Teacher Guide

An Adventure into Cells and Their Parts

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To the teacher

This material is designed to help students understand one of the most important scientific concepts, cells and their parts, in an interesting and meaningful way. Students can use this material to study in conjunction with your existing classroom lesson, or independently before or after the lesson.

After students complete this material, they will be able to explain what cells are, identify their parts and functions, and discriminate between plant cells and animal cells.

Lesson objectives

- Given graphic examples of living things and non-living things, all learners will be able to identify which examples are made up of cells.
- Given a graphic example of small living thing and its grown-up counterpart, all learners will be able to tell that the growth is caused by the reproduction of cells.
- Given the description of the functions of cell parts, all learners will be able to identify the cell parts matching the description.
- Given graphic examples of cell parts, all learners will be able to identify the cell parts by shape.
- Given graphic examples and descriptions of the functions of cell parts, all learners will be able to identify the cell parts by shape and function.
- Given a graphic example of a cell, all learners will be able to match the name of cell parts to their nicknames.
- Given graphic examples of an animal and a plant cell, all learners will be able to discriminate which is an animal cell or a plant cell.
- Given graphic examples of animal and plant cells, all learners will be able to tell how the structures of each differ.

Organization of this instruction

1. Introduction (paper-based)

2. Lesson (paper-based)

What are cells?
Comic strips
Things to Remember!
Practices

What are cell parts and their functions?
Comic strips
Things to Remember!!
Practices

Are plant and animal cells same or different?
Comic strips
Things to Remember!!!
Practices

3. Main Practice (computer-based)

4. Test (paper-based)

Components of this instruction

This material is composed of four parts: introduction, lesson, main practice, and test.

Introduction

This is a brief introductory section to the lesson. It provides the student with an overview of the lesson objectives and offers motivation to the student for completing the lesson.

Lesson

The lesson deals with three topics: 1) What are cells?; 2) What are cell parts and their functions?; and 3) Are plant and animal cells the same or different? Each topic is presented using an engaging comic strips featuring a likable narrator, attractive images, and interesting examples. Following each main topic, a "Things to Remember" section summarizes the important points for students. Each topic section ends with 2-5 small practice questions for students to complete. The practice will more thoroughly familiarize the students with the material in preparation for the next section, the main Web-based practice.

Main Practice

After students have read the comic strips and completed the small practices, the students will complete the main practice using a special Web site. In this web-based practice, students will answer several questions associated with each main topic. The Web site provides immediate feedback after the answer to each question. The Web site also tracks the number of correct and incorrect answers made, allowing the student to gauge their level of understanding prior to the test. The main practice can be repeated as many times as necessary. For this section, the student should have access to the Web site at http://mentor.ucs.indiana.edu/~r521002/Final/cells.html.

Test

After the main practice with the computer, the student will return to the paper-based materials to complete a ten question test. The test can then be checked by the student using the answer sheet provided in this package. Some teachers may also choose to assign the comic strips and Web-based practice as homework or independent study, and then have students submit the completed test for grading back in the classroom. In this case, the answer sheet would not be distributed to the students.

Key features of this instruction

Use of comic strips

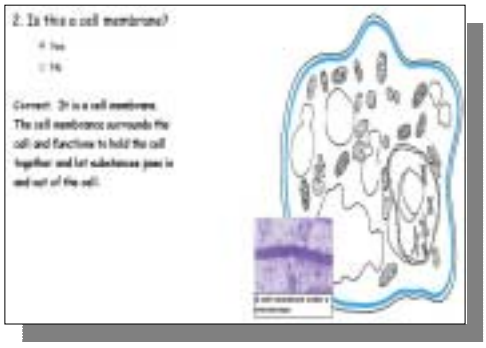
To facilitate student learning, it is especially important that student interest and focus be maintained. Comic strips are used to create and maintain this interest and provide motivation for the lesson. In addition to student familiarity and enjoyment of comic strips, the strips allow for use of a friendly and likable main narrator to serve as a guide throughout the lesson.

Attention Focusing

In order to focus student attention, important points in each comic strip are highlighted in blue text. Additionally, the comic strip panel containing these points is outlined in blue as well, as in this example.

Instructional Strategies

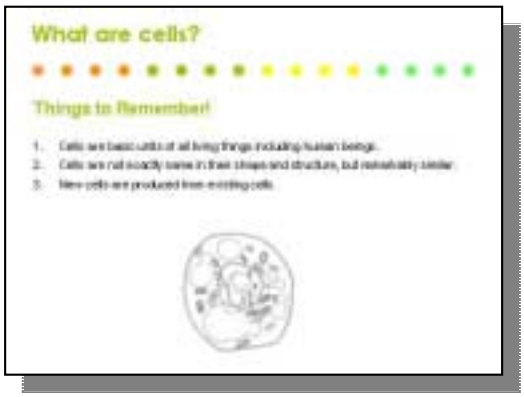
This lesson focuses on learning concepts. In order to facilitate this type of learning, research-based strategies are utilized throughout the lesson. Specifically, a general description with the critical concept characteristics of each concept is presented, followed by an example. Each example emphasizes the critical characteristics in the general description. Feedback for the practice questions follow this pattern by re-emphasizing the critical characteristics.



Key features of this instruction

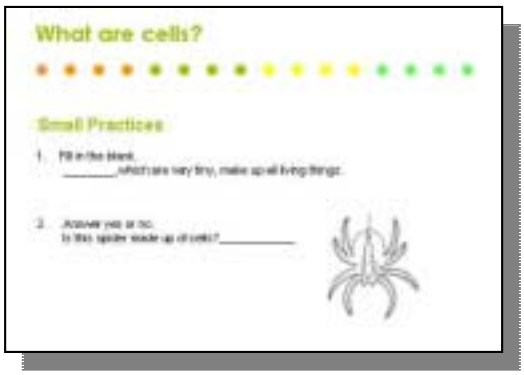
Things to Remember

The important points of the instruction that are highlighted in the comic strips in blue are also presented in the “Things to Remember” section after each main topic, as in this example. This is designed to assist you in understanding the material.



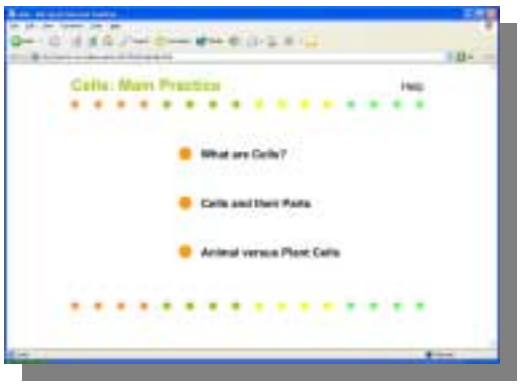
Multiple Practice Opportunities

Students are provided with several opportunities for practice. First students complete paper-based small practices after each main topic section to reinforce material that has just been read. After completion of all topics, a main Web-based practice is provided to integrate the material and prepare students for the final test.



Web-based practice

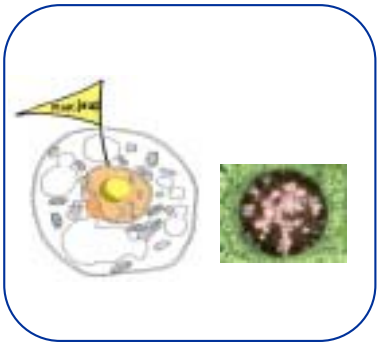
Capitalizing on student interest in using computers and the Internet, the main practice for the lesson utilizes a special Web site to provide multiple practice opportunities. The site also features immediate feedback after every answer to emphasize critical concept characteristics. In addition, the site allows students to track their progress to aid to gauge their understanding.



Key features of this instruction

Use of multiple graphical modes

In order to allow students to distinguish cell parts and details, simple line drawings are utilized when parts are initially introduced. To allow students to visualize cells as they would be seen in a real life setting (I.e. under a microscope) and thus to apply their new knowledge to the real world, real photographic images are also displayed after each line drawing.

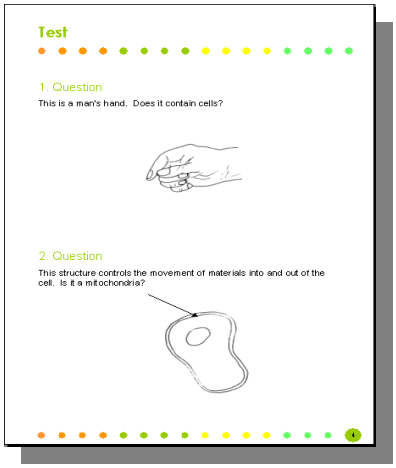


Repetition of components

The components of each main topic -- color, comic strips, Things to Remember, and small practices -- are repeated in each of the three main sections. This allows students to quickly familiarize themselves with each section while avoiding any confusion.

Reproducible practice and test materials

In anticipation of teachers assigning the lesson as self-study materials for students, the small practice and test components are designed to be easily removed from the other components and clearly photocopied. This allows for the repeated use of these components.



Use of the lesson

These instructional materials have been designed with an emphasis on flexibility of use for the teacher. The lesson can be used as a whole or individual components can be used separately. Some example uses include:

Whole Lesson

- As a standalone lesson in place of a classroom presentation.
- As a supplemental lesson for all students after a main presentation in a classroom.
- As a standalone enrichment lesson for advanced students.
- As a refresher lesson for students in need of review.

Individual Components

- Using the small paper-based practice and the web-based practice after a classroom presentation.
- Using the main comic strip presentation and practice materials prior to a classroom discussion.

Test options

The test can be delivered to students in one of two ways.

First, the student can be given the test as part of the complete presentation and practice materials. The student can then correct the test using the answer sheet provided in this package.

Second, the teacher may also choose to assign the presentation and practice materials as homework or independent study, and then have students submit the completed test for grading back in the classroom. In this case, the answer sheet would not be distributed to the students.

Test answers are included on the following page of this guide.

Test answers

1. Yes. All living things are made up of many cells. Since human beings are living things, they are made up of cells.
2. No. The structure shown and described is a cell membrane. A cell membrane functions to hold the cell together and let substances pass into and out of the cell. A cell wall, which is found only in plant cells, surrounds and protects the cell.
3. Yes. Chromosomes are found inside the nucleus and direct all cell activities.
4. Yes. Chloroplasts enable plants to store solar energy and make food. They are found only in plant cells, like the cell wall.
5. Yes. New cells are produced from existing cells. When a living thing grows, it is because many new cells are made from existing cells of the living thing.
6. No. The structure described is a nuclear membrane. Nuclear membranes do the same for the nucleus as the cell membrane does for the cell. Mitochondria produces energy for the cell and it is not found in the nucleus.
7. It is an animal cell. Plant cells contain these structures plus a cell wall and chloroplasts.
8. No. It is cytoplasm. Cytoplasm is the watery gel inside the cell where cell parts move around. The nucleus regulates and controls all cell activities.
9. Yes. A vacuole is a space in the cytoplasm where food, water, and chemicals are stored.
10. No. All living things have cells. Since a toaster is not living, it does not have cells.

References

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