

LEGO SPIKE KIT CAROUSEL PROTOTYPE

Course Name: STEAM Lab

Time Frame (in minutes): 40 Minutes

Unit/Theme: Engineering/Design Thinking & Computational Thinking **Grade Level: 2-3**

CONTENT AND SKILLS
Learning Objectives: • Students will collaborate to produce a model of a carousel. • Students will create a block code on their iPads to make the carousel function. • Students will make structural improvements and coding refinements to improve on their design prototype. • Students will communicate their process and reflections by participating in a whole class debrief session.
Essential Questions: • How can I create a functioning model of a carousel and then create iterations to improve my original design in structure and with code?
Students I can statements . . . • I can interpret directions to build a prototype of a carousel. • I can create a code to make the carousel function. • I can communicate and compromise with my partner. • I can rethink my ideas to improve my design.
How will you meet the needs of SWD and ELL/MLL students? • Modifications and accommodations according to individualized programs and 504s will be met • Partner/group work • Visuals
Content Standards List all standard indicators (do not need standard statement)
• NGSS 3-5-ETS 1-2: Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem. • 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. • 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.
NYS Computer Science and Digital Fluency Standards List all standards that authentically align
• 2-3.CT.4 Identify multiple ways that the same problem could be decomposed into smaller steps

- 2-3.CT.5 Identify the essential details needed to perform a general task in different settings or situations
- 2-3.CT.6 Create two or more algorithms for the same task.
- 2-3.CT.7 Name/label key pieces of information in a set of instructions, noting whether each name/label refers to a fixed or changing value.
- 2-3.CT.8 Identify steps within a task that should only be carried out under certain precise conditions.
- 2-3.CT.9 Identify and debug errors within an algorithm or program that includes sequencing or repetition
- 2-3.NSD.3 Describe and attempt troubleshooting steps to solve a simple technology problem.
- 2-3.NSD.4 Recognize that information can be communicated using different representations that satisfy different rules

NYS SEL BENCHMARKS

<https://www.p12.nysed.gov/sss/documents/SELBenchmarks2022.pdf>

- 1C.2a. Set a short term goal and begin working toward it.
- 1C.2b. Identify steps in working toward a goal.
- 2B.2b. Demonstrate ability to communicate across a variety of groups.
- 2C.2b. Engage in strategies to work effectively and cooperatively across lines of difference.
- 3B.2a. Identify and apply decision making steps that consider impact on self and others.
- 3B.2b. As part of a decision-making approach, generate multiple solutions and evaluate the impact on self and others for a range of academic and social situations and in multiple contexts.

INSTRUCTIONAL PLAN

List the steps of the lesson, including instructions for the students including how they will construct and practice content knowledge.

Add Standard Indicators next to activity that aligns and highlight them.

Introduction:

- Introduce students to SPIKE Essential Lego kits.
 - Introduce the “hub”: a programmable control unit to which LEGO sensors and motors can be attached. The block code we create on our ipads will be transmitted to the hub via Bluetooth and instruct the hub what action to complete. Students will understand that every battery hub is its own power source and that they need to connect to the correct one to ensure their data is being transferred to their own device (and not others). If students are not familiar with Bluetooth, describe how bluetooth transmits information between devices without cables using ultra-high frequency radio waves. 2-3.NSD.4. Discuss possible solutions to connectivity issues that may arise. 2-3.NSD.3
- Introduce Task/I Can Statements
 - Use photos of “carousels” (Google Slides - linked in resources) to ensure student background knowledge. What are the essential elements that make a carousel function and how might we mimic this motion with Lego kits?

- Facilitate a quick discussion about making improvements.
 - Talk with your students about going (or planning to go) to an amusement park and wanting to make a fun ride even better.
 - Ask questions, like: What would you do if you had the chance to change a ride? How could you improve it?
- Introduce the SPIKE iPad App. Demonstrate how to navigate to the desired lesson (Unit Plans- Amazing Amusement Park- Classic Carousel: linked in resources). Watch the animated introduction about Minifigure Sofie, and discuss the challenge: creating a model of a carousel and creating a code to make the carousel spin.
- Distribute a brick set and iPad to each group.

Students Create:

- Students will collaborate to follow the build directions of the “Classic Carousel” lesson, on the SPIKE iPad application. Discuss how the Master Lego Builders decomposed the build into smaller steps **2-3.CT.4**
- Students will then program a simple block code algorithm to make the carousel spin. If students need assistance, remind them that “order is important” in coding sequences. Test codes and debug if necessary. **2-3.CT.4, 2-3.CT.5, 2-3.CT.9**

Students Innovate:

- After students have solved the initial challenge, students will use additional legos and coding blocks to make changes to their builds in order to improve, alter, or personalize their carousel. For example, making structural changes, adding coding blocks to control speed & rotations, changing variables within the block code, and adding music within the code. Students may attempt multiple sequences of coding steps that solve the challenge. **2-3.CT.4, 2-3.CT.6, 2-3.CT.7, 2-3.CT.8, 2-3.CT.9**
 - Teacher: consider documenting collaboration and end products with iPad (to use as references for debrief at the end of the lesson)
- Teacher: While monitoring student work, identify and anticipate any coding or connectivity issues and help students to solve problems in real time. **2-3.NSD.3 2-3.NSD.4 2-3.CT.9**

Gallery Walk:

- Students will circulate around the room to observe examples of how other groups solved this challenge. **2-3.CT.4**

Clean Up: Students return all Lego pieces to appropriate locations within the kit.

Debrief:

- Glow and Grow (Google Slide linked in resources)
 - What did we do well?
 - Where can we improve?
 - Discuss and reflect on the process of making improvements and refinements. **2-3.CT.6**
 - Discuss and reflect on changing variables. (Which structures and coding settings would a ride operator utilize for younger kids? Which structures and coding settings would be appropriate for older, adventure seeking kids?) **2-3.CT.8**
- Revisit the “I Can” statements for this lesson. (Google Slide linked in resources) Use photos taken during lesson (or experiences observed) to find evidence that these statements have been met or need more time to develop within the debrief discussion.

Although guided by the teacher, students will lead the debrief discussion.

FUTURE READY COMPETENCIES

Check off each competency that students will interact with during this lesson.

- ☒ Collaboration
- ☒ Communication
- ☒ Critical Thinking/Problem Solving
- ☒ Creativity & Innovation

MATERIALS / RESOURCES

Add additional resources needed for this lesson such as instructional technology templates, images, videos, etc. ***Including Instructional Technology Tools***

- 12 LEGO Education SPIKE Essential Sets (link to Lego Edu products [HERE](#))
- Lego Spike Education App downloaded onto 12 iPads/devices
- [Google Slides Presentation](#)