



Grade 4 STEAM Unit 1 - The Engineers' Challenge: From Energy to Innovation

Unit Focus

In their first STEAM unit, students step into the role of young engineers and inventors! They explore a variety of materials and learn how to use them safely and creatively to solve real-world problems. As they build and test their own designs, students also practice communicating their ideas and explaining how science concepts influence their solutions.

Using Lego Education Spike and Lego Education Science, students investigate energy and energy transfer, applying these concepts throughout the engineering and design process. They deepen their understanding of energy conversion as they develop prototypes that transform energy to make devices work.

Through a hands-on, collaborative project in the MakerSpace, students are challenged to address an environmental problem. They take ownership of their design process, work as a team, and begin to see themselves as engineers making meaningful solutions.

The unit also introduces digital literacy, helping students understand their rights and responsibilities as creators and consumers in the online world. By the end of the unit, students will have combined creativity, problem-solving, science, and technology skills to tackle challenges and bring their innovative ideas to life.

Stage 1: Desired Results - Key Understandings

Standard(s)	Transfer	
Common Core English Language Arts: 4 - Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 4 topics and texts, building on others' ideas and expressing their own clearly. (CCSS.ELA-LITERACY.SL.4.1) Mathematics: 4 - Make a line plot to display a data set of measurements in fractions of a unit ($\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$). - Solve problems involving addition and subtraction of fractions by using information presented in line plots. For example, from a line plot find and interpret the difference in length between the longest and shortest specimens in an insect collection. (CCSS.MATH.CONTENT.4.MD.B.4) - Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement: (CCSS.MATH.CONTENT.4.MD.C.5) Next Generation Science Standards	<i>Students will be able to independently use their learning to...</i> T1 Ask questions to gain understanding, communicate their ideas, explain their thinking process, and evaluate efficiency or connectedness to a concept. T2 Work collaboratively and contribute constructively to project teams with a broader or global perspective. T3 Use the engineering design process to invent or innovate solutions. T4 Leverage technology to demonstrate learning competencies.	
	Meaning	
	Understanding(s)	Essential Question(s)
	<i>Students will understand that...</i> 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. U3 Effective communicators explain their ideas and decisions with evidence. U4 Communicating results helps connect learning to real-world concepts.	<i>Students will keep considering...</i> Q1 How can I use what I know to understand a problem and design a solution I can test? 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?

Stage 1: Desired Results - Key Understandings

Performance Expectations: 4

- Use evidence to construct an explanation relating the speed of an object to the energy of that object. (4-PS3-1)
- Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents. (4-PS3-2)
- Ask questions and predict outcomes about the changes in energy that occur when objects collide. (4-PS3-3)
- Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time. (4-ESS1-1)
- Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans. (4-ESS3-2)

CSTA: Computer Science Standards (2017)

3-5

- Use data to highlight or propose cause-and-effect relationships, predict outcomes, or communicate an idea. (1B-DA-07)
- Create programs that include sequences, events, loops, and conditionals. (1B-AP-10)
- Modify, remix, or incorporate portions of an existing program into one's own work, to develop something new or add more advanced features. (1B-AP-12)

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.)
- Create original works or responsibly repurpose or remix digital resources into new creations. (1.6.b.)

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)

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 Technology provides tools to develop, test, and refine solutions.

U10 Problem solvers break big challenges into smaller, manageable tasks.

Q5 What do effective problem solvers do — especially when they get stuck or face challenges?

Q6 How can technology help me accomplish a goal?

Q7 How do I begin when a task feels too big?

Acquisition of Knowledge and Skill

Knowledge

Students will know...

K1 Cause and effect relationships help explain why something happened.

K2 Energy can be observed and measured by how an object moves.

K3 Students can act as problem solvers and investigators, not just receivers of information.

K4 Modifying includes changing parts of the code.

K5 An event is something that triggers an action.

K6 Energy can be transferred from one place to another.

K7 Concepts of angle measurement.

K8 Rock layers can show the sequence of events and changes to the landscape.

K9 Humans can design solutions to help prevent or reduce impacts from natural disasters.

K10 The definition of copyright and explain how it applies to creative works.

K11 Their rights and responsibilities as creators.

Skill(s)

Students will be skilled at...

S1 Using evidence from data to explain a cause-and-effect relationship.

S2 Identifying a pattern that links speed and energy.

S3 Testing or discussing theories and improve them with feedback or new evidence.

S4 Engaging effectively in a range of collaborative discussions.

S5 Describing how energy changes when objects collide.

S6 Modifying code to improve how the program works.

S7 Creating a sequence of steps to complete a task or animation.

S8 Using events to trigger part of a program.

S9 Describing the result of energy transfer.

S10 Identifying patterns in how rocks and fossils are layered or distributed.

S11 Creating and comparing solutions to reduce the impact of earthquakes.