Methods of STEM Education

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5E Integrated STEM Lesson Plan Final

Topic:

The way humans use and dispose of materials impacts the natural environment

Title:

Garbage and biodegradable material

Grade level:

Second grade

Standards:

NGSS	Science and Engineering Practices • Asking Questions and Defining Problems: Asking questions and defining problems in K–2 builds on prior experiences and progresses to simple descriptive questions. • Engaging in Argument from Evidence: Engaging in argument from evidence in K–2 builds on prior experiences and progresses to comparing ideas and representations about the natural and designed world(s). • Construct an argument with evidence to support a claim • Developing and Using Models: Modeling in K–2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, storyboard) that represent concrete events or design solutions. • Obtaining, Evaluating, and Communicating Information: Obtaining, evaluating, and communicating information in K–2 builds on prior experiences and uses observations and texts to communicate new information. 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. • ETS1.B: Developing Possible Solutions: Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people. Crosscutting Concepts • Cause and Effect: Events have causes that generate

	observable patterns.
Common Core Standards	Language Art • W.2.1 Write opinion pieces in which they introduce the topic or book they are writing about, state an opinion, supply reasons that support the opinion, use linking words (e.g., because, and, also) to connect opinion and reasons, and provide a concluding statement or section. • W.2.8 Recall information from experiences or gather information from provided sources to answer a question. Math • Visual displays of data can be constructed in a variety of formats to solve problems. • Recognize area as an attribute of plane figures and understand concepts of area measurement.

Set up: place and time

The activity will take place in my classroom, and it will take five block periods (each one hour) and students will keep track of their observing in compost experiment for one month.

Background:

Our planet continues to grow in population and waste products. The way humans use and dispose of materials impacts the natural environment. To deal with this problem, recycling is important and its goal is to separate waste products into two major categories, Biodegradable and Non-biodegradable. Biodegradable materials are composed of waste from living organisms and the actual plant, animal or other organism when its life ends. Examples of Biodegradable materials, often referred to as “bio-waste”, include human and animal waste, plant products, wood, paper, food waste, leaves, grass clippings and remains from the death of living creatures. Materials having properties that do not breakdown or decay are called Non-biodegradable. Examples include glass, metals, plastics, electronic devices and medical waste.

Justification:

I choose this lesson because it gives students an opportunity to apply their scientific skills in a real world scenario. As human, we have responsibility to protect the earth. By learning how we use and dispose of materials makes impact on the environment, students could be encouraged in active participation in solutions.

This lesson could be used to create interdisciplinary unit. In social study strand, it could teach students the skills of formulating and asking questions, as well as using and analyzing evidence from a variety of historical, geographical and societal sources. Besides, this lesson not only integrates math concepts, such as addition and area, but also incorporates geography knowledge, such as the position of the Great Pacific Garbage Patch and France. In Visual Art, students are encouraged to take action to reuse and reuse garbage by using recycling to create art project and represent their thought.

Objectives:

- Students understand the concept of biodegradable material and how different methods of waste disposal impact natural environment
- Students learn to construct explanations and designing solution
- Students could take action based on their understanding of garbage problem and sense of responsibility

Materials:

- Projector
- Recording worksheet
- Masking tape
- Pair of gloves
- Large bowl
- Organic compostable items
- - Leaves, grass clippings, vegetable scraps, fruit scraps, coffee grinds, etc.
- 1/4 cup soil or dirt
- 1-2 teaspoons of water
- Piece of plastic wrap
- Rubber band

- Large plastic spoon

Lesson Procedure

Engage

The purpose for the ENGAGE stage is to pique student interest and get them personally involved in the lesson, while pre-assessing prior understanding.

- Thinking routine-See-Think-Wonder: in provocation, students observe photos of the Great Pacific Garbage Patch and go through a thinking routine--- See, Think, Wonder to formulate their questions about this unit. They will describe what they see on the photos, explain how they think and ask questions about those photos.
- Assess students' prior knowledge: By listening to students' record, I could get to know their prior knowledge and interests. It's interesting to see how their thinking evolves over course of unit.

Explore

The purpose for the EXPLORE stage is to get students involved in the topic; providing them with a chance to build their own understanding.

From the previous activity, students have a good start. To follow up questions from students, there are two activities for students to explore:

A. Watch Video: The Great Pacific Garbage Patch
   a. I will introduce two films related to The Great pacific Garbage Patch that allows them to explore the garbage problem and see their own responsibility to change their life habit--using too much plastic product without thinking and understanding about them.
      i. The Great Pacific Garbage Patch https://www.youtube.com/watch?v=_IfHrwdM4p4
      ii. Midway https://www.youtube.com/watch?v=J7f4F73bjvw&t=19s

B. Biodegradable and Non-biodegradable materials
   a. To deal with the garbage problem, it is important to learn about how to separate waste products into two major categories, Biodegradable and Non-biodegradable.
   b. Therefore, students investigate what kind of material is biodegradable material. First, I will put them three or four in a group and provide them various materials. By touching and exploring those materials, student have chance to build their own understanding.

Explain

The purpose for the EXPLAIN stage is to provide students with an opportunity to communicate what they have learned so far and figure out what it means.

- Group discussion: After exploring materials, I will invite each group to divide those materials into two groups: Biodegradable and

Non-Biodegradable. Students will work with a group to develop their explanation model of biodegradable materials and decomposing. By discussing with a group, they have chance to develop their explanation, argue to each other based on their reasoning and come up with a group statement by negotiating with each other.

- Document thoughts by writing and ipad recording: By discussing and debating to each other, they will come up with group consensus and recorded their explanation of what biodegradable material is on a paper to display in the classroom. It is a way not only to assess their knowledge, but also to help them build up a model to make adjustment later so that students could see how their thinking change. Once they are done with the chart, they could also record their thoughts by using ipad and seesaw app.

Elaborate / Extend

The purpose for the EXTEND stage is to allow students to use their new knowledge and continue to explore its implications.

In this period, students will do three activities:

A. Decomposing experiment: Students will do an experiment in the classroom and learn about what decomposition is. First, they will collect various type of trash and investigate the decomposition process to see which materials could be decomposed. There are five materials using for this experiment-- metal, wood, paper, fabric and plastic. After finished collected organic items, place them in a large glass cup, add 1/4 cup of dirt and 1-2 teaspoons of water, and mix. Next, Secure it around the rim of the cup with the rubber band. Make sure the plastic wrap is nice and tight on the cup and the rubber band is secure. Last, students keep track of the temperature of each container as evidence for several weeks.

B. Data integration:

   a. What If Waste Keeps on Piling: In addition to provide them authentic experience, there is a non-fiction Chinese book “What If Waste Keeps on Piling” that I will read-aloud to the class. It shows real information in terms of the decomposition process. For example, it takes 5000 years to decompose glass product and 1000 years to decompose metal product. This information will allow students to reflect their use and waste and come up with solution later.

   b. The exponential increase of The Great Pacific Garbage Patch

      i. As they learn about waste disposal, it would be great to engage contexts data in this unit by providing them real data of plastic production and the size of The Great Pacific Garbage Patch. I will

introduce students a website, "THE EXPONENTIAL INCREASE OF THE GREAT PACIFIC GARBAGE PATCH," that documented data entry on plastics, with a particular focus on its pollution of the environment and release the results of our study on the infamous Great Pacific Garbage Patch or GPGP.

ii. This website shows the fact that around 80 million kg of floating plastic debris of various size and shape, principally made of Polyethylene and Polypropylene, accumulated in an area 3 times the size of continental France. In order to allow them understand the concept of “area”, I will draw a model on the white board and it will help students to understood how big the Great Pacific Garbage Patch is. By learning about the data to show the growth of The Great Pacific Garbage Patch, students will have chance to see the cause-and-effect between plastic producing and ocean pollution.

Evaluate

The purpose for the EVALUATION stage is for both students and teachers to determine how much learning and understanding has taken place.

- Formative assessment: After students get to know the experiment result, explore their ideas and be confronted with new scientific information that challenges their initial ideas, they will have chance to revise their original answers based on what they know. I will provide students a sticker note and have them share their new thinking in their small groups and complete a new sticky note that is placed over their fir note to show the change of their thinking.
- Action taking: In addition, they are encouraged to come up with action to solve garbage problem and make our natural environment better. After learning about the concept of reusing materials, such as plastic containers, wood sticks and papers, they probably will engage in a project that create artwork with recycling materials. They might also want to build a plastic museum in our school to remind people that we could reduce and plastic products, as well as creating art project by using plastic garbage, as well as propose a field trip to go to a beach to pick up trash and protect the ocean. From their reflection and feedback, students will be assess their understanding of how human dispose make impact on natural environment, and they could take actions and come up with ways to reuse & reduce resource in their daily life.

Lesson material 1: Images of The Great Pacific Garbage Patch

Lesson material 2:

Thinking Routine: See-Think-Wonder

Name:_____ Date:_____

Looking at images of The Great Pacific Garbage Patch:

- What do you see?
- What do you think is going on?
- What does it make you wonder?

Draw a picture to represent your thought and write few sentences about your thought.

See	Think	Wonder

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Lesson material 3: Objects in our daily life











POCARI
SWEAT

Lesson material 4:

Is it biodegradable material?

Date:

Group member: _____

_____

_____

_____

Please explore each object on the picture. Discuss with your group if they are biodegradable material and give a reason. Try to debate what you believe and give a reason. After each group member agree with each other, cut and paste each item on the following chart.

Biodegradable	Non-biodegradable

References

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