05_Cell Growth and Division

Content Area: **Science**
Course(s):
Time Period: **Full Year**
Length: **1-2 weeks**
Status: **Published**

General Overview, Course Description or Course Philosophy

Biology focuses on the diversity, complexity, and interdependence of life on Earth. Students will develop an understanding of how organisms evolve, reproduce, and adapt to their environments. This will include an exploration of how to relate the structure and function of molecules to their role in cell biology and metabolism. Further understanding of evolution and reproduction will be explored through the science of genetics. Knowledge of biodiversity and adaptation will be illustrated through the science of ecology.

OBJECTIVES, ESSENTIAL QUESTIONS, ENDURING UNDERSTANDINGS

- In multicellular organisms individual cells grow and then divide via a process called mitosis, thereby allowing the organism to grow. The organism begins as a single cell (fertilized egg) that divides successively to produce many cells, with each parent cell passing identical genetic material (two variants of each chromosome pair) to both daughter cells. Cellular division and differentiation produce and maintain a complex organism, composed of systems of tissues and organs that work together to meet the needs of the whole organism.
- Use a model based on evidence to illustrate the relationships between systems or between components of a system.

CONTENT AREA STANDARDS

SCI.HS-LS1-4	Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.

RELATED STANDARDS (Technology, 21st Century Life & Careers, ELA Companion Standards are Required)

MA.K-12.4	Model with mathematics.
MA.F-IF.C.7	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.
LA.RI.9-10.1	Accurately cite strong and thorough textual evidence, (e.g., via discussion, written response, etc.) and make relevant connections, to support analysis of what the text says explicitly as well as inferentially, including determining where the text leaves matters uncertain.
MA.F-BF.A.1	Write a function that describes a relationship between two quantities.

LA.W.9-10.2	Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.
LA.W.9-10.5	Develop and strengthen writing as needed by planning, revising, editing, rewriting, trying a new approach, or consulting a style manual (such as MLA or APA Style), focusing on addressing what is most significant for a specific purpose and audience.
LA.W.9-10.7	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
LA.W.9-10.8	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation (MLA or APA Style Manuals).
LA.W.9-10.9	Draw evidence from literary or nonfiction informational texts to support analysis, reflection, and research.
TECH.9.4.12.CI.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).
TECH.9.4.12.IML.3	Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions (e.g., S-ID.B.6a., 8.1.12.DA.5, 7.1.IH.IPRET.8).

STUDENT LEARNING TARGETS

Declarative Knowledge

Students will understand that:

- Mitosis and differentiation are vital in producing and maintaining complex organisms.
- Daughter cells receive identical genetic information from a parent cell or a fertilized egg.
- Mitotic cell division produces two genetically identical daughter cells from one parent cell.
- Differences between different cell types within a multicellular organism are due to gene expression — not different genetic material within that organism.

Procedural Knowledge

Students will be able to:

- From the given model, students identify and describe the components of the model relevant for illustrating the role of mitosis and differentiation in producing and maintaining complex organisms, including:
    - Genetic material containing two variants of each chromosome pair, one from each parent.
    - Parent and daughter cells (i.e., inputs and outputs of mitosis).
    - A multi-cellular organism as a collection of differentiated cells.

- Students use the given model to illustrate that mitotic cell division results in more cells that:
    - Allow growth of the organism.
    - Can then differentiate to create different cell types.
    - Can replace dead cells to maintain a complex organism.
- Students make a distinction between the accuracy of the model and the actual process of cellular division.

EVIDENCE OF LEARNING

Formative Assessments

- Checks for understanding during lesson.
- Use of student-friendly proficiency scales to track progress.
- Do Now activities.
- Student-centered questioning and discussion that is facilitated by instructor.
- Exit Tickets.

Summative Assessments

- Benchmarks – departmental benchmark given at the end of MP1, MP2, and MP3 based on lab practices
- Alternative Assessments
    - Lab inquiries and investigations
    - Lab Practicals
    - Exploratory activities based on phenomenon
    - Gallery walks of student work
    - Creative Extension Projects
    - Build a model of a proposed solution
    - Let students design their own flashcards to test each other
    - Keynote presentations made by students on a topic
    - Portfolio

RESOURCES (Instructional, Supplemental, Intervention Materials)

Miller & Levine Biology Textbook

- Unit 3 - Cells
    - Chapter 11 - Cell Growth and Divison
        - Case Study: *Will stem cells change the future of healing?*
        - Interactivity: *The Cell Cycle.*
        - Quick Lab: *Make a Model of Mitosis.*
        - Analyzing Data: *The Rise and Fall of Cyclins.*
        - Video: *Meat Grown using Stem Cells.*
        - Exploration Lab: *Regeneration in Planaria.*
    - Chapter 10 - Cellular Respiration
        - Case Study: *You are what you eat.*
        - Animation: *Active Transport.*
        - Modeling Lab: *Making a Model of Cellular Respiration.*

POGIL Biology

- Mitosis

Gizmos

- Cell Division

NSTA

Data Nuggets

Online Resources

INTERDISCIPLINARY CONNECTIONS

ELA/Literacy :

POGIL Biology

- Mitosis

Gizmos

- Cell Division

Mathematics :

Data Nuggets

POGIL Biology

- Mitosis

Gizmos

- Cell Division

Technology:

Gizmos

- Cell Division

ACCOMMODATIONS & MODIFICATIONS FOR SUBGROUPS

See link to Accommodations & Modifications document in course folder.