Activity 1: Learn, Drive, and Test!

Robot Ready, Set, Compete

Subject: STEAM, Engineering, Computer Science	**Topic or Unit of Study:** Engineering Design, Coding
Grade/Level: Grades 6-8	**Time Allotment:** 2 hours
Objectives: ● We will explore the components of the LEGO Spike Prime kits. ● We will identify the purposes of the sensors. ● We will explore the basics of the SPIKE Prime App. ● We will connect the robot to the SPIKE Prime App.	**Standards:** **MS-ETS1-1:** Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions. **MS-ETS1-4:** Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved. **ISTE1.4A:** Students know and use a deliberate design process for generating ideas, testing theories, creating innovative artifacts or solving authentic problems. **ISTE1.4B:** Students select and use digital tools to plan and manage a design process that considers design constraints and calculated risks. **ISTE1.4C:** Students develop, test and refine prototypes as part of a cyclical design process. **ISTE1.7:** Students use digital tools to broaden their perspectives and enrich their learning by collaborating with others and working effectively in teams locally and globally. **2-CS-01 6-8:** Recommend improvements to the design of computing devices, based on an analysis of how users interact with the devices.
Synopsis: In this unit, your students will be introduced to the world of robotics competitions as they gradually learn the basics of building and programming autonomous robots using sensors. Working together to build an effective competition robot, they'll systematically test and refine programs, using the design process to develop a solution in order to complete missions, all the while developing skills related to collaboration and teamwork, and life skills for their future careers.	**Materials:** ● Teacher/instructor lesson plan ● Teacher/instructor Google Slides presentation ● Teacher computer with access to internet and teacher presentation ● Student computers ● LEGO Spike Prime kit (one per two students)

Activity 2: Detecting Lines

Robot Ready, Set, Compete

Subject: Engineering, Computer Science	**Topic or Unit of Study:** Engineering Design, Coding
Grade/Level: Grades 6-8	**Time Allotment:** 2 hours
Objectives: ● We will program our Driving Bases to stop at a black line. ● We will program our Driving Bases to follow a black line. ● We will assemble a competition-ready Driving Base. ● We will clearly present the main features of our Driving Base. ● We will use effective teamwork.	**Standards:** **MS-ETS1-1:** Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions. **MS-ETS1-4:** Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved. **2-AP-12 6-8:** Design and iteratively develop programs that combine control structures, including nested loops and compound conditionals. **2-CS-01 6-8:** Recommend improvements to the design of computing devices, based on an analysis of how users interact with the devices. **CCSS.ELA-LITERACY.SL.6.4:** Present claims and findings, sequencing ideas logically and using pertinent descriptions, facts, and details to accentuate main ideas or themes; use appropriate eye contact, adequate volume, and clear pronunciation.
Synopsis: In this unit, your students will be introduced to the world of robotics competitions as they gradually learn the basics of building and programming autonomous robots using sensors. Working together to build an effective competition robot, they'll systematically test and refine programs, using the design process to develop a solution in order to complete missions, all the while developing skills related to collaboration and teamwork, and life skills for their future careers.	**Materials:** ● Teacher/instructor lesson plan ● Teacher/instructor Google Slides presentation ● Teacher computer with access to internet and teacher presentation ● Student computers ● LEGO Spike Prime kit (one per two students) ● Black electrical tape (taped down on light- or white-colored surface) ● LEGO building instructions

Code

Robot Ready, Set, Compete!

Subject: STEAM, Engineering, Computer Science	**Topic or Unit of Study:** Engineering Design, Coding
Grade/Level: Grades 6-8	**Time Allotment:** 2 hours
Objectives: ● We will use My Blocks to help organize our programs. ● We will give a presentation to an adult in which we clearly describe how our program works.	**Standards:** **MS-ETS1-4:** Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved. **CCSS.MATH.CONTENT.7.G.B.4:** Know the formulas for area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle. **CCSS.ELA-LITERACY.W.6.1:** Write arguments to support claims with clear reasons and relevant evidence.
Synopsis: In this unit, your students will be introduced to the world of robotics competitions as they gradually learn the basics of building and programming autonomous robots using sensors. Working together to build an effective competition robot, they'll systematically test and refine programs, using the design process to develop a solution in order to complete missions, all the while developing skills related to collaboration and teamwork, and life skills for their future careers.	**Materials:** ● Teacher/instructor lesson plan ● Teacher/instructor Google Slides presentation ● Teacher computer with access to internet and teacher presentation ● Student computers ● LEGO Spike Prime kit (one per two students) ● LEGO Spike Prime expansion kit (one per two students) ● Building instructions (one per two students) ● Rulers

Mission Prep

Robot Ready, Set, Compete

Subject: STEAM, Engineering, Computer Science	**Topic or Unit of Study:** Engineering Design, Coding
Grade/Level: Grades 6-8	**Time Allotment:** 4 hours
Objectives: ● We will demonstrate our skills by solving a timed competition challenge.	**Standards:** **MS-ETS1-4:** Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved. **2-AP-11 6-8:** Create clearly named variables that represent different data types and perform operations on their values. **2-AP-14 6-8:** Create procedures with parameters to organize code and make it easier to reuse. **2-AP-19 6-8:** Document programs in order to make them easier to follow, test, and debug. **CCSS.ELA-LITERACY.W.6.1:** Write arguments to support claims with clear reasons and relevant evidence.
Synopsis: In this unit, your students will be introduced to the world of robotics competitions as they gradually learn the basics of building and programming autonomous robots using sensors. Working together to build an effective competition robot, they'll systematically test and refine programs, using the design process to develop a solution in order to complete missions, all the while developing skills related to collaboration and teamwork, and life skills for their future careers.	**Materials:** ● Teacher/instructor lesson plan ● Teacher/instructor Google Slides presentation ● Teacher computer with access to internet and teacher presentation ● Student computers ● LEGO Spike Prime kit (one per two students) ● LEGO Spike Prime expansion kit (one per two students) ● Crate building instructions (one per two students) ● Game module building instructions (one per two students) ● Line module building instructions (one per two students) ● Markers building instructions (one per two students) ● Python coding instructions (one per two students) ● Scoring rubrics (one per every two students)

7. Level Up

Robot Ready, Set, Compete

Subject: STEAM, Engineering, Computer Science	**Topic or Unit of Study:** Engineering Design, Coding
Grade/Level: Grades 6-8	**Time Allotment:** 2 hours
Objectives: ● We will create two tools for the Advanced Driving Base. ● We will explore how to program the Advanced Driving Base to use the tools to complete tasks.	**Standards:** **MS-ETS1-4:** Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved. **2-AP-17 6-8:** Systematically test and refine programs using a range of test cases. **CCSS.ELA-LITERACY.W.6.1:** Write arguments to support claims with clear reasons and relevant evidence.
Synopsis: In this unit, your students will be introduced to the world of robotics competitions as they gradually learn the basics of building and programming autonomous robots using sensors. Working together to build an effective competition robot, they'll systematically test and refine programs, using the design process to develop a solution in order to complete missions, all the while developing skills related to collaboration and teamwork, and life skills for their future careers.	**Materials:** ● Teacher/instructor lesson plan ● Teacher/instructor Google Slides presentation ● Teacher computer with access to internet and teacher presentation ● Student computers ● LEGO Spike Prime kit (one per two students) ● LEGO Spike Prime expansion kit (one per two students) ● Dozer building instructions (one per two students) ● Lift arm building instructions (one per two students) ● Python coding instructions