

## 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

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

## Engineering in Society

	<b>ES.A</b>	Explore the impacts of past engineering successes and failures on society as a whole.
	<b>ES.B</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.).
	<b>ES.C</b>	Integrate diverse disciplinary thinking and expertise to inform design solutions that add value to society.
	<b>ES.D</b>	Identify and analyze issues when bringing a solution to scale.

## Engineering Professional Skills

	<b>PS.A</b>	Use various engineering communication methods.
	<b>PS.B</b>	Collaborate effectively in a team.
	<b>PS.C</b>	Develop, implement, and adapt a project management plan.

## Engineering Design

	<b>ED.A</b>	Identify and describe a problem that can be solved with a potentially new product or process.
	<b>ED.B</b>	Identify appropriate stakeholders and content experts and evaluate their input.
	<b>ED.C</b>	Plan and conduct research by gathering relevant and credible data, facts, and information.
	<b>ED.D</b>	Articulate appropriate STEM practices and principles in the design
	<b>ED.E</b>	Evaluate solution alternatives and select a final design by considering assumptions, tradeoffs, criteria, and constraints.
	<b>ED.F</b>	Create a prototype.
	<b>ED.G</b>	Create and implement a testing plan to evaluate the performance of design solutions.
	<b>ED.H</b>	Apply iteration to improve engineering designs.
	<b>ED.I</b>	Articulate and reflect on how an engineering design process could be applied to solving a problem.

### 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

Understanding the E4USA Canvas Website - finding documents

Using Tools (making) Teaching

teaming

Teaching Engineering

Failing is still learning / Failure is necessary

### Lessons and Content Overview

<b>Lesson Name (duration)</b>	<b>Lesson Description</b>	<b>Activity</b>
1.0 Classroom and Laboratory Safety [time varies] Video: Lesson 1.0	Safety Overview	None
1.1 Career Relationship with Engineering [2 hours] Video: Lesson 1.1	Students explore relationships between their desired career and engineering	1.1.1 Career Relationship with Engineering [1 hour] 1.1.2 Think-Pair-Share [15 minutes]
1.2 Listening to Music Over the Years [40 minutes] Video: Lesson 1.2	Explore the evolution of the media through which we listen to music	1.2.1 Listening to Music Over the Years [40 minutes]

<p>1.3 Engineers are Everywhere [2 hours, 15 minutes to 3 hours, 15 minutes] Video: Lesson 1.3</p>	<p>Begin to explore and develop an engineering identity</p>	<p>1.3.1 Bryan Langford Interview [30 minutes]  1.3.2 Sylvia Acevedo Poster [45 minutes]  1.3.3 Identify an Engineer [1-2 hours]</p>
<p>1.4 Introductory Engineering Design Experience [2 hours] Video: Lesson 1.4</p>	<p>Groups of students create and test a robot arm</p>	<p>1.4.1 Creating a Hazardous Waste Cleaning Prototype [1 hour 30 minutes]  1.4.2 Design Brief [30 minutes]</p>
<p>1.5 Learning Through Failure [30 minutes]</p>	<p>Failure is a necessary step toward success. Explore failure from famous people</p>	<p>1.5.1 Why Failure is a Good Thing [25 minutes]</p>
<p>1.6 Engineering in Everyday Life [30 minutes] Video: Lesson 1.6</p>	<p>Explore engineering in everyday items - such as shoes</p>	<p>1.6.1 Shoe Sole Design [30 minutes]</p>
<p>1.7 Introduction to Engineering Ethics [1 hour or more] Video: Lesson 1.7</p>	<p>Students examine how ethics can play a role in engineering design</p>	<p>1.7.1 Playpump [1 hour or more]</p>
<p>1.8 Multidisciplinary Engineering [1 hour 40 minutes] Video: Lesson 1.8</p>	<p>Explore hardware and its environmental impact, manufacturability, etc.</p>	<p>1.8.1 Product Archaeology [1 hour 40 minutes]</p>