Sophienburg Grant: Naturalists of Texas

Time Frame: Two 1 hour class periods

Subjects

- [x] Science
- [x] Social Studies
- [x] Language Arts
- [ ] Math
- [x] Art
- [x] Technology Applications
- [ ] Music

Lesson Overview

After a study of Texas naturalists and identifying and collecting local flora, students will create artistic sheets of paper out of recycled paper to send to a person of their choosing. Students will learn the art of creating paper, which will help us review basic science concepts before the STAAR science test. These individual works of art will have seeds and flora native to the local area embedded within them so that they may be planted if desired to bring a little bit of the local area to the receiver.

TEKS

Art 5th Grade

(2) Creative expression/performance. The student expresses ideas through original artworks, using a variety of media with appropriate skill. The student is expected to: (A) combine information from direct observation, experience, and imagination to express ideas about self, family, and community; and (C) create original artworks and explore photographic imagery, using a variety of art materials and media appropriately.

Language Arts 5th Grade

(11) Reading/Comprehension of Informational Text/Expository Text. Students analyze, make inferences and draw conclusions about expository text and provide evidence from text to support their understanding. Students are expected to: (D) use multiple text features and graphics to gain an overview of the contents of text and to locate information; and (E) synthesize and make logical connections between ideas within a text and across two or three texts representing similar or different genres.

13) Reading/Comprehension of Informational Text/Procedural Texts. Students understand how to glean and use information in procedural texts and documents. Students are expected to:(A) interpret details from procedural text to complete a task, solve a problem, or perform procedures;

Science 5th Grade

(5) Matter and energy. The student knows that matter has measurable physical properties and those properties determine how matter is classified, changed, and used. The student is expected to: (A) classify matter based on physical properties, including mass, magnetism, physical state (solid, liquid, and gas), relative density (sinking and floating), solubility in water, and the ability to conduct or insulate thermal energy or electric energy; (C) demonstrate that some mixtures maintain physical properties of their ingredients such as iron filings and sand; and (D) identify changes that can occur in the physical properties of the ingredients of solutions such as dissolving salt in water or adding lemon juice to water.

Social Studies 5th Grade

(23) Science, technology, and society. The student understands the impact of science and technology on society in the United States. The student is expected to: (A) identify the accomplishments of notable individuals in the fields of science and technology, including Benjamin Franklin, Eli Whitney, John Deere, Thomas Edison, Alexander Graham Bell, George Washington Carver, the Wright Brothers, and Neil Armstrong; (C) explain how scientific discoveries and technological innovations in the fields of medicine, communication, and transportation have benefited individuals and society in the United States; and (D) predict how future scientific discoveries and technological innovations could affect society in the United States.

(4) History. The student understands political, economic, and social changes that occurred in the United States during the 19th century. The student is expected to: (G) identify the challenges, opportunities, and contributions of people from various American Indian and immigrant groups

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TEKS

Technology Applications, Grades 3-5
(5) Information acquisition. The student acquires electronic information in a variety of formats, with appropriate supervision. The student is expected to: (A) acquire information including text, audio, video, and graphics; and (B) use on-line help and documentation.

(6) Information acquisition. The student evaluates the acquired electronic information. The student is expected to: (A) apply critical analysis to resolve information conflicts and validate information; (B) determine the success of strategies used to acquire electronic information; and (C) determine the usefulness and appropriateness of digital information.

(7) Solving problems. The student uses appropriate computer-based productivity tools to create and modify solutions to problems. The student is expected to: (A) use software programs with audio, video, and graphics to enhance learning experiences; (B) use appropriate software to express ideas and solve problems including the use of word processing, graphics, databases, spreadsheets, simulations, and multimedia; and (C) use a variety of data types including text, graphics, digital audio, and video.

(8) Solving problems. The student uses research skills and electronic communication, with appropriate supervision, to create new knowledge. The student is expected to: (A) use communication tools to participate in group projects; and (C) participate with electronic communities as a learner, initiator, contributor, or mentor.

Objectives

The student will…

- Collect local flora and identify flora using a database. (Social Studies/ Language Arts)
- Ask local experts in the field of botany questions about local plants. (Social Studies)
- Compare and contrast the way naturalists in the past and naturalists today preserve and share local plant specimens. (Social Studies/ Lang Arts)
- Compare and contrast different types of paper under the microscope. (Science)
- Explain the importance of internet databases to share and collect information. (Social Studies/ Science/ Language Arts)
- Observe the properties of a mixture, and make predictions. (Science)
- Use a paper making technique to create an original work of art to preserve the collected flora and local seeds. (Art)
- Write informal letters. (Language Arts)

Extension objectives:

- Generate science STAAR questions related to the properties of matter and scientific processes.
- Create a marketing plan based on papermaking that will be shared in a slideshow or student-created video.

Sophienburg Grant: Naturalists of Texas

Vocabulary

solid	liquid	papermaking	flora
dissolve	recycle	deckle	evaporate
botany	naturalist		

Materials

- Native seeds to your state, region, or town
- Local flora (gathered by students and teacher)
- Glitter, confetti, foil pieces for decorating paper
- Screened form (deckle)
- Paper making materials: recyclable paper (shredded paper, construction paper, manilla paper, wrapping paper, newspaper, junk mail), towels or felt for drying, large tub(s), sponge, blender (for making paper pulp), water, wax paper, measuring cups, one piece of cardboard 9x12 cardboard for each child
- Hand held microscopes for looking at paper before and after papermaking
- Internet connection
- Science journals
- Writing journals
- Day 1 Activity Guide
- Day 2 Activity Guide
- Teacher Seeded Paper Tutorial

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Day 1- Spring Has Sprung!

Engage The Learner

Day 1 (social studies/ science):

Springtime in Texas is a wonderful time to begin discussing botany due to the abundant wildflowers growing around the area, and the naturally curious scientists in your classroom. Pass out the Day 1 Naturalists Student Guide. Students will bring in pictures and/ or specimens of the local flora that they found growing naturally around their homes, and our school. We will compare specimens and identify flora using a plant and flower database: http://texas.wildflowersightings.org/plants. If we find a plant we cannot identify, we will send our questions and unidentified plants to the same site http://texas.wildflowersightings.org/ or to the local naturalist society, http://txmn.org/lindheimer/more/native-information/. Students will fill out page one of the Day 1 Student Guide. Students will lay plant specimens out to dry on a screen, or press in phone books to use on the second day of this activity.

Activity/ Activities

Day 1 (social studies/ language arts):

We will discuss the purpose of the database Texas Wildflower Sightings, which is, "Help us create the most extensive and comprehensive wildflower database in the world!" Discuss the question, How has modern technology made it easy to share and find out information- the way that the site Texas Wildflower Sightings has?

- **Why is this beneficial to us now and in the future?**
- **What other sites share this type of information?**

Students will spend 10 minutes on a short expository essay, on this topic. Their ideas can be recorded on page 2 of the Day 1 Student Guide. Later in the week students will share their ideas in an online discussion, or in small groups. Students should find at least one other helpful database on the internet to share with the class on a science topic. As new naturalist sites are found, we will share the links on iTunesU, or in a shared Google Doc.

Evaluation

Day 1 (social studies):

Students will imagine what life was like before we could share information so easily through the telephone, cell phone, internet, and television. Students will draw a quick picture on page 3 of the Day 1 Student Guide, of what their local area might have looked like to a new settler. How would a new settler (before modern technology) have identified plants in their region when most of their neighbors were new to the area? They will think about:

- **How would a new settler (before modern technology) have identified plants in their region when most of their neighbors were new to the area?**
- **How is this different than the way we identify plants today using technology, and internet databases?**
- **What characteristics of plants would we have to use both then and now to identify plant specimens?**

Students will compare/ contrast identifying plants before technology with a partner using the chart on page 4 of the Day 1 Student Guide. We will use this information in a Venn Diagram on day 2.

Prelude to day 2

Preparation for Day 2 (science/ art investigation):

Another question students will try to answer is, "What will we do with our plant specimens?" We will create our paper pulp for day 2 by soaking bits of recycled notebook paper overnight in tubs at each table, without telling students yet what it will be used for. The students will tear paper into 1 inch squares, then add water to the torn paper and make predictions in their science journals on what will happen to the paper after it has soaked overnight.

- **Will the paper dissolve?**
- **Will it still be paper after soaking overnight?**
- **What would happen to the mixture if we added other materials?**
- **Will the mixture become something else?**
- **What could this mixture be used for and how will it help us preserve our specimens?**

These are all questions we will explore in day 2.

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Day 2- Preserving and Sharing Specimens

Transition Activity

Day 2 (social studies/ science):

Pass out Day 2 Student Guide. The teacher at this time will introduce the early Texas botanists using the Lindheiemer Naturalists card set. Using the information on Ferdinand Lindheimer, Louis Ernendburgs, and others, as well as the Wildflower Sightings database, students will work in small groups to create a Venn Diagram to compare ways that early botanists identified and preserved plants and shared their findings, to ways that botanists share and compare plants today. To find out more about Lindheimer, students will read the article http://www.statesman.com/news/lifestyles/home-garden/the-father-of-texas-botany-in-new-braunfels/nTps6/.

Engage

Day 2 (science/ art) :

Students will identify the flowers on the Lindheimer Naturalist card set. What do all of these have in common? Students will then find the card on Lindheimer's wife, Eleonore. She was a master at preserving and shipping the specimens that Ferdindand collected. Students will to try a method to preserve and send our collected flower and seed specimens - papermaking. Adding our seeds and flowers to paper pulp after it has been blended will allow the specimens to be transported in a beautiful easy way that can be read, enjoyed and then later planted.

Have students make predictions about the paper pulp that they created in day 1. How will it become paper? Have students make predictions on the process on page 2 in the Day 2 Student Guide or in their science journals.

- **Did the paper dissolve, how do you know? Draw a picture of what you see.**
- **Is it still paper after being mixed with water overnight? Explain.**
- **How could we turn this back into paper? What will need to happen to the water? What will happen to the paper pulp? Explain.**

Activity/ Activities

Day 2 (science):

Look at different types of paper under the handheld microscope. Draw what we notice about the different types in our science journals or page 3 of the Day 2 Student Guide. Then have students view the video of the papermaking process on **http://www.wikihow.com/Make-Paper**.

Day 2 (art/ science):

Prior to this activity, the teacher will have created enough paper pulp for the class using the Seeded Paper Tutorial steps 1 and 2. Students will follow the directions on pages 4 through 6 of the Day 2 Student Guide to create a unique sheet of paper of their choosing. Students will add their plant specimens and seeds to the paper and then drizzle on more pulp to get their designs to set. These designs can be pressed out on felt and left to dry for a few days.

Day 2 (art/ science):

Prior to this activity, the teacher will have created enough paper pulp for the class using the Seeded Paper Tutorial steps 1 and 2. Students will follow the directions on pages 4 through 6 of the Day 2 Student Guide to create a unique sheet of paper of their choosing. Students will add their plant specimens and seeds to the paper and then drizzle on more pulp to get their designs to set. These designs can be pressed out on felt and left to dry for a few days.

Evaluation

Day 2 (language arts/ social studies/ science- to be completed when paper is dry):
When paper has dried, students will use their creation to write a letter to send to a relative or pen-pal out of the local area. These letters can be "recycled" again and planted to bring a little bit of the student's town or city to the receiver.

Extensions/ Supplemental Information

Bibliography or Links

- With a partner come up with a marketing plan on using this idea for a fundraiser for our school or for a fifth grade field trip. Share ideas on where we could get our paper, seed and flower sources, when we could make the product and how it could be distributed. Share your ideas in a Google Drive slideshow or an iTunes commercial.
- Students will work with their table groups (about 4 or 5 students) in a shared Google Docs document to come up with 10 science Staar questions related to the art of papermaking. These questions can be related to process skills, using databases, botany, or scientists. These should have 4 answer choices each and two of the questions should include a table.

To find out more about papermaking, Ferdinand Lindheimer, or Central Texas wildflower databases please visit:

- **http://texas.wildflowersightings.org/**
- **http://www.statesman.com/news/lifestyles/home-garden/the-father-of-texas-botany-in-new-braunfels/nTps6/**
- **http://txmn.org/lindheimer/more/native-information/**
- **http://www.wikihow.com/Make-Paper (video of the papermaking process)**
- **http://www.graciousrain.com/2010/04/27/seed-paper-tutorial/**
- **http://www.kidsgardening.org/node/11978**
- **http://creativeconnectionsforkids.com/2011/12/wildflower-paper-christmas-ornaments/**
- **http://www.ginatepper.com/how-to-make-seed-paper-with-embedded-flowers-and-leaves/**
- **http://msucares.com/news/print/agnews/an12/120913_paper.html**

Name _____

Spring Has Sprung!

Identifying Plant Specimens

Draw or insert a picture of the plant specimen you chose growing near your home or school. Make sure and include the number of leaf points, the color, and other important characteristics.

Please answer these questions:

1. Did anyone else in the class bring in the same plant specimen? _____

If so, who? _____

Do you live close to one another?

_____

2. What color and shape is your plant?

_____

3. How many leaf points does your plant have?

_____

4. Does your plant have thorns? _____

Use the database Texas Wildflower Sightings and try to identify your plant by the characteristics you described.

5. Were you able to find your plant specimen in the database?_____

6. If yes, what is the name of your plant?

_____

If you could not find your plant in the database, please submit a photo to Texas Wildflower Sightings to have a botanist or community member help you identify your plant. Fill in the required information when you receive an identification.

Spring Has Sprung!

The Texas Wildflower Sightings website stated that they want the community to, "Help us create the most extensive and comprehensive wildflower database in the world!" How are they doing this? Why is a database like this important to us now and in the future?
Please explain below:

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

If you have other questions about your plant be sure and post those questions to the Texas Wildflower Sightings website to see if a botanist or other community member can help you.
Sometime this week find and share another helpful database, either in an online discussion, or small group. You should be able to explain how this database benefits the community both now and in the future.

Database address:_____

Spring Has Sprung!

What do you think springtime in your state would have looked like to a new settler in the 1800s? Imagine what it would have looked like, then draw a picture below.

Think about this:

- How would a new settler (before modern technology) have identified plants in their region when most of their neighbors were new to the area?
- How is this different than the way we identify plants today using technology, and internet databases?
- What characteristics of plants would we have to use both then and now to identify plant specimens?

Discuss these ideas with a partner and fill out your predictions on the next page as you reflect on these questions. We will come back to this idea on day 2.

Spring Has Sprung!

Identifying Plant Specimens

Before Technology

After Technology

Spring Has Sprung!

What will we do with our plant specimens? Please follow your teacher's directions to be ready to find out tomorrow!

Make some predictions in your science journals about will happen to the torn paper and water:

- **Will the paper dissolve?**

- **Will it still be paper after soaking overnight?**

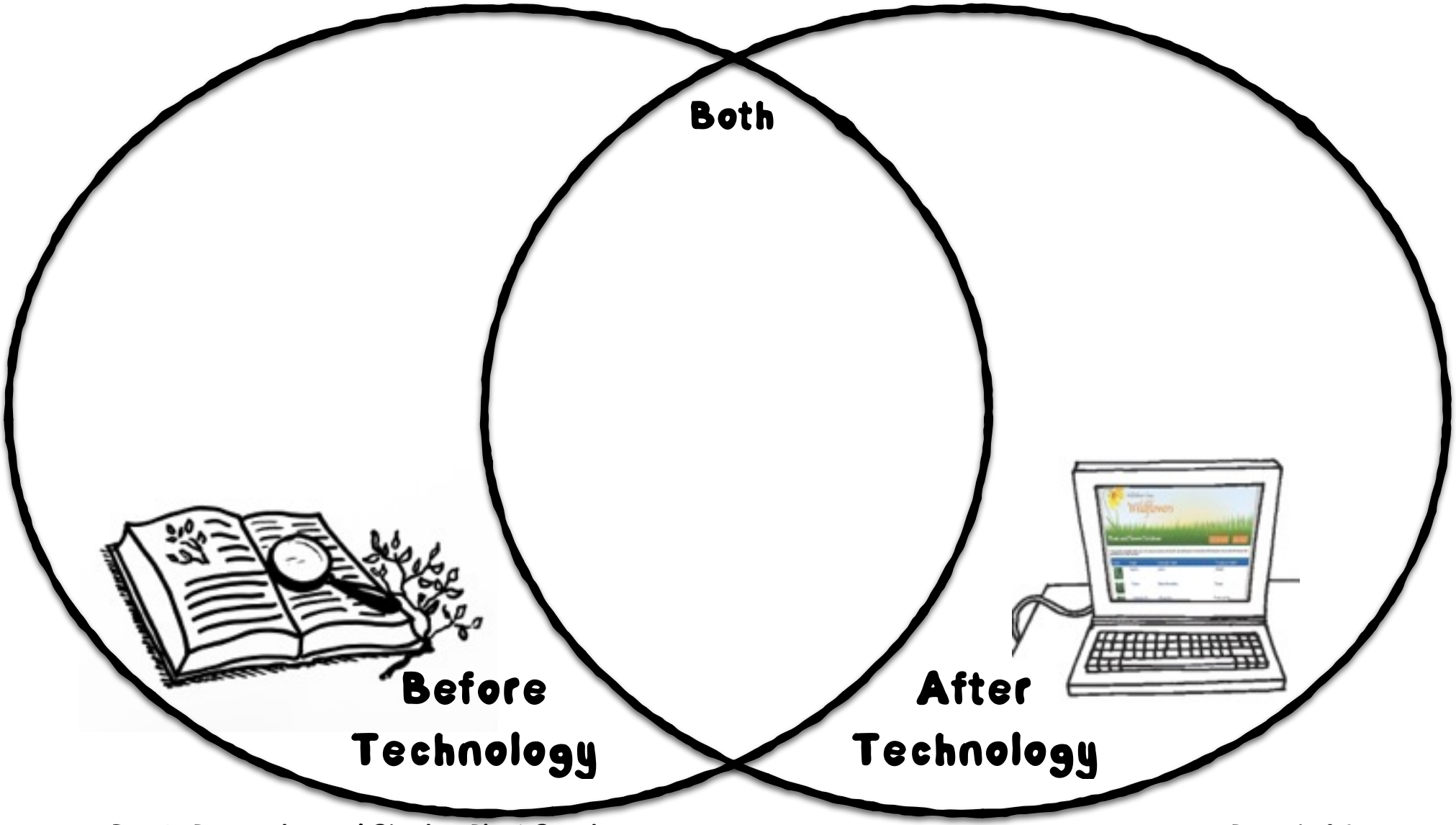
- **What would happen to the mixture if we added other materials?**

- **Will the mixture become something else?**

- **What could this mixture be used for and how will it help us preserve our specimens?**

Name _____ **Preserving and Sharing Plant Specimens**

Read this article on Ferdinand Lindheimer: http://www.statesman.com/news/lifestyles/home-garden/the-father-of-texas-botany-in-new-braunfels/nTps6/ to find out about how Lindheimer shared his findings on Texas wildflowers with the others. After reading complete the diagram to compare the way early botanists such as Lindheimer collected and shared information about plants to how we share using internet databases today.



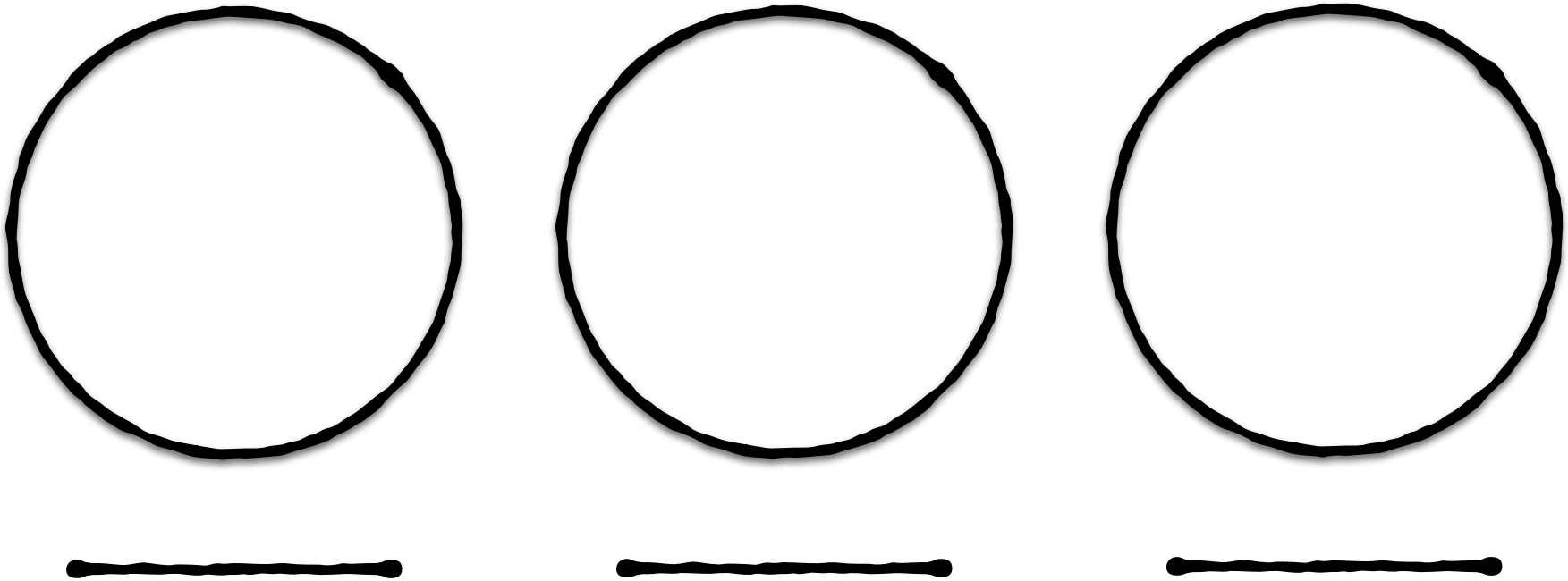
Observe the paper/ water mixture you created yesterday, and make some observations in your science journal.

* Did the paper dissolve, how do you know? Draw a picture of what you see.

* Is it still paper after being mixed with water overnight? Explain.

* How could we turn this back into paper? What will need to happen to the water? What will happen to the paper pulp? Explain.

* Observe different types of paper under the handheld microscope and observe what you see. Label each paper type:



How are these paper types alike?

_____

_____

_____

How are these paper types different?

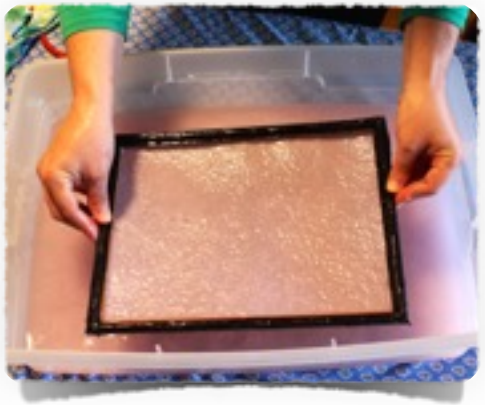
_____

_____

_____

Now make your own paper and share your plant specimen the old fashioned way, by mail! Follow these steps to create a beautiful piece of paper with local seeds and your plant specimen preserved within it, that would make Ferdinand Lindheimer proud. Before you begin go to http://www.wikihow.com/Make-Paper and view a quick tutorial of the papermaking process.

1. Gather your dried plant specimen, and some seeds. Choose any other add ins that you would like to include in your design (glitter, confetti, dried flowers, etc.).
2. At your table you should have a tub half full of water, wax paper, plenty of towels, cardboard, felt pieces, a sponge, a deckle, and a cup.
3. Your teacher has already created paper pulp for you. Add 6 cups of the the pulp created with your teacher to the water already in the tub. Label a piece of cardboard with your name and homeroom teacher.
4. Dip your screen into the pulp mixture. Move it from side to side to catch an even layer of pulp on the screen. If you aren't catching enough pulp on your screen, add 1 cup more pulp to the tub.
5. Rest your screen on the side of the tub and allow some of the water to drip out. Create a design on top with your seeds and flower and plant specimens, and then sprinkle on a little more pulp from your tub to seal everything in.



STEPS 4 & 5

6. Lift the frame and let water drain through. Rest it on the stack of towels at your table. Place waxed paper over the top and roll out as much water as you can.
7. When the dripping has stopped, lay the frame — pulp side down — onto a piece of felt.
8. Lift up the screen slowly. The paper should peel off onto the felt. If it sticks a little you can carefully get one corner going and peel it off the deckle. If it rips, just peel it off, put it back in the water and start again.

9. Let your paper dry on the cardboard provided for you.
10. Repeat steps 4 through 9 for each person at your table group. Once everyone at your table has made a sheet of paper, stack the cardboard pieces together, put a piece of cardboard on top of the stack and apply pressure to squeeze out any remaining water.
11. There you have it! Once your paper is dry, you can write a letter about your plant, mail your paper out to someone, and they can enjoy your beautiful creation! Don't forget to tell the recipient to plant it once they are finished with it!

Recycled paper examples:

Make Seeded Paper!

Gather these Supplies:

- Assortment of paper to recycle (see list at bottom of page)
- Native seeds and plant pieces
- Sponge
- Window Screening (mold)
- Wood Frame or old picture frame (deckle)
- Plastic Basin/Tub (Large enough to totally immerse frame)
- Blender or immersion blender (For making paper pulp)
- White Felt or Flannel Fabric
- Staple or tacking gun (For attaching screen on frame)
- Liquid starch (optional)

1. Rip the recycled materials into small bits (1 inch squares), and then soak in water overnight. Be careful about mixing different color construction papers, or a muddy looking paper will result. You may want to make different color soaking tubs for different colored paper. Pink paper is being made in this tutorial, so a small amount of pink tissue paper was added. For this tutorial about 10 sheets of paper were used (old bills printed on white paper.)

2. When ready to make the pulp, fill a blender half full with the paper/ water mixture (an immersion blender is used in this tutorial). Add enough warm water to fill the blender or container. Blend until the mixture looks smooth and no flecks of paper remain (about 30 seconds). It will look like oatmeal water. This much pulp should be plenty for 8 sheets of paper. If more sheets are desired, store the pulp in labeled buckets (label by color and paper type). For a classroom, a large amount of pulp can be made in advance. It is best to use the pulp the same day if possible to avoid mildew.

Different Paper to Try:

- Computer Paper
- Newspaper (will turn pulp gray)
- Magazines (looks artsy!)
- Paper Bags
- Office Paper
- Tissue Paper (produces a fine texture)
- Typing Paper
- Napkins
- Construction Paper
- Cardstock

Make Seeded Paper!

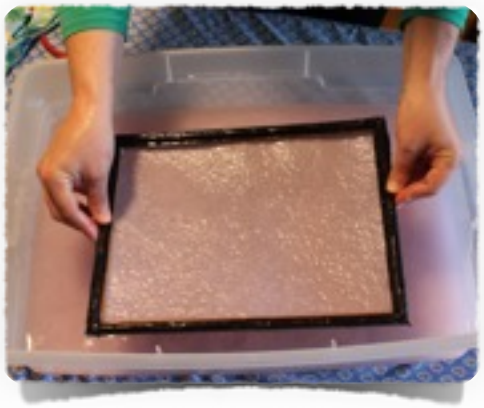
3. Next, make the mold by stretching plain

window screen up and over a wooden frame and stapling it. This will be the wrong side of the mold. You will catch the paper pulp on the other side of the frame.

4. Fill the paper-making basin about half way with water. Add 8 cups of pulp. (the more pulp you add the thicker the finished paper will be). Stir the mixture.

5. At this time 2 teaspoons of liquid starch can be added for sizing (This is optional, but helps to create a more durable piece of paper.)

6. Place the mold into the pulp with the non-stapled side at the top, and then level it out while it is submerged. Move it from



side-to-side until the pulp appears evenly distributed.

7. Slowly lift the mold out of the tub. Suspend the frame above the pulp until most of the water has drained. At this point create a design using flower petals, seeds and other natural materials, then pour a little more of the pulp over it using a spoon to seal in the design. If the paper is very thick, remove some pulp from the tub, stir and repeat steps 6 and 7. If it is too thin, add more pulp, stir the mixture again, and repeat steps 6 and 7. It is ok to add the petals and seeds straight to the pulp water if needed.

Make Seeded Paper!

8. When the mold stops dripping, lay some flannel or felt on top of the design to gently squeeze out the excess water. Then flip the mold over onto some towels. Using a sponge, press out as much water as possible. Wring the water from the sponge back into the tub and repeat.

9. At this point, hold the fabric square flat and slowly lift off the mold. With some practice, the wet sheet of paper should remain adhered to the flannel or felt. Don't worry if it tears, just put the pulp back in the bucket, stir, and try again.

10. Repeat the steps above, stacking the paper between towels to dry. Allow the paper to dry overnight. In a classroom, lay the paper on clean cardboard labeled with each child's name. Then stack the cardboard and let the paper dry outdoors.
11. Students can write letters on finished paper to share local seeds and flora with others. The paper is biodegradable and can be planted making it even more Earth friendly!
12. Don't throw away that left over pulp water! Strain it through some screen, dry it, and use it the next time you make paper!!

Try adding these items to create a masterpiece:

- seeds
- grasses
- glitter
- foil
- thread
- flower petals
- dried herbs
- lint (strengthens the paper)
- bark

Make Seeded Paper!

Recycled paper examples: