Week 1

Grade level: Kindergarten

Driving Question for the unit: When you're playing on the playground, what makes you get from the top of the slide to the bottom?

Specific Lesson Question: How can we get an object to move?

<table>
<tr><th colspan="3">Overview</th></tr>
<tr><td colspan="3">For lesson 1, what is the scenario/problem you are using to launch the unit?
How many of you have ever gone down a slide before?
When I was in Elementary School, my friends and I used to love going down the slide. My friends and I would even race to try and see who could go down the fastest. So we decided to have another slide competition. Can you help me figure out a way to be the fastest slider in the group?</td></tr>
<tr><td>Disciplinary Core Idea Addressed in lesson:

PS2: Motion and Stability: Forces and Interactions
Learning about what forces act upon objects causing them to move. This unit discusses how forces can have different strengths (strong or weak) and directions. Forces also have impact on the object's speed and direction and can cause it to start or stop.

Explain this idea (in your own words---not the internet) AND its importance to answering the driving question for the unit.</td><td>Science and Engineering Practices Addressed in Lesson:

Science: We will be inquiring about how we get objects to move.

1. Asking questions (for science) and defining problems (for engineering</td><td>Cross-Cutting Concepts Addressed in Lesson:

Cause and Effect: students are looking at the effect motion has on an object and the relationship between the two.</td></tr>
<tr><td colspan="3">Will another discipline of STEM (other than science) be included in this lesson? [highlight your response]
Yes
No
If yes, be sure to CLEARLY state in the Learning Plan below <u>when and how</u> STEM will be infused.</td></tr>
</table>

Learning objectives (outcomes):

What do you want students to be able to explain/state in response to the specific lesson question?

Students will be able to explain/state [USE KIDS' WORDS]:

- To get students to be thinking about motion, and how can they describe the motion of objects etc.
- "If I push my friend on the swing, they are going to move forward."
- "The objects are going to move."

Learning Plan
(using the 5E model--Meredith will explain as needed)

In person

ENGAGE (5-10 minutes)

-We will be able to discuss and converse with each other over what kind of movements take place on the playground and the how's behind the movement.

-Create a poster and write down ideas pertaining to the questions "What kind of words do we think of when we think about how we move and play on the playground?

Call on however many students raise their hand to answer and write down the answers on the posters. This poster will be used throughout the lesson and will be addressed again in the final lesson unit to show how far their knowledge has come.

EXPLORE

Part 1 (5 minutes)

Start by asking kids "How many of you have gone down a slide before?" Then we will ask the students probing questions like:

All of the highlighted questions are questions we are going to ask. All of the unhighlighted questions are questions that can be asked if the conversation leads there or more prompting is needed.

- What's your favorite thing to play on the playground?
- What kinds of motion do we see?
- What do we think can cause that movement?
- What kind of movement do we see on *that piece of equipment*on the playground?

Adaptations for Online

(as needed by phase)

ENGAGE

Same as the F2F group.

EXPLORE

During the drawing period, we will wait until all the kids are done with their drawings to ask the questions.

• How do you get the swings to move, pumping your legs? Running and using our feet to kick off ground? • Have you ever been on a merry go round? How does that move? • What words do you think about when you think about motion? • What ways have we talked about the cause motion on the playground? • When we go down the slide how do we get ourselves to move? • Is it easier or harder to move up a slide or down a slide? Why do we think that? Print out pictures of playground equipment and pin them to the white board (slide, swing, merry go round, monkey bars, tether ball, teeter totter, etc). Make sure each student is at their own station with their own dry erase marker. On each picture, have each student show the direction of movement (by using arrows) on each picture. If needed for the Kindergarteners, Karly and Summer will demonstrate how to show motion and movement in a drawing. **Part 2 (6-7 mins)** Part 2 of the explore phase will begin by playing a Go Noodle Roller Coaster video. Before the video begins, ask the students to pay attention to close details • "Pay really close attention to the different types of movement that you see." https://youtu.be/4jxqSHOad18 Students will stand by their chair and move to the video. (Getting students up and moving after a discussion and before another desk activity) Teachers will also participate in the video. After the video, have a short discussion (1-2 minutes) asking: • What did you think of the video? • "Why do you think that these types of movements are happening?" • Did you notice any types of movement? **Part 3 (6 minutes)** Draw a picture of you on the playground when you're doing something with movement. Try to show your movement through your picture. (4-5 mins to draw) Remind students when one minute is remaining. Make sure students are thinking about all the different types of movement happening on the playground.	

● Teachers will walk around to the different students during this time. ● Ask questions about what their drawing ○ What is your favorite part of the playing on the playground? ○ When you ____ (go down the slide, swing, go on the monkey bars) are you going fast or slow? ○ If you go fast on the slide, how can you make yourself go slower? ○ How are you showing that there is movement in this picture? ○ How could you change your picture to show that you are moving? *Some of these questions can also be touched on again during the explain section.	
EXPLAIN (20 minutes) For the explain section, we will talk about the pictures the students drew at the end of the explore section. Have the students explain: ● Where they are showing movement, ● What they drew, ● Why do they think it is considered a movement? Try and see where their thinking of movement is coming from and what they understand. **ELABORATING/EXTENDING Understanding** ***(WHOLE CLASS -- last 30mins together -- building your class Content Storyline)*** 1. We will start by looking at our initial poster and ask students if there is anything we would like to add to the chart today after our discussion. (Write in a different color.) It can be any new thoughts they might have or anything that they might have had a wrong idea about. 2. Asking the students questions related to some of the vocabulary words in the next lesson, so that they are more familiar with these words. 3. Introduce the word Motion.	**EXPLAIN** We will ask for each student to show their drawing on the screen, and ask them individual questions about their pictures Make sure that when we are watching the video, pause it and see what the students are thinking or see their response to it Answer questions as well

Formative Assessment Evidence	
What evidence will you gather to understand if ALL your students met the learning outcome (see green box above)? ● The initial poster that shows their current ideas on motion and movement. ● The students' drawing(s) of motion, and how they show it in their pictures. ● (less formal) Things children specifically said within our discussions about their experiences and current ideas on motion.	
Individual Student Accomodations	
Required Accommodations/Modifications: ● If students are struggling to keep up with the rest of their peers, slow down the lesson and take more time for that student to make sure they understand what we are doing. ● If a student needs help with showing the direction of movement, like using arrows, etc. Summer and Karly can help that student one-on-one until they can grasp the idea better.	
Additional Modifications for Individual Students: ● If a child needs extra assistance on an activity, we can use breakout rooms to give them individual help.	
Materials **REMEMBER to include Quantity. Also differentiate any materials for in person VS online.**	
In person ● Two pieces of printer paper for each student ● Different colored markers enough for one per student ● Two poster papers ● One Dry Erase Marker per student	**Online** ● Two pieces of printer paper for each student ● Different colored markers enough for one per student ● Two poster papers **(We do not have an online group at the moment. If we do, we will need 2 poster papers for online and F2F)**

Week 2

Driving Question for the unit: When you're playing on the playground, what makes you get from the top of the slide to the bottom? How do you slide down faster, slower, etc.

Specific Lesson Question:

How does the movement change depending on the object and what is causing the movement?

How does the movement of each object differ from each other depending on what you do?

Overview		
For lesson 2, how will you contribute to answering your overarching unit question? We will be talking about pushes and pulls, and how those forces affect an object in motion. This could relate to how fast or slow you push yourself down a slide. Introduce gravity as a force that pulls us down toward the ground.		
Disciplinary Core Idea Addressed in lesson: **PS2.A: Forces and Motion. Pushes and pulls can have different strengths and directions.** Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it. **PS3.C: Relationship between Energy and Forces.** A bigger push or pull makes things speed up or slow down more quickly. **Explain this idea (in your own words---not the internet) AND its importance to answering the driving question for the unit.**	**Science and Engineering Practices Addressed in Lesson:**	**Cross-Cutting Concepts Addressed in Lesson:** **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.**
Will another discipline of STEM (other than science) be included in this lesson? [highlight your response] **Yes** **No**		

*If yes, be sure to CLEARLY state in the Learning Plan below **when and how** STEM will be infused.*

Learning objectives (outcomes):
What do you want students to be able to explain/state in response to the specific lesson question?
Students will be able to explain/state [USE KIDS' WORDS]:

- What the differences between push and pull are: Push goes away from me, pull comes towards me
- How each movement looks
- How is the movement different during push and pull
- Different forces and a force is how we move things

Learning Plan
(using the 5E model--Meredith will explain as needed)

In person

ENGAGE (5-10 minutes)

- First, we will do a quick recap of last Saturday and the terms that are on the poster from last week (i.e. Push, Pull, Motion). This way students will be ready to start learning the new vocab and concepts. We will ask the questions:
- Did any of you notice anything new this past week that showed motion? Anything at home? School? Etc.
- Ask Students what they remember talking about from last week.
- We will look at the new push/pull poster and talk about the concepts on it.

Adaptations for Online

(as needed by phase)

THESE ADAPTATIONS ARE FOR ONLINE TEACHERS.

ENGAGE

- Give experience from the week about something we saw with motion

○ The push and pull poster that Lena is making will be used as a reference piece throughout the whole unit. ○ We will use a new poster to write down their ideas of push and pull. ● Students can share out answers as we write, if no student provides an answer, then we will call on them. ● We will demonstrate the action of *pushing* and *pulling examples*, so that they are able to see a specific type of motion. We will ask them to identify the motion as pushing and pulling through showing that in the air. ■ Moving a shopping cart in front of you ■ Taking Cereal off the shelf ■ Making a friend go high on a swing ■ Picking a flower ■ Opening the fridge ○ Ask the students to give the term you called this movement ○ If they are unsure, review what that motion is. **EXPLORE** ● **Part 1 (15 minutes)** ○ Stations: students will be given a variety of objects and will be testing how they move. (Students will go on a scavenger hunt to find objects they think they can push and pull.) ○ Objects to be used will be: toy car, dice, and marble. ○ Students will have a few minutes to go find 3-5 objects in their house/room.	● Ask the highlighted questions **EXPLORE** ● We will be placed at the tables to watch students do that activities and answer questions they might have.

■ To make sure students are back within a reasonable amount of time, we will play a song over our speakers and then when the music stops, students will need to be back. ● **<u>Part 2 (20-25 minutes)</u>** ○ **Venn Diagram Activity** ■ "When using a venn diagram, we have 3 different categories. In this circle, we will put everything that we can only push. In this circle, we will put objects we can only pull. In the middle we will put objects that can do both." ■ If by chance the kindergarteners are still confused, we will have a T Chart available for them to put the items in piles. ○ Students will look at objects they have in front of them and investigate whether they can be pushed or pulled. ○ They will separate and organize their findings into a venn diagram that includes push, pull, and both. ○ After they informally sort the objects on top of their papers, we will come together as a class to discuss what they classified each object as, push or pull or both. Together we will write down what we found on a poster for all to see and discuss why we put those things in their given categories **<u>EXPLAIN</u>**	Lena will share the screen with the venn diagram on it and Karly will lead this section. Lena will type as students are giving answers.

• For the explain section, we will talk about the venn diagrams or T-charts that the students made if we haven't gone over them already.
• Show video to wrap up what has been taught: https://www.youtube.com/watch?v=AKUgWLCNb68&list=PLkWP0CXUEmbaqJUArdCyuYXMMGS0h_Xmh&index=6
  ○ What are the differences between push and pull?
  ○ When we push something, does it go away from us or towards us?
  ○ If we pull something, does it go away from us or towards us?
  ○ Can you guys demonstrate what these actions look like?
  ○ Does gravity play a role in these movements?
 	
ELABORATING/EXTENDING Understanding
(WHOLE CLASS -- last 30mins together -- building your class Content Storyline)
• We will look at our initial poster from week 1 and discuss with each other whether there are any words we would want to add to it when we think about Motion and Movement on the Playground. (Extend Poster with additional sheets or write new/added ideas on board to take a picture and organize better later for referring back to.)
• We can discuss how we think things we talked about today like how gravity or how the material you're wearing can affect the way in which you go down a slide.
Think about our specific lesson 2 questions and discuss our ideas surrounding:
	EXPLAIN

• How does the movement change depending on the object and what is causing the movement? • How does the movement of each object differ from each other depending on what you do? • **Cause and effect… "If you push something, then it will move." etc.**	

Formative Assessment Evidence

What evidence will you gather to understand if ALL your students met the learning outcome (see green box above)?

- Venn Diagram/T-charts
- Correctly demonstrating the action of different push/pull actions in the engage activity

Individual Student Accomodations

Required Accommodations/Modifications:

- We will have pictures printed out for the Kindergartners to use during the Venn Diagram activity, and the second graders will use printed out words or sentences to use in their differences charts
- If the kindergarteners are confused by the venn diagram, then we will have a tchart available for them to use.

Additional Modifications for Individual Students:

- If one student is struggling they can ask the online teachers individual questions or we can bring the iPad to them.

Materials REMEMBER to include Quantity. Also differentiate any materials for in person VS online.	
In person - Poster from last week - 6 Toy cars - 6 Marbles - 6 dice - 6 pieces of sandpaper long enough to push different things on - 6 wash rags/cloth swatches - 6 glue sticks - 6 staplers (without staples) - 6 binder clips (Lena can bring) - 6 Hair ties/rubber bands (Lena will bring) - Package of sticky notes (Lena will bring) - 6 Push and Pull Diagram Worksheets (Jenna will make worksheet) - Venn Diagram Poster version (Lena) - 6 pairs of scissors - 1 blank poster	**Online**

Highlighted is what we will need provided. We will provide everything that is not highlighted.	

Week 3

Driving Question for the unit: When you're playing on the playground, what makes you get from the top of the slide to the bottom? How do you slide down faster, slower, etc.

Specific Lesson Question: How can the strengths of a push and pull affect the object's movement?

How can opposing forces affect an object's movement?

Overview		
How does this lesson contribute to your overarching unit question? ● This lesson gets our students thinking about the different strengths of forces (i.e. gravity) and how that can affect our movement (distance and speed) when going down the slide.		
Disciplinary Core Idea Addressed in lesson: **PS2.B When objects touch or collide, they push on one another and can change motion. (K-PS2-1)** **PS3.C A bigger push or pull makes things speed up or slow down more quickly. (K-PS2-1)**	**Science and Engineering Practices Addressed in Lesson:**	**Cross-Cutting Concepts Addressed in Lesson:** **Cause and Effect: Events have causes, sometimes simple, sometimes multifaceted. Deciphering causal relationships, and the mechanisms by which they are mediated, is a**

PS2.A: Forces and Motion. Pushes and pulls can have different strengths and directions. Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it. **Explain this idea (in your own words---not the internet) AND its importance to answering the driving question for the unit.**		**major activity of science and engineering.**

Will another discipline of STEM (other than science) be included in this lesson?
[highlight your response]
Yes
No
*If yes, be sure to CLEARLY state in the Learning Plan below **when and how** STEM will be infused.*

Learning objectives (outcomes):
What do you want students to be able to explain/state in response to the specific lesson question?
Students will be able to explain/state [USE KIDS' WORDS]:

- A harder push is going to make an object go farther
- A softer push is going to make an object go not as far
- An object rubbing against something can slow it down

- An opposing force is something that can go against an object's movement and slow it down, change it's direction, or stop it.
- Friction causes things to move slower.

Learning Plan
(using the 5E model--Meredith will explain as needed)

ONLINE

ENGAGE

- Start by recapping our last lesson:
  - Lena's poster about forces and motion, have students describe the terms
- Asking them questions like:
  - Does how hard I push/pull something matter?
  - How do harder pushes and pulls look different than softer pushes and pulls?
  - How do we get an object to stop or slow down?
- Show them a poster of a car going in one direction and another car going in another direction then those cars going in those directions toward each other with the arrows meeting.
  - Ask kids what they think would happen if the cars were going toward each other in those directions
    - They will crash
  - "If the red car was going faster than the blue car what do you think would happen?" if they were going the same speed? etc.

EXPLORE

Adaptations for Online

(as needed by phase)

ENGAGE

EXPLORE

EXPLAIN

1. Students will start out by pushing their cars on one surface (the table). We will direct them to use different strengths of force. So one time: a light tap, a medium push, and then another as hard as they can. After each push we will have them describe what happened to the car as a result of the force they put on it. (10 minutes)
    - What happened when you pushed the car super hard?
    - What happened when you lightly poked or tapped the car?

2. Then we will be making a table for our investigations all together as a class (10 minutes)
    - We will explain how to make the table and show an example of what it will look like.
        i. “In order to make our T chart, we are going to need to grab our pencils and our paper. First, we are going to draw a line straight down the middle of the paper. Towards the top of or line, we are going to draw another line crossing it. Can anybody tell me what letter this looks like? (It looks like a T) Yes! Very good. Now we need to add our headings. Who has an idea of what we can call our first category? What about our second?”
    - We will be making a T-chart to categorize our ideas.
        i. Categories will be: table, washcloth, and tin foil

ii. On the other side, they will chart their observations about the car's movement for each type of material. 3. Introduce investigation part of the lesson ● We will have the kids test cars on three different surfaces (a smooth table, bumpy tin foil, and a towel/blanket) ● We will demonstrate how to push the cars with the same amount of force on each surface ● First, the kids will push the car on the smooth surface and record their own observations ● Then, we will have them push the car with the same amount of force with it on the towel ● Lastly, they will push their car on the tin foil 4. We will have students bunch up the towel or tin foil and push the car into the towel/foil so we can see opposing forces in action ○ We will ask them what happened and what they noticed. i. Anticipated Student responses: It was harder to push the car on the wrinkly tin foil. It was easier to push it on the smooth table. 5. Have the students get out a sheet of paper and markers. We are going to introduce a drawing activity where the students are to draw what they perceive to be the most ideal surface for a car to drive on. They will also be asked	

to draw a picture of the least ideal surface for a car to drive on.

- Give students enough time to draw both of their examples
- Once they have finished, have them share what they drew

EXPLAIN

1. Talk about how we have been talking about forces. What are the forces we have talked about? Pushes and pulls?
2. What were we just doing or seeing happen when we were pushing our cars on different surfaces? Depending on the surface we pushed our cars on different things. Why is that? …….Do you think there is a word for that?

3. Start off by asking the students what they know (if anything) about friction?
4. https://www.youtube.com/watch?v=qN0V0NXV3Kw (stop at 1:20)

"**Friction** is the resistance of motion when one object rubs against another." It is a force.

So what are the forces we know at this point?

ELABORATING/EXTENDING Understanding

(WHOLE CLASS -- last 30mins together -- building your class Content Storyline)

1. "Over the course of the last few lessons, we have discussed different ways we can make something move and what forces oppose them."
    a. Can anyone name a type of force?

i. Anticipated responses: Push, Pull, Motion, friction, gravity b. How do these forces affect our objects movements? i. Anticipated responses: affects what way the object moves, how to stop and start. c. Can anyone name an example of showing force? i. Anticipated responses: Kicking a ball, dropping a bouncy ball, apple falling from the tree, etc. 2. After this short discussion, we will begin to relate these ideas back to our overarching unit question: When you're playing on the playground, what makes you get from the top of the slide to the bottom? How do you slide down faster, slower, etc. a. Based on what we have talked about, how can forces make us the fastest? b. Do we need a push or a pull force? c. Does a harder force go a shorter or further distance? What about faster or slower? d. What about a lighter force? e. What kind of force do you think we will need? f. Is it better to have more or less friction? 3. (If there is time and it comes up) What do you think gravity does? a. It pulls everything downwards b. If needed, we could describe to the students what happens when you drop a ball from your hand or throw it really hard at the wall, etc.	

Formative Assessment Evidence

What evidence will you gather to understand if ALL your students met the learning outcome (see green box above)?

- Their pictures that they draw of their ideal/non ideal surfaces for cars to move on in example their differences.
- The chart of observations of their different surfaces

Individual Student Accomodations

Required Accommodations/Modifications:

- If we were to do this in person we would have carried out an investigation that timed out the time it took for a toy car to get from point A to point be on a larger track we would have had on the floor. Since it is online we couldn't make a large track since all of the students would be in different spaces in their homes. We modified the activity to work at each child's home.

Additional Modifications for Individual Students:

- If any of the Kindergarten students seem to be struggling or falling behind with the material, one of the instructors can pull that student into a breakout room to work one-on-one with them. This way the students will be able to catch up with the rest of the group.

Materials

REMEMBER to include Quantity. Also differentiate any materials for in person VS online.

These need to be emailed (philland@iu.edu) to Andrea each Wednesday by 5:00pm)

In person	**Online**

Each kid should have a: **Toy car** **Hard table top (from home)** **Dish towel (From home)** **A sheet of tin foil (1 per student)** **Paper (3 sheets)** **Pencil/pen** **Markers to color with (4 per student) and different colors**	

Tips on how to bring up friction (before saying *friction*):

In order to push something to move there has to be something else happening.. Something pulling on it

There's a term we use to describe this type of opposing force, a push or a pull, that works opposite to the direction of the movement and eventually that movement will slow us down enough to stop

That type of force is called friction

Gravity can act as force to get something to move or to slow it down

Week 4

Driving Question for the unit: When you're playing on the playground, what makes you get from the top of the slide to the bottom? How do you slide down faster, slower, etc.

Specific Lesson Question: How do we get our car to go the farthest distance? What types of interactions affect the distance and motion of our car?

Overview

How does this lesson contribute to your overarching unit question? This lesson is leading our students to understand that the higher the slope, the faster and further you will go. Along with this, students are experimenting with different pressures of push and pulls (i.e. a harder push will go faster and further, a lighter push will go slower and not as far).		
Disciplinary Core Idea Addressed in lesson: **K-PS2-1 Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object.** **K-PS2-2 Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull.*** **Explain this idea (in your own words---not the internet) AND its importance to answering the driving question for the unit.**	**Science and Engineering Practices Addressed in Lesson:** • Analyzing and Interpreting Data • Developing and Using Models	**Cross-Cutting Concepts Addressed in Lesson:** ***Cause and effect:*** Events have causes, sometimes simple, sometimes multi-faceted. A major activity of science is investigating and explaining causal relationships and the mechanisms by which they are mediated. Such mechanisms can then be tested across given contexts and used to predict and explain events in new contexts. ***Systems and system models.*** Defining the

		system under study—specifying its boundaries and making explicit a model of that system—provides tools for understanding and testing ideas that are applicable throughout science and engineering.

Will another discipline of STEM (other than science) be included in this lesson? [highlight your response]

Yes

No

*If yes, be sure to CLEARLY state in the Learning Plan below **when and how** STEM will be infused.*

All of our STEM infusion will be in the Explore phase of this lesson.

Technology: Students will be using meter sticks to measure out the distance of their cars.
Math: Students will be using meter sticks and tape markers to measure how far their car has gone on the track.
Engineering: Students are engineering tracks with different amounts of books

Learning objectives (outcomes):

What do you want students to be able to explain/state in response to the specific lesson question?

- They will understand that the higher the ramp the further it will go and the faster it will go.
- They will understand that a car will go farther on a smooth surface than a bumpy surface.

Learning Plan (using the 5E model--Meredith will explain as needed)	
ONLINE **ENGAGE (15-20 minutes)** ● We will begin with a discussion about friction and what we did last week. ○ **Question**: Can anyone tell me what friction means? ■ **Anticipated Responses**: Based off the end of our last lesson, I don't think students will remember the term "friction" ○ **Question**: Do you think our car will go faster on a smooth road or a rocky road? ■ **Anticipated Responses**: (Based off the previous lesson) students will answer that the car will go faster on a smooth road. ● RECAP BIG TIME: Lena's Friction Poster ○ Students will identify the direction and movement of the object on the poster and will discuss ideas on friction ○ For this activity, students will be given 2 sheets of paper with different arrows on them. After I ask each question, they will hold up their arrow indicating which direction the force is coming from. ○ **Question**: If there is a push force acting on this object, which way would it go? ○ **Question**: If friction is acting against the force, which direction would the friction be going? ○ **Question**: How can friction affect the movement of the object?	**Adaptations for Online** ***(as needed by phase)*** **ENGAGE** ● https://www.youtube.com/watch?v=qN0V0NXV3Kw (stop at 1:20)

EXPLORE **Activity 1: (1 hour)** ● We will have created tracks with masking tape on the floor for the students. Kindergarteners will already have pre-measured meter tabs on their track so they can count their distance by ones, and can round to the closest tab. Second graders will use meter sticks to measure their distance. These sections for the kids to work in will be socially-distanced! ● We will have the students create a car ramp with the textbooks and cardboard. Each student will create their own on each side of the room. ○ The tape will be used to attach the cardboard to books and make sure the ramp is stable. ○ The textbooks will be added one by one each trial to see how the steepness of the track affects the car's speed and distance. (The first trial will be two book stacked, the second trial will be three books, and the third trial will be four.) ○ The cardboard will be used to make a straight, smooth path from the top of the textbooks to the floor part of the track ● As a class, we will make a prediction about what will happen as we add more books to the ramp. This will be used to refer back too. WRITE PREDICTION ON BOARD ● We will demonstrate how to make sure they are using the same level of force with each push ● We will have a worksheet chart where the students can record their distance measurements for each trial. We will refer to this for them to analyze their data.	**EXPLORE** ● We will explain to our one online student how to set up the track either on their floor/table and how we will be using the materials in a step by step setup ● We will have a prediction that we write down on a piece of paper and can hold up when needed

○ We will have a brief discussion on how the worksheet is laid out and explain how to correctly fill out. ○ We will define what 'data' is ○ Make sure that every student understands where to write down their data and what to refer to when they need information. **Brain Break (2-3 minutes)** ● Announce to the class that we will be taking a 3-4 minute warm up "break" to get our blood pumping and our brains working! ● "5-4-3-2-1" Game ● Have the student to 5 of something, then 4, 3, 2, and 1 ○ 5: "Skips in place because we are excited!" ○ 4: "4 raise the roofs because we have to get a good push for our cars!" ○ 3: "Froggy squats because we are going to have to bend down and measure the distance of our cars!" ○ 2: "Jumping jacks because those are just fun!" ○ 1: "One star jump because we think you guys are going to rock this activity!" ● Before we start, we will ask students questions to spark their interest with the investigation: ○ **Question:** Which texture do you think will slow down or speed up your car? ■ **Anticipated Response**: "Tin foil since it has bumps to slow it down!" ○ **Question:** Which ramp do you think is the fastest or slowest? ■ **Anticipated Responses**: "The flat surface will go faster and the bumpy surface will go slower."	● We will explain how the worksheet will help us see patterns when we are doing our activity. We will make the chart together with the data that our online student records since she is still in kindergarten and might need extra help with it

○ **Question:** What do you think will happen when you let go of your car? ■ **Anticipated Responses**: “The car will fall” or “the car will fall down the ramp.” ● Carry out Investigation and be sure that every student is staying on task and knows what they're doing ○ Walk around and see what each student is writing down ○ Ask them what types of observations they are making ○ Make sure that the Kindergarteners in the class are keeping up with the second graders ■ If they are struggling, assist if needed with the worksheet **EXPLAIN (15 minutes)** ● Discussion of trials ○ “Before we began our trials, we made a prediction of what we thought was going to happen. Can anyone remind me of what that prediction was?” ■ **Question**: Did anyones data support our prediction? ● **Anticipated response**: “Yes our data supported our prediction!” “No my data did not support this prediction” ○ If students say no, we are going to do a sub activity. ○ We will redo some of the trials on the teachers ramp to show that the higher the ramp, the faster and further the car will go.	● We will have our student angle her camera so that we can watch her go through her trials and make sure she is doing it correctly

- Once we finish the trials, the teacher will ask again about the prediction.
- **Question**: Did our data in these trials support our prediction?
  - Anticipated Response: “Yes! Our data shows exactly that!”

ELABORATING/EXTENDING Understanding

(WHOLE CLASS -- last 30mins together -- building your class Content Storyline)

- We will have a bigger version of the worksheet on the board to record times and distances for each student.
- Each student will tell us their number for the trials and we will add it to the big chart on the whiteboard. After recording everyone's numbers, begin a quick discussion on what the numbers are telling us.
  - **Question**: According to our data, on what surface did our car go the furthest?
    - **Anticipated response:** the carpet
  - **Question**: What surface did our car go the shortest distance on?
    - **Anticipated Response**: the tin foil
  - **Question**: How many books high did our car go the furthest?
    - **Anticipated Response**: 4 books high
  - **Question**: How many books high did our car go the shortest distances?
    - **Anticipated Response**: 2 books high

○ **Question**: Can anyone tell me what the best combination of surface and number of books would be to make our car go the furthest? ● **Anticipated Response:** Using the carpet and 4 books high ● We will come back together as a class and have a discussion about what types or surfaces and what heights work best to make the car go the farthest and have the most speed ● Be sure to ask students why they believe their answer is correct. Ask them to back up their answers with data from their chart.	

Formative Assessment Evidence

What evidence will you gather to understand if ALL your students met the learning outcome (see green box above)?

- The ramps
- The chart holding all their observations and data

Individual Student Accomodations

Required Accommodations/Modifications:

- We will have the car ramp stations on all four sides of the room for socially distanced areas
- For second graders, they will be measuring with the actual meter sticks.
- For the kindergartners, F2F teachers will premeasure out the meter sticks and mark it with masking tape.

Additional Modifications for Individual Students:

- For the kindergarteners, if they have issues using the timer or getting accurate times, one of the teachers will go over and time for them and they can record on their worksheet.

Materials **REMEMBER to include Quantity. Also differentiate any materials for in person VS online.**	
In person - **Masking tape (1 roll per student and teacher)** - **Toy cars (6)** - **Poster (we will provide)** - **4 textbooks of the same size per student and teacher** - **Cardboard (1 per student and teacher)** - **Dish towel (1 per student and teacher) Lena and Jenna will also bring towels** - **Tin foil sheets (we will provide)** - **Scissors (in case)** - **Meter sticks (6)** - **The chart we will provide**	**Online**

Week 5

Grade level: Kindergarten/second grade

Driving Question for the unit: When you're playing on the playground, what makes you get from the top of the slide to the bottom? How do you slide down faster, slower, etc.

Specific Lesson Question: How will you build your ramp? What made you build your ramp the way you did?

Overview
ow does this lesson contribute to your overarching unit question? his lesson allows students to build ramps the way they want them to get the results they want (i.e. rther, faster, slower, more friction, less friction, etc.)

sciplinary Core Idea Addressed in sson:	**cience and Engineering ractices Addressed in esson:**	**ross-Cutting Concepts ddressed in Lesson:**
PS2-1 Plan and conduct an investigation compare the effects of different rengths or different directions of pushes d pulls on the motion of an object. ● Students are planning and designing their own models of a ramp and comparing the different pros and cons to each model. Based on the different strengths that force has on an object. ● This concept helps answer our main question by allowing students to see the differences materials make in the way their car moves on the ramp. Also, allowing them to build a ramp for the desired results. **PS2-2 Analyze data to determine if a esign solution works as intended to**	● Developing and using models ● Planning and carrying out investigations ● Analyzing and interpreting data ● Using mathematics and computational thinking ● Constructing explanations and designing solutions	● **Structure and Function** e way that an object is aped or structured termines many of its operties and functions ● **Cause and effect:** Events have causes, sometimes simple, sometimes multi-faceted. A major activity of science is investigating and explaining causal relationships and the mechanisms by which they are mediated. Such mechanisms can then be tested across given contexts and used to predict and explain events in new contexts. ● **Systems and system models.** Defining the system under

hange the speed or direction of an object ith a push or a pull.* ● Students will look at how the design of their ramps affect their car's motion (distance and speed) and design additional ramps to work toward their desired outcomes. Changing speed and distance after looking at their data. ● This is important because it helps students understand that different factors go into speed and distance. Whether that is how much force they give the car, what kind of surface they put it on, how tall they make their ramp, if they add any bumps intentionally or unintentionally. It can relate to our slide question because it all comes into play. **xplain this idea (in your own words---not e internet) AND its importance to nswering the driving question for the nit.**		study—specifying its boundaries and making explicit a model of that system—provides tools for understanding and testing ideas that are applicable throughout science and engineering.

ill another discipline of STEM (other than science) be included in this lesson? [highlight
our response]

es

o

Both STEM disciplines will be utilized in the explore phase of this lesson.**

ath: Students will be measuring out the distances and time for the car's movement using anipulatives. They will use stopwatches to measure the time it takes to get down the ramp ntil it stops moving. They will measure out the distance with their tape measure in inches.

ngineering: building ramps by putting materials together and choosing what materials they ant to use for their ramps to achieve their desired speed level and distance.

earning objectives (outcomes):

hat do you want students to be able to explain/state in response to the specific lesson uestion?

- “I built my ramp this way because I think it will make my car go the fastest.”
- “I changed my ramp this way because I wanted it to go faster or farther.”

Learning Plan

(using the 5E model--Meredith will explain as needed)

ONLINE	Adaptations for Online *(as needed by phase)*
NGAGE ● We will be doing a recap of the last lesson by asking the student(s) questions about what we did and what we discovered in our investigation ○ **Question:** Can anyone tell me what we learned about friction last week? What does it do to an object's motion? ■ **Anticipated Response:** We learned that the bumpier a surface, the slower and less distance the object moves. ○ **Question:** What did we learn about what a ramp can do to an object's motion? And what happens to the object's motion when the ramp gets higher/steeper? ■ **Anticipated Response:** The higher the ramp, the faster the object moves and the farther it will go. ● Show Lena's Friction poster again to refresh the same material ○ **Question**: If there is a push force acting on this object, which way would it go?	**NGAGE**

■ **Anticipated Response:** Forward ○ **Question**: If friction is acting against the force, which direction would the friction be going? ■ **Anticipated Response:** The opposite way, backwards ○ **Question**: How can friction affect the movement of the object? ■ **Anticipated Response:** It can slow it down or stop it. **XPLORE** 1. Have a discussion with the students about good and bad characteristics of a ramp, and how we assembled our ramps last week. Ask the students to share out different characteristics while the teacher is writing them down on the board. This will be a great place for the students to refer to while they are assembling their own ramps. 2. Introduce all of our materials that can be used to build your ideal ramp for your car to go down. Let them know they will have a set amount of time to make each and we will have a timer on the	**XPLORE** ● We will pull up a word document with the characteristics of

board (or on screen) where they can see how much time they have left. ● Students will then one at a time pick out their materials they are going to utilize for their original ramp design. ● STUDENTS GET TO WORK AND START BUILDING!!! 3. Talk about the chart and how to fill in the chart. Logistics. 4. BRAIN BREAK ● Simon Says activity ○ Explain rules if students don't know. ○ Simon Says ■ Touch your toes ■ Do a star jump ■ Raise the roof	a good ramp so that she can refer back to it ● Pull up timer and share screen so student can keep track of time (7-10 mins for each build) ● We will show her the chart we are using and she can draw it out herself ● To make things quicker, we can write down on our online class chart what she changed in each ramp so that we can refer back to it

■ Frog jumps ■ Stretch!!! 5. Students will be doing 3 trials per ramp design. They will only be measuring the distance their car goes. Students can experiment with different levels of their push (i.e. a hard push). ○ We will have them write down what they changed in each ramp on their chart so that they can use that when analyzing their data ○ Students will make three different ramps, and perform three trials for each ramp design they make. **XPLAIN** 1. We will have the students look at their charts, and make a big class chart on the board. Be sure to tell the students to look for different patterns that they found. ● **Question:** What did your ramp look like when your car went the farthest?	**XPLAIN** ● Go over what we will be doing with the whole class with Frankie. Explain what she will be presenting to the rest of the class and maybe practice it with her first, before

○ **Anticipated Response:** “Our ramp was the highest when it went the farthest.” ● **Question:** What did you ramp look like when it went the fastest/slowest? ○ **Anticipated Response**: “Our ramp was the highest when it went the farthest.” ○ “It was slower when the ramp was lower.” ● **Question:** What kinds of surfaces did you use to drive your car on? ● **Question:** Did you ever change out your surface? Why? ○ **Anticipated Response**: “I changed the surface so it would be less bumpy and my car would go faster.” FRICTION :) 2. This time will be used to talk about what changes we made to our ramps in order to get our cars to go faster or farther. ● **Question:** What were some of the changes that you guys made to your ramps in each trial? ○ **Anticipated Response:** “We made our ramps higher/lower.” “We added (blank) material.” ● **Question:** Were the changes you made beneficial to the ramp? Or were they bad for the ramp?	we go back with the whole class.

○ **Anticipated Response:** “They were good, sometimes bad” 3. We can talk about what characteristics of the ramps affected the motion of our car. An example: a higher ramp makes the car go further, a harder push off the ramp makes it go farther, etc. ○ **Question:** What kind of push makes our car go farther and faster? i. **Anticipated response**: A harder push ○ **Question**: What kind of push makes our car go a shorter distance? i. **Anticipated response:** A weaker push ○ **Question:** If we are trying to go the farthest, should our ramp be higher or lower? i. **Anticipated response**: our ramp should be higher! **ELABORATING/EXTENDING Understanding**	

(WHOLE CLASS -- last 30mins together -- building your class Content Storyline) ● We will go over our separate findings to see if they were the same or different ○ We can go around the room and have each student give a brief explanation of why they chose the certain materials for their ramp and what they found. ○ This will ensure that our online student feels included when we come together as a whole class. Be sure to give sufficient time for each student to explain their findings. ● We will connect back to our main unit question by explaining how a ramp is similar to a slide and the movement of an object down a slide is the same as the car moving down the ramp. ● Discuss the surface of a slide and how it compares to the surface that they chose for their slides.	
Formative Assessment Evidence	
hat evidence will you gather to understand if ALL your students met the learning outcome ee green box above)?	

● If students can change their ramp to meet the objectives or desired results. (I.e. building a ramp with more friction and shorter to make the car go a shorter distance.)
Individual Student Accomodations
equired Accommodations/Modifications: ● All the ramp building stations will be on opposite sides of the room to allow for social distancing.
dditional Modifications for Individual Students: ● If students need help measuring, teachers will demonstrate first and then be available to help measure.
Materials **REMEMBER to include Quantity. Also differentiate any materials for in person VS online.**

• **Masking tape (3 full rolls) LIKE A TON** • **Scotch Tape (1 roll)** • **Yard sticks: 4** • **Textbooks: 6 each** • **Plastic Bins/tubs: 4 bins or tubs** • **Tin foil: 1 box** • **Cloths: 8 pieces (enough for 2 each)** • **Sandpaper** • **Manila file folder: 5** • **Toy cars: 5** • **Friction Poster (Lena will bring)** • **Scissors** • **Cardboard (enough to build multiple ramps with)**	**nline** • **Pots and pans** • **The thickest books you can find** • **Cardboard** • **Tape** • **Tin foil** • **Dish towels**

Week 6

Grade level: Kindergarten/second grade

Driving Question for the unit: When you're playing on the playground, what makes you get from the top of the slide to the bottom? How do you slide down faster, slower, etc.

Specific Lesson Question: How can I build a ramp to complete the challenge? How can we build a ramp to go the furthest distance?

Overview
ow does this lesson contribute to your overarching unit question? his lesson will tie in to our overall unit question by building a ramp to make us go the farthest. It will so drive home the idea of friction and how that affects the movement of the car.

sciplinary Core Idea Addressed in sson:	**cience and Engineering ractices Addressed in esson:**	**ross-Cutting Concepts ddressed in Lesson:**
PS2-1 Plan and conduct an investigation compare the effects of different rengths or different directions of pushes d pulls on the motion of an object. ● Students are planning and designing their own models of a ramp and comparing the different pros and cons to each model. Based on the different strengths that force has on an object. ● This concept helps answer our main question by allowing students to see the differences materials make in the way their car moves on the ramp. Also, allowing them to build a ramp for the desired results. **PS2-2 Analyze data to determine if a esign solution works as intended to**	● Developing and using models ● Planning and carrying out investigations ● Analyzing and interpreting data ● Using mathematics and computational thinking ● Constructing explanations and designing solutions	● **Structure and Function** e way that an object is aped or structured termines many of its operties and functions ● **Cause and effect:** Events have causes, sometimes simple, sometimes multi-faceted. A major activity of science is investigating and explaining causal relationships and the mechanisms by which they are mediated. Such mechanisms can then be tested across given contexts and used to predict and explain events in new contexts. ● **Systems and system models.** Defining the system under

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- “I built my ramp this way because I think it will make my car go the fastest.”
- “I changed my ramp this way because I wanted it to go faster or farther.”
- “I changed my ramp this way to make it do this.” (whatever challenge it is.)

Learning Plan

(using the 5E model--Meredith will explain as needed)

ONLINE	Adaptations for Online
NGAGE ● Start out with a discussion that reviews concepts we have touched on throughout Saturday Science. ● Questions: ○ We are going to review what we have learned! ○ Can anyone tell me what motion is? ■ Anticipated response: Pushes and pulls/ Making something move. ○ What are pushes and pulls examples of? ○ What do those pushes and pulls do? ■ Anticipated response: Pushes and pulls are forces that make things move. ○ Then we can talk about or clarify that motion is movement if they do not get that on their own. ○ When your cars go down the ramp that is motion. You make the motion by pushing your cars down the ramp.	**NGAGE**

○ We kinda just talked about this but can anyone tell me what a force is? ■ Anticipated response: Pushes and pulls. Friction. Opposing forces. Maybe gravity. ○ What do those pushes and pulls do? ■ They affect an object's motion or makes something move ○ So forces make things move! Forces are what cause the motion. ○ Can anyone tell me what friction is? ■ Anticipated response: Friction is an opposing force? *What does that mean? It* means it goes opposite of the first one. ○ Clear up any ideas on friction. **<u>rain Break</u>** ● **Act Like** ○ We will ask them to act like different things ○ Examples:	

■ act like you're a basketball player ■ act like you're driving a car ■ act like you're grocery shopping ■ act like are a famous singer, etc. **XPLORE** ● We will have the kids build multiple ramps that will fit different criteria. ● We will have all the materials that students can use in front of them so they can pick whatever materials they think will be best ● Different criteria for ramps: ○ Build a ramp that you think will make the car go the furthest ○ Build a ramp that you think will make the car stop on the ramp ○ Build a ramp that you think will make the car go the shortest distance ○ Build a ramp that will change the route of your car or make it go in a different direction	**XPLORE**

○ Build a ramp that may be bumpy for a car to drive on ● After each ramp we will ask them what about their ramp helped fit the criteria (ex. smooth surface helped my car go faster) ● We will also ask them if they thought their ramp worked/fit the criteria, and if it did not work, what about it should be changed ● Have the students jot down notes for each ramp that they created after each challenge ○ Students will draw out what their ramps look like and label each of the materials ○ Have each student write a brief explanation/description of how their ramp turned out ○ At the end of all of the challenges, they will rank their ramps from best to worst using a scale of 1-5. **XPLAIN** ● As a whole class, discuss each of the student's findings ○ Have them share their drawings of each ramp and explain why they ranked them in the order they did	● We can write down her notes on a pulled up document

● Have each student choose their favorite ramp or the ramp that they ranked as number 1 to share to everyone in the elaborate section **ELABORATING/EXTENDING Understanding** ***(WHOLE CLASS -- last 30mins together -- building your class Content Storyline)*** ● Every student will come up to the camera and show their favorite ramp to the camera and provide a quick sentence about why it was their favorite. ● Slide Contest Ramp Building ○ As the online group and F2F group come back together, we want to tie all the ideas we have learned over the past 5 weeks into our main problem: how can we make a ramp that allows us to go the farthest. We posed the scenario in lesson 1: We are in a slide contest and we have to build a slide that is going to make us go the farthest distance. How can we do that? ○ Pose that scenario to them again and ask students for their ideas on how to build a ramp to make us go the farthest.	**XPLAIN**

- Write all the ideas on the board.
- If ideas of surfaces or heights vary, have a small discussion to figure the students thinking and how they can all agree on one idea.

○ After all the students agree on the logistics of the ramp (i.e. surface, friction, height), the teachers will build the ramp on a table that everyone can see.

○ Once the ramp is built, we will test the ramp and measure the distance.

- **Question**: Do you think we can improve this ramp?
- **Anticipated Response:** yes!, No.
- **Question**: Does our ramp have the least amount of friction of all our materials?
- **Anticipated Response:** Yes, our surface is the least bumpy of everything.

Formative Assessment Evidence

hat evidence will you gather to understand if ALL your students met the learning outcome ee green box above)?

- If students can change their ramp to meet the objectives or desired results. (I.e. building a ramp with more friction and shorter to make the car go a shorter distance.)

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- All the ramp building stations will be on opposite sides of the room to allow for social distancing.

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