**Lesson 1: Project Introduction**

**Problem Statement:**

Dear Diary,

Mom and Dad said that we have to move to the country because we want more space and they want to be someplace quiet. I don’t know where we are planning to move but I know I’m sad that I’m leaving my friends. Mom says I can still chat with them online, and my computer and XBOX will be powered by poop! LOL!!

I’m really wondering how I can power my XBOX with poop. Do I just plug it into a pile of poop? I think living on a farm I’ll have a lot of chores. I wonder what I’ll have to do.

My parents said there will be lots of ways for us to get power for our house. We can use solar panels, wind turbines (whatever those are!) and even something called a “digester” that can break down poop (and some other materials) and use it for power. Wow! We can even use falling water to make power. Mom and Dad says we will be able to get all the power we need without even needing to get electricity from the city. They even said living like this will be better for the environment and we’ll be polluting less. How in the world will we be able to do this?

I’m really excited to learn about how sun, wind, and poop can make power. I also can’t wait to have so many animals! Plus, my parents said I get to actually help design the self-sustaining farm! I guess I’ll give it a try.

**Learning objectives:** Students will understand the differences between sustainable living and traditional living.

**Lesson standards (NGSS, CCSS, CTE):**

**NGSS**

* 4-ESS3-1 - Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.
* 3-5-ETS1-1 Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
* K-2- ETS1-1 Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

**CCSS**

* CCSS.ELA-LITERACY.SL.4.1.A Come to discussions prepared, having read or studied required material; explicitly draw on that preparation and other information known about the topic to explore ideas under discussion.
* CCSS.ELA-LITERACY.SL.4.1.B Follow agreed-upon rules for discussions and carry out assigned roles.
* CCSS.ELA-LITERACY.SL.4.1.C Pose and respond to specific questions to clarify or follow up on information, and make comments that contribute to the discussion and link to the remarks of others.
* CCSS.ELA-LITERACY.SL.4.1.D Review the key ideas expressed and explain their own ideas and understanding in light of the discussion.
* CCSS.ELA-LITERACY.W.4.8 Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources.

**Soft skills:** Communication, collaboration, creativity, and innovation

**Locally and/or personally relevant for students:**

* Personally Relevant: materials used to build a home, knowledge of the standard Western lifestyle
* Locally Relevant: begin to think about different sources of energy; where their own energy may come from; generating interest and knowledge for future job opportunities

**Connections to career and educational pathways:**

* Students are engaging in the engineering and design processes by developing solutions to a problem and testing the theory to refine their designs.
* Students will gain an interest in STEM fields by designing sustainable homes and learning about the benefits of renewable energy versus the way we use energy in our traditional homes.

**Materials:**

* Teacher copy of Sustainable Home: Earthship graphic organizer (attached) and way to project (option to turn this into large chart and use chart markers)
* Student copies of Sustainable Home: Earthship graphic organizer
* Pencils
* Paper for each group to create one Consensus List
* Team Folder for each group to keep materials for duration of unit
* Paper for each student to draw a rough draft of their own design for a sustainable home
* Projector (or other way) for students to see Problem Statement
* Way to show YouTube video to students

**Lesson preparation:**

**Time required:** 45 minutes

**Grouping of students for instruction:**

Group students heterogeneously--consider participation and language needs.

Ideally for this lesson, grouped students are sitting at a table together and are able to Turn and Talk or participate in a group discussion easily.

**What is the instruction? Consider the PBL Procedure that is being addressed here:**

|  |  |
| --- | --- |
| **Teacher** | **Student** |
| 1. Introduce Problem Statement:  In a whole group discussion, introduce Problem Statement and ask, “What do we need to know or what questions do we have about what it takes to live sustainably?” | 1. Students will brainstorm what they already know so far (background knowledge) and what they need to know about this problem moving forward. Share out to class. |
| 2. Introduce and give directions for Earthships: Sustainable Homes video to students:  “To help us understand sustainable living--or what some people call ‘living off-grid,’ we’re going to watch a video about a sustainable home. While watching the video, we’ll Stop and Jot on this graphic organizer (show graphic organizer) and take notes. Look for materials they used to build the home and listen for things they are able to provide for themselves on their own.”  Start video  <https://www.youtube.com/watch?v=ZXRqsCP7H20>  PAUSE video at 3:05  “Turn and Talk with a partner: What materials did they use to build the home? Add those to your graphic organizer.”  Play rest of video  “Turn and Talk with a partner: What things are they able to provide on their own? Add those to your graphic organizer.” | 2. Listening to directions for Earthships: Sustainable Homes video  Watching and listening to video  Partners Turn and Talk and take notes in graphic organizer  Partners Turn and Talk and take notes in graphic organizer |
| 3. Venn Diagram:  Lead a whole-class discussion about the video and chart answers on the graphic organizer where students can see it or on a large chart version:  Ask, “What are the differences between how we live and the lifestyle you saw in the video?” (chart students’ responses)  Then, “What are the similarities?” (chart students’ responses) | 3. Whole-class discussion: sharing out the similarities and differences between sustainable homes and traditional homes and copying down class notes on their own venn diagram. |
| 4. Define and present concept of “sustainable”:  Ask, “After watching the video, what do you think the word ‘sustainable’ means? Turn and Talk with a partner.”  Have students share out in whole-class discussion. Make sure definition includes: living in a way so that we don’t run out of natural resources.  Write this definition in teacher copy of graphic organizer. | 4. Partner Turn and Talk about what they think the word “sustainable” means  Sharing out in whole-class discussion  Copying definition on graphic organizer |
| 5. Create list of things to include in your sustainable home:  Bring students back to the Problem Statement: “You are going to get to design your own sustainable home! So, what do you want to include in your sustainable home? Right now you can create your own personal list of what you would want in your sustainable home on the back of this graphic organizer. Then, with your group, you’ll make a consensus list to use for your group’s design of a sustainable home.” | 5. Listing desired things for their own home |
| 6. Consensus List:  Tell students, “Now, come together as a group and create a consensus list--what do you all agree you’ll need in your group’s design of a sustainable home?”  (At end of this lesson, have students put this list in Team Folder; they will revisit it in Lesson 2.) | 6. Cooperatively creating a list of what they agree they will want in their design of a sustainable home |
| 7. Design Time:  Tell students, “Now that you’ve had some time to think about what you want in your sustainable home, you get to take some time to think about your design! Take time right now to draw out your own ideas and design of your sustainable home!” | 7. Drawing out design of their own ideas for a sustainable home |
| 8. Gallery Walk/Share Out:  To close out: “Let’s take a few minutes to look at and appreciate each other’s designs and ideas.”  (Gallery Walk: Students display work on desk or on walls and walk around viewing others’ work.) | 8. Either sharing out whole class or walking around classroom in a Gallery Walk. |

**Accommodations:**

Heterogeneous groups and partnerships

Graphic Organizer

**Extensions:** Have students answer: At home, what household objects require energy?

**Assessment:**

Formative Assessment: Observation of student conversations and notes on graphic organizer

**References/Resources:**

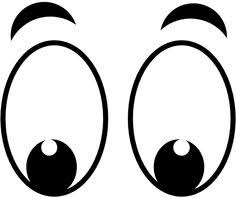
YouTube Video Resource: ORN#13 Earthships: Sustainable Homes, <https://www.youtube.com/watch?v=ZXRqsCP7H20>

Instructional Plan Created by Kristyn Reid, Teri deCocq, Amie Jette, Maria-Elena Velasquez, Catie McCready, Samuel Foley, Samayyah Williams

Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

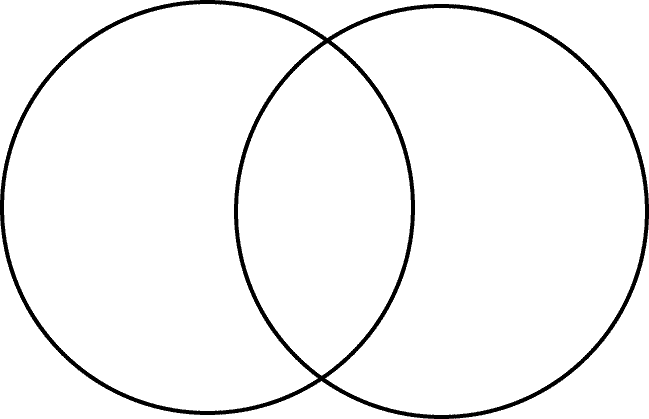
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**Sustainable Homes: Earthship Graphic Organizer**



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| Look for the materials used to build the sustainable home: | Listen for things they provide on their own: |

Sustainable homes Traditional homes



What does the word “Sustainable” mean?