

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

Discover Engineering		
Iterate and evolve the definition of what it means to engineer and be an engineer.	E.A	
Awareness of changing perspectives on one's current identities with respect to engineering through regular reflection.	E.B	
Recognize the value of engineering for all regardless of one's potential career.	E.C	
Explain and apply ethical considerations when exploring an engineering problem.	E.D	
Engineering in Society		
Explore the impacts of past engineering successes and failures on society as a whole.	S.A	
Use systems thinking to propose and analyze the relationship between inputs, intention, and impacts of technology in society.	S.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.).	S.C	
Integrate diverse disciplinary thinking and expertise to inform design solutions that add value to society.	S.D	
Identify and analyze issues when bringing a solution to scale.	S.E	
Engineering Professional Skills		
Apply strategies to collaborate effectively as a team.	P.A	
Use various forms of communication (oral, written, visual).	P.B	
Recognize when to use various communication tools based on audience.	P.C	
Develop, implement, and adapt a project management plan.	P.D	
Contribute individually to overall team efforts.	P.E	
Engineering Design		
Uncover a problem that can be solved with a potentially new product or process.	D.A	
Identify appropriate stakeholders and evaluate stakeholder input.	D.B	
Plan and conduct research by gathering relevant and credible data, facts, and information.	D.C	
Model physical situations using mathematical equations.	D.D	
Evaluate solution alternatives and select a final design by considering assumptions, tradeoffs, criteria, and constraints.	D.E	
Use and recognize when to use computational tools.	D.F	
Create a prototype.	D.G	
Create and implement a testing plan to evaluate the performance of design solutions.	D.H	
Apply iteration to improve engineering designs.	D.I	

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

Lesson Name (duration)	Lesson Description	Activity	Assessments
1.0: Safety	Safety notes (for teachers)		
1.1: What are we doing here? (1.5 hrs)	Relate dream job to engineering	TEACHER BIO Identify Engineers related to your profession	Written report on desired occupation and its tie to engineering
1.2: Where can we see the results of engineering? (1.5 hrs)	Engineering makes a difference in everyday life	Progression through music	Think/pair/share
1.3: What is an engineer? (1 hr)	Identify an engineer	Find and report on someone who is considered an engineer	Double-sided poster

1.4: Is this engineering design? (1.5 hrs)	Engineering design	Robot arm challenge	Written debrief
1.5: Where is engineering evident? (1 hr)	Engineering is all around us	Shoe tread activity	Sketches; design of an innovative shoe for developing countries
1.6: Are engineers responsible for considering ethics in design? (1 hr)	Engineering ethics in a global sense	Playpump activity	2-3 page written debrief
1.7: How many disciplines are involved in the creation of a single product? (2.5 hrs)	Product Archaeology	Hardware dissection	Individual goals and growth reflection from Unit 1