Activity 1: Good Morning Machine

School Solutions

Subject: STEAM, Engineering	**Topic or Unit of Study:** Engineering Design
Grade/Level: Grades 3-5	**Time Allotment:** 1.5 hours
Objectives: ● We will define and understand a problem. ● We will brainstorm and iterate to create a solution that meets the described needs. ● We will engage effectively in a range of collaborative discussions.	**Standards:** **3-5.AP.PD.04:** Communicate and explain program development to peers and adults using comments, presentations, and demonstrations. **NGSS 3-5 ETS1-1:** Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost. **ISTE1.4a:** Students know and use a deliberate design process for generating ideas, testing theories, creating innovative artifacts or solving authentic problems.
Synopsis: This unit will develop your students' engineering design skills as they investigate ways of defining problems, brainstorming solutions, and testing and refining prototypes. They'll refine their problem-solving skills as they create a solution to a problem that has constraints, and improve on others' ideas. All while honing their ability to identify failure points and success criteria when comparing, modifying, and evaluating a solution. Your students will improve their communication skills as they engage in a range of collaborative discussions about their solutions.	**Materials:** ● Teacher/instructor lesson plan ● Teacher/instructor Google Slides presentation ● Teacher computer with access to internet and teacher presentation ● Student computers with LEGO Education SPIKE App ● LEGO Spike Essential kit (one per two students) ● Printed building instructions (optional)

Activity 2: Tiny Taskmaster

School Solutions

Subject: STEAM, Engineering	**Topic or Unit of Study:** Engineering Design
Grade/Level: Grades 3-5	**Time Allotment:** 1.5 hours
Objectives: ● We will create a possible solution to a problem that has constraints. ● We will improve on others' ideas to develop a new program. ● We will engage effectively in a range of collaborative discussions.	**Standards:** **3-5.AP.A.01:** Develop, compare, and refine multiple algorithms for the same task and determine which algorithm is the most appropriate. **NGSS 3-5 ETS1-2:** 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. **ISTE1.4c:** Students develop, test and refine prototypes as part of a cyclical design process.
Synopsis: This unit will develop your students' engineering design skills as they investigate ways of defining problems, brainstorming solutions, and testing and refining prototypes. They'll refine their problem-solving skills as they create a solution to a problem that has constraints, and improve on others' ideas. All while honing their ability to identify failure points and success criteria when comparing, modifying, and evaluating a solution. Your students will improve their communication skills as they engage in a range of collaborative discussions about their solutions.	**Materials:** ● Teacher/instructor lesson plan ● Teacher/instructor Google Slides presentation ● Teacher computer with access to internet and teacher presentation ● Student computers with LEGO Education SPIKE App ● LEGO Spike Essential kit (one per two students) ● Printed building instructions (optional)

Activity 3: Futuristic Funpark

School Solutions

Subject: STEAM, Engineering	**Topic or Unit of Study:** Engineering Design
Grade/Level: Grades 3-5	**Time Allotment:** 1.5 hours
Objectives: ● We will use the design process to improve an existing object. ● We will develop, test, and refine prototypes as part of a design process. ● We will engage effectively in a range of collaborative discussions.	**Standards:** **3-5.AP.M.02:** Modify, remix, or incorporate portions of an existing program into one's own work, to develop or add more advanced features (grade-level appropriate). **NGSS 3-5 ETS1-2:** 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. **ISTE1.4c:** Students develop, test and refine prototypes as part of a cyclical design process.
Synopsis: This unit will develop your students' engineering design skills as they investigate ways of defining problems, brainstorming solutions, and testing and refining prototypes. They'll refine their problem-solving skills as they create a solution to a problem that has constraints, and improve on others' ideas. All while honing their ability to identify failure points and success criteria when comparing, modifying, and evaluating a solution. Your students will improve their communication skills as they engage in a range of collaborative discussions about their solutions.	**Materials:** ● Teacher/instructor lesson plan ● Teacher/instructor Google Slides presentation ● Teacher computer with access to internet and teacher presentation ● Student computers with LEGO Education SPIKE App ● LEGO Spike Essential kit (one per two students) ● Printed building instructions (optional)

4. Garbage Gobbler

School Solutions

Subject: STEAM, Engineering	**Topic or Unit of Study:** Engineering Design
Grade/Level: Grades 3-5	**Time Allotment:** 1.5 hours
Objectives: ● We will explore the benefits of automated solutions. ● We will refine a prototype as part of a cyclical design process. ● We will engage effectively in a range of collaborative discussions.	**Standards:** **3-5.AP.PD.01:** Use an iterative process to plan the development of a program by including others' perspectives and considering user preferences while solving simple problems. **NGSS 3-5 ETS1-1:** Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost. **ISTE1.5d:** Students develop and employ strategies for understanding and solving problems in ways that leverage the power of technological methods to develop and test solutions.
Synopsis: This unit will develop your students' engineering design skills as they investigate ways of defining problems, brainstorming solutions, and testing and refining prototypes. They'll refine their problem-solving skills as they create a solution to a problem that has constraints, and improve on others' ideas. All while honing their ability to identify failure points and success criteria when comparing, modifying, and evaluating a solution. Your students will improve their communication skills as they engage in a range of collaborative discussions about their solutions.	**Materials:** ● Teacher/instructor lesson plan ● Teacher/instructor Google Slides presentation ● Teacher computer with access to internet and teacher presentation ● Student computers with LEGO Education SPIKE App ● LEGO Spike Essential kit (one per two students) ● Printed building instructions (optional)

Extra Activity: Golazo!

School Solutions

Subject: STEAM, Engineering	**Topic or Unit of Study:** Engineering Design
Grade/Level: Grades 3-5	**Time Allotment:** 1.5 hours
Objectives: ● We will identify the failure points of a model or program. ● We will consider failure points in order to make improvements. ● We will engage effectively in a range of collaborative discussions.	**Standards:** **4.AP.M.01:** Decompose a large problem into smaller, manageable sub-problems to facilitate the program development process. **NGSS 3-5 ETS1-3:** Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved. **ISTE1.4d:** Students exhibit a tolerance for ambiguity, perseverance and the capacity to work with open-ended problems.
Synopsis: This unit will develop your students' engineering design skills as they investigate ways of defining problems, brainstorming solutions, and testing and refining prototypes. They'll refine their problem-solving skills as they create a solution to a problem that has constraints, and improve on others' ideas. All while honing their ability to identify failure points and success criteria when comparing, modifying, and evaluating a solution. Your students will improve their communication skills as they engage in a range of collaborative discussions about their solutions.	**Materials:** ● Teacher/instructor lesson plan ● Teacher/instructor Google Slides presentation ● Teacher computer with access to internet and teacher presentation ● Student computers with LEGO Education SPIKE App ● LEGO Spike Essential kit (one per two students) ● Printed building instructions (optional)

Extra Activity: Reading Randomizer

School Solutions

Subject: STEAM, Engineering	**Topic or Unit of Study:** Engineering Design
Grade/Level: Grades 3-5	**Time Allotment:** 1.5 hours
Objectives: ● We will define success criteria to help evaluate a solution. ● We will compare and contrast different solutions to determine which one meets the specified need.	**Standards:** **3.AP.C.01:** Create programs using a programming language that includes sequences, loops, conditionals, and variables to solve a problem or express an idea. **NGSS 3-5 ETS1-2:** 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. **ISTE1.4a:** Students know and use a deliberate design process for generating ideas, testing theories, creating innovative artifacts or solving authentic problems.
Synopsis: This unit will develop your students' engineering design skills as they investigate ways of defining problems, brainstorming solutions, and testing and refining prototypes. They'll refine their problem-solving skills as they create a solution to a problem that has constraints, and improve on others' ideas. All while honing their ability to identify failure points and success criteria when comparing, modifying, and evaluating a solution. Your students will improve their communication skills as they engage in a range of collaborative discussions about their solutions.	**Materials:** ● Teacher/instructor lesson plan ● Teacher/instructor Google Slides presentation ● Teacher computer with access to internet and teacher presentation ● Student computers with LEGO Education SPIKE App ● LEGO Spike Essential kit (one per two students) ● Printed building instructions (optional)