Activity 1: Boat Trip
LEGO Spike Essential - Great Adventures

Subject: STEAM, Computer Science, Storytelling	Topic or Unit of Study: Computational Thinking, Coding
Grade/Level: Grades 1-2	Time Allotment: 1.5 hours
Objectives: ● We will follow instructions to create a program. ● We will identify the main characters in a story. ● We will practice helping a story character. ● We will participate in collaborative conversations.	Standards: MD 2.AP.A.01: Model daily processes and follow basic algorithms (step-by-step lists of instructions) to complete tasks verbally, kinesthetically, via a programming language, or using a device. NGSS K-2 ETS 1-1: Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool. 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: *challenge, change, program, push,* and *robot.*
- *Challenge:* a difficult problem or task
- *Change:* to make different
- *Program:* a sequence of steps that allows a computer to perform a task
- *Push:* to use pressure against in order to move
- *Robot:* a machine that can perform some of the tasks as a human being

SLIDE 4:

Review the Engineering Design Process with students.

SLIDE 5:

Facilitate a quick discussion about following a plan to complete an activity.

Some facilitation suggestions are listed below:
- Talk with your students about how they'd put on clothing to go outside.
- Ask questions, like:
  - What would you do first?
  - What would you do next?

SLIDE 6-10:

Introduce your students to the story's main characters (using the LEGO minifigure bios) and the challenge: pushing the boat into the water.

SLIDE 11:

Share the SOARing expectations for the LEGO kits.

SLIDE 12:

Distribute a LEGO Essentials set to each pair of students.

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

SLIDE 13:

Have students open the LEGO Education SPIKE Essential App.
- Open the app
- Click SPIKE Essential
- Click Unit Plans
- Click Great Adventures
- Click Boat Trip

SLIDE 14:

Students will read/listen to slides 1 through 3:

1. Maria and Sofie are going on a boat trip!
2. Sofie wonders how the boat will get into the water.
3. Build the robot. It pushes the boat into the water.

SLIDE 15:

Explain Newton's First Law of Motion to students using the statements and the video clip.

Ask students, "How do you think this relates to today's LEGO boat activity?"

SLIDE 16:

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

SLIDES 17-38:

On Step 4, students will go through all twenty-two 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 39:

Step 5 provides students with today's challenge: make the program that pushes the boat into the water.
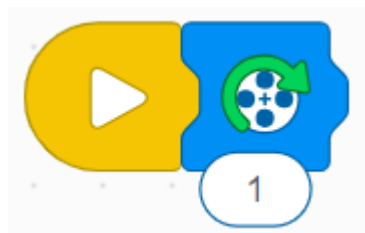
SLIDE 40:

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 41:

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 43:

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 boat to be against the arm that's connected to the motor, to move the boat the farthest.

SLIDE 44:
Have the students iterate and test their models to complete the next challenge in the app:
- Modify the program to make the movement of the boat better/more interesting.

Sample Improvements:

SLIDE 45:
Provide students with time to modify and re-test.

SLIDE 46:
Host a debrief discussion to reflect on the completed challenges. Ask questions like:
- ❖ What's the first thing you did to get the boat into the water?
- ❖ How did you change the program to make the robot better?

SLIDE 47:
Prompt your students to discuss and reflect on the process of following instructions.

Ask questions like:
- ❖ Why is it important to follow instructions?
- ❖ What happens if the steps are out of order?

SLIDE 48:
Display the RoboMasters info. Allow students/guardians time to scan the QR code for website access.

SLIDE 49:
Ask students, "How does today's activity connect to robotics?"

SLIDE 50:
Provide students with ample clean-up time, helping to ensure they are separating all pieces and placing them back appropriately.