

Unit 4 Guide - Engineering is Responsive

Driving Questions

Who is involved in engineering? (recognizing customer/stakeholder feedback)

How do I collaborate to work on a team? (seek and use peer feedback)

How can I learn from my team?

Does the engineering design process end?

What value can be gained from failure?

What role does feedback and debrief play in design iteration?

How has my understanding of what it means to engineer and be an engineer changed?

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

Effective engineering responds to feedback and evaluations to improve design.

Teamwork skills development is informed by feedback and evaluations.

Learning Outcomes

Discover Engineering		
Iterate and evolve the definition of what it means to engineer and be an engineer.	E.A	a
Awareness of changing perspectives on one's current identities with respect to engineering through regular reflection.	E.B	a
Recognize the value of engineering for all regardless of one's potential career.	E.C	a
Explain and apply ethical considerations when exploring an engineering problem.	E.D	a
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	a
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	a
Identify and analyze issues when bringing a solution to scale.	S.E	a
Engineering Professional Skills		
Apply strategies to collaborate effectively as a team.	P.A	a
Use various forms of communication (oral, written, visual).	P.B	a
Recognize when to use various communication tools based on audience.	P.C	a
Develop, implement, and adapt a project management plan.	P.D	
Contribute individually to overall team efforts.	P.E	a
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	a
Plan and conduct research by gathering relevant and credible data, facts, and information.	D.C	a
Model physical situations using mathematical equations.	D.D	
Evaluate solution alternatives and select a final design by considering assumptions, trade-offs, 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	
Key: (a) assessed during learning progression		

Misconceptions

First solution is THE solution. Avoid design fixation.

Failure ONLY means we did not succeed.

Feedback and criticism = summative assessment only.

We can determine what needs to be improved without feedback from others outside of the design team.

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 need 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	Assessment
4.1: How and who evaluates our design and teamwork skills? (1.5 hrs)	Designathon Debrief: Design solution and teamwork	Class, team, and individual review of Designathon re: your design, test, and team experience	Engineering notebook/journal entries for feedback and debrief Efforts to address peer evaluation results
4.2: How do we improve our solution? (3.5 hrs)	Design Iteration & Refinement	Team activity iterating their solution based on feedback from the designathon.	Observations at this time of teamwork, iteration, and Modified prototype
4.3: What are other ways to communicate? (2.5 hrs)	Design Presentation to Stakeholders	Video (or slideshow) preparation, practice, and production (or presentation)	Video (or optional showcase for parents / community)
4.4: How do we improve our engineering processes?	Iterative Debrief: Design iteration and teamwork	Student and team discussions of iterative process and teamwork. Complete CATME-style peer evaluation forms for	Journal entries Teamwork evaluations

(1.5 hrs)		teammates and self-reflection.	
4.5: What do I, as an engineer, think? (1 hr)	Unit Debrief	Feedback on solutions, processes, engineering identity, and teamwork skill development.	Journal entries