5. Underwater Quest
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 understand that an action can be repeated. ● We will develop programs that use simple loops (repetitions) to address 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 K-2-ETS 1-2:** Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem. **ISTE 1.5a:** Students formulate problem definitions suited for technology-assisted methods such as data analysis, abstract models and algorithmic thinking in exploring and finding 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: *loop, submarine, turtle,* and *underwater*.
- *Loop:* a set of instructions a computer program repeats over and over again
- *Submarine:* A sea vessel that can travel under water
- *Turtle:* A reptile with a soft body covered by a hard shell that lives in water or on land
- *Underwater:* Below the water's surface

SLIDE 4:

Review the Engineering Design Process with students.

SLIDE 5:

Facilitate a quick discussion about a time when your students had to repeat an action over and over in order to complete a task.

Some facilitation suggestions are listed below:
- Talk with your students about how they need to move their bodies in order to swim.
- Ask questions, like:
    - What do your arms and legs do when you're swimming?
    - What else do you need to do to keep your body moving in the water?

SLIDE 6-7:

Introduce your students to Maria (using the minifigure bios) and the challenge: getting the submarine to move.

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 Underwater Quest

SLIDE 11:

Students will read/listen to slides 1 through 3:
1. Maria is at the beach. She sees a turtle go into the water.
2. Maria wants to visit the turtle under the water.
3. Build a submarine. Maria can use it to visit the turtle.

SLIDE 12:

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

SLIDES 13-35:

On Step 4, students will go through all twenty-three 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 36:

Step 5 provides students with today's challenge: make the program that moves the submarine.
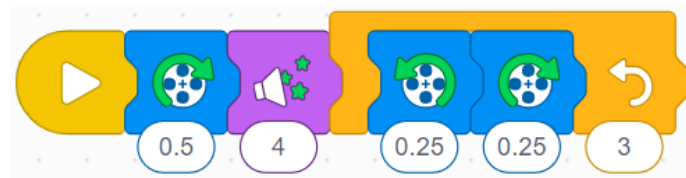
SLIDE 37:

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 38:

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 39:

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 may say they want their submarines to move in different ways, or add to their submarine designs.

SLIDE 40:

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 41 and 42:

Have the students iterate and test their models to complete the next challenge in the app:
- Change the program submarine for Maria's next trip.
- Show students the pictures below to spark their imaginations as they experiment and change their models

SLIDE 43:

Provide students with time to modify and re-test.

SLIDE 44:

Host a debrief discussion to reflect on the completed challenges. Ask questions like:
- ❖ How did the submarine move?
- ❖ How did you make the submarine repeat its movement?

SLIDE 45:

Prompt your students to discuss and reflect on ways of using loops or a program with repeated movement.

Ask questions like:
- ❖ How do you think programming the submarine with using a loop made it easier for Maria to visit the turtles?
- ❖ Why do you think it was helpful to program the submarine using a loop?

SLIDE 46:

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

SLIDE 47:

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

SLIDE 48:

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