

3. High Stick Hockey

LEGO Spike Essential - Crazy Carnival Games

Subject: STEAM, Science	Topic or Unit of Study: Energy, Energy Transfer
Grade/Level: Grades 3-5	Time Allotment: 1.5 hours
Objectives: <ul style="list-style-type: none">● We will observe and describe how energy can be transferred.● We will predict how energy moves from place to place.● We will engage effectively in a range of collaborative discussions.	Standards: <p>4-PS3-2: Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.</p> <p>CSTA.1B.AP.10: Create programs that include sequences, events, logos, and conditionals.</p> <p>ISTE 1.3d: Students build knowledge by actively exploring real-world issues and problems, developing ideas and theories, and pursuing answers and solutions.</p> <p>CCSS.ELA-LITERACY.SL.4.1: Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led), building on others' ideas and expressing their own clearly.</p>
Synopsis: <p>This unit will develop your students' understanding of energy, energy transfer, and collision. They'll explore ways of using observation skills as they anticipate the outcomes of changes in energy during a collision, describe the relationship between energy and speed, and predict how energy moves from place to place. They'll also broaden their understanding of energy conversion (potential and kinetic) by investigating a solution that converts energy from one form to another, testing the solution to improve and refine its function.</p>	Materials: <ul style="list-style-type: none">● 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)● Building instructions (optional)

SLIDE 2:

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

SLIDE 3:

Have students brainstorm a list of sports where a ball has to hit something.

SLIDE 4:

Facilitate a quick discussion about ways of finding evidence that energy can be transferred from place to place, by asking “What happens when a ball is thrown against a wall and ricochets off?”

Ask follow-up questions as necessary:

- What happens to the ball when it ricochets off the side of the wall?
- What happens to the wall?
- What happens to the ball?

SLIDE 5:

Introduce your students to Maria (using the LEGO minifigure bios) and today’s challenge: seeing how many goals they can score while playing the hockey game.

SLIDE 6:

Share the SOARing expectations for the LEGO kits.

SLIDE 7:

Distribute a Prime Essentials set to each pair of students.

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

SLIDE 8:

Have students open the LEGO Education SPIKE Essential App.

- Open the app
- Click SPIKE Essential
- Click Unit Plans
- Click Crazy Carnival Games
- Click High Stick Hockey

SLIDE 9:

Students will read/listen to slides 1 through 3.

1. Maria is excited to try the hockey game simulator.
2. Maria wants to find out how many goals she can score.
3. Build a hockey game like Maria’s. See how many goals you can score.

SLIDE 10:

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

SLIDES 11-34:

On Step 4, students will go through all twenty-four 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 35:

Step 5 provides students with today’s challenge: create the program for the hockey game. How many goals can you score in three tries?

SLIDE 36:

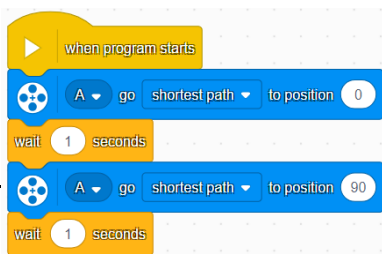
Step 6 has students connect their Hubs to the Spike Essentials App using the white USB cable.

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

SLIDE 37:

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 38:

Students will click the yellow PLAY button when directed to test their program.

Ask students, “What happened? How can we modify our code to be more successful?”

Teacher/Instructor Note: Students should notice the obstacle stays in front of the goal when the sequence is over, but it needs to constantly move back-and-forth.

SLIDE 39:

Provide students with time to modify and re-test their codes to get the ball into the “goal”.

Teacher/Instructor Note: Students will need to add the “repeat” block around several coding blocks to end up with this sequence:

```

when program starts
repeat (10)
  A go shortest path to position 0
  wait 1 seconds
  A go shortest path to position 90
  wait 1 seconds

```

SLIDE 40:

After the students complete this challenge, they'll be provided with three Inspiration Coding Blocks to help them modify their programs.

The Inspiration Coding Blocks are intended to spark their imaginations as they experiment to find their own solutions.

```

when program starts
  A go shortest path to position 0
  wait 1 seconds
  A go shortest path to position 90
  wait 1 seconds
  sound

```

```

when program starts
  repeat
    A go shortest path to position 0
    wait 1 seconds
    A go shortest path to position 90
    wait 1 seconds

```

```

when program starts
  A go shortest path to position 0
  wait random seconds
  A go shortest path to position 90
  wait random seconds

```

SLIDE 41:

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

- ❖ How did you program the hockey game to score a goal?
- ❖ How did the energy being transferred from the hockey stick to the ball impact the ball's motion?
- ❖ How was the energy of the ball impacted when it collided with the wall?

SLIDE 42:

Prompt your students to discuss and reflect on the importance of observing and understanding how energy transfers.

Ask questions like:

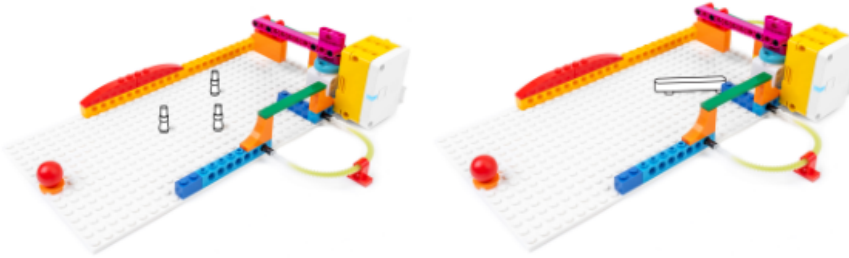
- ❖ How can you use your knowledge about energy transfer to help score more points?
- ❖ In what other games do you see energy being transferred from place to place?

SLIDE 43:

Provide your students with ample time to complete these two challenges:

1. Modify the program to make the hockey game more fun.

2. Upgrade the hockey game to make it harder to score. Some suggestions:



Teacher/Instructor Note: There are no building instructions for the challenge.

SLIDE 44

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

SLIDE 45:

Ask students, “How does today’s activity connect to robotics?”

SLIDE 46:

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