

Contextual Teaching in Science

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7th Grade Life Science

RESEARCH:

“Will I Ever Use This Again?”

Many times over the course of the year students will ask, “Why do I have to know this?” or “Will I ever use this again?” I am guilty of saying “because you will be tested over this material or because you will need to know this for high school or college.” I have learned over the last year and a half that if I apply science to real life and real life situations that the students are more interested and retain the information much better. This is where contextual teaching and learning comes alive. In contextual learning it is the major task of the teacher to broaden students’ perceptions so that meaning becomes visible and the purpose of learning immediately understandable” (Parnell, 1995).

Today in education we are held accountable for so many things that teachers and administrators are terrified to change the ways of thinking. What they do not realize is that if we made changes in the classroom and in our methods that the students will actually do better on tests. “Yet, despite inventions of automobiles, telephones, airplanes, computers, televisions, air conditioning, and cell phones most students sit in classrooms and experience teaching much as students did around 1900” (Parnell, 2001).

I truly believe that if there are any academic areas that are already somewhat contextually based it would be science. However, “national; concerns about Americas’ ignorance of science had increased sharply in recent years”(Zemelman, 109). “Several well-publicized reports, both national and international have suggested the science achievement of our children may be far behind that of children in most industrialized nations and even in some Third World countries” (Zemelman, 109,110). These results may be exaggerated because the US still leads the world in most fields of basic research and technology. “National bodies have agreed to great extent that contextual teaching could make science education more inviting and more effective”(Zemelman, 110). “They call for making science learning experimental instead of lecture-oriented, cognitive and constructivist rather than focused only on facts and formula, social and collaborative rather than isolating students from one another” (Zemelman, 110). “The American Association for the Advancement of Science (AAAS) set the tone in 1989, by asserting:

Teaching related to scientific literacy needs to be consistent with the spirit and character of scientific inquiry and with scientific values. This suggests such approaches as starting with questions about phenomena rather than with answers to be learned; engaging students actively in the use of hypotheses, the collection

and use of evidence, and the design of investigations and processes; and placing a premium on students' curiosity and creativity. (Zemelman, 110)

The essential spirit of science is process. There must be process of inquiry and questioning. Students learn this spirit by engaging in it themselves. "Learning science is something students do, not something that is done to them Emphasizing active science learning means shifting emphasis away from teachers presenting information and covering science topics"(Zemelman, 112). . "Students learn from what they do and from what they experience as a result of what they do" (Schlechy, 1997). This kind of curriculum, combined with practical experience, enables students to cope with situations they will inevitably encounter in everyday life. If students are doing then they are learning.

Authentic experiences are very important in science. "Inquiry into authentic questions generated from student experiences is the central strategy for teaching science" (Daniels, 111) " Authentic scientific inquiry starts with the interest and natural curiosity of the students"(Daniels, 173). When teachers develop their curricula around real issues that people face, the students are able to make an immediate connection to the importance of what they are learning. "When students see the connection between the concepts that they are learning and the way they are used in the real world, they are involved in contextual learning-learning that ties the concepts to real world practices and life experience" (Harwell, 1999). "These connections deepen the learning process and help the students to construct a personal meaning about their world" (Daniels, 173).

"It is the goal of contextual teaching to help all students feel successful and to increase their achievement. Higher standards are only half of the equation; the more important half is the design of teaching methodologies and programs that help students meet those higher standards" (Parnell, 2001)

STATE STANDARDS:

7.1 Standard: Uses process skills of observing, classifying, communicating, measuring, predicting, identifying, and manipulating variables. Also uses recording, analyzing, and operationally defining, formulating models, experimenting, constructing hypotheses and drawing conclusions.

7.2 Standard: Understands and applies laboratory safety rules and procedures.

7.4 Standard: Selects and uses multiple types of print and nonprint sources for information on science concepts.

7.6 Standard: Identifies the cell as a basic unit of life.

6.1 Describes the structure and functions of major components and organelles to include nucleus, nuclear membranes, cytoplasm, cell membrane, chromosomes, vacuoles, golgi bodies, lysosomes, endoplasmic reticulum (rough and smooth) and mitochondria.

6.2 Compares and contrasts the major structures and functions of typical plant and animal cells.

6.3 Discusses and illustrates the organization of cells into tissues, organs, and systems.

6.4 Describes and discusses the movement of materials into and out of the cell for the maintenance of homeostasis.

6.5 Describes the process of mitosis and meiosis.

6.6 Outlines the events that occur in meiosis and mitosis.

7.7 Standard: Identifies organs and their functions in these systems: circulatory, respiratory, reproductive, skeletal, digestive, nervous, endocrine, lymphatic, and skin.

7.1 Explains and describes the features and functions of the various organ systems.

7.3 Discusses and illustrates the organization of cells into tissues, organs, and systems.

7.4 Classifies group of cells as tissues, organs, or systems using observation and/or description.

7.8 Standard: Defines infectious diseases and how they affect the immune system.

8.1 Describes the body's lines of defense against infectious diseases.

7.9 Standard: Examines how health care technology has improved the quality of life.

9.1 Examines how improvements in health care practices have decreased infectious diseases.

OVERVIEW OF LESSON PLAN:

In this unit lesson, students will be able differentiate between plant and animal cells, understand the parts of a cell and their functions, cell reproduction and cell growth, students will research stem cells to learn how they function, the distinguishing characteristics of types of stem cells, and how stem cells may be manipulated by scientists to help bodies heal and regenerate unhealthy or damaged cells.

OBJECTIVES:

Students will:

1. Describe the structure and functions of major components and organelles.
2. Compare and contrast plant and animal cells.
3. Describe the process of mitosis and meiosis.
4. Brainstorm ways the human body regenerates and heals itself.
5. Research how stem cells function.
6. Explore current attempts to utilize and manipulate stem cells in order to heal and repair the body by reading and discussing "Teaching the Body to Heal Itself."
7. Discuss potential uses of regenerative medicine technology.

RESOURCES/MATERIALS:

Student journals or notebook

Paper

Pencils

Construction paper

Markers or colored pencils
2 pieces of butcher paper (1 for the plant cell and 1 for the animal cell)
White paper
Scissors
Supplies at home for cell model
Microscopes
Onion
Swab
Slides
Slide covers
Scalpel
Dried beans
Yarn
Toothpicks
Glue
Reference materials containing information about stem cells and regeneration (science textbooks, written resources about cells, computers with Internet access)
Copies of "Teaching the Body to Heal Itself"
Copies of article questions

ACTIVITIES/PRODEDURES:

Week 1

Day 1

Introduce plant cells and animal cells. Discuss the cell theory. Discuss the organelles of the cell and their functions. The parts and functions will be compared to the workings of a factory. Students will take twenty to thirty minutes of overhead notes. We will discuss the notes and have open forum for the students to ask questions. The students will be shown pictures from laser disk and the Internet. On construction paper the students will sketch a diagram and label a plant cell and an animal cell.

Homework:

Students will be assigned a cell part and group members. You will be assigned one of the following cell parts:

- Nucleus
- Endoplasmic reticulum
- Ribosome's
- Mitochondria
- Chloroplast and chlorophyll (you will draw your structures directly on the butcher paper)
- Cell membrane
- Cell wall
- Cytoplasm
- Vacuole

- Golgi bodies
- Cytoplasm

The students are required to find the following information about their assigned cell part:

1. Determine whether the cell part(s) belong in a plant cell, an animal cell or both types of cells
2. Write the function(s) of the cell part(s).
3. Draw and cut a picture of your cell part for both the plant and animal cell. If the cell is equipped with more than one of your cell parts, then you need to draw and cut out the appropriate number of cell parts for each cell. Be sure to notice the size of our plant and animal cells. Make sure that your cell part is the appropriate size.

Day 2

(Beforehand, the teacher must cut out two large pieces of butcher paper (approximately 3 feet by 4 feet). On one of the pieces, write animal cell and on the other piece write plant cell in large letters. With a pencil, draw an outline of a plant and an animal cell as a guide for students. This will enable students to judge how large their cell part must be. Then gather up paper to draw structures on, markers to color the structures and scissors to cut out the structures.)

Each group will present their cell part(s) to the class. Each member of the group must participate in the presentation. During the presentation, explain the information your group researched then place your cell part(s) on the butcher paper in the appropriate place for both the plant and animal cell.

At the end of all of the presentations, everyone will be responsible for the function of all of the cell parts so be sure to take good notes!

Cell Part Notes	
1. Cell wall:	
2. Cell membrane:	
3. Nucleus:	
4. Cytoplasm:	
5. Protoplasm:	
6. Vacuole:	
7. Endoplasmic reticulum:	
8. Ribosome's:	

9. Mitochondria:	
10. Golgi bodies:	
11. Chloroplast:	
12. Chlorophyll:	

QUESTION: What is the difference between an animal and a plant cell?

Day 3

Introduce mitosis. The students will take fifteen to twenty minutes of notes. They will be shown laser disks and pictures from the computer. We will have open discussion about mitosis and how it is happening every second we are living. They will be shown the different phases of mitosis on the laser disk and they are responsible for drawing the phases. They will then be prepped for a lab for the following day.

Day 4

For the first half of class the students will be in the lab to prep slides with the tips of onion roots. As they rotate through the lab their hopes are to find the different phases. They are to record their findings. When back in the classroom, they will be placed into groups and each group will be assigned a phase of mitosis. Using the supplies provided they will construct their phase. In the end the phases will be displayed in order for the students to see.

Day 5

The students will be given a comprehensive test and a hands on lab test over the material covered.

Week 2

Day 1

Introduce cell cycle and cell growth. Students will take fifteen to twenty minutes of overhead notes. We will discuss the notes and have open forum for the students to ask questions. The students will be shown pictures from laser disk and the Internet.

Homework:

Students are to respond to the following question in their notes: "How does the human body regenerate and/or heal itself? List as many ways as you can think of and give specific examples to illustrate your points." They are to think very critically.

Day 2

Students share and discuss their responses to the homework.

Computer Lab:

Students will be divided into small groups of 3 or 4 to work on research and develop a basic understanding of stem cells in animals. Using available resources, students explore stem cells, how they function, the different types of stem cells and their distinguishing characteristics, how stem cells are related to the regenerative functions of the body, and how stem cells are similar and different to other cells within the body.

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Day 4

Students will get back into their groups and create a poster presentation to organize and present their research findings. They are to use words and pictures to illustrate.

Day 5

Poster presentations.

Week 3

Day 1 – Day 2

The students will begin reading a fifteen-page article titled “Teaching the Body to Heal Itself”. This will be read orally in the classroom and terms and ideas will be discussed. The students will have a set of questions to answer on a separate sheet of paper concerning the article.

Article Questions:

- a. How is regenerative medicine different from conventional medical treatments?
- b. What does the author mean by the quote, "Scientists are not known for pessimism about the likely effects of their discoveries"?
- c. How do recent discoveries about the body's communication system support the development of regenerative medicine?
- d. How is messenger-RNA used to analyze and make gene transcripts of the genes involved in the cell-to-cell communications system?
- e. Why do the cells in human bodies naturally lose regenerative capabilities as a person ages?
- f. What are the primary similarities and differences between embryonic and adult stem cells?
- g. What is the "ethical burden" carried by human embryonic stem cells?

h. Which type of stem cell offers a lower risk of immune rejection if injected into a person and why?

Day 3

Students will participate in a class discussion to share what they understand about the article and stem cell research, address questions they still have about the topic, and share any additional applications they can imagine for use of this medical technology in the future.

Day 4

The students will write an essay about what they have learned and how they could use this information in their lives now and in the future.

Day 5

Students will present their papers to the class.

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BIOGRAPHY:

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