



Mini-SAS

Objectives:

Students will be able to:

- Understand the role of technology in advancing science
- Implement the STEM Engineering Design Process
- Work Collaboratively
- Design their own investigation and plan to answer a research question

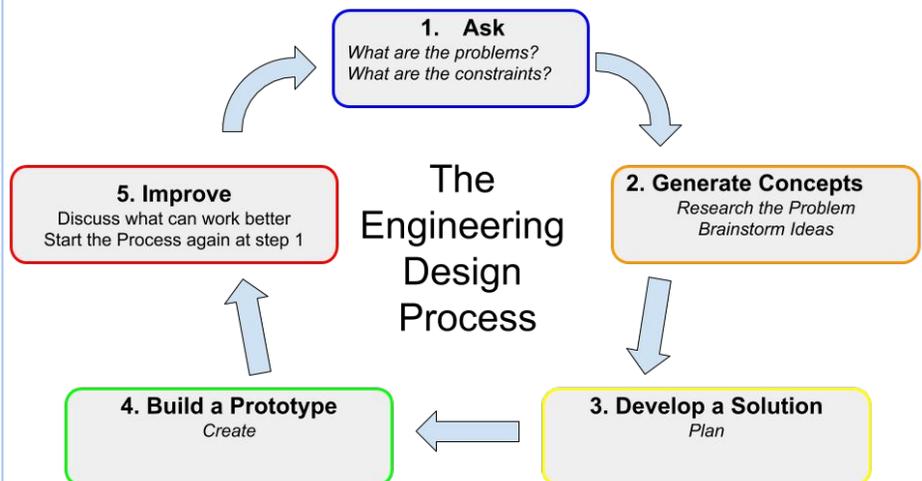
Standards

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.

Overview:

The harsh conditions associated with ocean exploration and research are constantly challenging researchers to seek out creative solutions. In order to prepare STEM students for careers at the frontier of ocean exploration, this unit will focus primarily on the engineering design process and problem solving. Students are not limited to building a water sampler, the focus should rather be on how students approach a problem, work together for finding a solutions, and attempt at making a prototype.

Introduction to the Engineering Design Process:



The engineering design process is a series of steps that engineers follow to come up with a solution to a problem. Many times the solution involves designing a product (like a machine or computer code) that meets certain criteria and/or accomplishes a certain task. This process is different from the Steps of the Scientific Method, which you may be more familiar with. If your project involves making observations and doing experiments, you should probably follow the Scientific Method. If your project involves designing, building, and testing something, you should probably follow the Engineering Design Process. If you still are not sure which process to follow, you should read Comparing the Engineering Design Process and the Scientific Method.

Student Activity #1

Historical Report Presentation:

Inspiration for Science and Technology

Objectives:

Have students visit the NOAA webpage on technology and research the history and impact on the science resulting from a new technology. There are many categories to choose from with sub-pages that ample information to create a short presentation summarizing a technology.

Key Websites:

Technology

<https://oceanexplorer.noaa.gov/technology/technology.html>

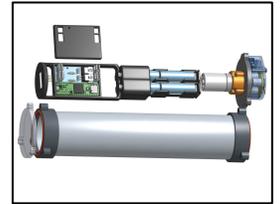
History of Ocean Exploration

<https://oceanexplorer.noaa.gov/history/history.html>

How to follow the Engineering Design Process?

- **ASK:** Students identify the problem, requirements that must be met, and constraints that must be considered.
- **GENERATE CONCEPTS:** Students brainstorm solutions and research ideas. They also identify what others have done.
- **DEVELOP A SOLUTION:** This is the planning stage. Students choose two to three of the best ideas from their brainstormed list and sketch possible designs, ultimately choosing a single design to prototype.
- **BUILD A PROTOTYPE:** Students build a working model, or prototype they can test, that aligns with design requirements and that is within design constraints.
- **IMPROVE:** Based on the results of their tests, students make improvements on their design. They also identify changes they will make and justify their revisions.

INSPIRATION ACTIVITY #1 Science and Technology:



Science and technology feed off of one another, propelling both forward. Technology uses science to solve problems, and science uses technology to make new discoveries. Marine science has benefited greatly by technological advances in many categories that have allowed scientists to stretch the limits of data collection techniques. All of these technological leaps can be tied to the engineering design process. Here are a few highlights of the technologies that make today's explorations possible.

- Research Vessels
- Submersibles
- Observing systems and sensors
- Communication technologies
- Diving technologies