

Science
Life Science
Grade 7



Lesson Plans

"Adding by Dividing"

Subject:

Science: Life Science

Level:

Grade 7

Abstract:

This lesson focuses on the circulatory system. Upon completing this lesson, students will be able to demonstrate the structure and function of the circulatory system and its components. The specific exercises are as follows:

- Students will use microscopes to observe and count the number of dividing cells in an onion root tip in three different fields of view.
- Students will use an Excel spreadsheet to calculate the average number of dividing cells.
- Students will use an Excel spreadsheet to graph the number of cells in each stage of mitosis for each field of view. The graph will then be analyzed to determine where on the root tip most cell division occurs.
- Students will write a paragraph in Word that explains the significance of the graph.

Invitation:

Humans are composed of billions of cells that perform many different functions. All of us, at one time consisted of only one cell. How did we get from being composed of a few cells to being composed of billions of cells?

The rate of cell division is different for different types of cells. Blood cells divide quite frequently whereas nerve cells do not divide at all. What do you think happens if nerve cells are damaged? Cancer is a disease where cells cannot stop dividing.

Plants also undergo cell division. Plant cell division is different from animal cell division in one important way. Think about the differences in plant and animal cells. Where on a young plant does most cell division occur?

In these lessons the students will observe real cells in various stages of the cell division from onion root tips. In addition students will determine where on the root tip most of cell division occurs.

Situations:

Where:

These activities will take place in the science laboratory and the computer laboratory. Some of these activities can be completed at home if the students have access to computers.

When:

These activities will take place in the seventh grade Life Science Class following the lesson on the structure and function of animal and plant cells.

How Long: These lessons will take 1-3 weeks depending on depth of coverage and students knowledge of microscope and computer usage. If the students are efficient at the equipment, these lessons can be completed in six, one-hour classes.

Tasks:

Task 1:

The students will complete the first half of an anticipation guide. (See the "Worksheet: Anticipation Guide" attachment.) This exercise is intended to spark interest and to draw upon students' prior knowledge to answer the questions. It is intended to allow students to make connections from previously learned material with the material from this lesson. After the lesson is completed, the students will revisit the questions and determine how much material was learned during this lesson.

Task 2:

Students will work independently with sugar cubes and an Excel spreadsheet to determine the importance of surface-area/volume ratios. Calculations will be made using Excel. (See the "Worksheet: Why Are Cells So Small?" attachment.)

Task 3:

As a class, students will answer the question, "Why are cells so small?" The class will discuss surface-area/volume ratios with respect to cell size.

Task 4:

The teacher will lead a discussion that explains the different stages of the cell cycle. The students will use the "Worksheet: Microscope Exercise Part 1"

and "Worksheet: Microscope Exercise Part II" attachments to take interactive notes.

Task 5:

Where on the root tip does most of the cell division occur? The students will work with partners on the microscopes to observe three different sections of the onion root tip. The students will observe 30 different cells from three different sections of the root tip: the apical meristem, zone of elongation, and zone of maturation. The students will count the number of cells in interphase and in mitosis from each section of the plant.

Task 6:

Students will analyze the data collected from Task 5. The students will first use Excel spreadsheets to determine the percentage of cells in mitosis from each section and construct a histogram that displays this data. (See the "Step Sheet: Creating Data Tables and Line Graphs" and the "Sample: Histogram" attachments.)

Task 7:

Students will write a formal lab report that will include an interpretation of the histogram. The histograms will be copied from Excel and inserted into Word. (See the "Step Sheet: Inserting Graphs from Excel" attachment.) The formal lab report will include:

- a. The investigative question: Where on the onion root tip does most cell division occur?
- b. Hypothesis. Should be logical and include information discussed in class.
- c. Procedure (methods).
- d. Results (contains the copied histograms from Excel).
- e. Conclusions. This includes the students' interpretations of the graphs.

Task 8:

The students will complete the final section of the anticipation guide. This will allow the students to revisit the questions presented to them at the beginning of the lesson. They will be able to self-assess their understanding of the material.

Interactions:

Class: The teacher will lead a discussion that explains the importance of cell division in single celled and multicellular organisms. The teacher will also introduce and explain cancer and its relationship to the cell cycle to the class.

Partners: Students will work in pairs with the microscope. The students will switch from counting and recording cells in various phases on the cell cycle.

Individual: The students will execute and analyze graphs using Excel. Individuals will write lab reports that explain the procedures and results of the exercise on mitosis in plant cells.

Standards:

California Seventh Grade Life Science Standards:

1.c. Students know the nucleus is the repository for genetic information in plant and animal cells.

1.e. Students know cells divide to increase their numbers through a process called mitosis, which results in two daughter cells with identical sets of chromosomes.

1.f. Students know that as multicellular organisms develop, their cells differentiate.

2.a. Students know the differences between the life cycles and reproduction methods of sexual and asexual organisms.

2.d. Students know plant and animal cells contain many thousands of different genes and typically have two copies of every gene. The two copies (or alleles) of the gene may or may not be identical, and one may be dominant in determining the phenotype while the other is recessive.

2.e. Students know DNA (deoxyribonucleic acid) is the genetic material of living organisms and is located in the chromosomes of each cell.

7.a. Select and use appropriate tools and technology (including calculators, computers, balances, spring scales, microscopes, and binoculars) to perform tests, collect data, and display data.

7.b. Use a variety of print and electronic resources (including the World Wide Web) to collect information and evidence as part of a research project.

7.c. Communicate the logical connection among hypotheses, science concepts, tests conducted, data collected, and conclusions drawn from the scientific evidence.

7.d. Construct scale models, maps, and appropriately labeled diagrams to communicate scientific knowledge (e.g., motion of Earth's plates and cell structure).

7.e. Communicate the steps and results from an investigation in written reports and oral presentations.

Assessments:

- Informal Assessment: Before beginning the microscope exercise, the teacher should conduct an informal assessment with the class on the material from the "Worksheet: Anticipation Guide."
- "Worksheet: Anticipation Guide:" The students answer questions about the cell cycle before the lesson and then return to answer them after the lesson. This allows the teacher to assess the amount of material learned by the students.
- "Adding by Dividing Rubric:" Rubric completed by the teacher. This assesses the student's ability to follow the steps on the scientific method and to describe information presented in graphs.

Tools:

- Microsoft Word
- Microsoft Excel
- Compound microscopes
- Prepared microscope slides of onion root tip

Project Tips and Alternatives:**Tip #1:**

The size of the group can be increased or decreased depending on the number of students in the class.

Tip #2:

Proper use of the microscope may be reviewed or explained depending on the students' experience with the microscope.

Tip #3:

If the students are not familiar with Microsoft Excel, you might want to review the attached Excel step sheets with your students.

Tip #4:

Depending on the students' prior knowledge, it may be useful to review the steps of the scientific method.

Tip #5:

Prior to the microscope exercise, it may be a good idea to have the students look at plant cell images from the web pages listed in the resources.

Attachments:

- "Worksheet: Anticipation Guide"
- "Worksheet Answers: Anticipation Guide"

- "Worksheet: Why Are Cells So Small?"
- "Worksheet: Microscope Exercise Part 1"
- "Worksheet: Microscope Exercise Part 2"
- "Step Sheet: Creating a Data Table and Line Graph"
- "Sample: Histogram"
- "Adding by Dividing Rubric"
- "Step Sheet: Inserting Graphs from Excel"

Web Resources – Content:

A list of [linked web resources](#) related to the content of this lesson can be found on the Lesson Page.

Web Resources – Excel:

A list of [linked web resources for Excel](#) can be found on the Excel Resources page.

Assistive Technology:

Please refer to the [Assistive Technology section](#) for information on methods and devices to help ensure that all students have access to the curricula in the least restrictive environment.