

Relay Race

Design, build, and test mechanisms that can pass objects to a teammate, creating a fun and exciting relay race!

🕒 45–90 min. 📦 Advanced 🎓 K-2



Teacher Support

Key objectives

Students will:

- Apply their knowledge of the effects of different strengths of push and pull forces on the motion of an object
- Brainstorm, sketch, design, prototype, build, test, iterate, rebuild, and experiment to create their own section of a bigger mechanical relay race contraption

Things you will need

- LEGO® Education BricQ_Motion Essential Sets (one for every two students)

Additional resources

[Building instructions, book "A"](#)

[Assessment Rubric](#)

Educational standards

- NGSS K-PS2-1
- NGSS K-2-ETS1-2
- ISTE: 7c
- CCSS.ELA-LITERACY.SL.1.2

Lesson extension

- CCSS.MATH.PRACTICE.MD1

Prepare

- Review the online student material. Use a projector to share this material with your students during the lesson.
- This lesson is designed to be facilitated over the course of at least two 45-minute class sessions. Part A comprises session 1, and Part B comprises session 2.
- Make sure that you've covered the concepts of pushes, pulls, and gravity in an earlier lesson.
- Consider the abilities and backgrounds of all of your students. Differentiate the lesson to make it accessible to everyone. See the *Differentiation* section below for suggestions.

Engage

(Whole Class, 10 Minutes)

- Watch the student video [here](#), or access it via the online student material.
 - Facilitate a discussion about what the students have learned about push and pull forces.
 - Ask questions, like:
 - What models do you remember building?
 - Which ones worked best for you?
 - Would you like to build any of them again?
 - If the students need a little guidance, help them by asking:
 - How can you use what you've learned about push and pull forces to make a relay race for the class?
 - How can you move an object without touching it with your hands?
 - What ideas do you have for a relay race?
 - Tell students they'll be using what they've already learned about push and pull forces to make a relay race for the class. Introduce the activity:
 - Tell the students to choose an object to be used as the "baton" that's passed. This could be, for example, a LEGO[®] pizza element or a crumpled-up ball of paper.
 - Ask them to invent a mechanism that will enable them to pass the "baton" with a push or a pull, without touching it with their hands.
 - Have them sketch their idea and then build it.
 - Explain that they can use the models they've built in earlier lessons for inspiration, or invent something new.
 - Distribute a set to each group.
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Explore

(Small Groups, 30 Minutes)

(Small Groups, 30 Minutes)

- Tell the students to discuss, sketch, and label their ideas before they start building.
 - Each student should build their own mechanism for passing the "baton" to their partner.
 - If some of the students finish building early, they can practice passing the "baton," help their partner finish their model, or mark the starting and finish lines.
 - You can find support for building in the *Tips* section below.
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Explain

(Whole Class, 5 Minutes)

- Gather the students together to review and discuss what they've built.
- Ask questions, like:
 - How is your model pushing or pulling the "baton?"
 - Which models inspired you?
 - Which parts of your model are the same as your sketch? What's different?
 - What could you change?

Part B (45 Minutes)

Elaborate

(Whole Class, 5 Minutes)

- Ask questions, like:
 - What part of this lesson was fun?
 - What was challenging?
 - Which students' models inspired you?
 - What other kinds of relay races could we make?
 - Allow time for the students to disassemble their models, sort the bricks back into the trays, and clean up their workstations.
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Evaluate

(Ongoing Throughout the Lesson)

- Ask guiding questions to encourage the students to "think aloud" and explain their thought processes and reasoning in the problem-solving decisions they've made when building their models.

Observation Checklist

- Measure your students' proficiency in describing how push and pull forces can move objects.
- Create a scale that matches your needs, for example:
 1. Needs additional support
 2. Can work independently
 3. Can teach others

Self-Assessment

- Have each student choose the brick that they feel best represents their performance:
 - Green: I think I can describe what "push" and "pull" mean.
 - Blue: I can describe what "push" and "pull" mean.
 - Purple: I can describe and explain what "push" and "pull" mean, and can help a friend understand, too.

Peer-Feedback

- In their small groups, have the students discuss their experiences working as a group.
 - Encourage them to use statements like:
 - I liked it when you....
 - I'd like to hear more about when you....
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Tips

Model Tips

- If any of your students get stuck, help them by asking open-ended questions, like:
 - What's your idea?
 - What have you tried?
 - What could you try next?
 - Is there a model you've already built in another lesson that can push the "baton?"
 - Some students might have ideas that are too big to build within the

- available time. Encourage them to think about ways they could simplify their idea before the next class. Foster their creativity, explaining that many designers take time away from a project to rethink and revise their plans.
- The photos below show sample solutions. However, we recommend not sharing these with your students unless they're having trouble coming up with ideas because it tends to limit their creativity.
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Differentiation

Simplify this lesson by:

- Having the students remix selected models (*e.g., the Hockey Practice model or Push Car launcher*) instead of building an entirely new model

Increase the difficulty by:

- Assigning each student either a push or a pull mechanism so that the relay race alternates between an object being pushed and an object being pulled
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Extensions

(Note: This will require additional time.)

To incorporate math skills development, have each team estimate the amount of time, in seconds, that their leg of the race will take to complete. As a class, add up all of the time estimates to determine the estimated time required to complete the whole race. Convert this estimate into minutes and seconds, and compare it to the actual relay race times.

CCSS.MATH.PRACTICE.MD1