3. Cave Car

LEGO Spike Essential - Great Adventures

Subject: STEAM, Computer Science	**Topic or Unit of Study:** Computational Thinking, Coding
Grade/Level: Grades 1-2	**Time Allotment:** 1.5 hours
Objectives: ● We will describe a program's sequence of events, goals, and expected outcome. ● We will explore objects that can be seen if light is available.	**Standards:** **MD 2.AP.C.01:** Create programs using a programming language that utilize sequencing and repetition to solve a problem or express creative ideas. **NGSS 1-PS4-2:** Make observations to construct an evidence-based account that objects in darkness can be seen only when illuminated. **ISTE 1.5d:** Students understand how automation works and use algorithmic algorithmic thinking to develop a sequence of steps to create and test automated solutions.
Synopsis: This unit introduces your students to computational thinking. They'll begin to understand what a sequence is, be able to follow instructions to create a sequence, and describe the sequence to their peers. They'll learn how to break problems down into smaller parts, identify cause and effect, and understand simple loops. Finally, they'll explore the process of testing and debugging programs to ensure that their programs work as intended.	**Materials:** ● Teacher/instructor lesson plan ● Teacher/instructor Google Slides presentation ● Teacher computer with access to internet and teacher presentation ● Student computers ● LEGO Spike Essential kit (one per two students) ● Paper copies of Building Instructions (optional)

SLIDE 2:

Display the RoboMasters info. Allow students/guardians time to scan the QR code for website access.

SLIDE 3:

Share basic definitions for the following words: *challenge, change, program, push,* and *robot.*

- *Cave:* a hole in the Earth
- *Dark:* Having little or no light
- *Light:* Energy that makes it possible for the eye to see
- *Sequence:* a process in which one thing follows another
- *Try:* attempt

SLIDE 4:

Review the Engineering Design Process with students.

SLIDE 5:

Facilitate a quick discussion about helping a friend when they have a problem.

Some facilitation suggestions are listed below:

- Talk with your students about what they could do for a friend who needs help seeing in the dark.
- Ask questions, like:
    - What could you do to help a friend see something in the dark?
    - How would you describe what you're doing to help?

SLIDE 6-7:

Introduce your students to Daniel (using the minifigure bios) and the challenge: turning on the cave car's light.

SLIDE 8:

Share the SOARing expectations for the LEGO kits.

SLIDE 9:

Distribute a LEGO Essentials set to each pair of students.

Teacher/Instructor Note: It would be best to have pairs pre-selected.

SLIDE 10:

Have students open the LEGO Education SPIKE Essential App.

- Open the app
- Click SPIKE Essential
- Click Unit Plans
- Click Great Adventures
- Click Cave Car

SLIDE 11:
Students will read/listen to slides 1 through 3:

1. Daniel finds a dark cave.
2. Daniel wants to know what's in the cave. It's too dark to see inside.
3. Build the cave car. It'll help light up the cave.

SLIDE 12:
Tell students that they are now going to build their cave car. Explain to students that if they do not follow each direction exactly as shown, their vehicle will not work properly.

SLIDES 13-29:
On Step 4, students will go through all seventeen building steps in pairs using their Spike Essentials kits.

Circulate the instructional space to ensure students are building correctly.

Teacher/Instructor Note: There is a picture of each building step on a separate slide in the presentation.

SLIDE 30:
Step 5 provides students with today's challenge: make the program that turns on the cave car's light.

SLIDE 31:
Step 6 has students connect their Hubs to the Spike Essentials App using the white USB cable.

Pictures are included on the slide of where to connect the cable into the Lego hub.

SLIDE 32:
Students will begin their coding sequence. The App is interactive and shows students exactly which coding blocks to drag into the work area.

They will end up with this sequence:

SLIDE 33:
Students will click the yellow PLAY button when directed to, to test their program.

Ask students, "What happened? How can we modify our builds to be more successful?"

Teacher/Instructor Note: Students will hopefully identify they need their lights to be on for longer than one second. They will also need their car to move forward.

SLIDE 34:

Review the Engineering Design Process with students.

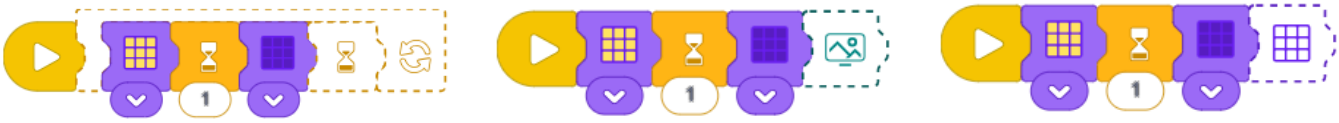
Ask them what steps they have completed thus far, and what steps they still need to complete.

SLIDES 35 and 36:

Have the students iterate and test their models to complete the next challenge in the app:

- Change the program for Daniel's next trip.

Sample Program:



SLIDE 37:

Provide students with time to modify and re-test.

SLIDE 38:

Host a debrief discussion to reflect on the completed challenges. Ask questions like:

- What was Daniel's goal in the story?
- What happened to the light after you made a program for it?

SLIDE 39:

Prompt your students to discuss and reflect as they describe the process of creating a program to solve a problem..

Ask questions like:

- What did you expect would happen when you changed the program for the light?
- Did your light do what you expected?
- How would you describe what you did to change the light?

SLIDE 40:

Display the RoboMasterminds info. Allow students/guardians time to scan the QR code for website access.

SLIDE 41:

Ask students, "How does today's activity connect to robotics?"

SLIDE 42:

Provide students with ample clean-up time, helping to ensure they are separating all pieces and placing them back appropriately.