Exploring Gravity

v2.0

Foundational Fluencies: Does It Move? | Teacher Lesson Plan

Overview:

In this lesson, students will build a helicopter and explore the concept of gravity.

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Unit Concepts & NGSS Alignment:

- Manipulate ROK Blocks to build objects that move
- Explore a specific problem engineers often face (making things move)
- Understand that pushes/pulls on objects can have different strengths and that bigger pushes/pulls cause bigger changes in the object
- Match 3-dimensional objects to 2-dimensional pictures
- Compare and contrast vehicle types and how different vehicles do work by moving

Scientific/Engineering Practice - Asking questions and defining problems
Crosscutting Concept - Cause and effect: Mechanism and explanation

Pre-Lesson Preparation:

Before class, build the helicopter that is featured in this lesson and show it during the lesson introduction. This will get students excited about the lesson and give them an example of what they are going to build. You can find instructions to assemble the helicopter on the Exploring Gravity Construction Mat.

Lesson Introduction:

Instructor: "Today we are going to build this cool helicopter and explore something called "Gravity". Are you ready to learn!?"

Core Learning Activity:

1. Give each team of two students an Exploring Gravity Construction Mat and the correct assortment of engineering materials listed.

2. ***Instructor: "In the previous lesson, we talked about different ways that we can make objects move by pushing or pulling them. When a push or a pull moves an object we call that "force". Now, watch me drop this block."*** Hold up a Blue ROK Block and drop it to the ground. Pick up the block and repeat, then have students try it out for themselves.

3. ***Instructor, "What is making this block move (fall to the ground)?"*** Some students will likely say "gravity" - if so, acknowledge that is right and follow up by asking is gravity a push or a pull? Discuss how the Earth pulls objects towards its center. ***Instructor, "That force, that pull, is called gravity. Gravity is the reason none of us or the objects around us go floating away."***

Activity Time:

30 Minutes

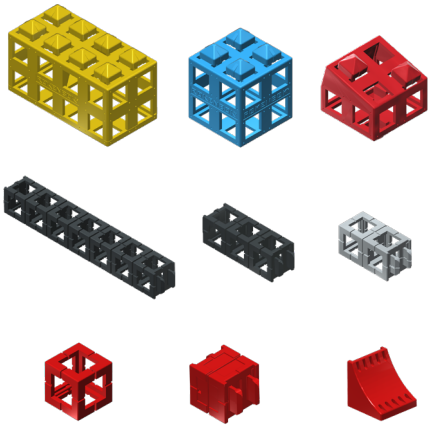
Kid Spark Mobile STEM Lab:

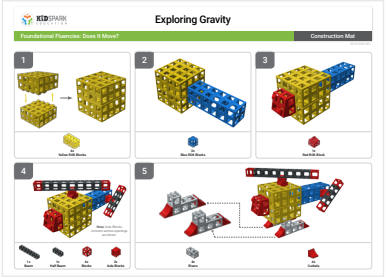
ROK Blocks

Materials Per Team:

Group students in teams of 2.

- 4 Yellow ROK Blocks
- 3 Blue ROK Blocks
- 1 Red ROK Block
- 1 Beam
- 1 Half Beam
- 4 Risers
- 4 Blocks
- 2 Axle Blocks
- 4 Corbels
- 1 Construction Mat



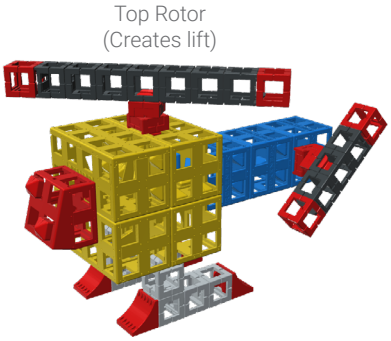


4. ***Instructor: "In previous lessons we have built a lot of vehicles. Can you remember what kind of vehicles we have built?"*** (cars, tractors, trucks) ***"Today, we are going to take the role of an aircraft engineer to build a new kind of vehicle. Does anyone know what aircraft engineers design and build?"*** (planes, helicopters)

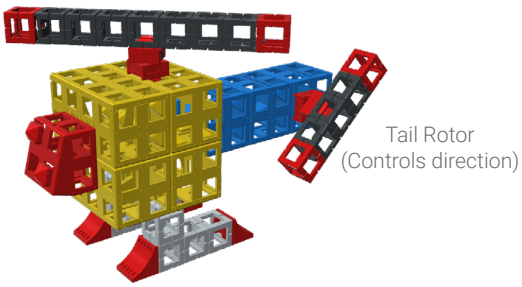
5. ***Instructor, " What do planes and helicopters do?"*** (transport people and things in the air, they fly in the air) ***"Thats right! Aircraft engineers design planes and helicopters to move against the force of gravity and not fall on the ground like our block did."***

6. Instruct teams to follow the instructions on the Exploring Gravity Construction Mat to assemble a helicopter.

7. After each team has assembled their helicopter, bring everyone together into a large group. ***Instructor, " Does our helicopter have wheels?"*** (no) ***"That's right, this helicopter does not have wheels. How is our helicopter going to move without wheels?"*** Draw students attention to the helicopters top rotor and note that even though the helicopter doesnt have wheels, it still has a part that moves in a circle called the "rotor". ***"The rotor goes around, or rotates, very, very quickly. When it rotates quickly it creates a force called "lift". The lift the rotor creates is stronger than the force of gravity, so the helicopter can fly and do the work of transporting whatever is in the helicopter."*** Demonstrate how this works using one of the helicopters. Since these helicopters obviously won't fly, you will have to tell students that we are using our imaginations.



8. ***Instructor, "Do you notice any more rotors on our helicopters?"*** (on the tail) ***"That's right, there is also a rotor on the tail of the helicopter. If the top rotor is used create lift (to raise the helicopter off of the ground/fly), what do you think the tail rotor is used for?"*** (to prevent the helicopter from turning in circles, to control the helicopters direction) Hold up an axle block and point out how both rotors are able to rotate because of the axle block that is used. Have students observe how one end of the axle block stays secure to the helicopter while the other end, that is connected to the rotor, can rotate freely.



9. To wrap up the lesson, use the following discussion prompts:

    a. **If a helicopters rotors stopped working mid-flight, what would happen?** (It would fall to ground/crash) **Why?** (If the rotors stopped working they would no longer create lift and gravity would cause the helicopter to fall to the ground)

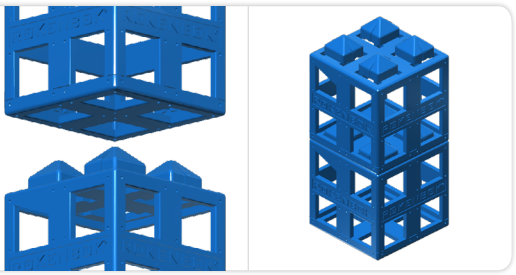
    b. **What can helicopters do that planes can't?** (Fly straight up. Hover in one place.) **Why?** (The rotor creates lift.)

Building Basics

The following tips will be helpful when using Kid Spark engineering materials.

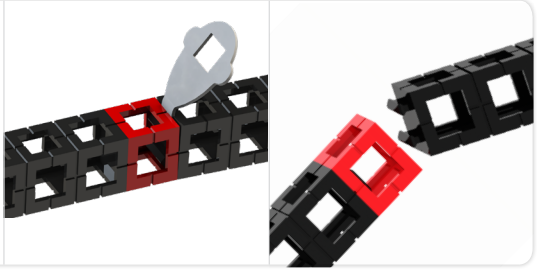
Connecting/Separating ROK Blocks:

ROK Blocks use a friction-fit, pyramid and opening system to connect. Simply press pyramids into openings to connect. To separate blocks, pull apart.



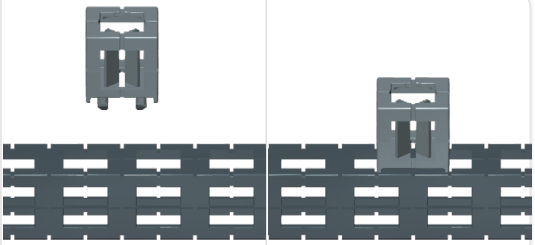
Connecting/Disconnect Smaller Engineering Materials:

Smaller engineering materials use a tab and opening system to connect. Angle one tab into the opening, and then snap into place. To disconnect, insert key into the engineered slot and twist.



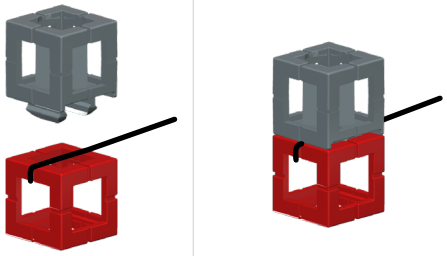
Snapping Across Openings:

Materials can be snapped directly into openings or across openings to provide structural support to a design. This will also allow certain designs to function correctly.



Attaching String:

In some instances, string may be needed in a design. Lay string across the opening and snap any component with tabs or pyramids into that opening. Be sure that the tabs are perpendicular to the string to create a tight fit.



Measuring:

The outside dimensions of a basic connector block are 2 cm on each edge. This means the length, depth, and height are each 2 cm. To determine the size of a project or build in centimeters, simply count the number of openings and multiply by two. Repeat this process for length, depth, and height.