

Inquiry (5E) Lesson Plan

Teacher: Megan Gundler	Subject: Science	Grade: 2nd
Lesson Title: Why We Should Recycle		
State Standard(s): grouped by subject and must be observable and measurable <i>K-ESS3-3</i> Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the natural environment Obtaining, Evaluation, and Communicating Information <ul style="list-style-type: none">Communicate solutions with others in oral and or/written forms using models and/or drawings that provide detail about scientific ideas. (K-ESS3-3) Disciplinary Core Ideas: ESS3.C: Human Impacts on Earth Systems <ul style="list-style-type: none">Things that people do to live comfortably can affect the world around them. But they can make choices that reduce their impacts on the land, water, air and other living things. (K-ESS3-3) Crosscutting Concepts: Cause and Effect: <ul style="list-style-type: none">Cause and Effect: Events have causes that generate observable patterns. (K-ESS3-3) Common Core State Standards Connections: <ul style="list-style-type: none">Reading: R.K.1 With prompting and support, ask and answer questions about key details in a text. (K-ESS2-2)Writing: W.K.2 Use a combination of drawing, dictating, and writing to compose informative/explanatory texts in which they name what they are writing about and supply some information about the topic. (K-ESS2-2),(K-ESS3-3)Math: MP.4 Model with mathematics. (K-ESS3-1)		
Learning Objective(s): kid friendly "I can" statement <ul style="list-style-type: none">I can use a model to show the relationship between my trash and the environmentI know how to reduce the waste I makeI understand how the way we are living now will affect the futureI could pick out the details in Chris Van Allsburg's <u>Just A Dream</u>I can write about why it is important to recycleI can figure out how much trash our classroom uses and show you on graph paper how much space that trash would take up		
Academic Vocabulary: with definitions <ul style="list-style-type: none">Waste-is anything we throw away that we didn't usePollution- happens when a bad or contaminating (dirtying) material is introduced to a natural environment and causes changeLandfill- an area where human waste materials are buried and slowly decompose.Reduce- means to make something smaller. In terms of waste: it means to create a smaller amount of waste.Reuse- instead of throwing out an item one finds a new purpose for it or gives it to someone who can use them. It results in less trash and fewer items needing to be made.Recycle- to convert waste into a reusable material		
Materials/Technology: <ul style="list-style-type: none">Chris Van Allsburg's <u>Just a Dream</u>Trash bags (double bag)Classroom garbage from a regular routinePaper and writing materialsClass set of calculators		
Resources: cite lesson references <ul style="list-style-type: none">No lesson references to cite, just informative sites.Content from the National Institute of Environmental Health Sciences kids page.Fun Facts from Time Magazine's: http://www.timeforkids.com/news/earth-day/87036		
Safety Concerns: <ul style="list-style-type: none">Student's use gloves when handling trash, or wash their hands directly afterward		
What's the BIG IDEA? How can people reduce the way they harm the environment?		

Engage

Description: Introductory lessons should stimulate curiosity and activate prior student knowledge. The activity should be a problem or an event that raises questions and motivates students to discover more about the concept.

Link to cognition: Students bring knowledge about how the world works but it is sometimes based on limited experiences and sometimes on misconceptions.

What teacher does:

- Create interest
- Generate curiosity
- Raise questions
- Elicit responses that uncover what students know or think about the concept/subject

Purpose:

- To activate prior knowledge
- To capture students' interest
- To pose questions based on the objectives that the students will try and answer during the explore phase.

Activities: to accomplish the purpose above (reading, demonstration, video, crazy statistics, interesting pictures)

- Whole-Class activity
- Read Chris Van Allsburg's Just a Dream
- Using the students' prior knowledge:
 - Discuss what is happening on each page (the big pictures don't have words, so it would be fun for the children to work through all their own observations and inferences, before the description is read.)
 - Discuss why it is happening or why it is a concern.
- This lengthy discussion should overlap with the Reading Standard: **R.K.1 With prompting and support, ask and answer questions about key details in a text.**

Guiding Questions:

- Is this book fiction or nonfiction? How do you know?
- What do you think Walter will see in the future? (make sure each picture is explained that this is a fictional future)
- *Garbage Dump [This image is great for the explore activity]
 - Is this what you thought Walter would see in the future?
 - How much trash do you think that is? How long did it take to build up?
- *Forest
 - What do you notice in this picture?
 - What do you think the men will do with the saw?
 - What do you think they might use the tree for?
- *Smoke Stacks
 - What is happening in this picture?
 - Does it look safe or good for the environment or for Walter?
 - Could it be prevented?
- Hotel Everest: All the other pictures seemed not so nice. Why do you think the author drew a picture of a hotel on top of Mount Everest?
- Ship: What can we notice about this picture? (this page is more dependent on the description)
- Freeway: Wow! Have you ever seen something similar to this? How do you think we could reduce traffic on the roads?
- *Grand Canyon
 - This picture is supposed to be of the Grand Canyon. Can you see it?
 - Why do you think it is so hard to see?
- Ducks (discuss based on class interest/level)
- *After the dream
 - Why do you think Walter decided to get a tree for his birthday?
 - Do you think this other future is possible too if everyone makes better decisions like Walter?
- Even though this book is fiction can it still teach us something? How?

*This page is very closely related to the upcoming activity

Assessment: teacher observation, small group discussion, class discussion, drawing/chart/table/diagram, notebook/journal, lab write-up, oral presentation, poster, quiz/test

- These images present a deep classroom discussion. This will reveal student's prior knowledge about pollution and recycling, as well as how humans effect the environment around them

- Make a classroom chart about what *might* happen in the future. The class would fill out why this pollution happens after they have learned more.
- This also gauges student interest in certain topics. Does the class want to talk about air pollution or trash build up or disturbed migration patterns?

Explore

Description: Students need the opportunity to actively explore the concept in a hands-on activity. This establishes a commonly shared classroom experience and allows students to share ideas about the concept.

Link to cognition: Experiences occur before the explanations! Students are actively exploring with little explanation from the teachers. Students acquire a common set of concrete experiences allowing them to help each other understand the concept through social interaction.

What teacher does:

- Encourage students to work together without direct instruction
- Observe and listen to students as they interact
- Ask probing questions to redirect students' investigations when necessary
- Provide time for students to puzzle through problems
- Act as a consultant for students

Purpose:

- to decipher what hands-on/minds-on activities the students will be doing
- to decide how students will use the materials for discovery
- to ask the “big idea” conceptual questions to encourage and/or focus students’ exploration
- to gauge responses to questions asked about the exploration

Activities: to accomplish the purpose above (build models, collect data, make and test predictions)

- Individual students make predictions on how much trash their class will use. Predictions are shared.
- The whole class collects all the trash they used for the day (including lunch trash, and bathroom paper-towels) in big trash bags provided by the teacher. [throw away everything, no recycling at all]
 - At the end of the day, the number of bags are counted, they are weighed to get total weight, and they are measured (how much floor space one bag takes up-students are learning about area, not volume)
- Students individually predict how much trash the class accumulates in one school year. (ie. *Enough to fill this room! Or 1 million pounds!*). Predictions are written in science notebook.
- The next day, students solve to figure out how much trash they make. (as a class, by partners, or independently depending on where the students are in their math practice)
 - Add up the number of trash bags for a week of trash; then add up the amount of weeks in a quarter of school, then add up the quarters of the school year. Calculators can be used due to the size of the numbers, the focus is setting up the problem and understanding what the numbers represent: the amount of trash the class uses in a year.
 - Do the same thing with weight. Compare the weight to heavy objects.
 - Chart out how much area one would need to fit the trash, if each square on a sheet of graph paper represented a trash bag. Find out what that would be in feet or yards (for example each square could be 2ft X 2ft which would be about 1 full trash bag) Where could someone fit all that trash?
 - How does this compare to the student predictions?
 - These comparisons of weight and number as well as their representations fulfill the math standard: **Math: MP.4 Model with mathematics. (K-ESS3-1)**
- Students discuss as a class why we have this much waste
- Students brainstorm how they can reduce this large amount of waste.
- The next day, the class collects a day’s worth of trash this time with a recycling bin.
 - The bin has “rules” of what can be recycled. Students follow these rules which state that (paper, cardboard, glass, aluminum and certain plastics (specific picture) can be recycled). (Follow local recycling program guidelines.)
 - This way students see what can be recycled before it is necessarily explained to them
 - Then the number of trash bags are weighed and measured
 - The recycling material is weighed/measured
- Students modify their predictions of school year trash based on the difference.
- Students complete similar math as above (as a class, in partners or individually) to figure out how much space this reduced trash will take up. It should be the same process, but with different numbers
- Students now have two sets of data. One without recycling and one with.

Guiding Questions:

- Why do we have this trash, where did it come from?
- Where do you think all this trash goes?
- What are some ways we could throw away fewer things?
- What are some ways we could reuse some of this trash ourselves? How can our community or city reuse some of this trash?
- When we introduced the recycling bin to the class, how did it change the amount of stuff we threw away?
- Could you have avoided throwing some of these items away?
- What are some other ways we can reduce the amount of stuff we threw away?

Assessment: teacher observation, small group discussion, class discussion, drawing/chart/table/diagram, notebook/journal, lab write-up, oral presentation, poster, quiz/test

- Students discuss with their table their answers to these questions
- Notes can be jotted down in each science notebook for a record.

Explain

Description: Teachers use questioning strategies to lead students' discussion of information discovered during the Explore stage (may or may not be a hands-on activity). Teachers introduce new scientific terms (vocabulary) and explanations at appropriate times during the discussion.

Link to cognition: When students engage in meaningful discussions with other students and the teacher, they can pool their explanations based on observations, construct new understandings, and have a clear focus for additional learning.

What teacher does:

- Encourage students to explain concepts and definitions in their own words
- Ask for justification (evidence) and clarification from students
- Formally provide definitions, explanations, and new labels
- Use students' previous experiences as the basis for explaining concepts

Purpose:

- To allow students to share what they have discovered
- to create questions or techniques that will help students connect their discovery to the concept
- to ask higher order level questions to solicit student explanations and help them to justify their explanations
- to gauge responses to questions asked about the explanation

Activities: to accomplish the purpose above (class discussion, taking minimal notes, creating diagrams).

Results are shared:

- First everyone shares their results from the first two experiments/class demonstrations
 - Student groups present on how they were able to find out how much trash they used
 - Student groups show what they compared this large amount of trash to, so that they could put it into perspective.
 - All of these "presentations" are hung in the class so that everyone can see the many ways the problem was solved. And represented.
- Then everyone shares their results for how much trash is accumulated throughout the year *if* the class recycles
 - These conclusions are both represented spatially (on graph paper as surface area) and through comparisons to other items that weigh a lot or take up a lot of space.
 - *When we did not recycle we had enough trash to fill up 3 football fields, when we recycled our classroom trash would fill up just 1.5 football fields.*
 - *We went from having 18 elephants worth of trash, to just 10 elephants.*
- Now it is clearer that the amount of trash the class accumulated can be decreased and how it was decreased.

The teacher uses a question answer approach to explain what the above experiment *means*.

Guiding Questions:

- Students discuss the reason for much of their trash:
 - Packaging on lunch items
 - Disposable bags
 - Papers for class
 - Disposable napkins, spoons, forks, straws.
 - Unused paper
- Why is it important that we reduce the amount of trash we collect? *Define reduce*
- How did we reduce the amount of trash we collected? *Recycling (definition time!)*
- Where does this trash end up when it is thrown away? *Landfills (definition time!)*
- Humans use a lot of stuff; what other stuff do we use up?

- Electricity, water, gas, paper, food.
- How does this affect the world around us?

This last question is rather tricky, it leads the discussion into the Elaborate section

Assessment: teacher observation, small group discussion, class discussion, drawing/chart/table/diagram, notebook/journal, lab write-up, oral presentation, poster, quiz/test

- Student oral presentations. (These are not formal presentations. Each group of students shares with the class their work, and how they compared the numbers they got to something more tangible.)

Elaborate

Description: Students are encouraged to apply, extend, and enhance the new concept and related terms during interaction with the teacher and other students (in science, a hands-on activity).

Link to cognition: Providing additional active learning opportunities for students to incorporate into their mental construct of the concept allows them to confirm and expand their understanding.

What teacher does:

- Expect students to use formal labels, definitions and explanations provided previously
- Encourage students to apply or extend concepts and skills in new situations
- Remind students of alternate explanations
- Refer students to existing data and evidence and ask "What do you already know?" "Why do you think.....?"

Purpose:

- to achieve a deeper understanding of the concept
- to apply the new knowledge to a different situation
- to apply the new knowledge in their daily lives
- to identify and correct any remaining misconceptions
- to gauge responses to questions asked about the elaboration

Activities: to accomplish the purpose above (build models, collect data, make and test predictions-could be on a smaller scale, or even using technology)

In the Elaborate section the teacher explains and helps the students understand the bigger picture which is the world around us and how humans interact with it in a way of harm and pollution.

Instead of using a video, the teacher can accomplish the same thing with high levels of student question and answering by putting together a power point that contains photographs of what the teacher is talking about when it comes to pollution. Many videos have this format, but here the teacher can narrate and ask questions.

- Need to explain that many of the daily activities humans have in this country can negatively impact the environment.
 - Electrical Usage > Energy Consumption > Burning of Coal > Air pollution
 - Definition of pollution
 - Natural pollutants can be dealt with through natural processes, the earth has a hard time undoing human pollution
 - Throwing things out > more items in the landfill > water and land pollution when things not disposed of correctly
 - Definition of Waste
 - Explain how long some things take to decompose
 - Soil Contamination
 - Water Contamination
 - "Fun" Facts about garbage usage.
- That this effects both how humans live and how animals live.
 - Health
 - Ecosystems for animals disrupted
- How we reduce these negative effects:
 - New energy sources: wind, solar, hydro, and natural gas as opposed to coal.
 - Making sure we throw away things correctly. No littering!
 - Reduce, Reuse and Recycle our trash.
 - Definitions for each are given
 - "Fun" facts about recycling.
- Several of these concepts can be understood in relation to Chris Van Allsburg's illustrations.

This entire presentation helps the class understand this standard: **Disciplinary Core Ideas: ESS3.C: Human Impacts on Earth Systems: Things that people do to live comfortably can affect the world around them. But they can make choices that reduce their impacts on the land, water, air and other living things. (K-ESS3-3)**

Guiding Questions:

- Why might our lifestyle now lead to the pictures our author drew? (this is where we would add to the chart made in Engage)
- Can we avoid these situations?

Assessment: teacher observation, small group discussion, class discussion, drawing/chart/table/diagram, notebook/journal, lab write-up, oral presentation, poster, quiz/test

- Class makes a Cause and Effect chart demonstrating some of the above ideas.
This completes the standard: *Crosscutting Concepts: Cause and Effect: Cause and Effect: Events have causes that generate observable patterns. (K-ESS3-3)*
- Students write up some ideas they have for things they can do at home to reduce the harm humans cause to the environment in a blank spot on the classroom's newsletter.

Evaluate

Description: Students demonstrate their understanding of the concept.

Link to cognition: In student-centered instruction, it is important for students to be aware of their own progress as an outcome of instruction. Students construct knowledge over time and may need additional experiences to refine their understanding of the concept.

What teacher does:

- Observe students as they apply new concepts and skills
- Assess students' knowledge and/or skills
- Allow students to assess their own learning and group process skills
- Ask open-ended questions, such as "Why do you think...?" "What evidence do you have?" "What do you know about x?" "How would you explain x?"
- Assure assessment correlates to the learning objectives

Purpose:

- to allow students to demonstrate that they have achieved the lesson objective
- to allow students to summarize the big idea.

Assessment: teacher observation, small group discussion, class discussion, drawing/chart/table/diagram, notebook/journal, lab write-up, oral presentation, poster, quiz/test

- Students write a brief "report" explaining these topics:
 - Why is it important to recycle? How does it help the environment? (*cause and effect standard, core standard*)
 - Use numerical values to help represent by how much recycling reduces the amount of trash thrown out in an average classroom? (This would be the same data from Experiment)
 - Tips for recycling
 - What else could the classroom do to reduce the harm they cause to the environment?
 - Examples: *run the air conditioner less, turn off lights, reuse items, less paper usage.*

Standards this activity uses: *Obtaining, Evaluation, and Communicating Information: Communicate solutions with others in oral and or/written forms using models and/or drawings that provide detail about scientific ideas. (K-ESS3-3)* ,*Writing: W.K.2 Use a combination of drawing, dictating, and writing to compose informative/explanatory texts in which they name what they are writing about and supply some information about the topic. (K-ESS2-2),(K-ESS3-3)*