

# THINKING AND ACTING LIKE A SCIENTIST

## TEACHER'S GUIDE

# Trees and Me

How does making paper affect the environment?

GRADE K

Earth & Space





# Trees and Me

<b>Grade Level/ Content</b>	K/Earth and Space Science
<b>Lesson Summary</b>	Students investigate how making paper from trees impacts the environment and determine how they can reduce that impact.
<b>Estimated Time</b>	2, 45-minute class periods
<b>Materials (per team)</b>	Drawing materials (crayons, markers, etc.), <a href="#">Fact Cards</a> , <a href="#">Observation Form</a> , journal
<b>Secondary Resources</b>	<p><i>A Tree Is a Plant</i> by Clyde Robert Bulla</p> <p><i>Be a Friend to Trees</i> by Patricia Lauber</p> <p><i>From Tree to Paper</i> by Pam Marshall</p> <p><i>Tell Me, Tree: All About Trees for Kids</i> by Gail Gibbons</p> <p><i>Miles Rose: How Paper Is Made</i></p> <p><i>Sesame Street: Where Does Paper Come From?</i></p> <p><i>Georgia-Pacific: How Paper is Made</i></p> <p><i>Making Stuff   Nat Geo Kids S1—E13 How to Make Paper</i></p>
<b>NGSS Connection</b>	<b>K-ESS3-3</b> Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.
<b>Learning Objectives</b>	<ul style="list-style-type: none"> <li>• Students learn how paper is made.</li> <li>• Students discover how the paper-making process affects the environment.</li> <li>• Students give examples of choices people can make to reduce the negative effect that making paper can have on the environment.</li> </ul>
<b>Cross-Curricular Project Connections</b>	Arbor Day; Reduce, Reuse, Recycle

## How does making paper affect the environment?

In order to reduce the impact of humans on the environment, students must first become aware of the impact that humans have. Paper is an item that is familiar to students and is something they use every day. Paper is made from trees, another familiar item. Trees used to make paper are often grown on a tree farm. Using paper impacts the environment contributing to deforestation as well as introducing pollutants into the air through the paper-making process. Students can reduce their impact on the environment by reducing, reusing, and recycling paper.

## Investigation is based on the Van Andel Education Institute (VAEI) Instructional Model for Inquiry-Based Science.

### In all investigations:



Students don't know the "answer" they are supposed to get.



Students play a driving role in determining the process for learning.



Teachers and students construct meaning together by journaling.



Students are working as hard as the teacher.

# Part 1

## INVESTIGATION SETUP

Students will draw a representation of data they are given from the [Fact Cards](#) (or your own research).

- Drawing materials (crayons, markers, etc.)
- [Fact Cards](#) (cut into individual cards)
- [Observation Form](#)
- Journal

# Part 2

## INVESTIGATION FACILITATION



### Question

*Introduce the investigation question.*

#### **How does making paper affect the environment?**

##### CURIOSITY

Go outside and hold up a sheet of paper or flip through the pages of a book as students watch. Ask students where they think paper comes from. After students give their ideas, point to a tree and explain that paper comes from trees. Have students brainstorm how a tree can be turned into paper. Then, tell students that they will learn about the process of making paper and how it affects the environment.



### Personal Knowledge

*Students capture what they already know about how paper is made and how people can impact the environment.*

- Ask students to describe what they know about how paper is made.
- Ask students to share what they know about how making paper affects the environment.



### Secondary Knowledge

*Students use secondary sources to understand how paper is made.*

- Use the resources below (or others of your choice) to help students understand how paper is made from trees.
- As the class discovers the paper-making process, document the key steps with simple graphics. Model how you decide to represent each step in a graphic way so students are prepared to do it on their own later in the investigation.
- When complete, explain that what you created is an infographic, information displayed in a graphic or visual way.

*Continued*

## BOOKS:

- *A Tree Is a Plant* by Clyde Robert Bulla
- *Be a Friend to Trees* by Patricia Lauber
- *From Tree to Paper* by Pam Marshall
- *Tell Me, Tree: All About Trees for Kids* by Gail Gibbons

## VIDEOS:

- Miles Rose: *How Paper Is Made*
- Sesame Street: *Where Does Paper Come From?*
- Georgia-Pacific: *How Paper is Made*
- Making Stuff | Nat Geo Kids S1—E13 *How to Make Paper*

## CRITICAL THINKING

Conduct a *Think Aloud* as you capture the steps of the paper-making process in a graphic way. Explain why you are drawing what you are drawing so the students understand the underlying thinking that goes into good communication.

## STUDENT ENGAGEMENT

Encourage students to role-play all of the steps in the papermaking process by acting out planting and harvesting trees to process in a paper mill. Students may decide to create trees and a paper mill with wooden blocks or clay, rolling out clay to cut into sheets in the art center. Students can also act out the roles of the workers they see in the books and videos.

1  
2  
3

## Investigation Plan

Students determine how making paper impacts the environment.

- Now that students understand how paper is made, they can investigate how making paper impacts the environment.
- Ask students to think of all the ways they use paper at home, at school, and in the community. Create a class list. (*At home: cardboard boxes, cereal boxes, juice cartons, paper labels on cans, paper placemats, paper napkins, toilet paper, paper towels, facial tissues, cards, letters, paper cups, baby diapers, etc. At school: posters, notebook paper, books, folders, sticky notes, worksheets, etc. In community: newspapers, store signs, packages, restaurant menus, pictures, etc.*)
- Then, lead students in researching how making paper impacts the environment. Use the [Fact Cards](#) or conduct your own Internet research as a class. You should use at least 3 facts that show the variety of environmental impacts caused by the paper-making process.
- You may want to hide the fact cards around the classroom where paper is used and challenge students to find them and bring them to you. You can read the fact aloud and help students understand each one until all have been found and discussed.
- Then, divide students into groups and give each group one fact to study further.

**FACT CARDS  
TREES AND ME**

- 40% of the trees that are cut down in the world are used to make paper.  
Source: The World Counts, [http://www.theworldcounts.com/trees/Environmental\\_Impact\\_of\\_Paper\\_Production](http://www.theworldcounts.com/trees/Environmental_Impact_of_Paper_Production)
- Over 30 million acres of forest are destroyed every year.  
Source: The World Counts, [http://www.theworldcounts.com/trees/Environmental\\_Impact\\_of\\_Paper\\_Production](http://www.theworldcounts.com/trees/Environmental_Impact_of_Paper_Production)
- Paper production uses up lots of water. It takes 10 liters of water to make one piece of paper.  
Source: The World Counts, [http://www.theworldcounts.com/trees/Environmental\\_Impact\\_of\\_Paper\\_Production](http://www.theworldcounts.com/trees/Environmental_Impact_of_Paper_Production)
- When paper rots, it creates a toxic gas.  
Source: International Institute for Environment and Development (IIED), founded in 1971, was commissioned by the World Business Council for Sustainable Development to do the study, "Changing Values for Paper: A Reassessment of the World's Forests & Sustainable Paper Supply"

Van Andel Education Institute | VAEI.org

Fact Cards



## Observation

Students obtain information about how making paper impacts the environment.

- Once in groups, students use the **Observation Form** to record what they learn during the investigation.
- They can tape the fact they are studying at the top of the page. (They will complete the rest of the page during Data Analysis.)

The image shows a template for an 'OBSERVATION FORM' titled 'TREES AND ME'. At the top right, there are two lines for 'NAME: \_\_\_\_\_' and 'DATE: \_\_\_\_\_'. The main body of the form is divided into two sections: 'Fact' at the top and 'What This Means' below it. At the bottom right of the form, there is a small copyright notice: 'Van Andel Education Institute | VAEI.org'.

Observation Form

## Part 3

### INVESTIGATION ANALYSIS AND DEVELOPMENT OF CLAIM



## Data Analysis

Students make sense of their data by organizing it and representing it visually.

- In their groups, have students analyze their fact. They can do this by discussing it as a group and then representing their fact as a drawing, just as you modeled with the paper-making process. They should make their drawings on the bottom of the **Observation Form**. Encourage them to be creative and to ask for your help as needed. *For example, if a group has the fact that the average American uses 749 pounds of paper, students may wonder, "What else weighs 749 pounds?" Help them find answers that will help them understand the data (e.g., 3 adult black bears weigh ~749 pounds). Then, they may draw 3 black bears next to a stack of paper to show the weight of paper used by 1 person.*
- As each group completes their **Observation Form**, paste them together so all facts are shown as one long infographic.
- Display the class infographic and analyze all the data for patterns and trends.
- Ensure they have enough data that it can be used as evidence to support a claim about how making paper impacts the environment.



## Explanation

Students develop a claim and provide evidence and reasoning to support it.

- Help students use what they've discovered from the analyzed data to develop an explanation that answers their investigation question. You may wish to use the **Explanation** prompt as a guide. You may want to develop the explanation as a whole-class guided writing activity or in small groups using the same **Fact Card**.
- Have students develop a **Claim** to answer the question: How does making paper affect the environment?
- Then, have them add **Evidence** (the analyzed data) to support their claim.
- Finally, have them add **Reasoning** to their claim. Reasoning should include the information obtained from this investigation as well as science principles they have learned.

*Continued*

### Claim

*The process of making paper has a negative effect on the environment.*

### Evidence

*I learned how paper is made. It is made from trees. The more paper we use, the more trees have to be cut down. This is not good for our environment.*

### Reasoning

*Investigation: I studied a fact about how making paper impacts the environment. I studied the fact that the average American uses 749 pounds of paper each year. That's the same weight as three black bears!*

*Science: I learned from videos, books, and my classmates more facts about how paper making can hurt the environment. The process of making paper uses dangerous chemicals. There is also a dangerous gas that is released in the process.*

### COLLABORATION

Develop student listening skills by guiding their collaborative discussions about their claims. Encourage them to share their ideas, but connect them to their classmates' ideas. For example, use the stem, "You said the paper-making process impacted the environment by \_\_\_\_\_. I also think it impacts the environment by \_\_\_\_\_."



### Evaluation

*Students reflect on the investigation.*

- Ask students to describe one thing that surprised them about the investigation.
- Ask students what else they want to know about how making paper impacts the environment.

**Application**

Students apply their understanding of how paper is made, its effect on the environment, and ways people can help.

- Now that students understand some of the negative impacts paper-making has on the environment, share ways they can help.
- Students can **reduce** their use of paper (*always print double-sided, only print what you really need, send electronic cards instead of paper cards, read online books*).
- Students can **reuse** paper (*keep used paper around as scrap paper, reuse gift bags, reuse paper cups and plates, use all the pages in a notebook*).
- Students can **recycle** paper:
  - Recycling paper uses 60% less energy than manufacturing virgin timber paper.  
Source: "1996 Statistics, Data Through 1995." American Forest and Paper Association. November 1996. Pg. 2
  - Every ton of recycled paper saves about 17 trees.  
Source: Purdue Research Foundation and US Environmental Protection Agency, 1996
  - Recycling half the world's paper would free 20 million acres of forestland.  
Source: The Recycler's Handbook, 1990

**INTEGRITY**

The choices students make each day have an impact on trees. Invite students to share the possibilities they have available to them with the paper recycling opportunities that they encounter each day. (*Writing on the back of a sheet of paper instead of using a new sheet, using fewer paper napkins in the cafeteria, or recycling old paper instead of throwing it in the trash.*)

**Assessment**

Evaluate understanding by ensuring students can:

- Describe how paper is made from trees.
- Name a product made from paper that people use.
- Explain at least 2 ways paper-making is harmful to the environment.
- Describe at least 3 things we can do to reduce the impact paper-making has on the environment.

## Take This Lesson Across the Curriculum

### Arbor Day

Students celebrate Arbor Day by planting trees at their school.

Reading/Language Arts	Math	Science	Social Studies
<p><b>Trees Grow Everywhere</b></p> <p>Students read <i>We Planted a Tree</i> by Diane Muldrow and discuss how people plant trees in different regions.</p> <p>CCSS.ELA-LITERACY.RI.K.2</p>	<p><b>Tree Tally</b></p> <p>Students count the trees growing at their school.</p> <p>CCSS.MATH.CONTENT.K.CC.B.4</p>	<p><b>We Plant Trees</b></p> <p>Students study local trees and decide which ones to plant at their school for Arbor Day.</p> <p>NGSS: K-ESS3-3</p>	<p><b>Where Are Our Trees?</b></p> <p>Students make a map of the trees planted at their school.</p> <p>NCSS: D2.Geo.1.K-2</p>

### Reduce, Reuse, Recycle

Students learn the Three R's (Reduce, Reuse, Recycle) and put them into practice at school.

Reading/Language Arts	Math	Science	Social Studies
<p><b>What are the Three R's?</b></p> <p>Students read and discuss <i>The Three R's: Reuse, Reduce, Recycle</i> by Nuria Roca.</p> <p>CCSS.ELA-LITERACY.RI.K.2</p>	<p><b>Let Me Count the Ways</b></p> <p>Students keep a tally of their efforts to reuse, reduce, and recycle for a week.</p> <p>CCSS.MATH.CONTENT.K.CC.B.4</p>	<p><b>The Three R's</b></p> <p>Students list ways they can reuse, reduce, and recycle and then take action.</p> <p>NGSS: K-ESS3-3</p>	<p><b>We Can Help</b></p> <p>Students write their own Three R's book as a class by documenting their efforts to reuse, reduce, and recycle for a week.</p> <p>NCSS: D2.Geo.5.K-2</p>

For additional lessons or to customize this lesson, go to [www.nexgeninquiry.org](http://www.nexgeninquiry.org).



OBSERVATION FORM  
**TREES AND ME**

NAME: \_\_\_\_\_

DATE: \_\_\_\_\_

**Fact**

**What This Means**

## FACT CARDS

# TREES AND ME

**40% of the trees that are cut down in the world are used to make paper.**

Source: The World Counts, [http://www.theworldcounts.com/stories/Environmental\\_Impact\\_of\\_Paper\\_Production](http://www.theworldcounts.com/stories/Environmental_Impact_of_Paper_Production)

**Over 30 million acres of forest are destroyed every year.**

Source: The World Counts, [http://www.theworldcounts.com/stories/Environmental\\_Impact\\_of\\_Paper\\_Production](http://www.theworldcounts.com/stories/Environmental_Impact_of_Paper_Production)

**Paper production uses up lots of water. It takes 10 liters of water to make one piece of paper.**

Source: The World Counts, [http://www.theworldcounts.com/stories/Environmental\\_Impact\\_of\\_Paper\\_Production](http://www.theworldcounts.com/stories/Environmental_Impact_of_Paper_Production)

**When paper rots, it creates a toxic gas.**

Source: International Institute for Environment and Development (IIED), founded in 1971, was commissioned by the World Business Council for Sustainable Development to do the study. "A Changing Future for Paper: A summary of the study "Towards a Sustainable Paper Cycle".

FACT CARDS  
**TREES AND ME**

**North America uses 1/3 of the world's paper.**

Source: International Institute for Environment and Development (IIED) Discussion Paper (IIED, London, September 1996)

**The paper industry is the 3rd largest user of fossil fuels worldwide.**

Source: American Forest and Paper Association, (Garner, J.W.. Energy Conservation Practices Offer Environmental and Cost Benefits. Pulp & Paper, October 2002).

**The average American uses 749 pounds of paper every year.**

Source: American Forest & Paper Association, 2004

**The average American's paper use each year equals a 100-foot tree with an 18-inch trunk.**

Source: American Forest & Paper Association, 2004