

Lesson 2 Engineering in my community

Essential Question: What is technology and how do I see engineering that uses technology in my community?

Standards

NGSS HS. Engineering Design

Students who demonstrate understanding can:

HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

Common Core State Standards Connections:

ELA/Literacy – RST.11-12.7 -Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

RST.11-12.9 -Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

Materials

- Video- What is Engineering
- Multimedia presentation
- Student Sheets
- Student notebooks
- Student Exit Slips

| Activities | | | |
|------------|--|-----------------|---|
| Activity | Name of the Activity | Photocopies | Materials |
| 1 | Preparation for Class - 1.3 and 1.8-Teacher Toolbox. Assigning Team rolls- 1.13 Teacher Toolbox- Roles and Responsibilities | | Student page Video: What is Engineering? Notebook |
| 2 | Standards Statement (Option: Unpacking the standards Teacher toolbox 1.12- Unpacking the standards) | 2 Student Sheet | PowerPoint Presentation 2 Student Sheet |
| 3 | Video: What is Engineering? Notebook | ↓ | Video embedded in PowerPoint 2 Student Sheet |
| 4 | Brainstorming Engineering examples in the community. | | PowerPoint Presentation 2 Student Sheet |
| 5 | Reflection and Formative Assessment | Exit Slips | PowerPoint Presentation Notebook Formative Assessment Sheet |

Overview

Students have learned that service-learning involves a partnership with the community. In this activity, we want to make the connection to the students and their own community, in that engineering design is all around. Students will explore their lives, researching and identifying how engineers impact their standard of living. Students present their example of engineering to the class. These examples can be any type of technology that can make life easier, anything from a cup to an electronic devise. Students will bring in a picture or the actual item.

Major Concepts

- Examples of Technology
- Building Self-Efficacy through cooperative learning strategies.
- Identification of Engineering design that serve the community
- Notebook and team building.

Objectives

Students will:

- Define Appropriate Technology
- Identify engineering examples in the community.
- Identify how engineering makes the student's lives better.

Lesson Preparation

Preparation

- **Lesson Preparation:** For specific directions on preparing lesson materials, see 1.3 and 1.8 documents in the Teacher Toolbox.
- **Instructional Resource:** Make sure that you have the **PowerPoint presentation** and the **video- What is Technology** ready for class viewing.

Procedure

Activity 1: Preparation for the Class

Multimedia Presentation: This lesson will have a multimedia presentation that will help to get the students thinking about the lesson and walking them through the information. Download the presentation in the folder to have the videos attached.

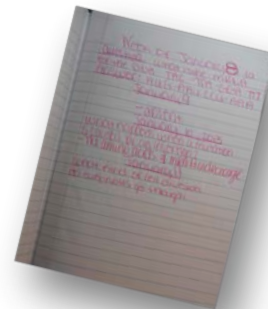


Preparing the notebooks- see document 1.3 in the Teacher Toolbox for specific instructions concerning notebooking.

Line of Learning.

2 Engineering and Technology

Question: *What is technology and how do engineers help produce it?*



Team Roles and Responsibilities- For more detailed information about team roles; use 1.13 Teacher Toolbox Team Roles and Responsibilities.

Activity 2: Unpacking the Standards

Class Explanation: Remind the class that they have been exploring different professional and volunteer service organizations that are aiding populations throughout the world. In this lesson the students will narrow the focus to how engineering and technology are intertwined and how technology has to be appropriate for the community.

Note to Teacher: Look above to see the standards that will be addressed through this lesson. The students need to understand the focus of the lesson, so an examination of the standards is a way of addressing this lesson essential.

Here is a possible Standard Statement which incorporates the standards used in this lesson:

Students will be exploring engineering in their community and how it makes their lives better and also will be able to synthesize information from different sources to be able to develop a coherent understanding of the connection between engineering and technology.

Optional Lesson Component: As an additional component for this lesson, you may use Teacher toolbox 1.12- *Unpacking the standards in a Student Centered Classroom*. This gives procedures to help your students create their own standards statement.

Activity 3: Engineering Examples

Note to teachers: In this activity the students will be looking to make that connection that engineering is all around them and that engineering and technology have a deep connection.

Introduction: Look around you. What technology do you see?

Discussion In Groups:

- Is technology only electronics why or why not?
- Can you give an example of something that is technology but not electronic?
- Share out an example of electronic technology and one example of technology that is not electronic.

1. **Engaging prior knowledge-** Discuss what Dr. Bernard Amdei discussed about Appropriate Technology. Discuss the example from Afghanistan about the fuel disks made from trash. (to review this video go to- <http://www.youtube.com/watch?v=ICIVHoYKmal>)
 - What are the components of appropriate Technology?

In Groups Discussion:

1. **What is Appropriate Technology Discussion:** Just like in Afghanistan, technology has to be useful to the members of the community. Think about what is useful in your life and your community.
 - Think of Appropriate technology in your community
 - Write down some appropriate technology
 - What is appropriate technology for you?

Note to teachers: This might be a great place to get the students thinking about accessibility devices that are used by students in the class, grandparents or parents.

2. **Non-appropriate technology Discussion:** In the next phase, the students will look at technology that would not be appropriate for them.

Example: For students who live in the desert or warm climates, a snow shovel would not be appropriate unless they use the technology in another way.
3. **Whole Group: Share out:** Have the groups share out examples of technology that is appropriate and non-appropriate in their community. Have your class scribe create a list for the class.
4. **Group Discussion: How does engineering fit with the technology?**
 - Give examples of technology and how it would be designed. Is this engineering?
 - Write the steps that would have to happen for that type of technology to be created.

Activity 4: Example of Engineering

Introduction: You have looked at technology around you, now you are going to look at technology and the engineering outside of the classroom.

Instructions:

- You are going to find an example of technology that involves engineering that is out in the community or in your home that makes your life or another person's life easier.
- These technologies have been created and designed by engineers.
- Use your student sheet to record the basic information about the engineering technology

Students will include the following information:

- Picture of the item or the actual item
- Description of Artifact
- Inventor if known
- What does this item do to serve people or the community?
- What professional would create this item?
- Is this item essential for quality of life?
- What are the step that might be taken to create this item?

Note to Teacher: Circulate among the teams as they discuss their examples of technology and engineering and give suggestions as needed. You may need to help them think about the steps that it would take to get a product from idea to production.

Using the example by Dr. Amdei with fishing, first the fishing pole, determine how to catch the fish, how to can the fish, how to cook the fish, how to get the fish to the table. Expanding this, we would need to explore who would be using the product, what their needs are. A product without a stakeholder or client is worthless. Listen to hear the students explaining their ideas. Some students may feel overwhelmed with expressing their thoughts and synthesizing information. This is one more reason why this activity was designed to be a small group for discussing their ideas. Remind students that they are looking to make a personal reflective statement about a particular item that is making their life better or someone in their family or community. This example must be personal and what makes sense to them.

This assignment will take more than one class period and could be started in class then used as a review for the next class period.

- Be sure to have a session to share out this information as a class.
- Remind students to bring in a picture of their item to place in their notebook and be ready to share their information in the group later.

Activity 5: Wrap-Up: Reflection and Formative Assessment

1) Back to the Standards:

Go back to the original class document about the standards.

Ask the students did they:

- Examine appropriate technology related to engineering design?
- Integrate and evaluate multiple sources of information?
- Create a statement about their personal reflections on a type of technology and the engineering that went into its design?



2) Formative Assessment and student reflection: Last 5 minutes of class

- Pass out the **Exit slips**. This will give you an idea of what they have learned in the lesson.
- Make sure that they students have their **notebooks open** with their sheets taped in their books.

Notebook check:

As the students are filling out the slips, walk around the room and check to make sure that the student have the following information in their notebook:

- ✓ Completed the 2 student sheet.
- ✓ Completed the information about a type of technology and engineering in the community. The students may need more time to complete their example.
- ✓ Have the students turn in the exit slip.



3) Teacher Reflection: Look at the student's exit slips and the student notebook. The teacher reflection sheet is helpful to reflect on the day's learning. It is also helpful as an artifact for the class and how they are progressing through the learning experience.

Questions:

- ✓ Have the students expressed an understanding of technology that you see in your community and engineering?
- ✓ How are the students reflecting in their notebook?
- ✓ Are the students showing self-efficacy when reflecting on their own learning in the class?

Resources:

- Video- *What is Engineering?* The University of Newcastle Australia, www.newcastle.edu.au
- NGSS Lead States. (2013). *Next Generation Science Standards: For States, By States*. Washington, DC: The National Academies Press. For more information see <http://www.nap.edu/NGSS/>
- National Governors Association Center for Best Practices & Council of Chief State School Officers. (2010). *Common Core State Standards for English language arts and literacy in history/social studies, science, and technical subjects*. Washington, DC: Authors.