Sample Lesson

Each of our Field Videos has an associated lesson. These lessons are not required to evaluate a mission's hypothesis, but give you a chance to explore related phenomena along the way as you address Next Generation Science Standards. They also give you the flexibility to pick and choose the lessons you want to do!

All K-5 lessons have a central activity that is appropriate across the grade span making them ideal for catch-up growth, differentiation, and multi-age learning environments. They also have grade level specific formative assessment rubrics aligned to the Next Generation Science Standards and grade level specific integrations for reading, writing, and math.

The attached sample lesson is from Mission: Rainforest in Panama.

GO$_2$ Science

Grade 2
Day 10

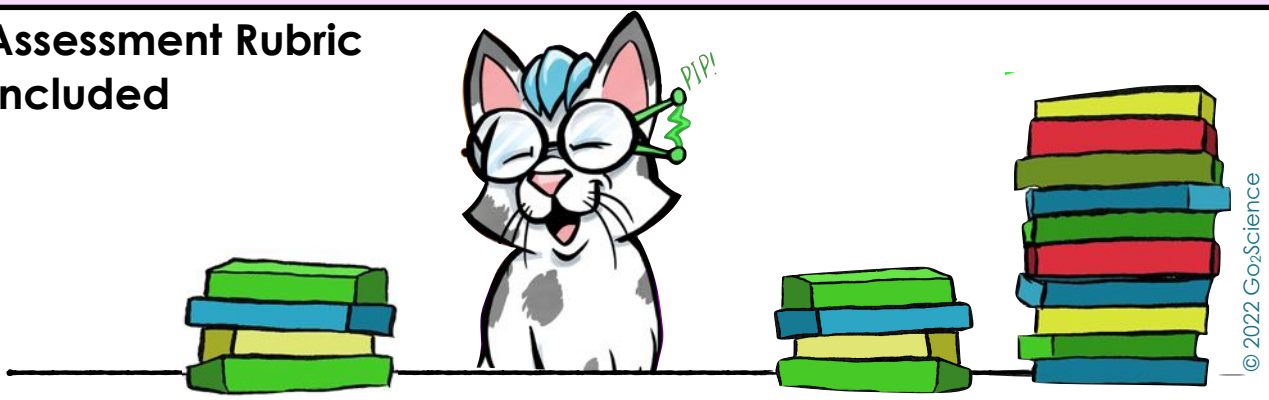
Zip Line!

Explore forces and motion using the design process to create functional mini zip lines!

This lesson addresses the following standards:

NGSS DCIs	CCSS ELA	CCSS Math
* **K-2-ETS1-1** - 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.	**W.2.1** - I can write my opinion about a topic and give reasons for my thinking in an organized way.	**2.MD.D.9** - I can collect measurement data and organize it on a line plot.
K-2-ETS1-2 - 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.	**W.2.3** - I can write to tell an organized story with details about actions, thoughts, and feelings.	**2.NBT.B.6** - I can add up to four 2-digit numbers.
* **K-2-ETS1-3** - Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.	**SL.2.1** - I can have collaborative conversations with my friends and teachers.	**2.GA.A.1** - I can name and draw shapes (triangles, quadrilaterals, pentagons, hexagons and cubes).
SDG Goal 11: Sustainable Cities and Communities - Make cities and human settlements inclusive, safe, resilient and sustainable		

***Assessment Rubric included**



Zip Line!

Go$_2$Science | Field Mission: Rainforests | Day 10

Grades K-2 Ready....

OBJECTIVES

In their study of force and motion, students will design, create, and test different zip lines, and demonstrate their understanding by presenting their zip lines to the class and comparing the different designs.

Next Generation Science Standards: Crosscutting Concepts *(When these concepts are made explicit, they can help students develop a coherent and scientifically-based view of the world around them.)*

Cause and Effect: Events have causes, sometimes simple, sometimes multifaceted. Deciphering causal relationships, and the mechanisms by which they are mediated, is a major activity of science and engineering.

BASE KNOWLEDGE	MISCONCEPTIONS	VOCAB
Objects will slide down a slope because of gravity. The steeper the slope the faster the object tends to travel. Zip lines must travel from a higher point to a lower point.	Zip lines are only used for fun. Zip lines are only used in rainforests.	Zip line: A pulley suspended on a cable that runs on a slope through the air from point to point. A person is attached to the pulley with a harness and moved by gravity. Platform: A raised, flat structure placed at each end of a zip line to support a rider.

Set...

MATERIALS AND PREPARATION

For this lesson you will need:

- Spring-loaded (have a hole through the middle) clothespins for each length of zip line
- Markers
- Paper landing platform (attached)
- Zip line: try fishing line, string, yarn, etc. for different results
- Duct tape, pipe cleaners, cotton balls
- Beth and Curtis zip line marker harness (attached)
- Optional: timing device; ruler or measuring tape

Optional for integrations:

- Journal pages and rubrics of choice: "I think " or "I remember"

Go! (Grades K-2)

SETTING THE STAGE

1. Post or state desired learning targets for your class.
2. Did zip lining look scary? Why do they need to use platforms? Why do scientists use zip lines to study the rainforest?
3. Ask students to imagine building the best zip line ever. What would it look like? Would it be high up? Long or short? Steep or mostly flat? How could they make sure the riders slow down enough to stop safely at the next platform?
4. Show the students the markers, clothespins, and line they will use to create their own zip lines across the classroom. The "riders" will be markers wrapped in a picture of Beth or Curtis. The students must get their Beth/Curtis from one platform to the next safely, until they finally reach the ground.

MAIN EVENT

1. **Divide the class into small groups**. Provide each group the materials necessary for making their zip lines. As a class, identify possible locations for platforms to begin and end each zip line. These could include shelves, cabinets, desks, and chairs of different heights. Zip lines should go from a higher platform to a lower one until it finally reaches the ground.
    a. Students have two objectives: 1. Get Beth/Curtis from the highest point they can reach to the ground safely with the fewest platforms possible; and 2. Take Beth/Curtis to as many cool places in your classroom as possible before landing on the ground.
2. **Plan it!** Students should work together to discuss their plan for the zip line. They can talk about their ideas and then draw their plan in their science journal.
3. **Build it!** Students should use their drawings to implement their design. They can affix one end of the string to the topmost platform and the other end to the next platform with tape, a tack, heavy object etc. Affix the paper platform (attached) at the next lower stop to test if that section of the ride was completed safely (see below).
4. **Test & Modify it!** Once the zip line is built, students should attach the marker to the clothespin using the paper tab, take off the marker cap, give it a push to set it in motion. If the marker stops before the next platform, Beth/Curtis are stranded! Try again! If the marker leaves a mark on the paper platform below, Beth/Curtis crashed. Try again!
5. **Discuss!** After initial testing, how can they make their zip line safer and more effective? Encourage them to try as many different materials for the line as possible. Continue to make improvements until the students are satisfied with their zip lines.
6. **Publish!** Have them draw their modifications and final designs in their journals.

ENCORE!

1. Gather all of the groups together and have each group demonstrate their zip line.
2. Use a timer to determine which zip line takes the longest time for the marker to travel from one platform to the next. Which one is the quickest ride? Is the quickest also the safest?
3. Which material you used for the zip line worked best? How does the marker move differently on each type of zip line? Which seems to be the strongest? The fastest?

Second Grade Ideas
(Zip Line!)

CCSS ELA INTEGRATION

W.2.1 - I can write my opinion about a topic and give reasons for my thinking in an organized way.

- Have the students write about what type of design would make the most effective zip line. Which would deliver Curtis or Beth safely and quickly to the next platform? A zip line with a steep drop, or one that is mostly flat? Which material worked best to create the zip line? Why?

W.2.3 - I can write to tell an organized story with details about actions, thoughts, and feelings.

- Have students write up their process for designing their zip line, explaining the sequence of events. How did they feel about successes and failures?

SL.2.1 - I can have collaborative conversations with my friends and teachers.

- Facilitate structured conversations among the students. Make sure each student has an opportunity to express their ideas. Encourage them to ask each other questions and build on each other's ideas. Do the same with the large group discussions comparing, contrasting, and evaluating all of the slide designs at the end of the class.

CCSS MATH INTEGRATION

2.MD.D.9 - I can collect measurement data and organize it on a line plot.

- Have the students use a standardized object such as a pencil to measure the length of each of their zip lines. How many pencils long are they? Have them make a line plot of all of their measurement data. (Note: use an object that will result in a one- or two-digit number for each measurement.)

2.NBT.B.6 - I can add up to four 2-digit numbers.

- Using the measurements above, have students add up the lengths of their zip lines, from the first platform, to the next and so on. How long is it in total from the first platform to the fifth?

2.GA.A.1 - I can name and draw shapes (triangles, quadrilaterals, pentagons, hexagons and cubes).

- Challenge the students to create shapes with specific attributes with their zip line and platforms. For example, instruct them to arrange their platforms in a shape that has three angles and three straight lines, or four angles with two pairs of equal length sides. Can they make a zip line with curves? Why or why not?

SERVICE LEARNING OPPORTUNITY

Help your community enjoy sustainable and healthy recreation. Design a nature trail on your school grounds or in your community. Choose a location and design that would allow visitors to see a familiar area from a new perspective, just as Beth and Curtis saw the rainforest from a new perspective by zip lining through the canopy. How can you make your trail inclusive and welcoming for all ages and abilities? Have the students draw their ideas. Can you recruit volunteers to make it a reality?

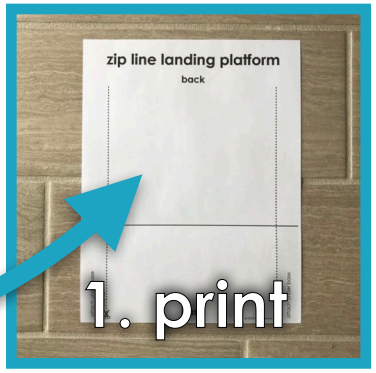
ARTS INTEGRATION

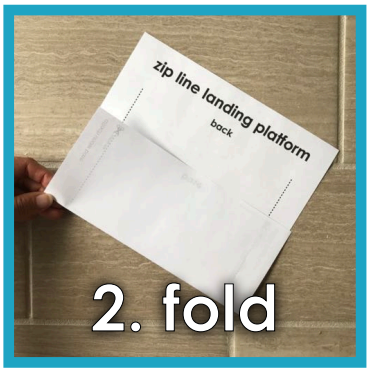
String art! Put nails, pins, or tacks into a bulletin board and arrange them in different shapes (trees, leaves, rainforest animals, or more abstract geometric shapes). If time and materials permit, children can practice hammering nails into boards. Have the children wind colored string or yarn around the tacks to make colorful designs. They can use the string to outline a design, fill a space or both! See lesson attachments for ideas and patterns.

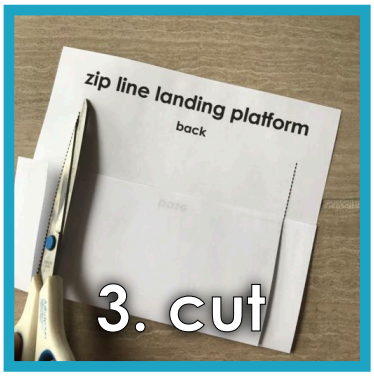
Materials and Prep

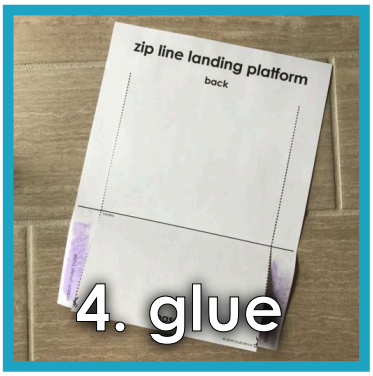
The materials for this activity are pretty simple, but there are two key ingredients: spring clothes pins and good line. We used fishing line and had great results!

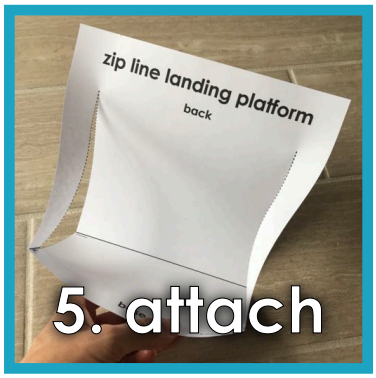
Assemble landing platforms for each zip line or move one from platform to platform. Have a few spares on hand for the testing phase!











Wrap pipe cleaner around a pencil to create optional springs to soften the landing.

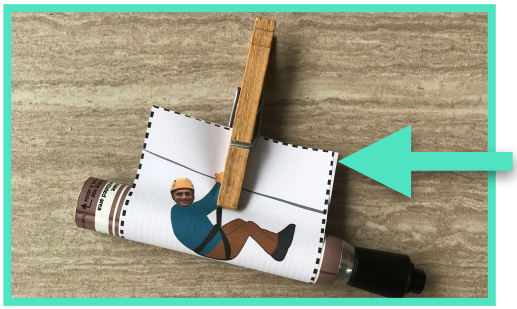
Vary slope and tautness to alter speed!

Run line through spring!

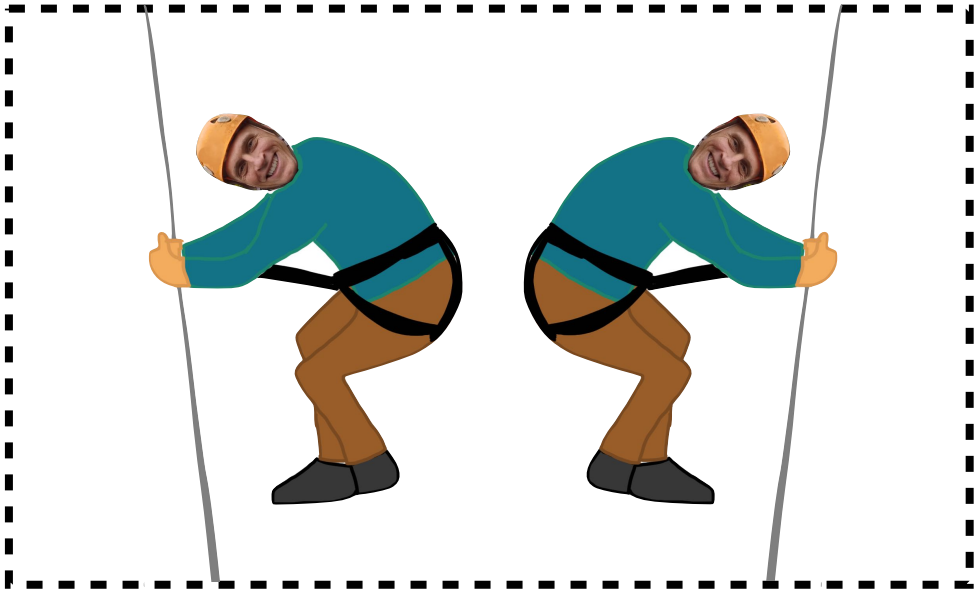
Zip Line Marker Harnesses

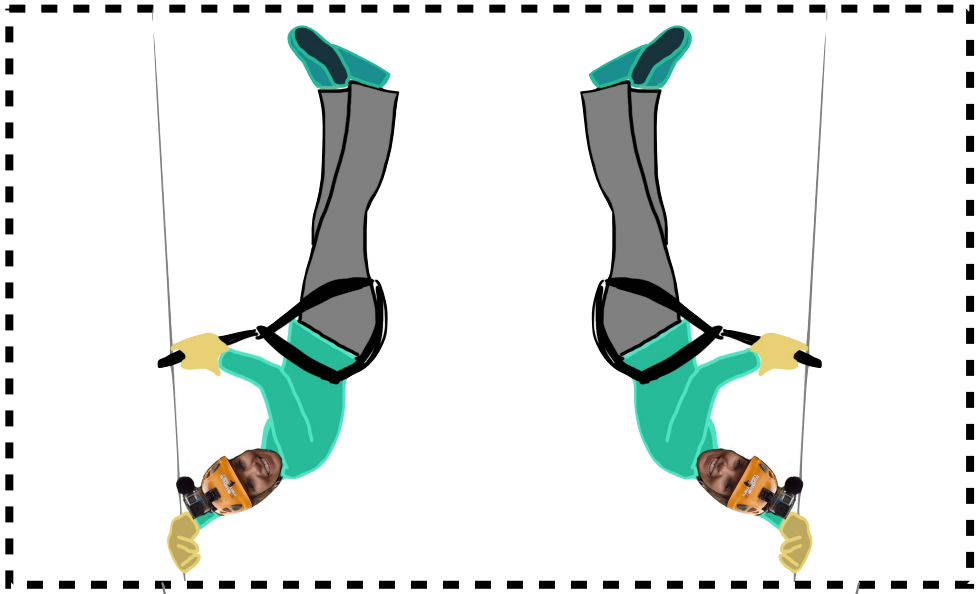
Print and cut on dotted lines.

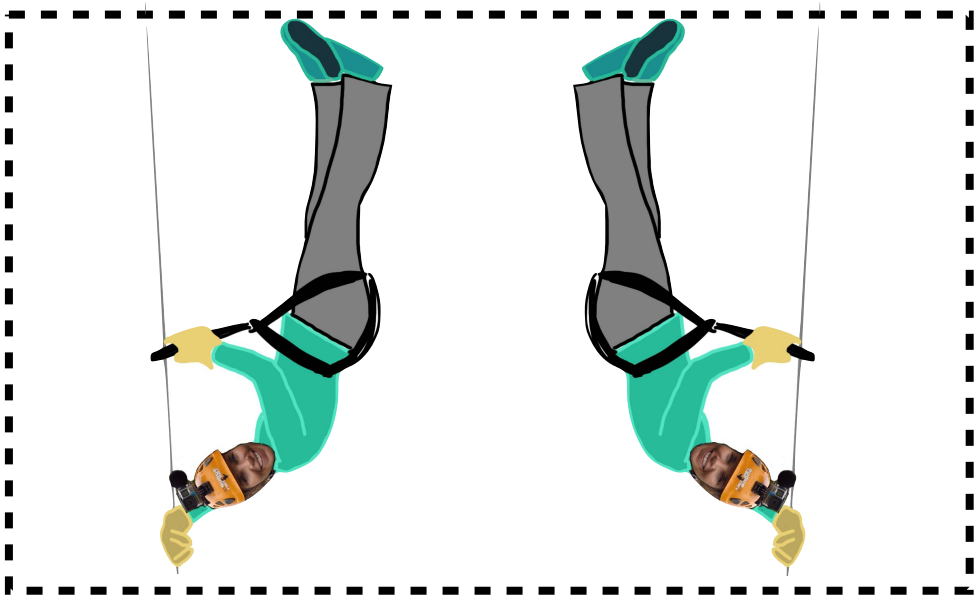
Fold around marker and hold in place with a clothes pin! Uncap marker before ride!

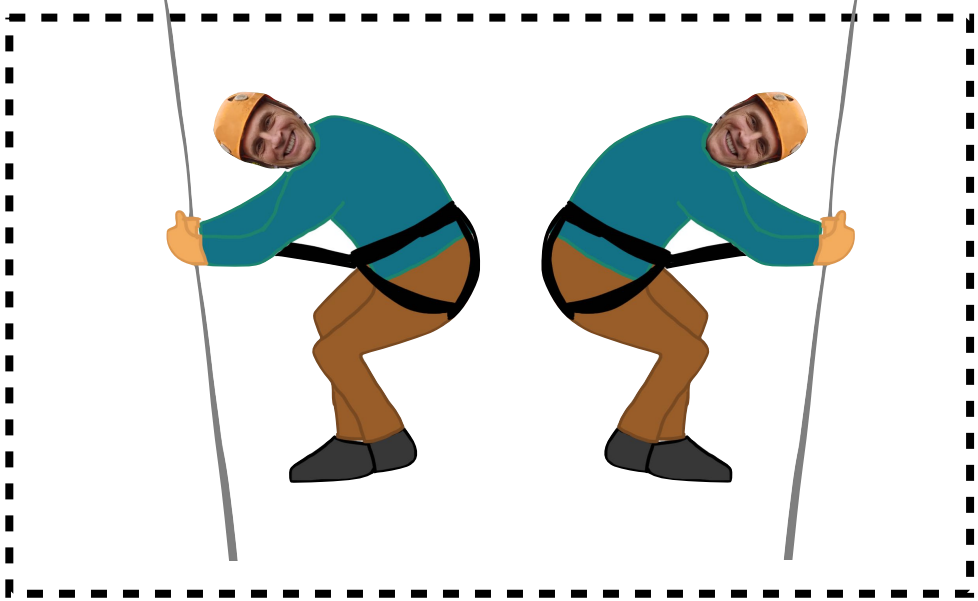


Fold the top edge down to snugly fit around narrower markers. Be sure to get a tight fit!









zip line landing platform

back

fold line

attach under base

cutting line

base

cutting line

attach under base

Name:

I think...

What do you think makes the best zip line?
How steep is it? How many stops does it have?
How do riders stop safely?

Name:

I think...

What do you think makes the best zip line?
How steep is it? How many stops does it have?
How do riders stop safely?

Name:

I think...

What do you think makes the best zip line?
How steep is it? How many stops does it have?
How do riders stop safely?

Name:

Date:

I think...

Second Grade Opinion Writing

	 Developing	 Emergent	 Established	 Glorious you!!!
Writing Standards (W.2.1)	I can use writing, drawing and dictating to tell about a topic.	All by myself, I can write to tell about a topic.	I can write to introduce a topic, tell what I think about it, and say why.	I can organize my writing to list reasons supporting my opinion.
(W.2.1)	I can tell what **I think** about a topic.	I can write what **I think** about a topic and **why**.	I use linking words to connect my opinions to my reasons.	I use linking words and a closing statement.
Language Conventions (L.2.2.a)	I capitalize the first word in my sentences and the word "I."	I capitalize for first word in sentence, "I", names, dates.	I capitalize holidays, product names, and places, too!	I even know how to capitalize titles.
(L.2.2.b)	I experiment with commas.	I use commas in dates and between words in lists.	I also use commas in greetings and closings of letters.	I use commas in addresses and dialogue, too.
(L.2.2.c)	I add an "s" to words to attempt to show possession.	I experiment with apostrophes.	I use apostrophes to make contractions and show possession.	I use apostrophes to show possession even when words end with s.
(L.2.2.e)	I can sound out and write simple words phonetically.	I spell new words in ways others can read.	I use references to check and correct spelling.	I use beginning dictionaries to check and correct spelling.
(L.2.6)	I stick to familiar words in my writing,	I add new vocabulary words to my writing.	I use new vocabulary in ways that show understanding.	I use new vocabulary in different ways that show understanding.

Grades K-2

Zip Line Assessment Rubric

NGSS Performance Indicator	Guiding Questions	 Developing	 Emergent	 Established	 Glorious you!!!
K-2-ETS1-1 - 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.	What problem are we trying to solve? What do you need to know to solve it? How will you solve the problem?	Student identifies the problem **but does not** say what will need to know to solve it **or** how they plan to solve it.	Student identifies the problem **AND** says what will need to know to solve it **but does not** say how they plan to solve it.	Student identifies the problem **AND** says what will need to know to solve it **AND** says how they plan to solve it.	Student identifies the problem **AND** says what will need to know to solve it **AND** says **in detail** how they plan to solve it.
K-2-ETS1-3 - Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.	How do you know which zip line is best at getting the rider safely to the platform? What features help it do that well?	Student compares designs **but does not** say why one works the best or why.	Student compares designs **AND** says why one works the best **but does not** explain which feature(s) of the design make it the most successful.	Student compares designs **AND** says why one works the best **AND** explains which feature(s) of the design make it the most successful.	Student compares designs **AND** says why one works the best **AND** explains **in detail** which feature(s) of the design make it the most successful.

Assessment Checklist

Standard Code:

student name					notes