

Impact of Light in the Forest

Title: Forest Ecology-Environment-Light

Grade Level: 7-9

Science Concepts to be learned

Main concept to be invented: Light is a necessary factor for life via photosynthesis in a forest. The intensity of light varies throughout canopy levels.

Secondary Concept to be invented: Biomes are affected by the climatic zone they are located in and other environmental factors such as humidity, temperature, and light. Light moves as waves.

Learning Objectives

- Life Science Indicators-
 - For ecosystems, the major source for energy is sunlight. Energy entering ecosystems as sunlight is transferred by producers into chemical energy through photosynthesis. Energy then passes from organisms to organisms in food webs.
 - Organization of living systems.

- Earth/Space Science Indicators

Global climate is determined by energy transfer from the sun at and near the earth's surface.

Physical Science Indicators

Each kind of atom or molecule can gain or lose energy only in particular discrete amounts and thus can absorb and emit light only at wavelengths corresponding to these amounts.

Waves, including sounds and seismic waves, waves on water, and light waves, have energy and can transfer energy when they interact with matter.

Science as Inquiry

Activities that investigate and analyze science questions.

Groups of students often analyzing and synthesizing data after defending conclusions.

Science and Technology

Students should be introduced to the roles of models and simulations in these processes.

Students should present their results to students, teachers, and others in a variety of ways, such as orally, in writing, and in other forms-including models, diagrams, and demonstrations.

Technology Objectives:

1. Basic operations and concepts
 - a. Demonstrate an understanding of concepts underlying hardware, software, and connectivity and of practical applications to learning and problem solving.
2. Social, ethical, and human issues

- a. Analyze advantages and disadvantages of widespread use and reliance on technology in the workplace and in society as a whole. (What were the advantages and disadvantages of this technology?)

Technology communications tools

Use technology tools and resources for managing and communicating personal/professional information. (Did you find that this technology helped or impeded your data collection, results, conclusions, etc.?)

6. Technology problem-solving and decision-making tools

Investigate and apply expert systems, intelligent agents, and simulation in real-world situations. (Who would use this in real life? How effective would it be in the field)

Materials

Computer Functions: Work in research teams to download Palm data and analyze data.

Software Needed: LOGGER Pro, Microsoft Word and Excel, Internet Explorer

Science Materials Needed:

For exploration activities: One (1) Palm Pilot, Vernier Light Sensor, ImagiWorks interface and one-prong interface to sensor adaptor per four (4) students.

For expansion activities: Alternative lab worksheets

Classroom Management/Teaching Strategies

How will you organize the students?

For exploration activities: Teacher selected groups of four (4). Roles of data collector, operator, materials manager, and error recorder will be filled.

For expansion activities: Guided discussion of photosynthesis in large group.

How will you use the computers available with your students? They will work in research teams to download Palm data and analyze data.

What are the safety issues you should address as the students participate in each of the unit activities?

- Handle all equipment with care
- If any equipment is broken, contact teacher immediately
- Do not take equipment near water
- Use caution when working in a poorly lighted area
- Always walk, not run, in classroom settings

Activities to Support Concept Development

Exploration Phase (Student Activities):

Which process skills will be used? Observation, Interpretation, Hypothesizing.

What will the students do? **Introduction to Light**

Students will be put into groups and given Vernier Probes and Palm Pilots and asked to measure the amount of light in different areas of the room with the lights off and only one window with open curtains. Students will be given three specific areas to measure light in and three areas to choose themselves. Students will collect and analyze data. Results will be portrayed in model form on the chalkboard.

Specific Technology Standard(s) Addressed:

Student Standard(s): Use technology tools and resources for managing and communicating personal/professional information.

Teacher Standard(s): Design developmentally appropriate learning opportunities that apply technology-enhanced instructional strategies to support the diverse needs of learners.

Explanation Phase (Teacher Activities):

What is the main idea? **Light is a necessary factor for life via photosynthesis in a forest and intensity varies throughout canopy levels.**

How will the main idea be constructed?

As the students maneuver through the experiment, they will find that areas away from the window have less light. Wave properties of light will be seen when light is detected even behind obstacles.

- Where is the intensity of the light greatest and least?
- Why is the light greatest or least there?
- How does light get around obstacles?
- How does light move? (Straight lines? Curves?)
- Does light bend? Explain.

Specific Technology Standard(s) Addressed:

Student Standard(s): Demonstrate an understanding of concepts and of practical applications to learning and problem solving.

Teacher Standard(s): Apply technology to develop students' higher order skills and creativity.

Expansion Phase (Student Activities): Light Intensity and Photosynthesis

Which process skills will be used? Experimentation, hypothesizing, observing, recording data, cognitive thinking

How will the idea be expanded?

The students groups will be assigned a field study area within the forested school land lab, in the open prairie area, and in an area right next to the school void of vegetation. On day one as a team the students will go to all three of their assigned study areas and record the type and amount of vegetation found within each area. It is up to the student teams to develop a data table to collect and record this data. A schedule will be set up so that at specific times during the school day, different students within the group will be responsible for going to those three study areas and collecting data on light intensity using the light probes. They will record the light intensity data on their record sheets (Note: this can be created on the Palm through Excel or even using the ImagiProbe software on the Palm.) They will record this data at the same times throughout the day for 5 consecutive days. The driving question behind this study is: "Do different light intensities effect the type of vegetation found in an area?" Once they have collected and analyzed this

data use that information to get into a discussion on photosynthesis – asking how they think varying levels of light effect the rate of photosynthesis.

Photosynthesis and alternate labs

Determine what students already know about photosynthesis. Determine what they want to know about photosynthesis.

In keeping with state and national standards for science education the following areas should be addressed in every lesson. You should create questions to ask or discuss with your students that will address the following areas:

Science in Personal and Social Perspectives

-How do you think scientists can apply technology to photosynthesis?

Science and Technology

-What is the benefit of using the probes with the Palm Pilots in the field or the lab?

Science as Inquiry

-Why do we need plants? Can we live without plants?

History and Nature of Science

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Specific Technology Standard(s) Addressed:

Student Standard(s): Analyze advantages and disadvantages of widespread use and reliance on technology in the workplace and in society as a whole.

Teacher Standard(s): Connect work done in the classroom to possible use in real life.

Evaluation Phase

These may be re-stated as the lessons objectives – what do you expect the student to know and be able to do by the time they have completed all phases of the lesson?

Cognitive: involve intellectual activities such as memorizing, interpreting, applying, problem solving, reasoning, analyzing and critical thinking.

Explain the properties of light

Explain photosynthesis

Explain the light levels in the forest canopy

Performance: engages students in activities that require them to apply their understanding of the concept in a new context.

- Perform a measurement experiment
- Conduct themselves accordingly in a laboratory situation
- Handle hardware and apply to different activities

References

PLT International – *Forest Ecology Module – 2001*

Holt Science – on Photosynthesis