

Tree Density Unit

Title: Tree Density

Grade Level: 7-9

Science Concepts to be learned

Main Concept to be invented: Tree Density – Varying factors within a forest will impact tree density. Tree density depends on an amount of light, moisture (humidity), pH, climate, soil nutrients (etc.) and these factors can help one predict tree types found within the forest.

Learning Objectives

Science Objectives: Select the benchmarks and indicators from the Ohio Science Standards

- Earth/Space, Life or Physical Science Indicators
 - Grade 7 #8. Describe how temperature and precipitation determine climatic zones (biomes) (e.g., desert, grasslands, forests, tundra, alpine).
 - Grade 8 #8. Name and describe tools used to study the universe (e.g., telescopes, probes, satellites and spacecraft).
 - Grade 10 #7. Describe advances and issues in Earth and space science that have important long-lasting effects on science and society (e.g., geologic time scales, global warming, depletion of resources, exponential population growth).
- Science and Technology
 - Grade 9 #1. Identify a problem or need, propose designs and choose among alternative solutions for the problem.

Technology Objectives: (Pulled from the National Educational Technology Student Standards - NETS)

2. Social, ethical, and human issues

- Students understand the ethical, cultural, and societal issues related to technology.
- Students develop positive attitudes toward technology uses that support lifelong learning, collaboration, personal pursuits, and productivity.

5. Technology research tools

- Students use technology to locate, evaluate, and collect information from a variety of sources.

Materials

Computer Functions: Internet search capabilities

Software Needed:

- Probeware for Palms
- pH probe
- Dissolved oxygen probe
- Temperature probe
- Humidity probe

Science Materials Needed:

For exploration activities: Students will need 1 computer per group with internet capabilities.

For expansion activities: Palms and Probeware (pH, dissolved oxygen, humidity, or temperature) with sheet to go as well as a dichotomous key

Classroom Management/Teaching Strategies**How will you organize the students?**

For exploration activities: groups of two

For expansion activities: groups of two (half will be Tree identification group and the other half will be the condition identification group.)

How will you use the computers available with your students?

- Internet search for exploration
- Probeware and Palm for expansion

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

- Students will need supervision outdoors
- Students must know not to eat plants
- Students must follow basic classroom rules
- Students will need permission slips and emergency medical cards if this lesson is done as a field trip

Activities to Support Concept Development**Exploration Phase (Student Activities):**

Which process skills will be used?

- Searching
- Inferring

What will the students do? *Tree Data Search*

Have the students search the internet (in groups of two) for types and density of trees in our area. Students must confirm data with at least two resources. Next, students will choose a geographic area they are interested in, and find the types and densities of trees. Students will then compare and contrast these areas. The students will then hypothesize the reasons for the differences in trees of those two areas, and write these hypotheses in their lab books.

Specific Technology Standard(s) Addressed**Student Standard(s):**

1. Explain how needs, attitudes and values influence the direction of technological development in various cultures.
2. Describe how decisions to develop and use technologies often put environmental and economic concerns in direct competition with each other

3. Recognize that science can only answer some questions and technology can only solve some human problems.

Teacher Standard(s):

Technology Operations and Concepts

1. Demonstrates introductory knowledge and understanding of technology operations and concepts
2. Planning and Designing Learning Environments and Experiences
3. Design developmentally appropriate learning opportunities that apply technology-enhanced instructional strategies to support the diverse needs of learners
4. Identify and locate technology resources and evaluate them for accuracy and suitability
5. Plan strategies to manage student learning in a technology-enriched environment

Teaching, Learning and the Curriculum

1. Facilitate technology-enhanced experiences that address content standards and student technology standards
2. Use technology to support learner-centered strategies that address the diverse needs of students
3. Manage student-learning activities in a technology-enhanced environment

Explanation Phase (Teacher Activities):

What is the main idea? **Varying factors within a forest will impact tree density. Tree density depends on an amount of light, moisture (humidity), pH, climate, soil nutrients (etc.) and these factors can help one predict tree types found within the forest.**

How will the main idea be constructed?

After students finish their search, have the class come back together as a whole, and share their hypothesis (in a discussion format.) Define and explain students' ideas as they come up during the discussion. Consult pre-made list of factors, in case students miss any important ideas. (See attached outline). Check for any misconceptions during the discussion. Students will be taking notes on the discussion.

Expansion Phase (Student Activities):

Which process skills will be used?

- Searching
- Predicting
- Measuring
- Counting
- Identifying

How will the idea be expanded? Density of Trees-Id types or nutrients

Students will get back into groups, and will be assigned a group type. Groups will either be a tree ID group or a nutrient ID group (pH, dissolved oxygen, humidity, or temperature). Students in the tree ID group will be given environmental conditions of our area, and will try to predict which trees are in our area based on an Internet search of possible trees that survive in these conditions. The nutrient ID group will be given tree types (and density) in our area, and students will search what conditions these types of trees survive in. Based on this search, the students will make predictions

either on types of trees & densities, or nutrients (whichever group they were originally assigned) they will most likely find when they go out into the field. Students will then go into the field and collect data using palms and probes, or dichotomous keys and palms, to support their predictions. Students identifying nutrients will take multiple measurements of assigned probe in area that is defined. Tree ID group will count types and number of each tree in a defined area and come up with the density. Once back in the classroom, one tree ID group and one nutrient ID group will work together and create an informal lab report.

The Lab report must include:

- What was the purpose of this experiment?
- What was the procedure?
- What was the theory (the nutrients, the climate, the soil, etc.) behind why certain trees are in certain geographical areas and why they have their respective densities?
- What were your observations? (Here is where the data table can be placed)
- What were your conclusions?
- Explain why you concluded that?
- What were some sources of error in this experiment?
- Propose another experiment that could find similar data.

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
 - What industries might this data affect?
 - Where have you been in your life and what types of trees did you see or now think you will see?
 - What might the dangers of rainforest deforestation be?
- Science and Technology
 - What are we losing by destroying trees in the rainforest or in local forests?
- Science as Inquiry
 - What might happen if altitude is added to the list of variables?
- History and Nature of Science
 - How might trees in this area have been different when the dinosaurs lived?
 - Who might have started these studies and why?

Specific Technology Standard(s) Addressed: if applicable

Student Standard(s):

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5.Technology research tools

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Teacher Standard(s):

Technology Operations and Concepts

- Demonstrates introductory knowledge and understanding of technology operations and concepts

Planning and Designing Learning Environments and Experiences

- Design developmentally appropriate learning opportunities that apply technology-enhanced instructional strategies to support the diverse needs of learners
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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.

- Interpret results of their findings and apply them to their internet searches
- Given soil and climate variables, predict types and density of trees present

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

- Write and informal lab report stating a purpose, their Internet search results, their findings, and how they compared to the groups results.

References

PLT International – *Forest Ecology Secondary Module* – 2001.

Outline Of Key Concepts for Class Discussion

- What is Density?
- What factors may cause certain tree densities to occur?
 - Climate
 - pH of soil
 - Soil Nutrients (dissolved oxygen)
 - Temperature
 - Humidity
 - Light
 - Seasons
- Why are there different types of trees in different areas?
 - Are the same factors for density important for predicting the types of trees in an area as well?