Lesson Plan 2-First LEGO ® League "White Energy Journey"

Due: November 15, 2022 (original due date, Sept. 15, 2022)

Lesson 'Hook":

Students will enter the room to 4 tables, or stations. On each station, there will be a LEGO SPIKE set with bags of LEGO's on the tables. On the SmartBoard (located in the front of the room) will be introductory videos playing from the LEGO Education YouTube account.

Grade: 7th & 8th Grade (Middle School)

Content Area: Computer Science & Robotics

Club/Activity: McCormick Junior High School Robotics & Computer Science Club (after school activity)

Lesson Activity/Subject: Computer Science, Engineering, Critical Thinking, Problem Solving

CS Domains: Computing Systems-Devices (D), Hardware & Software (HS), and Troubleshooting (T)

NGSS: Next Generation Science Standards

- **MS-LS1-1:** Conduct an investigation to produce data to serve as the basis for evidence that meet the goals of an investigation (Grades 6 - 8)
- Use mathematical representations to describe and/or support scientific conclusions and design solutions (Grades 6 - 8)
- **MS-ETS1-3:** Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

Materials: LEGO SPIKE Education, LEGO SPIKE PRIME App, First Lego League Engineering Notebooks, SmartBoard, iPad or tablet (to access individual project build guides/instructions)

Background Knowledge: LEGO assembly, following detailed directions, construction, troublesthooting design errors, Problem Solving, Critical Thinking, basic coding

Lesson Description: Students will work independently to design a 'driving base' using the SPIKE PRIME LEGO sets. Upon completion of the base students will develop the code to drive the base around the LEGO SuperPowered map. Students will have to problem solve to find errors in code and re-program their driving bases to allow their model to follow the most accurate and direct

path around the map.

Key Objectives

After this activity, students should be able to:

- Work as a team to learn how to connect and use the sensors and motors contained in the LEGO SPIKE PRIME building sets
- Build a simple driving base using LEGO ® SPIKE PRIME materials
- Explain and describe their models before and after construction
- Draw or sketch their models prior to beginning construction
- Design model changes to make the driving base more effective, faster, or accurate and record changes in their Engineering Notebook
- Describe and make connections from the mission models to the 'White Energy Journey Project SPARK' ideas

Deliverables

After this lesson students will be able to research ideas about energy challenges that exist in different areas of the world (solar, nuclear, coal, wind, etc.) They will be able to problem-solve solutions both individually and as teams and record their solutions about innovations that could solve their identified energy challenges and record these changes in their Engineering Notebooks.

After this lesson students will be able to build a working model of a driving base and place the model on the mat in the correct location with Dual Lock squares according to the field setup in the First LEGO League Challenge Rulebook ®.

Students will be able to use block coding to program their driving base to maneuver around the mat and make changes or edits to their code to make their driving base more accurate.

Pre-Questions

1. Looking at your rule book, identity missions that could be solved with the coding skills learned in this lesson/project
2. What do you know about energy?
3. What are resources available to you that could help you learn more about different energy sources and their uses in various parts of the world?
4. How could stopping a motor help you solve a mission with your robot?

Post Questions

1. What 'Innovation Project' ideas do the mission models spark?
2. What are the pros and cons of the different parts of the white energy journey?

Procedure

Background Information

Students should have some information and background knowledge of natural resources and energy needs around the world. They need to know that renewable energy comes from energy sources found in our world that will never run out.

Class Discussion Prompts:

1. What is renewable energy?
2. What types of renewable energy can we use in our community/state?
3. What types of renewable energy exist in other areas of the world?
4. What technologies exist that allow us to capture and store energy from these renewable resources?
5. What are some technologies that we could develop to harness these energies in the future?

Teacher Duty/Task-Before the Activity

1. Prior to this activity the teacher should ensure the FIRST LEGO ® League YouTube channel is pulled up on the classroom screen (SmartBoard, Promethean, etc.)
2. Ensure all students have their own copies of the FIRST LEGO League Challenge Engineering Notebook
3. Ensure all students have access to a personal device to use for coding their robot and one additional device to follow project directions and record their project work.
4. Ensure all students have an account and can access the LEGO Education SPIKE Prime app (™)
5. The night before, make sure all controllers and devices are plugged in and charging
6. Guiding question/Essential Question: *" Think about how a sensor could be helpful to get the robot to stop in the right place to engage with a mission model on the mat"*

During Lesson-With the Students (1-2 hour session)

1. Have students access the FIRST LEGO ® League Challenge videos on the FIRST LEGO ® League YouTube Channel
2. After videos, have each student individually read pages 3-9 in their Engineering Notebooks on how the LEGO Challenge works (10-15 minutes)

3. After videos and reading, have students open the SPIKE (™) Prime app (this should already be downloaded, or added, and ready for them to use) and go to Lesson 1
4. Students should identify the missions that could be solved with the coding skills learned in the lesson. Have students record their own ideas in their Engineering Notebook.
5. Students should use digital building instructions from books 4, 7, and 8 and models in bags 4, 7, and 8 from the Challenge set.
6. Determine code and building skills that students can apply in the Robot Game
7. After construction, students should place their models on the mat and show how thor models work and see if they can use their code to drive the robot to one of the mission models.