



Grade 2 STEAM Unit 1 - From Ideas to Innovation: Exploring Science and Engineering with LEGO

Unit Focus

As their introductory unit to STEAM, students will explore Lego Education Spike and Lego Education Science materials and learn how to use them appropriately to innovate their own designs in response to presented problems. They will learn expectations for communication and engage in collaborative discussions as they work with peers to develop prototypes that meet shared goals. Students will be introduced to the engineering design process, understanding the importance of fully analyzing a problem before designing solutions, brainstorming multiple ideas, and testing and refining their prototypes. Through hands-on challenges, they will extend their science learning from the classroom by creating solutions that address the effects of changing land and by building models representing land and bodies of water. Along the way, students will practice observational skills to determine how to modify their solutions to best meet the needs of the Lego characters, apply science concepts in their design process, compare different designs, and evaluate their effectiveness.

Students will also be introduced to the MakerSpace, where they will tackle open-ended problems and design solutions to science-related, real-world tasks. In this creative space, students will evaluate the effectiveness of different materials, observe how materials affect their prototypes, and make iterative changes as needed. Across the unit, they will develop critical STEAM skills, including problem-solving, collaboration, and design thinking, while building a strong foundation in science concepts, engineering practices, and innovation.

Stage 1: Desired Results - Key Understandings

Standard(s)	Transfer	
Common Core English Language Arts: 2 - Participate in collaborative conversations with diverse partners about grade 2 topics and texts with peers and adults in small and larger groups. (CCSS.ELA-LITERACY.SL. 2.1) - Recount or describe key ideas or details from a text read aloud or information presented orally or through other media. (CCSS.ELA-LITERACY.SL.2.2) Next Generation Science Standards Performance Expectations: 2 - Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land. (2-ESS2-1) - Develop a model to represent the shapes and kinds of land and bodies of water in an area. (2-ESS2-2) - 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-ETS1-1) - 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-ETS1-2)	<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 Leverage technology to demonstrate learning competencies. T4 Use the engineering design process to invent or innovate solutions.	
	Meaning	
	Understanding(s)	Essential Question(s)
	<i>Students will understand that...</i> U1 They can share ideas, respect others' contributions, adjust their thinking based on feedback, and use input to improve solutions. U2 Asking questions, gathering information, and using strategies helps them understand tasks, try solutions, and evaluate results. U3 Problems can have multiple solutions, and that using the engineering design process and technological tools helps develop and test ideas.	<i>Students will keep considering...</i> Q1 How can I better understand a problem or task, and get started when it seems too big? Q2 How do effective group members contribute, work toward a common goal, and clearly communicate their ideas, thought process, and results? Q3 How do I develop and test a design, and how can technology help accomplish a goal? Q4 Why is it important to persevere through challenges, and what makes an effective problem solver?

Stage 1: Desired Results - Key Understandings

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

CSTA: Computer Science Standards (2017)

K-2

- Develop programs with sequences and simple loops, to express ideas or address a problem. (1A-AP-10)
- Decompose (break down) the steps needed to solve a problem into a precise sequence of instructions. (1A-AP-11)
- Develop plans that describe a program's sequence of events, goals, and expected outcomes. (1A-AP-12)

ISTE Standards (2024)

ISTE Standards (2024): K-12

- Know and use a deliberate design process for generating ideas, testing theories, creating innovative artifacts or solving authentic problems. (1.4.a.)
- Develop, test and refine prototypes as part of a cyclical design process. (1.4.c.)

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)

Acquisition of Knowledge and Skill

Knowledge

Students will know...

- K1** Understand a system and its functions
- K2** Hardware components have different purposes and work together to make the system function
- K3** If a program is not sequenced correctly, the task cannot be completed.
- K4** A situation that people want to change or create can be approached as a problem to be solved through engineering.
- K5** Asking questions, making observations, and gathering information are helpful in thinking about problems.
- K6** Before beginning to design a solution, it is important to clearly understand the problem.
- K7** The engineering design process is a series of steps used to solve a problem.
- K8** Having a plan for a program clarifies the steps that need to be created and can be used to check if the program is correct.
- K9** A prototype is a first model of something that can be modified or replicated.
- K10** A problem can be decomposed into smaller, more manageable steps.
- K11** Because there is always more than one possible solution to a problem, it is useful to compare and test designs.

Skill(s)

Students will be skilled at...

- S1** Participating in collaborative conversations
- S2** Identifying what each component does using age-appropriate language.
- S3** Describing how characters in a story respond to major events and challenges.
- S4** Developing a model to represent the land and water in an area.
- S5** Comparing designs and solutions for preventing erosion.
- S6** Developing programs with sequences to express ideas or address a problem.
- S7** Using loops to repeat actions instead of writing the same steps over and over.
- S8** Asking questions, making observations and gathering information to evaluate a problem that needs to be solved.
- S9** Using the engineering design process to design an artifact or solve a problem.
- S10** Building prototypes using the engineering and design process.
- S11** Creating designs using sketches, drawings, or models.
- S12** Comparing and testing different designs that address the same problem to examine performance.