4. Animal Alarm
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 develop a program to solve a problem.	**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-PS4-4:** Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance. **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: *alarm, cause, Color Sensor, creature, effect,* and *react.*

- *Alarm:* a bell, buzzer, or siren that warns of danger
- *Cause:* Something that makes something else happen
- *Color Sensor:* Detects the light of objects
- *Creature:* A living person or animal
- *Effect:* A result
- *React:* To act or feel a certain way

SLIDE 4:

Review the Engineering Design Process with students.

SLIDE 5:

Facilitate a quick discussion about cause and effect.

Some facilitation suggestions are listed below:
- Talk with your students about what happens when an alarm (e.g., fire alarm, alarm clock, cell phone alert) goes off.
- Ask questions, like:
  - What would happen if you heard an alarm going off?
  - What would you think is happening?

SLIDE 6-7:

Introduce your students to Leo (using the minifigure bios) and the challenge: turning on the animal alarm.

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 Animal Alarm

SLIDE 11:

Students will read/listen to slides 1 through 3:

1. Leo is sleepy. It's time to go to bed.
2. But Leo is curious. He wants to see all the creatures that walk by his camp at night.
3. Build an animal alarm. It'll turn on when a blue creature walks by the Color Sensor.

SLIDE 12:

Tell students that they are now going to build their animal alarm. Explain to students that if they do not follow each direction exactly as shown, their alarm will not work properly.

SLIDES 13-40:

On Step 4, students will go through all twenty-eight 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 41:

Step 5 provides students with today's challenge: make and try the program that turns on the alarm when a blue creature walks by the Color Sensor.
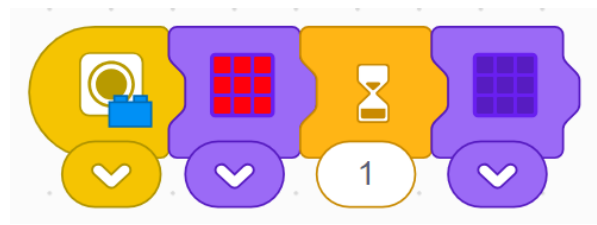
SLIDE 42:

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 43:

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 44:

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 can say that they will have the light matrix change different colors or make a sound when the color sensor detects a blue creature.
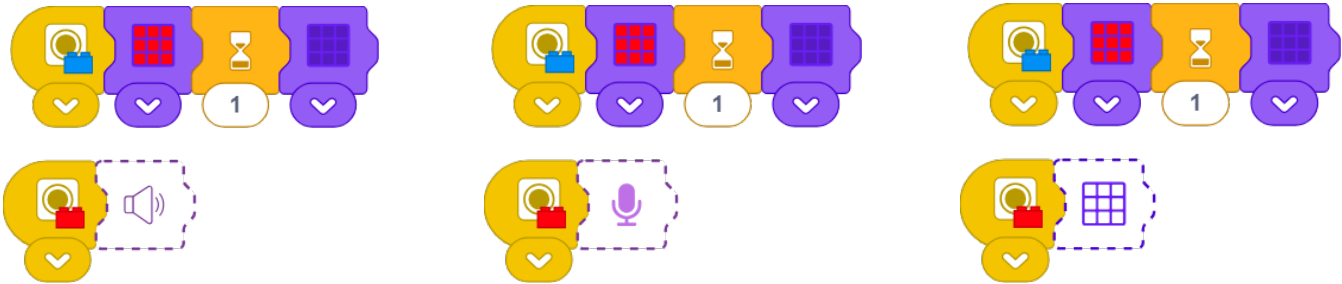
SLIDE 45:

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 46 and 47:

Have the students iterate and test their models to complete the next challenge in the app:
- Change the program to react when a red creature walks by.

Sample Programs:

SLIDE 48:

Provide students with time to modify and re-test.

SLIDE 49:

Host a debrief discussion to reflect on the completed challenges. Ask questions like:
- ❖ What happened when a blue creature walked by the alarm?
- ❖ How did you change the alarm to react when a red creature walked by?

SLIDE 50:

Prompt your students to discuss and reflect on cause and effect.

Ask questions like:
- ❖ Where do you see cause and effect happening around you?
- ❖ Why is it important to predict cause and effect?

SLIDE 51:

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

SLIDE 52:

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

SLIDE 53:

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