Grade 3-5 NGSS Standards for Engineering Design embedded in our curriculum:

3-5. Engineering Design

3-5-ETS1-1. Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

3-5-ETS1-2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

3-5-ETS1-3. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

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

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. The robot itself, the definition of the problem, the time available, and the environment provide the constraints. They ask questions, develop possible solutions, and then plan a method for solving the problem. They create a prototype, test the code, conduct failure analysis, and make improvements until their code satisfactorily solves the problem. While creating the code, they are using math and computational thinking. They create additional solutions and compare them to see which is the best. 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 as time allows. They compare 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.