uBEATS Teacher's Guide:

Cell and Nucleus Introduction

(Grades 6-8)

This teacher guide is a supplementary text to support the use of the uBEATS "Cell and Nucleus Introduction" module for grades 6-8.

To help students develop the knowledge necessary for an incredible future in health care, we created UNMC Building Excellence in Academics Through STEM (uBEATS), an online health science resource for Nebraska students.

UNMC uBEATS modules are short (15 minutes or less), interactive online health science modules to supplement curriculum taught in grades 6 – 12. These do not replace curriculum but are a supplement for teachers and students incorporating evidence-based information and UNMC expert guided material. Each module is chunked into sections with formative and summative assessments with immediate feedback provided.

Tips on how to utilize uBEATS modules:

- Internet access is required to view uBEATS modules.
- For those who have access to one-to-one technology, modules can be used in or outside of the classroom as a topic introduction, extension, or review.
- For classrooms without individual student devices modules can be used in whole group instruction. Formative assessment questions can use the teacher's preferred call and response method and summative assessment questions can be displayed on the board and answered individually by students or printed and distributed to students after viewing the module.

Objectives

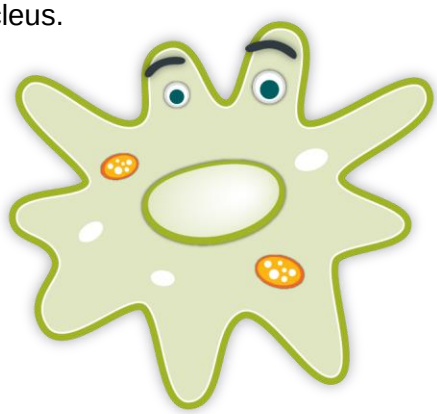
- Identify the differences between unicellular and multicellular organisms.
- Distinguish between different specialized cell structures and their corresponding functions.
- Rank the levels of cellular organization withing multicellular organisms.

ubeats@unmc.edu

Introduction

How do organisms live, grow, respond to their environment, and reproduce?

Like all living things, we are made up of cells. The more complex the organism the many more types of specialized cells it contains. In this module you will learn about the cell, similarities and differences between plant and animal cells, and about some parts of the cell, including the nucleus.



Prior Knowledge

Before beginning this module, the student should understand the Grade Band Endpoints for LS1.A. A Framework for K-12 Science Education

- **By the end of grade 2.** All organisms have external parts. Different animals use their body parts in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find, and take in food, water and air. Plants also have different parts (roots, stems, leaves, flowers, fruits) that help them survive, grow, and produce more plants.
- **By the end of grade 5.** Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction.

Key Terms/Vocabulary

Organism, organ system, organ, tissue, cell, prokaryote, eukaryote, unicellular, multicellular, nucleus, mitochondria, chloroplasts, cell membrane, cell wall, cytoplasm, vacuole, organelle.

Science Standards

Nebraska Science Standards

Next Generation Science Standards (NGSS) featuring Three-Dimensional Learning

Core Idea LS1.A Structure and Function A Framework for K-12 Science Education

- All living things are made up of cells, which is the smallest unit that can be said to be alive. An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular). Unicellular organisms (microorganisms), like multicellular organisms, need food, water, a way to dispose of waste, and an environment in which they can live.
- Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell.
- In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues or organs that are specialized for particular body functions.

Science and Engineering Practices (Bolded Practices are addressed in the module)

- **Developing and using models**
- Constructing explanations and designing solutions
- Engaging in argument from evidence
- Obtaining, evaluating, and communicating information

Crosscutting Concepts (Bolded Concepts are addressed in the module)

- Scale, Proportion, and Quantity: Phenomena that can be observed at one scale may not be observable at another scale. (MS-LS1-1)
- **Systems and system models: Systems may interact with other systems; they may have sub-systems and be a part of larger complex systems. (MS-LS1-3)**
- **Structure and function: Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the relationships among its parts, therefore complex natural structures/systems can be analyzed to determine how they function. (MS-LS1-2)**

Extensions of the lesson

- To help students become more familiar with the Key Terms of this module, the teacher can use the vocabulary list for a classroom Word Wall or integrate the vocabulary into classroom word games during review sessions.
- To help the students see personal relevance, remind them that they are each an individual eukaryotic organism. They are composed of organ systems, which are made of unique organs. Those organs (body parts) are built out of tissue (specialized cells). Those eukaryotic cells contain their own organelles (cell parts). One of the organelles, the nucleus, in each cell has its own membrane that encloses the stored DNA instructions for the entire body. Stress that every cell in the body has the same exact DNA, even though specialized cells are used to build different kinds of tissue, organs, etc.
- The teacher may need to address student misconceptions by emphasizing these important concepts:
    - Prokaryotic cells do not have a nucleus.
    - All prokaryotic cells are unicellular organisms, made up of no more than one cell.
    - However, not all eukaryotic organisms are multicellular. Amoeba, yeast, simple algae are all eukaryotic organisms having only one cell, but they do possess a true nucleus having its own distinct membrane.

The cell wall and cell membrane are uniquely different from each other. All cells have a membrane that separates the interior of the cell from the outside environment. Animal cells and protozoans do not have a cell wall outside of that membrane. But a cell wall is present in prokaryotic bacteria, as well as in eukaryotic algae, fungi and plants

Enrichment

- For information about Healthcare Career Opportunities, see the UNMC Health Career Book.
- To make connections in your community, contact local hospitals, healthcare clinics, zoos, nurses, doctors, veterinarians.
- To see the nucleus in their own bodies, students can perform a microscope lab to observe their own cheek cells. An example lab would be The Human Cheek Cell.