DISTRICT OF COLUMBIA
PUBLIC SCHOOLS

Grades 3-5 Science Recycle Right Competition Lesson Plan
A Secret Message for the President

Lesson Plan to be done in conjunction with Recycle Right Competition

Approximately 5 hours of instruction

Brief Lesson Description: In this lesson students will deepen their understanding of the paper recycling process by developing and implementing a paper recycling process of their own. Students will work together in groups to create "new" stationery to send a secret message to the President.

Embedded Accessibility Supports

Technology Integration Opportunities

Materials and Supplies

Durables

Item	Purpose	When used
Blender	To make Paper Pulp	Elaborate
Towels	To dry paper pulp	Elaborate
Parchment Paper	To prevent paper pulp from sticking	Elaborate
Rolling Pin/ Soda Cans	To flatten paper pulp	Elaborate
Lamp/Light Bulb	To heat invisible ink	Elaborate
Spoon	To mix invisible ink	Elaborate
Q-tip/Cotton Ball	To write with invisible ink	Elaborate

Consumable materials

Item	Purpose	When used
Water	To make invisible ink and paper pulp	Elaborate
Lemon Juice	To make invisible ink	Elaborate

Written by Lola Odukoya, TLI Lead Science Teacher at Drew Elementary School, through the DCPS Recycles! Curriculum Project in partnership between the D.C. Department of General Services and District of Columbia Public Schools, Office of Teaching and Learning

Classroom Supplies to Gather

Item	Purpose	When used
WHITE Paper scraps/ WHITE recycled paper (White works best for invisible ink)	To make paper pulp	Elaborate
Various supplies for students to perfect the paper making process (glue, etc)		Elaborate

Technology Resources to prepare

Resource and preparation required	Purpose	When use
http://www.pennilessparenting.com/2012/05/making-homemade-paper-from-trash-no.html	As a reference to create paper	Elaborate
http://www.sciencekids.co.nz/experiments/invisibleink.html	As a reference for invisible ink	Elaborate
https://www.youtube.com/watch?v=2c8YxMb0tlk	Paper Recycling Process	Engage, Explain

Standards		
Science and Engineering Practices: Planning and Carrying Out Investigations Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions. Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered. (3-5-ETS1-3) Constructing Explanations and Designing Solutions Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design problem. (3-5-ETS1-2)	**Disciplinary Core Ideas:** ETS1.B: Developing Possible Solutions Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions. (3-5-ETS1-2) At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs. (3-5-ETS1-2) Tests are often designed to identify failure points or difficulties, which suggest the elements of the design that need to be improved. (3-5-ETS1-3) ETS1.C: Optimizing the Design Solution Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints. (3-5-ETS1-3)	**Crosscutting Concepts:** Influence of Engineering, Technology, and Science on Society and the Natural World People's needs and wants change over time, as do their demands for new and improved technologies. (3- 5-ETS1-1) Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands. (3-5-ETS1-2)

Lesson Plan- 5E Model		
Engage (30 minutes) **Teacher will need:** Access to YouTube video, projector, chart paper or board to capture responses **Students will need:** Journal to respond to teacher questions		
Teacher	**Students**	**Notes**
Ask: How do we recycle paper? Write the steps. Go over and identify common trends among the steps that students have identified	Students brainstorm and write the steps.	
Say: We're going to watch a video to see what happens after we recycle paper. https://www.youtube.com/watch?v=2c8YxMb0tlk Set up video and allow students to watch	Students watch video	The video has many steps so it would be best to pause it along the way so that students can catch digest each part of the process.
After video, Ask: Share with your partner, one thing that you learned about the recycling process.	Allow students to share with each other and as a group. Walk around to identify any misinterpretations	
Ask: Why is it important that we sort out the paper correctly at school? Why do we need to RECYCLE RIGHT?	Have students write their responses	Give students the opportunity to explore what happens when the recycling bin is "contaminated". They should come to the conclusion that if something other than paper is introduced to the recycling bin then the entire bin is now trash. They might also suggest that the sorting process will become even harder at the facility. To close this activity out, you can mention that recycling from schools looks a tad different. We put the paper into the bins, the custodial staff places it into the dumpers, DGS picks it up and takes it to the recycling facility, and finally it is sold to the manufacturer and made into paper.

Explore (30 minutes): Students will analyze Recycle Right Data for one week and create a series of morning announcements using the information that they learned from the video. Morning announcements should be delivered by the students and focus on the reasons why sorting into the correct bins is so important. **Teacher will need**: Recycle Right data for at least one week, coordinate with administration to allow students to give morning announcements **Students will need**: Journals to write their morning announcements		
Teacher	Students	Notes
Say: We're going to look at our Recycle Right data to see if classrooms are using their bins correctly. Analyze data as a class to determine the following: 1. How many classrooms are utilizing the recycling bins correctly 2. How many classrooms are not utilizing the recycling bins correctly 3. What types of items (non-paper) are found in the recycling bins Come up with a goal to increase the percentage of classrooms utilizing the bins correctly	Students look at the data to come up with the answers	Percentages can be used
Say: One of the best ways to solve this problem would be to educate our peers. We are going to write morning announcements that include the data that we just found, facts from the paper recycling video that we watched and our goal for the challenge.	Students will write their announcements as a group.	Also write instructions on the board
Have student groups sign up for when they want to say their announcement in the morning and allow them to practice in front of the class.	Students should practice reading their announcements in front of the class and their peers should offer constructive feedback	If you are having trouble getting constructive feedback, try using sentence starters

Explain (45 minutes): **Teacher will need**: Projector to watch the video again **Students will need**: Paper to write stories of Preston the Postcard		
Teacher	**Students**	**Notes**
Show video again, but this time students will need to take notes on the major steps of the recycling process.	Students will take notes on the steps of the recycling process for paper. 1. Turn the paper into pulp 2. Clean the paper pulp 3. Get rid of the water in the pulp 4. Flatten the pulp using heated rollers 5. Paint the paper white 6. Let the paper dry 7. Iron the paper 8. Roll the big sheets of paper up 9. Test the quality of the paper 10. Cut the paper down to the needed size	Pause the video after each major step
Check student notes to make sure that they have correctly identified steps	Students turn their papers in to the teacher for quick grading/ or peer grading can occur	
Say: Preston is a post card. You are going to work with your group to write a story that explains how Preston started off as a sheet of paper but was recycled into a post card. You must include all of the steps of the recycling process from Preston's point of view.	Students write stories of Preston the postcard as a group	The group work element is important here. Students need to be able to work together here in order to be successful in the next section. If students are having trouble starting the story, give them an example using Preston's point of view. They can start with : Hi I'm Preston. I used to be a sheet of paper but now I am a Postcard….
Have student groups read each other's stories.	Groups trade stories.	
Set up for stories to be read to younger children in the building.		

Elaborate (Two 45 minute sessions): Students create a procedure for recycling paper within their classroom **Teacher will need:** Scenario, Reference sheets for creating paper and Invisible Ink for students (see technology materials) **Students will need:** Materials to recycle paper, Journal to write out steps, Invisible ink to write message, Lamp to test ink		
Teacher	**Students**	**Notes**
Give students the following: Scenario: The President of the United States is coming to your school! The Presidential team has been gathering information on your school for months now. They have interviewed the adults in the building and think they already know everything there is to know about (insert school name)! But they don't know the secrets that the students know. It is important that the President knows everything before he (or she depending on election results) arrives. Your team mission is to secretly send the President a message.	Students read the scenario in their groups to determine what their task is.	
Explain the task to students. Explain materials that are provided for them. Give them the following: Criteria: Your message must be written using the special "ink" provided by your teacher Your message must be untraceable! To achieve this it has to be on paper that you recycled to create.	Students work as a group to recycle old paper to make new paper. They use the lemon juice solution to write a message in invisible ink. They use the lamp to heat the paper to see the message.	Answer clarifying questions, **Make sure students know that they must write their procedure as they go.** This is the most important part. They will be excited about the scenario, feel free to keep the mystery going. **Do not give students a clue on how to begin. Let them struggle through the process. Have them brainstorm their procedure FIRST! Once they use materials do not replace them.**

Constraints: You may only use the following materials to create your new paper Sheets of old paper Glue Water Parchment Paper Towel Rolling Pin or Soda Can You only have 2 days to get your messages in the mail. You must work together as a group and keep your message a secret from others. Your message should be a secret about the school, the food, the playground, etc. Anything that you think the adults don't know. You must write out your procedure for making your paper.		
Test recycled paper to see which groups created papers that allowed the secret messages to be read. Allow groups to go back and refine their procedures. If there is time, let them re-do the process.	Test recycled paper to see which groups created papers that allowed the secret messages to be read. Students modify their procedures to get the best results.	

Evaluate (30 minutes): **Students will need:** Paper to write responses		
Teacher	**Students**	**Notes**
Write a paragraph to answer the following: 1. Did your procedure meet all of the criteria and constraints of the engineering challenge 2. Which groups had the best procedures? What did they do differently? 3. How could you improve your process	Write conclusions to the challenge.	