

Topic: Cell Cycle

Teacher: RPravasi
Genre: Science & Math
Grade Level: 8th

Unit: Cell division
Duration: 4 periods

Essential Question

(Domain 1: Planning and Preparation-Component 1c: Designing Coherent Instruction)

- ★ Why is studying the mechanisms of cell cycle important?
- ★ Why is DNA replication essential to the cell cycle?
- ★ How does the duration of the phases of the cell cycle vary from each other?
- ★ What is the significance of each phase?
- ★ How is cancer related to cell cycle?

Background Knowledge

Background Summary: Through this lesson, students will learn the following concepts:

- **The cell cycle is a repeating series of events that cells go through. It includes growth, DNA synthesis, and cell division. In eukaryotic cells, there are two growth phases, and cell division includes mitosis.**
- **G1 phase: Metabolic changes prepare the cell for division. At a certain point - the restriction point - the cell is committed to division and moves into the S phase.**
- **S phase: DNA synthesis replicates the genetic material. Each chromosome now consists of two sister chromatids.**
- **G2 phase: Metabolic changes assemble the cytoplasmic materials necessary for mitosis and cytokinesis.**
- **M phase: A nuclear division (mitosis) followed by a cell division (cytokinesis).**

- The period between mitotic divisions - that is G1, S and G2 - is known as interphase.
- The cell cycle is controlled by regulatory proteins at three key checkpoints in the cycle. The proteins signal the cell to either start or delay the next phase of the cycle.
- Cancer is a disease that occurs when the cell cycle is no longer regulated. Cancer cells grow rapidly and may form a mass of abnormal cells called a tumor.

Lesson Objective: Students will

- cite **textual evidence** to **explain** the importance of cell division.
- use a **model** to understand the phases of Cell cycle.
- **make a distinction between the accuracy of the model and the actual process of cellular division** through the use of a Pie chart.
- **Write informative/explanatory texts** to explaining the importance of checkpoints in a cell cycle.
- **compare** the behavior of a normal cell division to a Cancerous cell division by using a Robot.
- use **context clues** to create a timeline on the History of Cancer from 2500 BC to present.
- **design** a poster on Cell cycle.

Standards

(Domain 1: Planning and Preparation- Component 1a: Demonstrating Knowledge of Content and Pedagogy)

NGSS:

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

Life Science Standard:

LS1.B: Growth and Development of Organisms

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.

Common Core State Standards Connections:

ELA/Literacy –

- RST.6-8.1 **Cite specific textual evidence** to support analysis of science and technical texts. (MS-LS1-3),(MS-LS1-4),(MS-LS1-5),(MS-LS1-6)
- RST.6-8.2 **Determine the central ideas or conclusions of a text;** provide an accurate summary of the text distinct from prior knowledge or opinions. (MS-LS1-5),(MS-LS1-6)
- WHST.6-8.2 **Write informative/explanatory texts** to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. (MS-LS1-5),(MS-LS1-6)
- WHST.6-8.7 **Conduct short research projects to answer a question** (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. (MS-LS1-1)
- WHST.6-8.8 **Gather relevant information from multiple print and digital sources,** using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. (MS-LS1-8)
- WHST.6-8.9 **Draw evidence from informational texts to support analysis, reflection, and research.** (MS-LS1-5),(MS-LS1-6)
- SL.8.5 **Integrate multimedia and visual displays** into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-LS1-2),(MS-LS1-7)

Mathematics –

- 6.EE.C.9 **Use variables to represent two quantities in a real-world problem** that change in relationship to one another; **write an equation** to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. (MS-LS1-1),(MS-LS1-2),(MS-LS1-3),(MS-LS1-6)
- 6.SP.A.2 **Understand that a set of data collected** to answer a statistical question has a **distribution** which can be described by its center, spread, and overall shape. (MS-LS1-4),(MS-LS1-5)
- 6.SP.B.4 **Summarize numerical data** sets in relation to their context. (MS-LS1-4),(MS-LS1-5)

Vocabulary (Domain I: Planning and Preparation - Component 1e: Demonstrating Knowledge of Students.)	Prep Work/Materials (Domain 1 Planning and Instruction- Component 1e: Designing Coherent Instruction, Domain 3 Instruction-Component 3c: Instruction Engaging Students in Learning)	Cross Curricular Connection (Domain I: Planning and Preparation - Component 1a: Demonstrating Knowledge of Content and Pedagogy, Component 1b: Demonstrating Knowledge of Students.)
Anaphase Cancer Cell Division Cell Cycle Checkpoint Chromosomes Cytokinesis Cytoplasm Diploid Deoxyribonucleic Acid (DNA) Eukaryote Life Cycle Genes Genetic material Interphase Metaphase Mitosis Nuclear division Phase Prophase Restriction point Synthesis Telophase	EV3 Robots Glossary Vocab Cell Cycle article Worksheets - Understanding Cell Cycle Vocabulary Cell Cycle article Cancer and Cell Cycle Article Cell Cycle quiz Chinese	Science Mathematics Technology Engineering ELA
Differentiation (Domain I Planning and Preparation-Component 1e: Designing Coherent Instruction, Domain 3: Instruction - Component 3b: Using Question and Discussion techniques Domain 3: Instruction - Component 3c: Engaging Students in Learning)		

- Bodily kinesthetic learners - EV3 robot activity.
- Audio and Visual learners – Visual representation of activity in the Do Now. The observations collected throughout the activity.
- ELL/Low reader - Guided notes printed for those who require them
- Technology- Utilizing Lego Mindstorms robot kit and digital program. See additional resources
- Enrichment: Additional articles printed
- Extended time for those who require it
- Small groups
- Individual attention from ICT teachers and paraprofessionals
- Resource room remediation for those who require

Procedure
(Domain I Planning and Preparation-Component 1e: Designing Coherent Instruction, Domain 3: Instruction - Component 3b: Using Question and Discussion techniques Domain 3: Instruction - Component 3c: Engaging Students in Learning)

Student Engagement (Teacher Assessment)

Slide #1: Do Now - Prior knowledge on Life Cycle
 Project: Life cycle of a Bed Bug and Human life cycle
 Guide students into understanding that cycle means repeating events; Life Cycle -- organisms go through a cycle of events.

Slide #2: What is Cell Cycle? Have students make connections between life cycle and Cell Cycle. Guide students into understanding that Cells go through stages of growth and division.
 Use picture of Human Life Cycle
 Have a student explain human life cycle
 Make personal Connection of how human life begins as a single cell and eventually grows through division and differentiation to form a tiny human. By the time we've reached our 20's, we've changed from a single cell into a fully-grown adult.

Slide #3: Compare Life cycle and Cell Cycle
 Have students compare life cycle and Cell cycle.

Slide #4: Have students read textbook pages #38 and 39, Have them answer the following question:
Why is cell division important? Write atleast 3 reasons and indicate the pg#, paragraph number, and line # for each 3 reasons..
 Have students share their responses.
 3 mains reasons: Reproduction in single cells,

Begin the [Student learning outcome sheet](#)

(Use the students' response as pre-test assessment)

(Hook)

Use picture of Life cycle and Cell cycle

Have students use Glossary for new terms

Growth and development,
And Repair.

Close Reading: Gathering Information

Group Work: Read the passage on Cell cycle Pg#38 - 39

Answer the following question:

- 1) Define Cell Cycle
- 2) How many phases does the Cell cycle go through? List them down.
- 3) What is the significance of each phase of the Cell cycle?
- 4) Identify Key Vocabulary terms

Slide #5: Watch an animation on cell cycle

Slide #6: Examining the phases of cell cycle and listing down core points

Slide #7: Understanding the duration of cell cycle phases
Prediction Pie chart (**refer to the worksheet**)

Slide #8: Using Robot to understand relative duration of cell cycle phases (**refer to the worksheet**)

Slide#9: Compare two pie chart **Prediciton vs Relative duration** of the cell cycle (**refer to the worksheet**)

Slide #10: Understanding the importance of Checkpoints
Students will use Robots to understand how a normal cell behaves during cell cycle. (**refer to the worksheet**)

Slide #11: Cancer vs Cell Cycle
Students will use Robots to understand how a cancerous cell behaves during a cell cycle. (**refer to the worksheet**)

Slide #12: Cancer vs Cell Cycle
Students will use compare the cancerous cell behavior to a normal cell behavior (**refer to the worksheet**)

Have students use
Glossary for new terms

(Test students to gauge
their understanding on
cell cycle phases)

[Quiz#1](#)

Assessment (*Formative or Summative*)
**(Domain 1 Planning and Instruction- Component 1e:
Designing Coherent Instruction, Domain 3 Instruction-
Component 3c: Engaging Students in Learning, Domain 3
Instruction- Component 3d: Using Assessment in
Instruction)**

**Student Engagement
(Teacher Assessment)**

<p>Teacher Assessment) Pre-assessment: Do Now Worksheet -Assessment will occur during lesson and after the lesson, by gauging understanding and mastery through student responses to lesson discussion as well as their answers to the in class activity worksheets. I will wrap up by answering the objectives; reviewing in class worksheets, and having the students summarize the lesson activity. -Students will also write a reflection identifying all the science and math components that are covered in this lesson.</p> <p>Quizzes will be administered during the course of the lesson as Do Now.</p> <p>They will identify the science standard and how it's used to demonstrate understanding.</p> <p>Students notes will demonstrate understanding and will be used to guide instructions</p>	<p>Student learning outcome sheet will keep track of student's progress during this lesson.</p>
<p>Additional Resources</p>	
<p>Quizlet to build vocabulary Khan Academy to strengthen foundational knowledge Homework assignment on Creating a Poster on Cell Cycle Cancer Myths and Facts sheet History of Cancer Timeline</p>	

Student Learning Outcomes - Lesson (Depth of Knowledge)

All: (Knowledge and comprehension)

- Cell goes through phases to divide
- Phases of the Cell Cycle are G1, S, G2, and M
- G1: Cell grows in size, needed proteins are produced
- S: Cell makes a copy of the genetic material
- G2: Cell grows in size; prepares for mitosis
- M: Cell divides into two new cells
- Cell goes through checkpoints to ensure that damaged or incomplete DNA is not passed onto daughter cells.
- Duration of Cell cycle phases is different.
- Cancer is abnormal cell division.

Most:(Synthesis + Create)

- Duration of Cell cycle phases varies considerably and is dependent on the activity of the cell in that phase.
- 95% time a cell spends in the interphase
- The longest phase of the Cell cycle is the G1 phase and the shortest is M phase.
- Cancerous cell behaves different from a normal cell.
- Cancerous cell skips checkpoints.

(Application and analysis)

Few:

- A normal cell can divide 40 to 60 times but a cancerous cell can divide indefinitely.
- Specific proteins controls the process of cell cycle
- Genes upon mutation can turn a cell into a cancerous cells
- checkpoints enable the cell to check if the conditions are favorable for division or for apoptosis.