Light Dependent Role Play

Lesson Overview

Unit Title: Photosynthesis

Lesson Summary: Photosynthesis is a complex process that converts light energy into chemical energy in the form of carbohydrates and/or other compounds in photosynthetic organisms. Photosynthesis occurs in two stages: light dependent reactions and light independent reactions/Calvin Cycle. This kinesthetic activity takes students through the steps of the light dependent reactions.

Subject Area(s) and Grade Levels: Click box(s) of the subject(s) and grade(s) that your Unit targets.

☒ Life Science ☐ Physical Science ☐ Earth Science ☐ 5th ☐ 7th ☒ Biology

Arkansas Framework: http://arkansased.org/education/word/biology_9-12_06.doc

SLE – Student Learning Expectation Details

Science Standards

- MC.3.B.4 Describe and model the conversion of light energy to chemical energy by photosynthetic organisms:
  1. light dependent reactions
  2. light independent reactions

Math Integration

Literacy Integration

- Student constructed responses to reflection questions.

National Standards: http://www.education-world.com/standards/national/index.shtml

National Standards Details:

- Standard C: Develop an understanding of the cell.

Student Objectives and Procedures: (All 7-E's may not be present in a single lesson)

Objective:
- Model and Identify the major events involved in the light dependent reactions.
  1. Describe and model the conversion of light energy to chemical energy.

Focus Question:
- How do cells obtain and use energy?

Prerequisites / Background Information:

- Photosynthesis is a complex process that converts light energy into chemical energy in the form of carbohydrates and/or other compounds in photosynthetic organisms.
- Photosynthesis occurs in two stages: light dependent reactions and light independent reactions/Calvin Cycle.
- Reminder: It is important for the student to read his or her script/card as the process occurs. This will help the student understand the function of each component. Role play narration linked below.

Timeline: 1-2 class periods

Preparation:	• 1st time 1 hour, materials are reusable
Elicit/Engage:	
Explore:	• 40 min
Explain:	• 15-30 min
Cleanup:	• 5 min

Teacher Preparation:

- Gather materials and supplies
- Print and highlight scripts and cards

Materials:

- 15 Tennis size balls – (photons of light, i.e. energy), 5 muffin pans- 6 cup-(electrons), 1 green shower curtain or green butcher paper- (photosystems I and II), 1 blue balloon– (labeled oxygen), 2 white balloons – (labeled H for hydrogen ions (Note: Hydrogen ions are protons), 1 purple or different colored balloon-(NADP+), Sheet protectors – optional-(used for student signs), Template handouts- see Appendix A, B, C
- Teacher supplied: 3 containers such as a box one foot wide, or plastic buckets – labeled as: water, ADP+, NADP+ , OPTIONAL -2 plastic chains, each 1 meter long (electron transport chain)

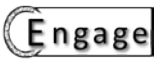
Technology – Hardware: (Click boxes of all equipment needed)

☐ Camera	☐ Computer(s)	☐ Digital Camera
☐ Projection System	☐ Television	☐ VCR
☐ Video Camera	☐ Internet Connection	☐ Other:

Technology – Software: (Click boxes of all software needed.)

☐ Database/Spreadsheet	☐ Multimedia	☐ Other:
☐ Internet Web Browser	☐ Word Processing	

Internet Resources: List Resources Here or at End.

Procedures:	**Teacher's Notes:**
	
• Appropriate classroom behavior is required.	
	
	

Explore

- The activity is linear in design, although many of the events happen simultaneously. After the students become familiar with the overall process, have the students run the scenario with all the parts moving at the same time.

Explain

Elaborate

- Draw and label a diagram showing Photosystem I and Photosystem II and the processes that occur during the light dependent reactions.

Evaluate

Formative Assessment

- Student constructed responses to reflection questions.

Summative Assessment

- Photosynthesis graphic organizer

Extend

Cross-Curricular

- PE
- Technology

Notes:

- Biology, Eighth Edition. Neil Campbell, et.al. San Francisco: Pearson 2008.
- Biology. Kenneth Miller, & Joseph Levine. Upper Saddle River: Pearson 2006