

Blank Lesson Template

Yellow highlight = required component

Subject Area(s) AP Biology

Associated Unit Plants

Lesson Title Paper: What Would We Do Without It?

Lesson Dependency

Time Required 40 Minutes

Summary

The creation of paper is arguably one of the most important contributions to the advancement of knowledge. By providing a convenient, lightweight writing surface, ideas have been spread across cultural, political, and geographical boundaries. Paper-making has had a fascinating history coming full circle from the artfully hand-made papers in eastern Asia, to mass produced paper rolls in mills, and now a resurgence in hand-made papers as the internet becomes the leading instrument of information transmission.

Engineering Connection

Paper mills are interesting industrial plants whose products are used continuously throughout the day. It is hard to imagine our world today without such common items as toilet paper and books. For many years, paper mills received a large percentage of the capital investment in American industry, in efforts to obtain the most efficient equipment possible. The challenge of today's engineers is to redesign mass production methods to provide sustainable products and reduce environmental pollution.

Engineering Category = #1

Choose the category that best describes this lesson's amount/depth of engineering content:

1. Relating science and/or math concept(s) to engineering

Keywords

Plants, Cellulose, Paper

Educational Standards

Science: Texas, science, 2009, The Texas Essential Knowledge and Skills, Chapter 112

3B communicate and apply scientific information extracted from various sources such as current events, news reports, published journal articles, and marketing materials

3D evaluate the impact of scientific research on society and the environment

9A compare the structures and functions of different types of biomolecules, including carbohydrates, lipids, proteins, and nucleic acids

Pre-Requisite Knowledge

Learning Objectives

After this lesson, students should be able to:

- Describe the function of cellulose in plant structure
- Explain the importance of paper in our society and how it is produced

- Understand the challenges engineers face in creating sustainable products

Introduction / Motivation

Our modern world was built by the dissemination of knowledge via paper goods. From books to pamphlets to everyday items as paper tissues and paper plates, it's hard to imagine life without it. But how do trees become the bright white sheets we're so familiar with? In this lesson, we will start with the raw material for paper (cellulose) all the way to your spiraled notebooks. In the process, we will briefly cover the history of papermaking. In this way, you'll be able to relate the techniques that ancient paper makers used with the automated machinery that produces thousands of tons of paper each year!

Lesson Background & Concepts for Teachers

Teachers should review the plant unit of the biology textbook. Useful information on paper making and paper mills is provided by the Robert C. Williams Paper Museum, hosted by the Georgia Institute of Technology:

<http://www.ipst.gatech.edu/amp/index.html>

I have also found chapter 14 in Caveman Chemistry by Kevin Dunn to be very useful. He teaches chemistry at Hampden-Sydney College and his website can be found at:

<http://www.cavemanchemistry.com/index.html>

Vocabulary / Definitions

Word	Definition
Cellulose	A structural polysaccharide of cell walls, consisting of glucose monomers joined by β -1, 4-glycosidic linkages. (<u>Biology</u> , 3 rd edition, Neil Campbell)
Paper	Thin writing surface produced by the pulp of processed plant matter, mostly consisting of cellulose.
Hydrolysis	The cleavage of chemical bonds by the addition of water.
Economy of Scale	The decreasing of cost per unit produced with increased production volume

Associated Activities

Paper Production from Pesky Plants

Lesson Closure

Assessment

Students will answer questions orally throughout lesson to determine their understanding of plant structures and functions.

Lesson Extension Activities

Additional Multimedia Support

References

Attachments

Paper: What Would We Do Without It? – presentation

Other

Redirect URL

Contributors

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Supporting Program

National Science Foundation GK-12 program, University of Houston, Department of Civil and Environmental Engineering