process.
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
Evaluate solution alternatives and select a final design by considering assumptions, tradeoffs, criteria, and constraints. D.E a
Create a prototype. D.G a
Create and implement a testing plan to evaluate the performance of design solutions. D.H a
Apply iteration to improve engineering designs. D.I a

Key: (a) assessed during learning progression

Misconceptions
Iteration should be dropped if there isn’t enough time.
My design will at some point be fully finished.

Teaching Challenges
Students may have a difficult time producing suitable project ideas.
Time will likely be crunched at the end of the year. Take care to adapt the lessons while still maintaining time for iteration and reflection.
The final portfolio for assessment of the E4USA course may be due before the end of the school year.

Unit 7 Lesson and Content Overview

<table>
<thead>
<tr>
<th>Lesson Name</th>
<th>Lesson Description</th>
<th>Activity</th>
<th>Assessments</th>
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<tr>
<td>7.1A: What meaningful design work can we co-create? (0.5 hrs) -or- 7.1B: What meaningful design work can we co-create? (1 hr)</td>
<td>Students explore and select problems in their everyday lives that can be pursued by small teams during the last quarter of the year. 7.1 Version B offers more student autonomy in forming teams than 7.1 Version A.</td>
<td>●Explore and select personal projects ●Form teams</td>
<td>●[7.1A&amp;B] Problem scoping assignment ●[7.1B] Written team proposal</td>
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<tr>
<td>7.2: What can I learn from past team experiences to best prepare</td>
<td>Students meet their teams, create new team charters, and begin the</td>
<td>●Discuss team norms ●Write team charter ●Begin problem definition</td>
<td>●Team charter ●Individual reflection on teamwork</td>
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<tr>
<td>Section</td>
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| 7.3: How can we find the best design idea? (1.25 hrs) | Teams explore a wide variety of design options and make a plan for how they will pick the best design ideas. | ● Brainstorm  
● Decide on criteria and weights |
| 7.4: How does my team propose tackling the problem? (2.25 hrs) | Teams make final design decisions and prepare a project proposal that will be reviewed by the teacher. | ● Make final design decisions using decision matrix  
● Prepare project proposal |
| 7.5: How do we determine the details of our design? (3.5 hrs) | Teams flesh out the details of their designs. | ● Detailed design and sub-system definition  
● CAD and technical engineering drawings  
● Consultations with instructor  
● Update project development plan |
| 7.6: Can we create a functional prototype? (3.5 hrs) | Teams construct their 1st functional prototype. | ● Construct prototype  
● Update testing plan |
| 7.7: How did the 1st prototype perform? (1.5 hrs) | Users test the prototype while the team collects data and feedback. | ● Testing |
| 7.8: How can we do better? (1.5 hrs) | Teams debrief and make a plan for iteration. | ● Debrief testing data  
● Identify iteration focus  
● Refine the problem definition  
● Brainstorm  
● Select changes to implement  
● Justify chosen changes and predict effects |

● Short write-up on deficiencies of existing solutions

● Record of brainstorming

● List of criteria and weights

● CAD and technical engineering drawings

● Revised project development plan

● Written iteration plan
| 7.9: How do we determine the details of our design? (1.25 hrs) | Teams flesh out the details of their improved designs. | ● Update detailed designs and sub-system definitions  
● Update CAD and technical engineering drawings  
● Update project development plan | ● Updated CAD and technical engineering drawings  
● Revised project development plan |
| --- | --- | --- | --- |
| 7.10: Can we create an improved functional prototype? (3.5 hrs) | Teams construct their 2nd functional prototype. | ● Construct prototype V2  
● Create testing plan V2 | ● Prototype V2  
● Written testing plan V2 |
| 7.11: How did our 2nd prototype perform? (1.5 hrs) | Users test the prototype while the team collects data and feedback. | ● Testing V2 | ● Testing results V2 |
| 7.12: What would we do differently? (1.5 hrs) | Teams debrief the project, considering improvements they would make to the design, the team, and project management. | ● Pair and team discussions  
● Individual reflections | ● Team design brief  
● CATME peer evaluations  
● E4USA team performance rubric  
● Individual reflection on growth towards individual goals |
| 7.13: What is the role of engineering in society? (1.25 hrs) | Teams reflect on the role of engineering in society and share with the class through a gallery walk. | ● Team discussions  
● Class gallery walk  
● Class debrief | ● Gallery walk |
| 7.14: How am I an engineer? (2 hrs) | Students debrief their experiences in this course, focusing on the self as an engineer. | ● Think-pair-share discussions on red thread topics | ● Revised and forward thinking double-sided poster of “myself as an engineer”  
● Compiled inspirational video  
● Preparatory work for share-out with the larger
| 7:15: How can we share out to the larger school community? (outside of class) | All members of the school community are invited to engage with the teams and learn about their final projects. | ● School showcase | ● Various modalities of team share-outs |