Alyssa Stewart
Engineering Design Lesson Plan
Summer 2022

Grade Level: 8
Topic: Engineering and ELA
Objective: As a result of activities, all students should be able to:
Develop understandings about scientific inquiry

Cite textual evidence to support claims and analysis.

Standards:

MS-ETS1-2 Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

R.8.1 Cite the textual evidence that most strongly supports an analysis of what the text says explicitly as well as inferences drawn from the text.

Content/Procedures

Build Materials (For each team)
Foam board or thick corrugated cardboard
Rulers
Pipe cleaners or easily bendable wire
Pencils
Glue
A variety of small objects with relatively simple shapes for students to choose from:
Balls Vases Bowls Bottles Cups

For Teachers:
1. Review the Engineering Design Process, Design Challenge, Criteria, Constraints and Materials. Provide students reading material about 3-D printing as well as the PBD video about 3-D printing.
2. Explain that students will be creating a three-dimensional model of one of the objects you've made available. Discuss how 3D printers build objects using layers, which is why it is sometimes referred to as "additive manufacturing."
4. Instruct students to start brainstorming and sketching their designs.
4. Provide materials for students.
5. Provide reflection time and questions for each group.

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Directions for students:

You are part of a team of engineers working together to create a “3D-printed” model of an object using everyday materials. 3D printing software maps the shape of an object, then “slices” it into layers. 3D printers then print objects by adding layer upon layer of material together to create the object. This process is called “additive manufacturing.” The thickness of your layers will be the same as the thickness of your building material (foam board or cardboard).

In order to measure your layers, you will wrap pipe cleaners around your object at each layer/height marker (if your foamboard is ¼” thick, you will measure your object with a pipe cleaner at ¼” high, ½” high, ¾” high, and so on). The pipe cleaner will give you the size and shape of thelayer.

Step 1: Use the NASA design Model to plan your design. First identify what solution/product is needed

Step 2: Work with your group to imagine the solution

Step 3: Plan out your solution and what materials you will need.

Step 4:Create your product. Tracing the pipe cleaner shape onto your building material, you will cut out each layer of your model. Adding one layer on top of the other and attaching them with glue, you will create your three-dimensional model. Criteria Constraints Object for modeling must be selected by team Use ruler and pipe cleaners to measure the object at each height marker Use only the materials provided

Step 5:Experiment to determine the success of your product. Does it meet the criteria of a 3-D printed item as outlined in the video from PBS LearningMedia for a visual introduction to 3D printing
https://ny.pbslearningmedia.org/resource/b9194612-d6e7-4307-b08c9c2857956713/will-3d-printing-change-the-world/

Step 6: Make any necessary adjustments or improvements to your 3-D print model.

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Assessments

On Demand Writing Activity
Task: Write an essay or paragraph about the ways 3D printing can be helpful to society and the potential dangers, pitfalls, or moral issues that it may raise. An LDC rubric will be used to score on-demand writing responses.

Short Answer Assessment Reflection Questions:

1. How does the model you created compare to the object you based it on?

2. In what ways is the process you used to create your 3D model similar to the actual process used by a 3D printer?

3. How do you think the thickness of the layers you created here compare to the layers created for a 3D printer?

4. What challenges did you run into in creating your 3D model?

5. What other tools or materials might have helped you make your measurements and construct your layers?