Exploring Robotics STEM Curriculum
 Ensuring teachers are successful in teaching STEM and coding.

Grade K-2 NGSS Standards for Engineering Design embedded in our curriculum:

K-2. Engineering Design

K-2-ETS1-1. Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

K-2-ETS1-2. Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

K-2-ETS1-3. Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

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 activities.

There are multiple coding activities or hands-on robot building challenges, progressing from easy to more complex. Each time students solve a problem, 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 it conduct rudimentary failure analysis (what works and what doesn’t), and make improvements until their design or 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 real-world problem using the robot or STEM kit. They draw the robot they built and describe how it solves the problem. They label the parts of their robots and describe what each part does, or its function. Then they create two or more solutions to the problem and compare the two solutions. They define the strengths and weaknesses of each solution. Then they choose the best solution. Finally, they write about their robot and describe how it functions and how it was the best solution to solve the problem.

STEM Characteristics of Courses:

✓ Integrates Science and Math
✓ Teamwork
✓ Student-Centered
✓ Hands-On Approach
✓ Real-World Related Problems
✓ Collection and Analysis of Data
✓ Students have Choice in Design
✓ Multiple Design Options
✓ Engineering Design Testing and Re-Design
✓ Solutions Based on Experiments and Testing Prototypes

Diagram:

- **Ask:** Identify the need and constraints
- **Research:** the problem
- **Imagine:** Develop possible solutions
- **Plan:** Select a promising solution
- **Create:** Build a prototype
- **Test:** and evaluate prototype
- **Improve:** Redesign as needed

**ENGINEERING DESIGN PROCESS**