TEKS Cluster: Characteristics and Variations of Organisms

6.13 **Organisms and environments.** The student knows that organisms have an organizational structure and variations can influence survival of populations.

Cell Theory

Readiness Standards

6.13(A)* describe the historical development of cell theory and explain how organisms are composed of one or more cells, which come from pre-existing cells and are the basic unit of structure and function

Characteristics of Organisms

Readiness Standards

6.13(B)* identify and compare the basic characteristics of organisms, including prokaryotic and eukaryotic, unicellular and multicellular, and autotrophic and heterotrophic

Ecosystem Stability

Supporting Standards

6.13(C) describe how variations within a population can be an advantage or disadvantage to the survival of a population as environments change

* Eligible for assessment on Grade 8 STAAR

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6.13(A) Readiness

TEKS Scaffold

TEKS	Student Expectation
8.13(A)	identify the function of the cell membrane, cell wall, nucleus, ribosomes, cytoplasm, mitochondria, chloroplasts, and vacuoles in plant or animal cells
	6.13 Organisms and environments. The student knows that organisms have an organizational structure and variations can influence survival of populations. The student is expected to:
6.13(A)*	**(A) describe the historical development of cell theory and explain how organisms are composed of one or more cells, which come from pre-existing cells and are the basic unit of structure and function**

Stimulus

Investigation	Demonstration	Graph	Chart/Table
Diagram	Visual/Image/ Illustration	Web/Cycle/Chain	Model
Informational Text/List	Map	Formula/Equation	

Content Builder

Standard breakdown:
- Describe the historical development of cell theory
- Explain how organisms are composed of one or more cells, which come from preexisting cells
- Explain how cells are the basic unit of structure and function

Major concepts in this standard include:
- Cell theory

Instructional Implications

6.13(A) is eligible for assessment on Grade 8 STAAR. (Note: Standards designated as "readiness" are essential for success in the current grade. Standards may have a different designation when assessed on Grade 8 STAAR.)

Cell theory's historical development can be summarized in three stages. In the 17th century, scientists used microscopes to observe cells, and Robert Hooke named them while studying cork. In the 19th century, Schleiden, Schwann, and Virchow made important contributions, proposing that all plants and animals are made of cells and cells arise from pre-existing cells through division. By the mid-19th century, cell theory was established, stating that all living organisms are composed of cells, which are the fundamental units of structure and function. Cells play a vital role in an organism's functions and processes, dividing and specializing as organisms grow. Students may struggle understanding the timeline of scientific discoveries or remembering the contributions of different scientists.

When you teach this concept, remember to:
- Present a clear and concise timeline of the historical development of cell theory, highlighting the key contributions of scientists Robert Hooke, Matthias Schleiden, Theodor Schwann, and Rudolf Virchow.
- Explain that Rudolph Virchow is credited with cell theory but his work was built on the work of other scientists, including Robert Hooke, Antonie van Leeuwenhoek, Matthias Schleiden, and Theodor Schwann.
- Use illustrations, models, and videos to demonstrate the microscopic world of cells.
- Start with fundamental concepts such as the definition of cells, their characteristics, and their functions.
  - All living organisms are composed of one or more cells.
  - A cell is the basic structural and functional unit of living organisms.
  - All cells arise from pre-existing cells.
- Help students see the Recurring Theme and Concept of *structure and function* in this standard.

Learning from Mistakes

Students may make the following mistakes:
- Thinking that cell theory was one scientist's idea, failing to appreciate how collective contributions built upon each other
- Ignoring the diversity of organisms and thinking that all organisms have cells that are structured the same way
- Overemphasizing microscopes by thinking that the only way to study cells is through microscopes

Academic Vocabulary

cell
cell theory*
organism

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6.13(B) Readiness

TEKS Scaffold

TEKS	Student Expectation
7.14(B)	describe the characteristics of the recognized kingdoms and their importance in ecosystems such as bacteria aiding digestion or fungi decomposing organic matter
7.14(A)	describe the taxonomic system that categorizes organisms based on similarities and differences shared among groups
6.13(B)*	**6.13 Organisms and environments.** The student knows that organisms have an organizational structure and variations can influence survival of populations. The student is expected to: **(B) identify and compare the basic characteristics of organisms, including prokaryotic and eukaryotic, unicellular and multicellular, and autotrophic and heterotrophic**

Stimulus

Investigation	Demonstration	Graph	Chart/Table
Diagram	Visual/Image/ Illustration	Web/Cycle/Chain	Model
Informational Text/List	Map	Formula/Equation	

Academic Vocabulary

autotrophic*
eukaryotic
heterotrophic*
multicellular
prokaryotic
unicellular*

Content Builder

Standard breakdown:

- Identify the basic characteristics of [prokaryotic, eukaryotic unicellular, multicellular, autotrophic, and heterotrophic] organisms
- Compare the basic characteristics of prokaryotic and eukaryotic organisms
- Compare the basic characteristics of unicellular and multicellular organisms
- Compare the basic characteristics of autotrophic and heterotrophic organisms

Major concepts in this standard include:

- Characteristics of organisms: prokaryotic and eukaryotic, unicellular and multicellular, and autotrophic and heterotrophic

Instructional Implications

6.13(B) is eligible for assessment on Grade 8 STAAR. (Note: Standards designated as "readiness" are essential for success in the current grade. Standards may have a different designation when assessed on Grade 8 STAAR.)

Organisms can be classified based on their fundamental characteristics:

- Prokaryotic organisms lack a defined nucleus and membrane-bound organelles while eukaryotic organisms have a true nucleus and such organelles.
- Unicellular organisms consist of a single cell that functions independently whereas multicellular organisms are composed of specialized cells collaborating to perform various functions.
- Autotrophic organisms produce their own food through photosynthesis or chemosynthesis while heterotrophic organisms rely on consuming other organisms or organic matter for energy and nutrients.

Students may struggle if they have not encountered diverse examples of organisms with these characteristics, leading to a lack of context and understanding of their significance.

When you teach this concept, remember to:

- Investigate and compare the basic characteristics that classify organisms, including prokaryotic/eukaryotic, unicellular/multicellular, and autotrophic/heterotrophic. Use card sorts, Venn diagrams, and drag-and-drop practice.
- Use diagrams, charts, and images to illustrate the differences between prokaryotic and eukaryotic cells, unicellular and multicellular organisms, and autotrophic and heterotrophic organisms.
- Provide diverse and relatable examples of organisms for each characteristic.
- Incorporate hands-on activities, experiments, or virtual simulations that allow students to observe and interact with different types of organisms.

Learning from Mistakes

Students may make the following mistakes:

- Thinking that all single-celled organisms (e.g., bacteria and protists) are prokaryotic
- Thinking that all multicellular organisms (e.g., plants and animals) are eukaryotic
- Thinking that all prokaryotic organisms, particularly bacteria, are harmful and cause diseases
- Thinking that all autotrophic organisms are green due to chlorophyll
- Thinking that all heterotrophs are predators or carnivores

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6.13(C)

6.13 Organisms and environments. The student knows that organisms have an organizational structure and variations can influence survival of populations. The student is expected to:

(C) describe how variations within a population can be an advantage or disadvantage to the survival of a population as environments change

Stimulus

Investigation	Demonstration	Graph	Chart/Table
Diagram	Visual/Image/ Illustration	Web/Cycle/Chain	Model
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Academic Vocabulary

environmental change*
genetic variation
natural selection
population
stability
survival
variation*

Role in Concept Development

Supports

- 8.12(B) describe how primary and secondary ecological succession affect populations and species diversity after ecosystems are disrupted by natural events or human activity
- 8.12(C) describe how biodiversity contributes to the stability and sustainability of an ecosystem and the health of the organisms within the ecosystem

Connection/ Relevance

Understanding variations within populations and their role in survival during environmental changes is closely tied to how populations recover and to species diversity during ecological succession. It also relates to how biodiversity contributes to ecosystem stability and the health of organisms within the ecosystem.

When to Teach

After 6.13(A) and 6.13(B)

Instructional Implications

Variations within a population can be both advantageous and disadvantageous as environments change. Advantageous variations help some individuals adapt and thrive, passing on beneficial traits. However, disadvantageous variations may lead to struggles in survival and reproduction. Over time, nature selects the best traits for the environment. Students may struggle to grasp the concept that long-term variations must benefit the population as a whole rather than just benefiting individual organisms within the species.

When you teach this concept, remember to:

- Provide real-life examples of variation in populations and how it can lead to advantages or disadvantages in specific environments. Use case studies of organisms adapting to different habitats or changing conditions.
- Engage students in interactive activities where they simulate natural selection in changing environments. Use games or virtual labs to demonstrate how advantageous traits increase in frequency over time.
- Use graphs or charts to illustrate changes in trait frequencies over generations due to natural selection.
- Emphasize the role of environmental changes as the driving force for natural selection. Explain how certain traits become advantageous in new environments and others may become disadvantageous.
- Help students see the Recurring Theme and Concept of *stability and change* in this standard.

Learning from Mistakes

Students may make the following mistakes:

- Thinking that all individuals within a population have identical traits and characteristics
- Thinking that populations can immediately adapt to environmental changes simply by acquiring new traits
- Thinking variations within a population have a predetermined purpose or goal rather than recognizing that natural selection acts on existing traits
- Overemphasizing individual adaptation rather than recognizing that the population as a whole evolves over time
- Overlooking the role of environmental factors (e.g., changes in temperature or availability of resources) in influencing the survival and reproduction of different traits
- Assuming every variation within a population provides a survival advantage
- Ignoring the long timescales involved in the process of natural selection

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