

Unit 4 Guide - Engineering is Responsive

Driving Questions

How is being responsive important to engineering success?

Description

Students review and discuss customer feedback and teamwork evaluations to identify needed improvements to their design solution and their ability to work collaboratively on a team. The debrief, which includes review and discussions, is a crucial step to inform students of areas they need to address in order to improve. Students then use a project management plan to identify and assign tasks and duties to their team members to iterate their design solution. Afterwards, students present the revised design to their class and their community stakeholder(s). Students engage in a final debrief to address feedback and discuss further improvements. Having explored engineering to address a local problem, students will continue their exploration of what it means to engineer and be an engineer.

Key Concepts

Connect with Engineering: Engineering teamwork, the considerations of ethics in engineering design are important in engineering design

Engineering in Society: Engineering solutions must take societal implications into account

Engineering Professional Skills: Teamwork skills development is informed by feedback and evaluations.

Engineering Design: Effective engineering responds to feedback and evaluations to improve the design.

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.
	PS.B	Collaborate effectively in a team.
	PS.C	Develop, implement, and adapt a project management plan.

Engineering Design

	ED.A	Identify and describe a problem that can be solved with a potentially new product or process.
	ED.B	Identify appropriate stakeholders and content experts and evaluate their input.
	ED.C	Plan and conduct research by gathering relevant and credible data, facts, and information.
	ED.D	Articulate appropriate STEM practices and principles in the design
	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.
	ED.H	Apply iteration to improve engineering designs.
	ED.I	Articulate and reflect on how an engineering design process could be applied to solving a problem.

Misconceptions

First solution is THE solution. Avoid design fixation.

Failure ONLY means we did not succeed.

Feedback and criticism = summative assessment only.

Design teams don't necessarily need feedback from others outside the team to know how well their designed solutions perform.

Teaching Challenges

Helping students recognize feedback will help them improve their design and their ability to work together as a team.

Ensuring all students have a voice that contributes to their team.

Project iteration work in teams needs to occur inside the classroom as working outside of class time collaboratively will be challenging. However, we can expect individual parts of the projects to be accomplished outside of class time.

Due to availability of stakeholders, the video presentation may not get feedback, but the teacher can still use the listed needs and the feedback to assess their iteration.

Lesson and Content Overview

Lesson Name	Lesson Description	Activity
4.1 Valuing Feedback [2 hours, 10 mins] Video: Lesson 4.1	Design-a-thon Debrief	3.2.2 Knowledge Café [45 mins] 3.6.2 Chiming with Team Members [40+ mins]
4.2 Iteration [3.5 hours] Video: Lesson 4.2	Planning for and beginning the process of Design Iteration & Refinement	3.8.3 Project Management Planning for Design-a-thon [1 hour]
4.3 Design Communication Through Presentations [5.5 hours] Video: Lesson 4.3-4.4	Design Presentation to Stakeholders Iterative debrief: Design iteration and teamwork	4.3.1 Iteration Presentations [3.5 hours] 4.3.2 Musical Share One - Get One [1 hour]
4.4 Reflect on What it Means to Engineer and be an Engineer [1 hour]	Unit debrief	1.1.2 Think-Pair-Share [15 mins] 3.2.2 Knowledge Café [45 mins]