

Lesson Template

Subject Area(s) life science, science & technology, measurement

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Associated Unit

Yellow highlight = required component

Lesson Title Plants and Engineering



Image 1

ADA Description: This image shows oregano herb plants.

Caption: None

Image file: oreganoherbplant.bmp

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Grade Level 5

Lesson # ___ of ___

Lesson Dependency

Time Required 40 minutes

Summary

One of the goals of this lesson is for the students to have a better understanding of different SI units, from meters to nanometers. Engineers work in many different fields including nanotechnology; any technology on the scale of nanometers. Nanotechnology is introduced and connected to plants through moisture wicking clothes that use cellulose nanofibers.

Engineering Connection

Engineers work in various fields including nanotechnology; any technology on the scale of nanometers. These technologies are used in various fields from electronics to clothing. Nanotechnology is introduced and connected to plants through moisture wicking clothes that use cellulose nanofibers.

Engineering Category = #1

1. Relating science and/or math concept(s) to engineering
2. Engineering analysis or partial design
3. Engineering design process

Keywords

plant, transpiration, nanotechnology, engineering

Educational Standards

TEKS for Science, Texas, Beginning with School Year 2010-2011, Grade 5, 9A:

(9) Organisms and environments. The student know that there are relationships, systems, and cycles within environments. The student is expected to:

- (A) observe the way organisms live and survive in their ecosystem by interacting with the living and non-living elements

TEKS for Math, Texas, Beginning with School Year 2010-2011, Grade 5, 10A:

(10) Measurement. The student applies measurement concepts involving length (including perimeter), area, capacity/volume, and weight/mass to solve problems. The student is expected to:

- (A) perform simple conversions within the same measurement system (SI (metric) or customary)

Pre-Requisite Knowledge

The students know the fundamental SI units of measurement like the meter and centimeter.

Learning Objectives

After this lesson, students should be able to:

- Understand SI units from meters to nanometers
- Perform simple conversions within the metric system
- Understand engineering is a broad discipline
- Understand engineers can work in the field of nanotechnology

Introduction / Motivation

How many have you used a meter stick to measure an object? (Hold up a measure stick) What did you use it to measure? If you wanted to measure a smaller object, like a tissue box, what units would you use? (Expect "centimeters" to be a common answer, if you get inches explain you are looking for SI units) How many centimeters are in a meter? (Expect "There are a 100 centimeters in a meter". If they don't know let them look at the meter stick to figure it out.) How many centimeters are in five meters? (Answer: 500 cm; Have them individually calculate the conversion on a piece of paper and then show them how on the board.)What if you wanted to measure something even smaller like the diameter of a human hair? (Take suggestions for units but don't expect the correct answer. Answer: micrometers or nanometers.) The diameter of a human hair is about 75,000 nm or 75 μm . (Write these values on the board.) A micrometer is one-millionth of a meter and a nanometer is one-billionth of a meter. (Also, write these values on the board) How many nanometers is the length of e. coli bacteria? (Have students guess.) E. coli bacteria has a diameter of 2,000 nm and you can't see them with the naked eye. Now let's practice taking measurements and making simple unit conversions with plants!

(Have the students complete the Plant Transpiration activity.)

Lesson Background & Concepts for Teachers

Engineers work in various fields and design many different things ranging from electronics to bridges. One field that engineers work in is nanotechnology which is any technology on the scale of nanometers. These technologies are used in various fields from electronics to sports. Nanotechnology can be used to reduce the size of electronic components or to increase the tensile strength of sport equipment like a badminton racket. It is a growing field and seems to have infinite possibilities. In this lesson the metric system is reviewed all the way to the nanometer. Also nanotechnology is introduced and connected to plants through moisture wicking clothes that use cellulose nanofibers.

Vocabulary / Definitions

Word	Definition
Transpiration	The process when water evaporates from the leaves of a plant and more water moves up through the plant to replace lost water
Engineer	A person who applies science and mathematics to create for the benefit of society.
Nanotechnology	Any technology on the scale of nanometers

Associated Activities

Plant Transpiration Activity

Lesson Closure

Plants are used for many different things other than for food. An application of plants designed by engineers was to make moisture wicking clothes. People wear these clothes when working out to make them more comfortable. They are more comfortable because the clothing absorbs sweat and keeps it away from your body. These clothes use the natural absorption qualities of wood pulp cellulose to wick moisture away. This material is 50% more absorbent than cotton. What type of material are your shirts made of? (Have some students look at the tag in their shirts.) The wood pulp cellulose used in this type of clothing is from the cell wall of wood. They call this material cellulose nanofibers because the fibers have a thickness in nanometers and a length in micrometers. Since these fibers have a thickness in nanometers these moisture wicking clothes are considered a nanotechnology. Engineers work in many different fields including nanotechnology, which is any technology on a scale of nanometers.

(Have students complete the Post-Lesson Assessment)

Assessment

Post-Lesson Assessment

Discussion Questions: Have the students discuss the following questions together in small groups.

- What fields do engineers work in?
- What types of things do engineers design or build?
- Do you use anything regularly that you think an engineer had a part in building?
- How do the things you list help society?

Lesson Extension Activities

Additional Multimedia Support

References

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<<http://allseasonsuniforms.com/dfinfo.htm>>.

Moyer, Richard, and National Geographic. *McGraw-Hill Science*. 2000. Print.

"Nanotechnology." 2010. Web. <Dictionary.com>.

Attachments

Other

Redirect URL

Contributors

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Supporting Program

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