**MS. Engineering Design**

**MS-ETS1-1.** Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution.

**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.

**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.

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**Science and Engineering Practices (SEPs):**

- **Asking Questions and Defining Problems**
- **Developing and using models**
- **Planning and Carrying Out Investigations**
- **Analyzing and interpreting data**
- **Using mathematics and computational thinking**
- **Constructing Explanations and Designing Solutions**
- **Engaging in argument from evidence**
- **Obtaining, evaluating, and communicating information**

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**How our STEM courses address these standards:**

**1. The completion of hands-on coding activities.**

There are multiple coding activities, progressing from easy to more complex. Each time students create code, they go through the engineering design process. They are given a scenario and then define a particular problem they are trying to solve. They define the constraints of time and resources. They ask questions, research, develop possible solutions, and then plan a method for solving the problem. While creating the code, they are using math and computational thinking. They create a prototype, test the code, conduct failure analysis, and make improvements until their code satisfactorily solves the problem. Finally, they present their solution and describe how it solved the problem.

**2. An engineering design project.**

Each course includes a design project where students are challenged to define and solve a community problem or an issue for an elderly person or someone with a disability. They use the robot or STEM materials provided and then add materials and write code to create their solution. They learn about the engineering design process, and work in a team to go through the process. They use an engineering design notebook to document their progress. They ask questions, define constraints, conduct research, build prototypes, test them, evaluate and conduct failure analysis, then improve and redesign. They create alternative solutions, compare the alternatives, formulate evidence based on test data, make arguments from evidence to defend their conclusions. At points within the project, and at the end, teams create communication artifacts to demonstrate the problem and present their solutions for review.