

Unit 1 Guide - Engineering is Everywhere

Driving Questions

- What is engineering?
- Am I an engineer?
- Where can we see the results of engineering?
- Is this engineering design?
- Where is engineering evident?

Description

Students will explore engineering through the evolution of engineering products. They will define engineering by relating it to their future plans and engaging in two one day challenges in teams. Students will explore engineers, and begin to explore their engineering identity.

Key Concepts

(Identity) Students are expected to grapple with understanding their current status within the context of engineering - first by understanding and creating their own definition and then hearing what 'we' think engineering is.

(Design) At its core - engineering design is about engaging in conflict (explicitly or implicitly) and making choices about purpose and intention. There is no way to 'engineer' in a vacuum. Engineering is an act and therefore must have an object of action.




(Teamwork) Students will be introduced to habits and practices of teamwork

(Society) Engineering is responsible for the reliable delivery of many of the goods and services. Products evolve over time due to improvements in engineering tools and processes.

Learning Outcomes*







Connect With Engineering

CE.A	Iterate and evolve the definition of what it means to engineer and be an engineer.	
CE.B	Recognize the value of engineering for all regardless of one's potential career.	
CE.C	Explain and apply ethical considerations when exploring an engineering problem.	




Engineering in Society

ES.A	Explore the impacts of past engineering successes and failures on society as a whole.	
ES.B	Recognize and investigate the world's greatest challenges and the role that engineering plays in solving these challenges (e.g., Engineering Grand Challenges, UN sustainability goals, etc.).	
ES.C	Integrate diverse disciplinary thinking and expertise to inform design solutions that add value to society.	
ES.D	Identify and analyze issues when bringing a solution to scale.	







Engineering Professional Skills

PS.A	Use various engineering communication methods.	



Engineering Design

ED.A	Identify and describe a problem that can be solved with a potentially new product or process.	
ED.E	Evaluate solution alternatives and select a final design by considering assumptions, tradeoffs, criteria, and constraints.	
ED.F	Create a prototype.	
ED.G	Create and implement a testing plan to evaluate the performance of design solutions.	

Misconceptions

What is engineering?

- Building roads + buildings = engineering
- Strong math + science = engineering
- Solutions are developed from first attempt

Who are engineers?

- Engineers = men in cubicles OR Engineers = men in hard hats

Teaching Challenges

- Navigating the e4usa curriculum
- Teaching teaming
- Teaching Engineering
- Failing is still learning / Failure is necessary

Lessons and Content Overview

Lesson Name (duration)	Lesson Description	Activity
Lesson 1.0 - Classroom and Laboratory Safety [time varies] Video: Lesson 1.0	Safety overview	none
Lesson 1.1 - Career Relationship with Engineering [2 hours] Video: Lesson 1.1	Students explore relationships between their desired career and engineering	Activity 1.1.1 - Career Relationship with Engineering [1 hour] Activity 1.1.2 - Think-Pair-Share [15 min]
Lesson 1.2 - Listening to Music Over the Years [40 min] Video: Lesson 1.2	Explore the evolution of the media through which we listen to music	Activity 1.2.1 - Listening to Music Over the Years [40 min]
Lesson 1.3 - Engineers are Everywhere [2 hr 15 min to 3 hr 15 min] Video: Lesson 1.3	Begin to explore and develop an engineering identity	Activity 1.3.1 - Bryan Langford Interview [30 min] Activity 1.3.2 - Sylvia Acevedo Poster [45 min] Activity 1.3.3 - Identify an Engineer [1-2 hours]
Lesson 1.4 - Introductory Engineering Design Experience [2 hours] Video: Lesson 1.4	Groups of students create and test a robot arm	Activity 1.4.1 - Creating a Hazardous Waste Cleaning Prototype [1 hr 30 min] Activity 1.4.2 - Design Brief

		[30 min]
Lesson 1.5 - Learning Through Failure [30 min]	Failure is a necessary step toward success. Explore failure from famous people	Activity 1.5.1 - Why Failure is a Good Thing [25 min]
Lesson 1.6 - Engineering in Everyday Life [30 min] Video: Lesson 1.6	Explore engineering in everyday items - such as shoes	Activity 1.6.1 - Shoe Sole Design [30 min]
Lesson 1.7 - Introduction to Engineering Ethics [1 hour or more] Video: Lesson 1.7	Students examine how ethics can play a role in engineering design	Activity 1.7.1 - Playpump [1 hour or more]
Lesson 1.8 - Multidisciplinary Engineering [1 hr 40 min] Video: Lesson 1.8	Explore hardware and its environmental impact, manufacturability, etc.	Activity 1.8.1 - Product Archaeology [1 hr 40 min]