Refining Your Prototype
Through technical tests and community feedback

Lesson 9
Draft Class Periods 2

Driving Question: What data do I need to improve my design?

Objectives:
Students will improve their engineering designs using technical tests and community feedback.

I Can Statement:
I can improve my engineering design using technical tests and community feedback.

Lesson Standards:
MS-ETS1-2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

MS-ETS1-3. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

MS-ETS1-4. Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

Overview:
This is an opportunity to investigate the technical and social specifications of their prototype. First, they will design technical tests to use on their prototype. Then, they will optimize their prototype based on the test results. After that, they will share their prototype with community members and ask them social specification questions in an interview. Then, they will optimize their prototype based on the interview feedback.

Materials:
- All of the prototyping supplies from lesson 8
- Prototypes

Equipment:
- All of the prototyping equipment from lesson 8
- Audio recording device
Background for Teachers

Here students are conducting technical tests on their designs. They do this first to optimize their design before they get social specification feedback.

Here students are getting social feedback on their design. Students can do informal interviews with individuals in your building. At this point, students will be working predominantly on their own pace.
I. Design and complete three technical tests

A. Introduce today’s objective to optimize the design through technical tests.

B. In your ideal engineering dream, describe in one or two sentences exactly how your prototype works. You need to include something about a) your power source, b) your load, c) the function.

Sample sentence starter: My prototype [name] uses [name power source] to power [name load] to [do what? Name function].

My Woot Wall uses a hand crank to power 12 LED lights to celebrate students’ accomplishments.

C. As a group, list all of the ways you already improved your design. Ex. We switched from a series to a parallel circuit. We colored the lights.

D. How will you test your design to get ideas for how to improve it?
   - Technical question:
     - [if my design is working] Can I see all of the lights from the back of the classroom?
     - [if my design is not yet working] Can I figure out why it is not working?
   - Sustainability question: How can I improve my design so that is can last for the rest of the school year?
   - Social question: Do people like it?
   - Record your results in the hand-out.

E. Design Tests for each question (see handout)
   - Include: How the test will be conducted? What data will be collected. How your test will be a “fair test”?

F. Review class norms for projects

G. Have groups design and test three tests
H. Have students record their results in the “test your prototype” hand-out

II. Optimize design based on results
A. Have students draw the changes they are going to make on their original sketch up based on the technical tests.
B. Have students make the changes on their actual prototype.
C. As a class, have groups share what changes the groups made to improve their prototypes.
Name__________________________  Lesson #9 Refining your prototype
Group Name ________________  Testing your prototype

1. How does your design work:

Our prototype [name] uses [name power source] to power lights to [do what?].

Our prototype ________________________________ uses __________________________

_____________________________________________________________

We have already improved our design in these ways:

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<tr>
<th>Technical Changes:</th>
<th>Social Changes:</th>
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Make sure you draw all of those changes on your sketch up.

Testing my Design

Conduct each test 3 times to ensure you have a fair test

Test #1 (Technical)

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<th>Test:</th>
<th>Results</th>
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Test #2 (Sustainability: will it last?)

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Test #3 (Social)

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What did I learn from these tests about my design?

*Draw & list the changes you will make to your design on your sketch up.*