Grade 4 STEAM Unit 3 - Exploring Structure, Function, and Design

Unit Focus

In this exciting STEAM unit, students will explore the connections between structure and function in both animals and man-made designs using Lego Education Science and Lego Education Spike. Through hands-on activities, they will build models that represent how internal and external structures help organisms survive, grow, and respond to their environment, while also examining how design choices in human-made structures meet specific needs.

Students will apply this understanding to the engineering design process, creating devices and solutions whose structure directly supports their function. They will investigate how criteria and materials influence the success of their designs and, as the unit progresses, use evidence from experimentation and observation to make claims about their design choices.

Collaboration is a key part of the unit. Students will engage in productive discussions, build on the ideas of their peers, and refine their own thinking based on feedback. The MakerSpace encourages creativity, allowing students to explore multiple materials and approaches to achieve the best structure and function for each challenge.

In addition, students will explore digital citizenship, learning the characteristics of responsible online behavior and strategies to combat cyberbullying, helping them develop empathy and responsibility in both digital and real-world communities.

By the end of the unit, students will have strengthened their problem-solving skills, cultivated a creative and collaborative mindset, and deepened their understanding of how science, technology, and engineering work together to solve real-world problems.

Stage 1: Desired Results - Key Understandings

Standard(s)

Next Generation Science Standards
Performance Expectations: 4

- Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. (4-LS1-1)
- Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways. (4-LS1-2)
- 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-ETS1-1)
- 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-ETS1-2)

CSTA: Computer Science Standards (2017)
3-5

Transfer

Students will be able to independently use their learning to...
T1 Ask questions to gain understanding, communicate their ideas, explain their thinking process, and evaluate efficiency or connectedness to a concept.
T2 Use the engineering design process to invent or innovate solutions.
T3 Exhibit a tolerance for ambiguity, perseverance and the capacity to work with open-ended problems.
T4 Work collaboratively and contribute constructively to project teams with a broader or global perspective.

Meaning

Understanding(s)	Essential Question(s)
Students will understand that... **U1** Engineers use strategies and the design process to solve problems and test solutions. **U2** There can be more than one solution to a problem.	*Students will keep considering...* **Q1** How can I use what I know to understand a problem and design a solution I can test?

Stage 1: Desired Results - Key Understandings

- Use data to highlight or propose cause-and-effect relationships, predict outcomes, or communicate an idea. (1B-DA-07)

ISTE Standards (2024)

ISTE Standards (2024): K-12

- Demonstrate empathetic, inclusive interactions online and use technology to responsibly contribute to their communities. (1.2.b.)
- Build knowledge by actively exploring real-world issues and problems, developing ideas and theories and pursuing answers and solutions. (1.3.d.)

Madison Public Schools Profile of a Graduate

- Design: Engaging in a process to refine a product for an intended audience and purpose. (POG.2.2)
- Collective Intelligence: Working respectfully and responsibly with others, exchanging and evaluating ideas to achieve a common objective. (POG.3.1)

U3 Effective communicators explain their ideas and decisions with evidence.
U4 Communicating results helps connect learning to real-world concepts.
U5 Scientific concepts and patterns can inspire and improve designs.
U6 Collaborative problem-solvers share, respect, and adapt ideas to strengthen the group's work.
U7 Effective problem solvers use feedback, try new approaches, and persevere.
U8 Persevering through challenges builds resilience and a growth mindset.
U9 Problem solvers break big challenges into smaller, manageable tasks.

Q2 How do I clearly communicate my thinking and results to others?
Q3 How might my design connect to scientific concepts or patterns?
Q4 How do effective group members work together to achieve a common goal?
Q5 What do effective problem solvers do —especially when they get stuck or face challenges?
Q6 How do I begin when a task feels too big?

Acquisition of Knowledge and Skill

Knowledge	Skill(s)
Students will know... **K1** Plants and animals have internal and external structures that each relate to a function **K2** Animals have sensory receptors that gather information from the surrounding environment **K3** Engineering solutions are created to solve a problem that people have, either a necessity or a desire. **K4** Solutions have materials and constraints that dictate and limit their design choices **K5** There can be multiple solutions to an engineering problem and that these solutions can be systematically compared **K6** Ways to combat cyberbullying.	*Students will be skilled at...* **S1** Making a claim about the structure or function of a plant or animal **S2** Creating a physical model to explain how an animal receives stimulus **S3** Defining a design problem that involves identifying a need or want. **S4** Making a reasoned comparison of the different solutions to determine which one is the most promising