedness among organisms. In classifying organisms, biologists consider details of internal and external structures to be more important than behavior and general appearance.	5
L.EV.05.21	Relate the degree of similarity in anatomical features to the classification of contemporary organisms.	5

5 – Unit 3: Evolution and Traits of Organisms

Big Ideas (Key Concepts)

- Traits are influenced by both genetics of the individual and the environment.
- Traits can be classified as either inherited or acquired.
- Each organism (plants and animals) has specific behavioral and physical characteristics allowing them to better survive in a given environment.
- As environments change over time, these characteristics may change (adaptations) to allow them to continue to survive or flourish in their environment.
- Fossils provide evidence that life forms have changed over time and were influenced by changes in environmental conditions including catastrophic events.
- Organisms that are similar in anatomical structures are more likely to be more closely related than those whose structures are less similar to one another.

Clarification of Content Expectations

Standard: Heredity

Content Statement – L.HE.M.1

Inherited and Acquired Traits – The characteristics of organisms are influenced by heredity and environment. For some characteristics, inheritance is more important; for other characteristics, interactions with the environment are more important.

Content Expectations

L.HE.05.11 Explain that both the environment and the genetics of the individual influence the traits of an individual.

Instructional Clarifications

1. Explain is to clearly describe by means of illustrations (drawing), demonstrations, and/or verbally how traits are influenced by the environment and genetics.
2. The similarity of genetic (inherited) traits between parents and their young is easily recognized.

3. Differences in soil minerals, exposure to sun, availability of water or other environmental factors are conditions that may cause variation in growth among offspring of the same parent plants or plants of the same species. Differences in growth among these plants are also influenced by the genetic traits of each plant.
4. Differences in nutrition, disease exposure, or other environmental factors are conditions that may cause variation in growth among offspring of the same animal parents or animals of the same species. Differences in growth among these animals are also influenced by the genetic traits of each animal.
5. A common misconception is that organisms can develop adaptations to a changing environment. Organisms may adapt behaviorally during their lifetime but these changes are not heritable. The term “adaptation” refers to genetically based traits that develop at the population level due to genetic variation and subsequent natural selection. These adaptations are heritable.

Assessment Clarification

1. Environmental effects on inherited traits include disease and nutrition levels.
2. The environment may alter inherited traits.

L.HE.05.12 Distinguish between inherited and acquired traits.

Instructional Clarifications

1. Distinguish means to recognize or know the difference between inherited and acquired traits.
2. Inherited traits develop from the genetic “instructions” passed along from parents to offspring. Plant examples: Shape of leaves or shape of flowers. Animal examples: Body shape, body covering.
3. Acquired traits are a consequence of an organism’s experiences and are not part of their genetic makeup. For example, amputation of a limb, scars, learned knowledge, small size due to lack of food (animals) or sunlight (plants).
4. Inherited traits may be modified by disease, nutrition or other environmental factors and represent acquired traits. Example: One twin of a genetically identical pair may acquire a disease that retards growth in comparison to his/her twin.
5. A common misconception is that daughters inherit most of their characteristics from their mothers while boys inherit most of their characteristics from their fathers.
6. Another common misconception is that traits are either inherited or acquired. In fact, some can be a combination of both, such as athletic ability.

Assessment Clarifications

1. Identify common inherited traits of plants and animals. Plant examples: Shape of leaves or shape of flowers. Animal examples: Body shape, body covering.

2. Identify acquired traits of plants and animals that may result from environmental conditions. Examples include: amputation of a limb, scars, learned knowledge, small size due to lack of food (animals) or sunlight (plants).

Standard: Evolution

Content Statement - L.EV.M.1

Species Adaptation and Survival- Species with certain traits are more likely than others to survive and have offspring in particular environments. When an environment changes, the advantage or disadvantage of the species' characteristics can change. Extinction of a species occurs when the environment changes and the characteristics of a species are insufficient to allow survival.

Content Expectations

L.EV.05.11 Explain how behavioral characteristics (adaptation, instinct, learning, habit) of animals help them to survive in their environment.

Instructional Clarifications

1. Explain is to clearly describe by means of illustrations (drawing), demonstrations, and/or verbally how behavioral characteristics help animals survive in their environment.
2. Learned behavior may become a habit. Example of a learned behavior: Birds coming to a bird feeder, raccoons getting into garbage cans to look for food.
3. Example of habit: Some animals have the habit of being active at night (nocturnal) and may be protected from predators that are active during the day.
4. Example of instinct: A bird building a nest is an instinctive (unlearned) behavior. All birds of the same species build the same type of nest.

Assessment Clarification

1. Some behavioral characteristics such as birds coming to a bird feeder, raccoons getting into garbage cans to look for food, nocturnal activity and nest building help animals survive in their environment.
2. Give examples of behaviors due to adaptation, instinct, learned, and habit.

L.EV.05.12 Describe the physical characteristics (traits) of organisms that help them survive in their environment.

Instructional Clarifications

1. Describe is to tell or depict in spoken or written words how physical traits allow organisms to survive in their environment.

2. Observe and relate physical characteristics of plants and animals to the ways in which these traits may improve their survival. Examples: Thorns or spines discourage plant eaters. Webbed feet improve the swimming ability of animals making it possible for them to better avoid predators or get food. Shapes of bird beaks/bills adapt them to using certain types of foods. Mammals have specialized teeth adapted for eating certain types of foods.

Assessment Clarification

1. Specific physical characteristics such as thorns or spines, webbed feet, shape of beaks or bills, specialized teeth help improve the organisms' chances for survival.

L.EV.05.13 Describe how fossils provide evidence about how living things and environmental conditions have changed.

Instructional Clarifications

1. Describe is to tell or depict in spoken or written words how fossil evidence shows how living things and environmental conditions have changed over time.
2. Plant and animal types that live today and somewhat resemble fossil plants and animals indicate that living things have changed as the environment has changed. For example, whales once being land animals.
3. Some plants and animals exist only as fossils and not as living things, today.

Assessment Clarification

1. Fossils indicate that environmental factors have led to changes of particular organisms. For example, whales as land animals.

L.EV.05.14 Analyze the relationship of environmental change and catastrophic events (for example: volcanic eruption, floods, asteroid impact, tsunami) to species extinction.

Instructional Clarifications

1. Analyze means to carefully examine by identifying key factors in the relationship between species extinction and either environmental change or other catastrophic event.
2. Catastrophic events may change widespread environmental conditions such as world temperatures (volcanic eruption dust and gases) or destroy habitat (tsunamis) leading to species extinction.
3. Records of mass extinctions follow evidence of catastrophic events such as asteroid impacts.
4. Localized catastrophic events such as tsunamis and volcanic eruptions may eliminate species with limited ranges and/or numbers, such as those existing only on one or a few ocean islands.

Assessment Clarifications:

1. Link catastrophic events (volcanic eruption, floods, asteroid impact, tsunami) to specific changes in environmental conditions.

2. Link specific environmental changes due to catastrophic events to species extinction.

Content Statement - L.EV.M.2

Relationships Among Organisms- Similarities among organisms are found in anatomical features, which can be used to infer the degree of relatedness among organisms. In classifying organism, biologists consider details of internal and external structures to be more important than behavior or general appearance.

Content Expectation

L.EV.05.21 Relate degree of similarity in anatomical features to the classification of contemporary organisms.

Instructional Clarifications

1. Relate means to establish an association or connection between the degrees of similarity in anatomical features to the classification of organisms.
2. Organisms with substantial similarities in anatomical structure are more closely related genetically than those organisms with fewer similarities. All vertebrate animals have a backbone; they can be further classified by body covering (fur, feather, scales) into groups showing greater degree of similarity and closer relatedness.
3. Similarities of behavior among organisms of different types, is not a reliable indicator of genetic relatedness. Example: all animals that are active at night (nocturnal) are not necessarily genetically related.

Assessment Clarifications

1. Compare and contrast species appearance based on anatomical features. For example vertebrates can be further classified by body covering.
2. Infer degree of relationship between species based on anatomical features.

**Inquiry Process, Inquiry Analysis and Communication,
Reflection and Social Implications**

Inquiry Process
S.IP.05.11 Generate scientific questions about heredity, traits that allow organisms to survive and evolution based on observations, investigations, and research.
S.IP.05.12 Design and conduct scientific investigations showing traits/characteristics and how they are influenced by the environment and genetics.
S.IP.05.13 Use tools and equipment appropriate to scientific investigations of environmental influence on characteristics and traits and characteristics improving survival rate. (research materials, plants, soil of varying nutrient levels)
S.IP.05.14 Use metric measurement devices in an investigation of environmental factors on plant growth. (Height in centimeters, volume of water in milliliters, etc.)
S.IP.05.15 Construct charts and graphs from data and observations found while investigating heredity and factors affecting populations and traits.
S.IP.05.16 Identify patterns in data from investigations of behavioral, physical and environmental factors affecting traits and changes in populations.
Inquiry Analysis and Communication
S.IA.05.11 Analyze information on behavioral and physical characteristics and environmental influences on traits from data tables and graphs to answer scientific questions.
S.IA.05.12 Evaluate data, claims, and personal knowledge of traits, changes in traits/characteristics over time and degree of organism similarity through collaborative science discourse.
S.IA.05.13 Communicate and defend findings of observations and investigations using evidence of students traits and factors influencing traits.
S.IA.05.14 Draw conclusions from sets of data from multiple trials of a scientific investigation on environmental influence on traits.
S.IA.05.15 Use multiple sources of information to evaluate strengths and weaknesses of claims, arguments or data while conducting research on environmental factors causing change in species/organisms over time.
Reflection and Social Implications
S.RS.05.11 Evaluate the strengths and weaknesses of claims, arguments, and data recorded investigating influences on traits.
S.RS.05.12 Describe limitations in personal and scientific knowledge on heredity and traits as well as how the environment influences these traits.
S.RS.05.13 Identify the need for evidence in making scientific decisions while investigating factors influencing traits.
S.RS.05.15 Demonstrate scientific concepts of heredity, traits and characteristics through various illustrations, performances, models, exhibits, and activities.

Vocabulary

Critically Important- State Assessable	Instructionally Useful
anatomical features genetic relatedness adaptation	inherited traits acquired traits learned behavior nocturnal heredity environmental factors fossil catastrophic events (volcanic eruptions, tsunamis, asteroid impacts, floods) natural selection

Instruments, Measurements, and Representations

meter stick	to measure plant growth
graduated cylinder	to measure water level
research resources	computers, encyclopedias or other media center resources
representations	t-chart, bar graphs

Instructional Framework

*The following Instructional Framework is an effort to clarify possible units within the K-7 Science Grade Level Content Expectations. The Instructional Framework provides descriptions of instructional activities that are appropriate for inquiry science in the classroom and meet the instructional goals. Included are brief descriptions of multiple activities that provide the learner with opportunities for exploration and observation, planning and conducting investigations, presenting findings, and expanding thinking beyond the classroom. The Instructional Framework is **NOT** a step-by-step instructional manual, but a guide intended to help teachers and curriculum developers design their own lesson plans, select useful and appropriate resources and create assessments that are aligned with the grade level science curriculum for the State of Michigan.*

Instructional Examples

Heredity: L.HE.05.11, L.HE.05.12

Objective

- Demonstrate understanding of the influence of traits by genetics and the environment.

Engage and Explore

- Using a T- chart, have students' list traits they believe were passed on from their parents on one-side and list traits they have obtained from other sources on the other side. Allow students to share their ideas in pairs before discussing as a class. (L.HE.05.11, L.HE.05.12, S.IP.05.11, S.IP.05.12, S.IP.05.15, S.IA.05.12, S.IA.05.13, S.IA.05.11)
- Students explore their own traits and consider where they may have originated. This can help students explore genetic (inherited) traits as well as acquired traits. Traits may include widow's peak, eye color, scars, tongue rolling, etc. There is no intent to trace inherited patterns but to identify traits that have been genetically passed down from parents and grandparents. Students discuss and compare personal traits with classmates. (L.HE.05.11, L.HE.05.12, S.IP.05.11, S.IP.05.12, S.IA.05.12, S.IA.05.13, S.RS.05.12, S.RS.05.15)
- Have students research the inherited traits of the ability to roll one's tongue and the ability to do the "Vulcan hello." (Separate the middle finger and ring finger to form a "V"). Have students find out if their grandparents or parents have these inherited traits and how many siblings. Students realize that they cannot learn to roll the tongue or

make the “Vulcan hello”. They are inherited traits. (L.HE.05.11, L.HE.05.12)

Explain and Define

- Discuss with students the difference between acquired and inherited traits in the context that they can inherit a family member’s wealth but could also acquire wealth themselves throughout their lifetime. Give students time to define the terms inherited traits and acquired traits. In pairs share definitions and change them if they desire. As a class, with teacher directions, define the terms. (L.HE.05.11, L.HE.05.12, S.IA.05.12)

Elaborate and Apply

- Students design an experiment by altering environmental factors of plants to determine the influence these factors have on the traits of the plants. For example, vary soil nutrients, amounts of water, exposure to sunlight, etc. In small groups students choose which aspect of the environment to alter then design the experiment. Students collect data over a given period of time. This data will then be interpreted and analyzed and presented to the entire class. Presentations should include how the traits were influenced by the environmental factor tested. (L.HE.05.11, S.IP.05.12, S.IP.05.13, S.IP.05.14, S.IP.05.15, S.IP.05.16, S.IA.05.11, S.IA.05.12, S.IA.05.13, S.IA.05.14, S.RS.05.11, S.RS.05.12, S.RS.05.13, S.RS.05.15)

Evaluate Student Understanding

Formative Assessment Examples

- Evaluate student presentation of information on environmental influences affecting plants traits. (L.HE.05.11)
- Evaluate student design and investigations of the classroom habitat and presentations. (L.EV.05.11 and L.EV.05.12)

Summative Assessment Examples

- Give each student 3 separate index cards and label the first with an A (Acquired), the second with an I (Inherited) and the third with a B (Both). Read different traits aloud and have each student independently choose which type of trait it represents. Visually scan the room to determine each students understanding (or misunderstanding) of the Content Expectation. (L.HE.05.12)
- Design matching type questions for inherited and acquired traits. (L.HE.05.12)
- Describe situations in which the environment would affect a trait of a plant or animal and have student describe how the trait would be affected in the given situation. (L.HE.05.11)

Enrichment

- Allow student to trace a particular trait prominent in their family back a few generations.
- Student independently researches a particular environmental factor (teacher or student chosen) and how it would affect plant or animal traits. The student would gather data, interpret results and design a presentation to share information to the class.
- Students research the types of traits or differences in traits found regionally or within particular ethnic groups
- Student visits a place that researches genetic diseases (or interviews an adult that has had an experience with genetic diseases or disorders) and compiles a presentation to share with the class.

Intervention

- Show two parents with their offspring and together discuss similarities with traits. Give student two additional parents to demonstrate similarities of genetic traits.
- Provide student with a short video or video clips depicting how variation among species occur.

Examples, Observations, and Phenomena (Real World Context)

Students both biological and adopted are generally interested in investigating the traits that they possess. Students are easily engaged in discussions regarding these traits.

Most students relate well to professional sports. Athletes in these sports may have inherited genes allowing them to be better at a particular sport. However, if they do not practice and acquire the traits, they may not be as good.

The comparisons between the characteristics humans have to help them survive in their environments and other animals lead to an understanding of evolution and connections between animals. The opposable thumbs of humans separates humans from all other animals.

Literacy Integration

Reading

R.WS.05.04 know the meaning of words encountered frequently in grade-level reading and oral language contexts.

R.CM.05.02 retell through concise summarization grade-level narrative and informational text.

R.CM.05.03 analyze global themes, universal truths, and principles within and across text to create a deeper understanding by drawing conclusions, making inferences, and synthesizing.

R.CM.05.04 apply significant knowledge from grade-level science, social studies and mathematics texts.

- After student complete their designed plant experiment and compile results, students research (textbooks or computer technology) similar studies to compare results.

Writing

W.PR.05.01 set a purpose, consider audience, and replicate authors' styles and patterns when writing a narrative or informational piece.

W.PR.05.02 apply a variety of pre-writing strategies for both narrative and informational writing (e.g., graphic organizers such as maps, webs, Venn diagrams) in order to generate sequence, and structure ideas (e.g., role and relationships of characters, settings, ideas, relationship of theory/evidence, or compare/contrast).

W.PR.05.03 draft focused ideas using linguistic structures and textual features needed to clearly communicate information composing coherent, mechanically sound paragraphs when writing compositions.

W.PR.05.04 revise drafts based on constructive and specific oral and written response to writing by identifying sections of the piece to improve organization and flow of ideas (e.g., position/evidence organizational pattern, craft such as titles, leads, endings and powerful verbs).

W.PR.05.05 proofread and edit writing using grade-level checklists and other appropriate resources both individually and in groups.

W.SP.05.01 in the context of writing, correctly spell frequently encountered words (e.g., roots, inflections, prefixes, suffixes, multi-syllabic); for less

frequently encountered words, use structural clues (e.g., letter/sound, rime, morphemic) and environmental sources (e.g., word walls, word lists, dictionaries, spell checkers).

- It is reasonable for students to use all these GLCE's when completing writing assignments intended to demonstrate knowledge and learning of the science material.
- Students concisely write a conclusion using their results and researched information of similar plant experiments from the one they designed. It may be beneficial to provide students with a simple rubric to follow when writing a conclusion.

Speaking

S.CN.05.01 use common grammatical structures correctly when speaking including irregular verbs to express more complex ideas.

S.CN.05.02 adjust their use of language to communicate effectively with a variety of audiences and for different purposes including research, explanation and persuasion.

S.CN.05.03 speak effectively using varying modulation, volume, and pace of speech to indicate emotions, create excitement, and emphasize meaning in narrative and informational presentations.

S.CN.05.04 present in standard American English if it is their first language (Students whose first language is not English will present in their developing version of standard American English)

S.DS.05.01 engage in interactive, extended discourse to socially construct meaning in book clubs, literature circles, partnerships, or other conversations protocols.

- Students are expected to engage in cooperative or social learning during activities that are directed in pairs or small groups.
- Students need to appropriately and effectively present information orally to classmates.

Instructional Framework

Instructional Examples

Evolution - Species Adaptation and Survival: L.EV.05.11, L.EV.05.12, L.EV.05.13, L.EV.05.14

Objectives

- To identify behavioral and physical traits allowing organisms to survive better in particular environments.
- To determine how these may characteristics have changed over time through analyzing catastrophic events and fossils.

Engage and Explore

- In cooperative learning groups, students can identify unique physical and behavioral characteristics they have that allow them to survive. They create a visual representation of their ideas. For example, they may draw a person and label characteristics while giving an explanation of how they feel it allows them to survive. (L.EV.05.11, L.EV.05.12, S.IP.05.11)
- Explore how organisms better suited for a specific environment survive better. For example, camouflage is a characteristic that allows some organisms to survive better in some environments. Place students in groups of 3-4. Set up containers for each group containing 25 squares of one color construction paper and 25 squares of another color. The container should be lined with one of the colors, allowing one set of 25 to be camouflaged. The students will act as predators and have a limited amount of time (10-15 seconds) to find prey. The container should be located at least an arms length distance away from each student so they have to move to obtain the prey. The students will take turns until 6-8 trials are completed. (Upon completion of the trials, they should be able to determine that animals possessing camouflage have a better chance of survival). Students can then integrate math by making graphical representations and interpreting the mean of the class data (see math integrations below). Be sure to ask students to extend their thinking to include other factors (behavioral and physical characteristics and environmental) that would allow some organisms to survive better. (L.EV.05.11, L.EV.05.12, S.IP.05.12, S.IP.05.13, S.IP.05.15, S.IP.05.16, S.IA.05.11, S.IA.05.14, S.RS.05.11, S.RS.05.13, S.RS.05.15)
- Set up a classroom habitat with plants and animals for students to observe over a period of time. Students make purposeful observations of the behavioral and physical traits and how they help the organisms to survive in the model habitat. Students do further research on the classroom habitats to make connections between what they are observing in the model habitat and how the animals and plants survive in their

natural habitats. (L.EV.05.11, L.EV.05.12, S.IP.05.11, S.IP.05.12, S.IP.05.15, S.IA.05.11, S.IA.05.12, S.IA.05.12, S.IA.05.15)

- Design an investigation to try to teach the animals a “learned” behavior, such as ringing a bell, making a noise, or changing the lighting, before placing food in the habitat. (L.EV.05.11, L.EV.05.12, S.IP.05.12, S.IP.05.13, S.IA.05.12, S.IA.05.13)

Explain and Define

- Students work collaboratively, with a variety of animals (pictures/images or plastic pieces) to identify their unique behavioral and physical characteristics that allow them to survive in their particular environment. (L.EV.05.11, L.EV.05.12, S.IP.05.13)
- Students choose an animal to research and gather information about the behavioral characteristics and physical characteristics of the animal that helps it to survive in its environment. Students use multiple sources of information, organize and present the information to others. (L.EV.05.11, L.EV.05.12,

Elaborate and Apply

- Students design an imaginary organism with specific behavioral and physical characteristics allowing it to survive in a chosen environment. A written description of the characteristics must be included in the diagram or illustration. (L.EV.05.11, L.EV.05.12, S.RS.05.15)
- Students (individually, in pairs or small groups) research a particular organism, chosen by student or by teacher, and the organisms’ history to explain characteristic changes over time. Directions lead students to investigate changes in the organism’s fossils over time and other catastrophic events that may have caused these characteristics to change. Students then give short oral presentations while others take notes. Teacher should provide a rubric to help evaluate student research. (L.EV.05.11, L.EV.05.12, L.EV.05.13, L.EV.05.14, S.IP.05.13, S.IP.05.16, S.IA.05.12, S.IA.05.15)

Evaluate Student Understanding

Formative Assessment Examples

- Evaluate student diagrams/illustrations depicting characteristics allowing survival in particular environments. (L.EV.05.11, L.EV.05.12)
- Evaluate student research and presentations of organisms’ changes over time. (L.EV.05.11, L.EV.05.12, L.EV.05.13, L.EV.05.14)
- Evaluate students’ ability to identify characteristics allowing organisms to survive in their environment. (L.EV.05.11, L.EV.05.12)

Summative Assessment Examples

- Choose an organism to have students identify the behavioral and physical characteristics that allow it to survive in its particular environment. (L.EV.05.11, L.EV.05.12)

- Students analyze fossil evidence to determine how environmental conditions changed over time. (L.EV.05.13, L.EV.05.14)

Enrichment

- Allow student to research environmental factors that affect populations. The student can choose to investigate a particular environmental factor (change in temperature, deforestation, etc) or a catastrophic event (volcanic eruption, tsunami, etc). The student or teacher can choose the method of completion for the activity (essay, poster, etc).

Intervention

- Give students a short article with information (or computer information) on two different organisms. They read the article or information (you may choose to read aloud) then together list the features the organisms have. After, discuss how the features may be helpful for the organisms in their particular environment. Allow students to practice more with two different organisms.

Examples, Observations, and Phenomena (Real World Context)

Variation in the appearance of plants and animals of the same species may be caused by both differences in nutrition, disease, or other environmental factors and by differences in inherited genetic traits. Students generally recognize variations very easily within their own species but cannot always distinguish environmental from genetically influenced traits. In situations where genetically identical twins were raised in environments with different nutrition and exposure to diseases and other environmental factors, they displayed greater differences in appearances as adults than twins raised in the same environment.

Students can observe variations in nature. Some plants receive more sunlight, due to either competition or an object obstructing the light, than others therefore growing taller. Some may become infested with parasites limiting their growth and survival. After discussing human variation, it may be easier for students to understand variation among plants of the same species.

The case of the Peppered moth shows how pollution caused by the industrial revolution caused population changes. The darker moths were able to survive better and pass on their traits living in the more polluted forest while the lighter colored moths survived better in the unpolluted forests.

Evolution at this grade level refers to behavioral and physical characteristics that allow animals to survive better in a particular environment as well as how these characteristics may have changed over time.

Students may observe characteristics of animals as they view them in different habitats in a zoo. For example, zookeepers provide specific conditions for penguins, such as cool temperatures, clean air, a large swimming area and fish for food. Penguins have characteristics that require these conditions for their healthy survival.

Literacy Integration

Reading

R.WS.05.04 know the meaning of words encountered frequently in grade-level reading and oral language contexts.

R.CM.05.02 retell through concise summarization grade-level narrative and informational text.

R.CM.05.03 analyze global themes, universal truths, and principles within and across text to create a deeper understanding by drawing conclusions, making inferences, and synthesizing.

R.CM.05.04 apply significant knowledge from grade-level science, social studies and mathematics texts.

- In addition to instructional examples given, students need to read concepts in textbooks and other appropriate texts. They are expected to know vocabulary pertinent to the unit.
- Students should incorporate information read in texts with that learned while engaged in activities.

Writing

W.GN.05.04 use the writing process to produce and present a research project; use a variety of resources to gather and organize relevant information into central ideas and supporting details for a teacher-approved narrowed focus question and hypothesis.

W.PR.05.01 set a purpose, consider audience, and replicate authors' styles and patterns when writing a narrative or informational piece.

W.PR.05.02 apply a variety of pre-writing strategies for both narrative and informational writing (e.g., graphic organizers such as maps, webs, Venn diagrams) in order to generate sequence, and structure ideas (e.g., role and relationships of characters, settings, ideas, relationship of theory/evidence, or compare/contrast).

W.PR.05.03 draft focused ideas using linguistic structures and textual features needed to clearly communicate information composing coherent, mechanically sound paragraphs when writing compositions.

W.PR.05.04 revise drafts based on constructive and specific oral and written response to writing by identifying sections of the piece to improve

organization and flow of ideas (e.g., position/evidence organizational pattern, craft such as titles, leads, endings and powerful verbs).

W.PR.05.05 proofread and edit writing using grade-level checklists and other appropriate resources both individually and in groups.

W.SP.05.01 in the context of writing, correctly spell frequently encountered words (e.g., roots, inflections, prefixes, suffixes, multi-syllabic); for less frequently encountered words, use structural clues (e.g., letter/sound, rime, morphemic) and environmental sources (e.g., word walls, word lists, dictionaries, spell checkers).

- It is reasonable for students to use these GLCE's when completing all writing assignments provided in the instructional examples.

Speaking

S.CN.05.01 use common grammatical structures correctly when speaking including irregular verbs to express more complex ideas.

S.CN.05.02 adjust their use of language to communicate effectively with a variety of audiences and for different purposes including research, explanation and persuasion.

S.CN.05.03 speak effectively using varying modulation, volume, and pace of speech to indicate emotions, create excitement, and emphasize meaning in narrative and informational presentations.

S.CN.05.04 present in standard American English if it is their first language (Students whose first language is not English will present in their developing version of standard American English)

S.DS.05.01 engage in interactive, extended discourse to socially construct meaning in book clubs, literature circles, partnerships, or other conversations protocols.

- Students are expected to engage in cooperative or social learning during activities that are directed in pairs or small groups.
- Students need to appropriately and effectively present information orally to classmates.

Mathematics Integration

D.AN.05.03 Given a set of data, find and interpret the mean and mode

D.RE.05.01 Read and interpret line graphs, and solve problems based on line graphs, e.g., distance –time graphs, and problems with two or three line graphs on same axes, comparing different data

- Students will interpret the data from the engage and explore activity associated with species adaptation and survival.
- Students analyze line graphs representing population changes among species over time. They can compare this graph to one depicting catastrophic events or other environmental changes to interpret any connection.

Instructional Framework

Instructional Examples

Evolution - Relationships Among Organisms: L.EV.05.21

Objective

- Relate anatomical features to classification of organisms.

Engage and Explore

- In pairs, students place a variety of vertebrates (pictures or plastic pieces) into groups based on similar characteristics. They should be able to give a title to each group and defend their choice. (L.EV.05.21, S.IP.05.11)

Explain and Define

- Discuss with students how these characteristics (from above) have to be universally recognized. For example, students may place organisms into groups based on color. This would not be a good characteristic to use, as species may vary in color. Instead, other characteristics like body covering or if they have a backbone are used. Students devise a list of appropriate characteristics to use by scientists when discussing anatomical features when classifying organisms. (L.EV.05.21, S.IA.05.12, S.RS.05.12)
- Research the work of Charles Linne and the early work of other scientists that began to classify organisms on the basis of physical characteristics. (L.EV.05.21, S.RS.05.19, S.IA.05.15)

Elaborate and Apply

- Students create Venn diagrams comparing and contrasting features of two different organisms. After completing the diagram, students infer the degree of relatedness of the two organisms. Students will follow think, pair, and share model for discussion. (L.EV.05.21, S.IP.05.15, S.IP.05.16, S.IA.05.12, S.RS.05.11)
- Discuss and explore the advantages of classification of organisms by physical structures compared to behavioral characteristics. (L.EV.05.21)

Evaluate Student Understanding

Formative Assessment Examples

- Evaluate the list of appropriate characteristics to help scientists classify organisms. (L.EV.05.21)

- Evaluate students completed Venn diagrams. (L.EV.05.21)

Summative Assessment Examples

- List organisms that would be placed into a similar group based on characteristics and have students determine the similarity. (L.EV.05.21)
- Give students different organisms to determine the degree of relatedness. (L.EV.05.21)

Enrichment

- Give students several animal skeletal pictures, such as, a bat, whale, human, fish, cat, duck, etc. Student colors the bones they believe to be similar in the pictures (some may not have any similarities). From there they can determine/infer the degree of relatedness based on similar skeletal structures.

Intervention

- Use a different type of organizer than a Venn diagram. For example, allow students to use a T-chart to compare organisms then infer relatedness.

Examples, Observations, and Phenomena (Real World Context)

Students may have noticed that the zoo animals are organized based on similar characteristics or relatedness. Such as primates are usually together as well as birds.

Students recognize similarities between themselves and primates.

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