



Grade 4 STEAM Unit 2 - Energy and the Crazy Carnival

Unit Focus

In this hands-on unit, students become engineers and inventors as they explore how energy works in the world around them. Using Lego Education Spike and Lego Science kits, students design, build, and test a variety of devices, discovering how potential and kinetic energy move objects and how energy can be converted from one form to another.

Through exciting challenges, students collaborate in teams, share ideas, compare solutions, and improve their designs based on feedback. They investigate how objects interact and affect one another's movements, predict outcomes during collisions, and explore the relationship between energy and speed.

Students continue Lego Spike Crazy Carnival, where they apply what they've learned about energy transfer and collisions to invent their own carnival games, testing and refining prototypes to make them work effectively.

In addition to engineering and science, students continue digital literacy lessons, learning the difference between personal and private information and why it's important to protect private information online.

By the end of this unit, students will have combined science, technology, engineering, and creativity to solve real-world problems, collaborate effectively, and develop critical thinking skills—all while having fun building and experimenting!

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 - Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures. (CCSS.MATH.CONTENT.4.G.A.1) Next Generation Science Standards Performance Expectations: 4 - Use evidence to construct an explanation relating the speed of an object to the energy of that object. (4-PS3-1)	<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 Use the engineering design process to invent or innovate solutions. T3 Leverage technology to demonstrate learning competencies. T4 Work collaboratively and contribute constructively to project teams with a broader or global perspective. T5 Exhibit a tolerance for ambiguity, perseverance and the capacity to work with open-ended problems.	
	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?

Stage 1: Desired Results - Key Understandings

- 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)
- Apply scientific ideas to design, test, and refine a device that converts energy from one form to another. (4-PS3-4)

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)
- Compare and refine multiple algorithms for the same task and determine which is the most appropriate. (1B-AP-08)
- 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

- Understand fundamental concepts of how technology works, demonstrate the ability to choose and use current technologies effectively, and are adept at thoughtfully exploring emerging technologies. (1.1.d.)
- 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)

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.

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 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 The faster an object moves, the more energy it has.
K2 Energy can be transferred between objects or locations
K3 Energy conversion means changing means changing one form of energy to another
K4 How to describe potential and kinetic energy
K5 Cause and effect relationships help explain why something happened
K6 There can be more than one way to solve a problem
K7 Modifying includes changing parts of the code
K8 Students can act as problem solvers and investigators, not just receivers of information.
K9 Define personal and private information
K10 An angle is formed by two rays with a common endpoint
K11 Energy and fuels come from natural resource
K12 Energy can be transferred from place to place by sound, light, heat, and electric currents.
K13 When objects collide, energy is transferred from one object to another

Skill(s)

Students will be skilled at...

S1 Building and testing the device to observe energy transformation
S2 Planning and carrying out observations
S3 Explaining that energy increases with speed and can be seen in real-world examples
S4 Explaining how interactions between two objects can impact the energy of an object
S5 Using evidence from data to explain a cause-and-effect relationship
S6 Applying and testing their existing scientific knowledge of energy conversion
S7 Testing the solution to improve and refine its function
S8 Testing or discussing theories and improve them with feedback or new evidence
S9 Engaging effectively in a range of collaborative discussions
S10 Recognizing and describing geometric relationships in real-world or diagrammed figures
S11 Identifying the reasons why people share information about themselves online
S12 Explaining why it is risky to share private information online