

YOU SOLVE THE PROBLEM

LESSON OVERVIEW

In this activity students will create a solution to solve a problem facing the local or international community. Students will use the engineering design process to create a prototype of an invention that can help solve this problem. This activity can either be done in the classroom or as an at home activity.

STANDARDS

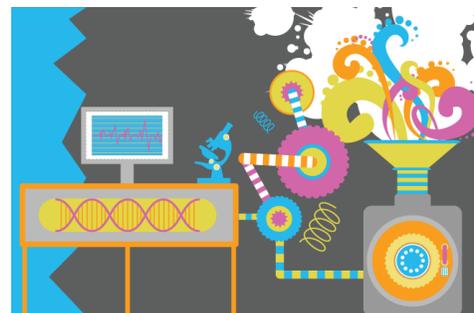
CCSS – ELA SL.8-12.4	Present information clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.
NGSS HS-ETS1-1	Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
NGSS HS-ETS1-2	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
NGSS 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.
NCSS C3 FRAMEWORK D4.6.8-12	Draw on multiple disciplinary lenses to analyze how a specific problem can manifest itself at local, regional, and global levels over time, identifying its characteristics and causes, and the challenges and opportunities faced by those trying to address the problem.

OBJECTIVES

- Students will research current problematic events.
- Students will use the engineering design process.
- Students will create a prototype of their invention.

MATERIALS

- Computer/mobile device for research
- Paper
- Supplies needed for prototype will vary by student
- Engineering design process handout for reference



PROCEDURES

1. Have students perform independent research on a problem that they would like to solve.
 - a. Problems can be local, regional, national, or worldwide.
 - b. Students should feel a connection to the problem.
2. Students should then brainstorm how they would solve this problem with an invention.
 - a. Ask students to answer the following to help them brainstorm: *who* would this affect, *what* would it solve, *when* could it be used, *where* can it be used best, *how* does it work to solve the problem, and *why* is it important?
 - b. Provide each student with the “Engineering Design Process” handout.
3. Students should sketch their design before they begin working on it.
 - a. Sketches should include labels and ideas on materials to use for their prototype.
4. Students can build their prototype.
 - a. This can be done at home or school. Students would need to bring in the necessary supplies to complete their prototypes.
5. Have each student present their invention.
 - a. Students will discuss and question the inventions in either groups or a full class setting.
 - b. Students should ask questions about each other’s inventions and discuss whether they could possibly solve the problem.

ENGINEERING DESIGN PROCESS OVERVIEW

IDENTIFY THE PROBLEM

What is the problem, and why is it important?

RESEARCH AND BRAINSTORM

Research: What has been done to solve this problem? Who is affected by this problem? What current solutions are available?

Brainstorm: What sort of things can be used to solve this problem? How can current solutions be improved? What materials will you need? Create concept designs.

BUILD

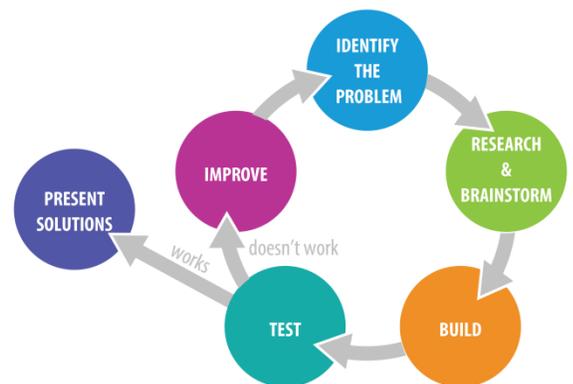
Decide upon your best design, gather your materials, and build your prototype.

TEST

Test your prototype to determine its challenges, problems, and level of effectiveness.

Improve

If the prototype does not work, repeat the process by identifying problems with the prototype design, conducting more research and brainstorming possible improvements, modifying or rebuilding the prototype, and performing additional testing until a solid solution is found.



PRESENT SOLUTIONS

Once an effective solution is discovered, present your work to others. Possible forms of presentation include a project board or multimedia presentation at a meeting or conference, documentation made accessible to those who can benefit from the work, and electronic communication of the solution via email, social media, blogs, websites, digital signs, videos, etc.

RUBRIC

	Target (3)	Meets (2)	Partially Meets (1)	Does Not Meet (0)
Conceptual Design	Effectively demonstrates understanding of conceptual design for a specific purpose.	Demonstrates some understanding of conceptual design but some elements do not reinforce the purpose.	Attempts to demonstrate understanding of conceptual design but the design provides limited evidence of this knowledge.	Does not demonstrate understanding of conceptual design.
Use of Materials in Prototyping	Inventively and successfully chooses materials that produce visual interest and serves to support the project's purpose.	Appropriately chooses materials that serve to support the project's purpose.	Chooses materials but some work against the purpose of the project.	Does not choose appropriate materials.
Collaboration / Discussion	Works well with others and discusses ideas in a fair, respectful, and encouraging way and is considerate of the feelings of others.	Works okay with others and discusses ideas in a fair, respectful way, but may not have been encouraging. Considers the feelings of others.	Works with others, but did not contribute a fair share of work OR was discouraging and did not consider the feelings of everyone.	Did not work well with others and/or discusses ideas in an unfair, disrespectful way.
Prototype	The prototype is thoughtfully constructed to accomplish the assigned task.	The prototype is constructed to accomplish the assigned task but has minor flaws.	The prototype was constructed but has major flaws in accomplishing the assigned task.	The prototype was not constructed to accomplish the assigned task.
Requirements	Meets all of the requirements for the project.	Meets most of the requirements for the project.	Meets some of the requirements for the project.	Does not meet the requirements for the project.
Demonstration of knowledge of Curricular Content in Discussions and Activities	Demonstrates an advanced understanding of the curricular content covered in class related to this project.	Demonstrates an adequate understanding of the curricular content covered in class related to this project.	Demonstrates limited understanding of the curricular content covered in class related to this project.	Does not demonstrate an understanding of the curricular content covered in class related to this project.
Total				/18