The Evolution of the T2L Science Curriculum

Over the last four years, the Teach to Learn program created 20 NGSS-aligned science units in grades K-5 during our summer sessions. True to our plan, we piloted the units in North Adams Public Schools, and asked and received feedback from our science fellows and our participating teachers. This feedback served as a starting point for our revisions of the units. During year 2 (Summer of 2015), we revised units from year 1 (Summer/Fall 2014) and created new units to pilot. In year 3, we revised units from years 1 and 2 and created new units of curricula, using the same model for year 4. Our understanding of how to create rich and robust science curriculum grew, so by the summer of 2018, our final summer of curriculum development, we had created five exemplar units and established an exemplar unit template which is available in the T2L Toolkit.

We made a concerted effort to upgrade all the existing units with exemplar components. We were able to do much, but not all. So, as you explore different units, you will notice that some contain all elements of our exemplar units, while others contain only some. The fully realized exemplar units are noted on the cover page. We did revise all 20 units and brought them to a baseline of "exemplar" by including the Lessons-At-A-Glance and Science Talk elements.

Grade K

Matter and Motion

MCLA NAPS Williams

Teach To Learn

A collaboration between MCLA, Williams College, and North Adams Public Schools

Funded by NSF DUE-IUSE Award #1432591

T2L Curriculum Unit

Matter and Motion

Physical Science/Grade K

In this unit, students will learn about different kinds of movement and stages of matter. During this unit students will investigate pushing and pulling as well as the difference between liquids and solids and the impact temperature has on each. The unit will end with an activity combining both motion and the different states of matter, allowing the students to apply the knowledge they learned during this unit.

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Table of Contents

Unit Plan

Stage 1 Desired Results

K-PS1-1(MA). Investigate and communicate the idea that different kinds of materials can be solid or liquid depending on temperature. [Clarification Statements: Materials chosen must exhibit solid and liquid states in a reasonable temperature range for kindergarten students (e.g., 0–80°F), such as water. Only a qualitative description of temperature, such as hot, warm, and cool, is expected.]

2006 PK- 2. PS. 3. Describe the various ways that objects can move, such as in a straight line, zigzag, back-and-forth, round and-round, fast, and slow.

K-PS2-1. Compare the effects of different strengths or different directions of pushes and pulls on the motion of an object. [Clarification Statements: Examples of pushes or pulls could include a string attached to an object being pulled, a person pushing an object, a person stopping a rolling ball, and two objects colliding and pushing on each other. Comparisons should be on different relative strengths or different directions, not both at the same time. Non-contact pushes or pulls such as those produced by magnets are not expected.

Meaning

UNDERSTANDINGS **U**

Students will understand that…

- One can push and pull with different degrees of strength and in different directions.
- Pushing or pulling on an object can change the speed or direction of its motion.
- When objects touch or collide, they push on one another and can change motion.
- The force of a push or a pull demonstrates the relationship between energy and force

ESSENTIAL QUESTIONS **Q**

1. How can we use temperature to tell the difference between a solid and a liquid?
2. Why is the way we move things important?

Learning Targets

Students will be able to…

- Compare and contrast different kinds of scientists
- Draw the motion of an object
- Discuss how objects and people move in many directions and ways

	• Categorize pictures of pushes and pulls • Discuss how the strength and direction of a push/pull determines the final position of an object • Predict whether or not two objects will collide • Determine which toy car is the fastest by conducting a simple investigation • Identify a material as a solid or a liquid. • Use properties of a material to determine whether something is a solid or liquid. • Observe and describe matter at different temperatures • Predict what will happen to an ice cube in the presence of a heat source • Identify why liquids change to solids and solids change to liquids • Predict the result of a change in temperature

Stage 2 – Evidence

Evaluative Criteria	Assessment Evidence
Pre-unit Assessment (if any)	
	OTHER EVIDENCE: OE Drawings and worksheets Class Discussions

Stage 3 – Learning Plan

Potential prior grade level knowledge:

PRE-K Standards

1. Raise questions and investigate the differences between liquids and solids and develop awareness that a liquid can become a solid and vice versa.
2. Investigate natural and human-made objects to describe, compare, sort, and classify objects based on observable physical characteristics, uses, and whether something is manufactured or occurs in nature.
3. Differentiate between the properties of an object and those of the material of which it is made.
4. Recognize through investigation that physical objects and materials can change under different circumstances.
5. Clarification Statement: Changes include building up or breaking apart, mixing, dissolving, and changing state.

Lesson 1: Students will brainstorm ideas around what a scientist is and what they do. In small groups, students will talk about different types of scientists. Students will then be introduced to their science journals and will draw a picture of what they think a would look like as a scientist.

Lesson 2: Students will learn about motion and will brainstorm different ways of moving. Volunteers will demonstrate some of these movements to the class. **Note**: Part of this lesson should take place outside or in the gym, so the teacher must make the appropriate accommodations prior to this lesson.

Lesson 3: Students should discuss what a "push" and a "pull" is and how they compare and contrast to each other. Students will be partnered up and will take turns pushing and pulling their partner. Students will also go on a scavenger hunt for examples of things being pushed and pulled.

Lesson 4: Students will learn about strength and direction. Students will investigate the consequences of different forces and directions using various kinds of objects.

Lesson 5: Students will learn about force, speed, and collisions. The classroom teacher can demonstrate these concepts by releasing a marble down a ramp. This lesson will include the following stations: a marble station, bowling station, domino station, and a newton's cradle station.

Lesson 6: Students will create ramps using different types of blocks and books found in the classroom. They will investigate how the height of a ramp can change how fast and far their Matchbox car can go. They will also compare the distance and speed of the cars.

Lesson 7: In this lesson, students are introduced to solids and liquids and will classify pictures. Students will also participate in an activity to help them further understand how to classify solids and liquids.

Lesson 8: Students will observe two objects undergo a change. The two objects the students will observe are wax and ice, which will be exposed to heat. Students will need to pay close attention to see what changes these items experience.

Lesson 9: Students will create a frozen treat during this lesson. Students will need to rely on their knowledge of matter and motion to think critically about they will make ice cream. Students will make predictions about how they might go about making the ice cream, then they will make the ice cream following the instructions. Be sure to revisit the predictions at the end of the lesson to see if the students had accurate predictions.

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KEY

Lessons at a Glance

 Tech Integration  Outdoor education

Lesson	Core Activities	Optional Extensions	Tech Integration	Field Work/Outdoor Ed
1	• Scientist presentation and discussion • Science journal introduction and explanation			
2	• Motion stations • Motion song • Reading Eric Carle book			
3	• Motion scavenger hunt • Playground trip • Picture sorting activity	Scooter/gym activity		 Playground trip/exploration
4	• Push and pull stations			
5	• Marble chute demo • Turn and talk review • Collision Stations			
6	• Ramp it Up! activity • Car activity			
7	• Mystery bag activity • Solids and liquids investigation • Muffin tin classification	Making oobleck		
8	• Solids and liquids review • Wax and ice melt activity			

Tiered Vocabulary List

Tier 1	Tier 2	Tier 3
Science	Investigation	Motion
Scientist	Title	Collision
Move	Categorize	Ramp
Fast	Match	Speed
Slow	Direction	Solid
Push	Strength	Liquid
Pull	Speed	Freeze
Marble	Prediction	Temperature
Domino	Test	Compare
Car	Melt	Attribute
Observe	Heat	Ingredients
Water	Warm	Consistency
Ice	Hot	
Refrigerator	Cold	
Freezer	Wax	
Change	Cream	
Ice cream	Vanilla	
Sugar	Motion	
Up	Zig zag	
Down	Pitcher	
Circle	Salt	

Lesson Feature Key

Lessons in this unit include a number of features to help instructors. This key is a quick guide to help identify and understand the most important features.

Icons

 **Talk science icon:** Look for this icon to let you know when to use some of the talk science strategies (found in the unit resources of this unit)

 **Anchor phenomenon icon:** Indicates a time when an anchoring scientific phenomenon is introduced or when an activity connects back to this important idea**.**

Text Formatting:
[SP#: ....] Any time you see a set of brackets like this, it indicates that students should be engaged in a specific science or engineering practice.

Underlined text in the lesson: This formatting indicates important connections back to the central scientific concepts, and is useful to note these connections as an instructor, as well as for students.

Callouts

Teaching Tip
In these call out boxes, you'll find tips for teaching strategies or background information on the topic.

Student Thinking Alert
Look out for common student answers, ways in which students may think about a phenomenon, or typical misconceptions.

Lesson 1: What is a Scientist?

BACKGROUND

Overview of the Lesson

Students will brainstorm ideas around what a scientist is and what they do. In small groups, students will talk about different kinds of scientists. Students will then be introduced to their science journals and will draw a picture of what they think a would look like as a scientist.

Focus Standard(s)

RI.K.3 With prompting and support, describe the connection between two individuals, events, ideas, or pieces of information in a text

RI.K.7 With prompting and support, describe the relationship between illustrations and the text in which they appear (e.g., what person, place, thing, or idea in the text an illustration depicts).

Learning Targets

1. I can identify why certain pictures were chosen based on the accompanying text
2. I can compare and contrast different types of scientists and describe what makes them the same and different

Assessment

- During the PowerPoint, students will discuss why each person is a scientist and what makes them different from the other scientists
- Create a picture that fits with a given caption in their science journals

WIDA Language Objectives

(Dependent on the needs of your ELL students)

Key Vocabulary

Tier 1: science, scientist

Tier 2: investigation, title

RESOURCES AND MATERIALS

Quantity	Item	Source
	Scientist PowerPoint	CMC Website
1	**Hand held mirror**	**Bin**
1	**Cloth to cover the mirror**	**Bin**
	Craft supplies (glue sticks, crayons, pencils, safety scissors)	Classroom Teacher
	Chart Paper	Classroom Teacher

****Items in bold should be returned for use next year****

LESSON DETAILS

Lesson Opening/ Activator

Ask students "*what is a scientist?"* and have them identify individuals that may be a scientist, some examples that the students might be familiar with are, Sid the science kid, characters in Wild Kratts, Bill Nye, Albert Einstein, Jane Goodall, and Benjamin Franklin. Here is a great list of scientists that kids may be familiar with, the site also shares some basic

information about each scientist: http://www.dkfindout.com/us/science/famous-scientists/. Make a list (on chart paper) of the scientists you students brainstorm. You can keep this paper in the classroom and add to it.

During the Lesson

1. Show the students the Scientist PowerPoint and discuss the different careers and people who we consider scientists.

2. "What makes someone a scientist? What do all these people have in common?" Guide the discussion to the conclusion that scientists are people who ask questions and carry out investigations. In order to learn about new things, you have to ask questions. If I want to know your name, or your favorite ice cream I'd have to ask you. If I wanted to know what a T-Rex looked like, I'd have to ask questions and do some investigating.

3. Have students make connections between the scientists you've been talking about. Can they find similarities and differences?
4. Ask the students, "If you were a scientist (an archeologist perhaps) and you wanted to be sure that a T-Rex really existed, what would you do? What kind of questions might you ask? What would you look for? Use examples of what other scientists investigated and questions they asked when trying to learn more about the dinosaurs.

5. The last slide of the power point will include a picture of kids. Ask the students, "*Can you be a scientist?"* If the students say no, ask "*Why not?"* or if they say yes say *"You are absolutely correct, why?* Lead students to the conclusion that they can be scientists too because they will ask questions about things in the world around them. **[SP- 6. Constructing explanations]**

6. The teacher should grab the mirror out of the materials bin and have students close their eyes. Instruct the students to keep their eyes closed until you are ready to show them the "picture". Have students open their eyes and look into the mirror. They will see that they are the scientists!

7. Introduce the students to their science journals, tell them they will be drawing a picture of themselves as a scientist in their science journal. Have them caption their pictures using the following: ("My name is_____ and I am a scientist"). Have an example to share and walk the kids through the process. Have materials (glue, pencils, and scissors) available.

Lesson Closing

Review that a scientist is a person that asks questions about our world and investigates to find the answers. Remind students that anyone can be a scientist.

Assessment

- During the PowerPoint, students will discuss why each person is a scientist and what makes them different from the other scientists
- Create a picture that fits with a given caption in their science journals

Lesson 2: Introduction to Motion

BACKGROUND

Overview of the Lesson

In this lesson, students will learn about motion, and brainstorm different ways of moving. Volunteers will demonstrate some of these movements to the class. **Note**: Part of this lesson should take place outside or in the gym, so the teacher must make the appropriate accommodations prior to this lesson.

Focus Standard(s)

K-PS2-1. Compare the effects of different strengths or different directions of pushes and pulls on the motion of an object.

- Examples of pushes or pulls could include a string attached to an object being pulled, a person pushing an object, a person stopping a rolling ball, and two objects colliding and pushing on each other.
- Comparisons should be on different relative strengths or different directions, not both at the same time.
- Non-contact pushes or pulls such as those produced by magnets are not expected.
- Describe the various ways that objects can move, such as in a straight line, zigzag, back-and-forth, round-and-round, fast, and slow.

Learning Targets

1. I can draw the motion of an object
2. I can discuss that objects and people move in many directions and in many ways

Assessment

Students will illustrate two types of motion in their science journals. This might include spinning in a circle, moving up and down, forwards, backwards, or in a zig-zag pattern.

Key Vocabulary

Tier 1: move, fast, slow

Tier 3: motion

RESOURCES AND MATERIALS

Quantity	Item	Source
	Movement Song (https://youtu.be/LfR_Nn9dmmw)	CMC Website
	Laptop	Classroom Teacher
5	**Jump Rope**	**Bin**
5	**Ball**	**Bin**
5	Hula Hoop	Borrow from P.E. Teacher
1	**"From Head to Toe" by Eric Carle**	**Bin**
1	Shaving Cream	Bin
1 copy per student	Booklet (7 pages total to be completed over lessons 2-5)	Binder (Classroom Teacher to copy)
3	Ropes (optional)	Borrow from the P.E. Teacher

****Items in bold should be returned for use next year****

LESSON DETAILS

Lesson Opening/ Activator

Ask students, why is the way we move things important? Write the essential questions on a piece of chart paper and refer to them throughout the unit, now would be a great time to pose the questions to the students and gauge what they already know.

Ask the students to think about different ways they are able to move (up, down, side to side, jumping, skipping, running, walking), then have the students turn to a neighbor and share their ideas and ask them to brainstorm more ways they can move. Feel free to have students demonstrate the movements they came up with in front of the class.

Student Thinking Alert

Students may think if they sit completely still they are no longer moving, when in fact they are breathing, which causes movement, and even if they hold their breath, the blood in their veins is still moving.

During the Lesson

1. Ask the students, "*What does it mean to move?*" and "*How do you know if something is moving?*" If no one answers, give them examples such as sliding a pencil across a desk or picking up a book. Encourage the students to think of their own examples by asking "*What can we move right at our own desks?*" and *"What can cause something to move?"* **[SP 2: Developing and Using Models]**

2. **Stations: Note: This portion of the lesson should be done outside/in the gym (if possible), the stations should be set up before the lesson. Teachers should demonstrate each activity before the students begin. This will ensure students understand how to do each activity safely and appropriately.** There are four stations: one station has jump ropes, one station has balls, one station has Hula hoops, and one station has shaving cream. Each station should have ample room for student movement. Assign the students a station to start at and ask them to pay close attention to movement and to make note of what is moving and how it is moving (aim for 3-5 students at a station). The teacher should move from station to station asking questions about the kinds of movement happening. Students should spend 3-5 minutes at each station and then rotate to the next station. Once the students have completed all the stations bring everyone together to discuss what sort of movement they experienced.

a. Station 1: Jump ropes: This station will have one jump rope per student. Students will jump rope and explore the kind of motion happening (jumping and swinging the rope around).
b. Station 2: Balls: The students will throw and catch balls with each other to help demonstrate that the balls are moving up and down.
c. Station 3: Hula Hoops: Each student will have a hula hoop to experiment with, students can try to hula hoop, swing the hula hoop around their arms, or roll the hula hoop across the floor. Help the students identify this motion as spinning and or moving in a circle.
d. Station 4: Zig-Zag: Spread shaving cream out on a table and have the students draw zig zags in the shaving cream using their fingers. It would be helpful to have a drawing of a zig zag nearby so that the students can use it as a reference. Once the students understand what a zig zag movement is they can walk around the area using a zig zag motion.

3. **The teacher should bring a laptop or audio player to the space they will be moving around in.** Tell the students that they will be exploring more movement. Students will watch a video about moving fast versus moving slow. Before watching the video, ask students if they know the difference between fast and slow. Perhaps have them demonstrate by waving their hands very fast and then very slow. Before showing the video have students spread out in the gym or outdoor space (https://youtu.be/LfR_Nn9dmmw) because they will need their own space to move.

4. Tell the students to listen closely to what the song is saying. For example, the video may say "Run!" the students should run in place. Review and demonstrate the types of movement with students (Walk, Gallop, Tiptoe, Run, Skate, Hop). Once the students understand the types of movement you can play the song. After this activity review the different types of movements and ask the students which were fast and which were slow.

5. Return to the classroom and gather the students to read, *From Head to Toe,* by Eric Carle. Ask students to be think about the type of movement that happens in the book. As the animals move in different ways, have the students copy the motions from their seats.

Lesson Closing

1. Review the different movements the students explored today
2. Introduce the booklet. *How Do Things Move?*
3. Complete the first page of the booklet as a class.

Assessment

Students will illustrate two types of motion in their science journals. This might include spinning in a circle, moving up and down, forwards, backwards, or in a zig-zag pattern.

Lesson 3: Pushes and Pulls

BACKGROUND

Overview of the Lesson

Students should discuss what a "push" and a "pull" is. Students will be partnered up and take turns pushing and pulling their partner. Students will also go on a scavenger hunt looking for examples of things being pushed and pulled.

Focus Standard

K-PS2-1. Compare the effects of different strengths or different directions of pushes and pulls on the motion of an object.

Learning Targets

1. I can label an illustration of an action as either a push or pull.
2. I can categorize pictures of pushes and pulls.

Assessment

Students will complete a worksheet and organize images into the categories "push" and "pull".

WIDA Language Objectives

(Dependent on the needs of your ELL students)

Key Vocabulary

Tier 1: push, pull, sled

Tier 2: categorize, match

RESOURCES AND MATERIALS

Quantity	Item	Source
1 per student	Matching Picture cards	Binder
1 per student	Matching labels worksheet	Binder
1 per student	Matching Assessment worksheet	Binder
5	Scooter (optional)	Borrow from P.E. Teacher

****Items in bold should be returned for use next year****

LESSON DETAILS

Lesson Opening/ Activator

Ask the students what they remember about the different ways they moved in the previous lesson. Then introduce students to the concept of pushing and pulling by asking, "*What happens when we push something"?* After a brief discussion, the teacher can pair up the students. Tell the students that they will be lightly pushing on each other, have the students

hold up their hands (at shoulder height), with their palms facing each other. They can take turns pushing on each other's hands. Demonstrate how this should be done before the students try it out themselves, emphasizing that they should not push hard. Now tell the students to take turns lightly pushing on each other hands. After a few minutes ask the students "*When you push your partner, how do they move?"* Lead students to the conclusion that when you push something it moves away from you.

Now ask the students what they know about pulling, "*How is a pull different from a push"?* After a brief discussion, have the students return to their partners and tell them they will be pulling on each other. The students will hold hands with their partner and should take turns pulling each other. Demonstrate how this should be done before the students try it out themselves emphasizing that they should not pull hard. Now tell the students to take turns lightly pulling on each other. Ask the students "*When you pull your partner, how do they move?"* Lead the discussion to the conclusion that when you pull something, it moves towards you. **[SP-4: Analyzing and Interpreting Data]**

During the Lesson

1. Tell the students that they will be going on a scavenger hunt around the classroom. The teacher can make groups of 3-4 students. Tell the students they will be looking for examples of pushes and pulls in the classroom and that they will need to find one example of something you can push, one example of something you can pull, and one example of something that you can both push and pull.
   The teacher can walk around to help the students find their examples. Once all groups have found their examples ask some of the students to share. The teacher can make a chart of the examples the students found.

2. **Playground Trip** Take the students on a "field trip" to the playground. Make sure to tell the students that this trip is for "scientific research". Have each adult available take a group of students to a different piece of equipment on the playground (choose four or five pieces of equipment to look at).

Teaching Tip
Before beginning the scavenger hunt make sure to ask the students to give you examples of what they could find around the room to be sure that they are understanding the task at hand.

3. Ask students, "*What are some ways we can push or pull using this part of the playground?"* Allow them to experiment with the playground equipment to answer this question. After 5-10 minutes, gather the students and discuss what

they discovered. Rotate the groups so that each group visits each piece of equipment. Feel free to give the students some time to explore the playground on their own terms and search for their own examples of pushing and pulling.

4. Now, the students will be completing a matching activity. You will need the matching labels and matching pictures documents. Students will be matching the various picture cards with what kind of motion is happening on the card. You can have the students work in groups or individually to cut the labels and pictures then sort them into the two categories (push and pull).

5. Have the students complete the next page in their *Do Things Move?* Booklet. You can complete the pages as a class or let the students work on the pages on their own.

Assessment

Students will complete the matching assessment worksheet and organize images into the categories “push” and “pull”.

Lesson Extension

Gym Activity: This activity can be done with the physical education teacher at any point after this lesson.

1. Break the students into 4-5 groups. Each group will be given one basic scooter and one scooter with a rope attached.
2. Tell the students that they will be in a relay race where one students will take turns pulling/pushing the student sitting on the scooter.
3. The students will push the scooters with no rope and pull the scooters with rope.
4. Have the groups push the first student from one side of the gym to the other.
5. Next have the group pull the second student from one side of the gym to the other.
6. Alternate pushing and pulling until everyone in the group has gone.

Lesson 4: Strength and Direction of Pushes and Pulls

Note: This lessons takes a good amount of space to perform. Therefore, it is best done outside or in a room that allows access to another room or hall, or a gym.

BACKGROUND

Overview of the Lesson

Students will learn about strength and direction. Students will investigate what happens when using different degrees of force. Students will also explore what happens when an object is moved in different directions.

Focus Standard

K-PS2-1. Compare the effects of different strengths or different directions of pushes and pulls on the motion of an object.

Learning Target

I can discuss how the strength and direction of a push/pull determines the final position of an object.

Assessment(s)

- As a class, review each station, asking questions about how the objects moved
- Have students complete the next three pages in their booklet

Key Vocabulary

Tier 2: direction, strength, speed

RESOURCES AND MATERIALS

Quantity	Item	Source
10	**Hacky sacks**	**Bin**
1	Hula Hoop	Borrow from P.E. Teacher
1	**Rope**	**Bin**
1	**Ball**	**Bin**

****Items in bold should be returned for use next year****

LESSON DETAILS

Lesson Opening/ Activator

Revisit the essential question, *"Why is the way we move things important?"* Prompt the students to think about the concept of pushing and pulling. Ask the students to talk with their neighbor about what they have learned about pushing and pulling. Be sure to review the concept of fast and slow and introduce students to the word "speed" to define how fast or slow something goes.

During the Lesson

1. Ask the students "*What happens if you push/pull something really hard? What happens if you push/pull something really softly? Does it make any difference?*" Have the students share their ideas. Now ask "*What if I push a ball to this side, is that any different than if I push it to that side? {teacher demonstrates) Does it matter what direction I push the ball?"* Again, have the students share their ideas.

2. **Stations: Investigating Forces:** There will be four stations; the teacher should put students into groups of 4-6 students. The students will be at each station for 3-5 minutes. Give the students an overview of each station, demonstrating what they will be doing at each station. **[SP 2: developing and using models]**
    a. **Station 1**: Hacky Sacks and Hula Hoops: The students will attempt to throw the hacky sacks into the hula hoop from roughly five feet away. Ask the students how hard or soft they have to throw the hacky sack to get it into the hula hoop.

    b. **Station 2**: Balls: Students will sit in a circle and roll the ball to each other. Have the students spread out so that students have to aim and roll the ball to a specific student. Discuss the difference in strength when rolling the ball all the way across the circle as opposed to rolling it to the person next to them. Make sure to have the students experiment with rolling the ball across the circle and to the person next to them. You can let the students experiment with rolling the ball fast and slow.

    c. **Station 3**: Pulling a Classmate: Students will need a partner so they can take turns pulling each other up from the floor. Ask the students what direction they are pulling in and how hard or soft they have to pull in order to get their partner off the floor. Have the students pull their friend up quickly then slowly and have them compare how difficult it was to do it quickly or slowly.
        - If students finish this early before switching groups, have them sit back to back and ask them to try and stand up without using their hands, (simply pushing off of one another) and see if they can do it. Ask them what type of force they were applying to stand and where.

    d. **Station 4**: Pulling Rope: The students will be divided into two equal groups and they will pull on opposite ends of a rope. There will be a line marking the middle of the rope on the ground, with the groups trying to pull each other across the line. Tell the students to pull on the rope from their end. If there were equal groups, ask students why it was hard to pull the other team, and why they didn't move much. (i.e. they were pulling in

opposite directions at roughly equal strengths.) If time permits, move people from one group to the other (creating unbalanced teams) and then discuss why it was harder/easier to pull now that they had more or less people. **[SP 1: Asking Questions]**

Lesson Closing

Have the students share what their favorite station was. Ask the students to describe the type of motion at their favorite station. You can have students volunteer to share their favorite stations and what type of motion happened at that station.

Assessment(s)

- As a class, review each station, asking questions about how the objects moved
- Have students complete the next three pages in their booklet

Lesson 5: Collisions

BACKGROUND

Overview of the Lesson

Students will be introduced to the concepts of force, speed, and collisions. The classroom teacher can demonstrate these concepts by releasing a marble down a ramp. This lesson will include: a marble station, bowling station, domino station, and a newton's cradle station.

Focus Standard

K-PS2-1. Compare the effects of different strengths or different directions of pushes and pulls on the motion of an object.

Learning Target

I can predict whether or not two objects will collide

Assessment

Have the students complete the final two pages of their booklet (focused on collisions).

Key Vocabulary

Tier 1: marble, domino
Tier 2: prediction, bold
Tier 3: collision

RESOURCES AND MATERIALS

Quantity	Item	Source
10	**Marbles**	**Bin**
1	**Target sheet (laminated)**	**Bin**
1	**Box of Dominoes**	**Bin**
1	**Bowling set**	**Bin**
1	**Newton's Cradle**	**Bin**
1	**Wooden Ramp**	**Bin**

****Items in bold should be returned for use next year****

LESSON DETAILS

Lesson Opening/ Activator

The teacher should grab the ramp and marbles and gather the students around. Ask the student scientists to predict what will happen when the marble rolls down the ramp, have the students draw a prediction in their science journals. When all the students have made a prediction, release the marble. Now place a marble at the base of the ramp and ask the students to predict what will happen when the marble rolls down the ramp towards the marble at the base, have the students draw a prediction in their science journals. When all the students have made a prediction, release the marble.

During the Lesson

Stations: There will be four stations in this activity, divide students into groups of 4-6. Each group will stay at a station for 3-5 minutes. Give the students an overview of each station, demonstrating what they will be doing at each station.

a. **Station 1**: Marbles: The students will use marbles and a target. Place the target on a flat surface if possible. Give students one or two marbles each and let them try and roll the marble so it lands on or closest to the target. Ask the students *"How is the marble getting to the target? What is causing it to move forward?"* Now place one marble in the center of the target and see if the students are able to roll their marble so that it collides with the marble on the target. Ask the students, *"What happens when the marbles run into one another?"* and *"Why do you think the marble that is on the target moves when another marble hits it?"* Share with the students that when one marble hits the other marble, we call this a collision. The goal of this station is to explore the concept of collisions.

b. **Station 2**: Dominoes: Students will experiment with dominoes at this station. They will line up dominoes and knock over the first domino (which should cause a chain reaction). Ask the students "*How come all the dominoes fall over even though you only pushed one of them?*" Prompt students to realize that the domino they pushed on then pushed the next domino.

c. **Station 3**: Bowling: The students will take turns rolling a bowling ball towards the pins, trying to knock them over. Ask the students "*How were you able to knock over the pins without touching them yourself?"* You can encourage the students to roll the ball at different speeds to see what happens to the pins.

d. **Station 4**: Newton's Cradle: In this station the students will look at Newton's Cradle. This station will require an adult to lead the discussion. Have the students pull one of the balls away from the apparatus and release it so that it hits the other balls, the balls on the ends should continuously swing outwards and back in. Ask the students "*Why do you think the balls on the end are moving?"* Help the students realize that the balls in the middle are pushing each other and ultimately pushing the balls on the end outwards.

Assessment

Have the students complete the final two pages of their booklet (focused on collisions).

Lesson 6: Investigating Speed

BACKGROUND

Overview of the Lesson

Students will create ramps using different types of blocks and books found in the classroom. They will investigate how the height of a ramp can change how fast and far their Matchbox car can go. They will also compare the distance and speed of the cars. This lesson has been adapted from http://www.weareteachers.com/blogs/post/2014/09/16/simple-physics-experiments-for-kids-pushing-and-pulling.

Focus Standard

K-PS2-1. Compare the effects of different strengths or different directions of pushes and pulls on the motion of an object. [Clarification Statements: Examples of pushes or pulls could include a string attached to an object being pulled, a person pushing an object, a person stopping a rolling ball, and two objects colliding and pushing on each other. Comparisons should be on different relative strengths or different directions, not both at the same time. Non-contact pushes or pulls such as those produced by magnets are not expected.]

Learning Targets

1. I can determine which toy car is the fastest by conducting a simple investigation.
2. I can design and test ramps.

Assessment

Pick three different sized balls and ask the students to hold and compare them. Then ask students make a prediction as to which ball would roll the fastest down the ramp, and then ask to the students elaborate using evidence to justify their choice.

WIDA Language Objectives

(Dependent on the needs of your ELL students)

Targeted Academic Language

Tier 1: car, fast, slow
Tier 2: predict, investigate, test
Tier 3: ramp, speed

RESOURCES AND MATERIALS

Quantity	Item	Source
20	**Toy Cars**	**Bin**
4 per student pair	Books or blocks	Classroom Teacher
20	**Ramp board (flat piece of wood or sturdy cardboard)**	**Bin**
10	Pencil	Classroom Teacher
1 roll	Masking tape	Bin
10 small, medium, and large	**Different sized balls**	**Bin**
40-50	**Metal Washers**	**Bin**

****Items in bold should be returned for use next year****

LESSON DETAILS

Lesson Opening/ Activator

Have students think–pair–share about what types of pushes and pulls they have investigated so far.

During the Lesson

1. **Ramp it Up!** Students will be conducting an investigation to find out how they can make a toy car go the fastest. Ask students to think about how they can make the car their car go the furthest and fastest Hopefully, students will recognize the connection between pushing the car harder will make it go farther. Break students into pairs and have them push a car gently and then with more force to help them make connections about speed, direction, and movement.

2. The teacher should demonstrate how one might build a ramp with blocks or books from the classroom as well as a piece of wood or sturdy cardboard. Remind students of the marble activity from lesson four. Demonstrate how to position the ramp. You can pair students up and give them 5 to 10 minutes to explore making ramps and rolling the car down them.

3. Tell students they need to design two different ramps. One of their ramps should be designed to make their car travel very fast and one should be designed to make their car go slower. Let the students brainstorm and work on their designs. Circulate to ensure that the groups are testing their ramps and have an understanding of the task. Give students 10-20 minutes to work on their designs.

Teaching Tip

Emphasize the difference in speed when using different heights of ramps. Students may have trouble understanding that the height of the ramp is imperative to speed, as the higher the ramp is the more kinetic energy it builds as it falls. (This is a concept they will learn in fourth grade).

4. You can have students test out their designs and let the groups circulate to see what other groups created. After the students have seen the other ramps have the class come back together and make sure to demonstrate the impact the height of the ramp has on the speed of the car. Show students that a steeper ramp makes a car go faster and a ramp that is less steep will make a car go slower.

OPTIONAL BREAKING POINT IF THERE IS A TIME CONSTRAINT

5. The teachers should collect the cars. Tape 1 washer to a few cars, tape 2 washers to a few cars, and tape 3 washers to a few cars.

6. Bring the students together and show them what you've done to the cars. State the following: *"Now that we know we can make the car go fast or slow depending on the height of our ramp, we are going to find out which car is the fastest of these four different cars."* Show them the cars (one with no washer, one with one washer, one with two washers, and one with three washers).

7. Ask the class to predict which car will go the fastest/furthest and note that in their science journal. Create new groups with 3-5 students in each group, make sure each group has four cars (one with no washer, one with one washer, one with two washers, and one with three washers).

8. Show the groups how you would like them to build their ramp to ensure each group has similar ramp height and style. Now have the students construct the ramps- following your example. Have the students experiment with the different cars.

9. Now ask the students to release each of the cars down the ramp and note which went down the ramp the fastest and rolled the furthest. Have one student hold a pencil at the top of the ramp to keep the car in place at the start. Begin with the car with no washer and then test the other three cars. Ask the students to record which car was the fastest and went

the furthest in their science journal.

10. Call students back together and use the following questions to discuss the experiment; *"Was your prediction correct? Was there anything you noticed about the cars that went faster? Were they bigger, smaller, heavier, or lighter? Do you think a car that is heavier would be fast or slow?"* Guide student discussion towards the core components of this lesson (weight, height, and velocity). Encourage them to use full sentences when giving explanations and use words that they have learned in glass such as height, weight, and speed.

Assessment

Pick three different sized balls and ask the students to hold and compare them. Then ask students make a prediction as to which ball would roll the fastest down the ramp, and then ask to the students elaborate using evidence to justify their choice.

Lesson 7: Classifying Solids and Liquids

BACKGROUND

Overview of the Lesson

In this lesson, students are introduced to solids and liquids and will classify pictures. Students will also participate in an activity to help them further understand how to classify solids and liquids.

Focus Standard

K-PS1-1(MA). Investigate and communicate the idea that different kinds of materials can be solid or liquid depending on temperature.

Learning Targets

1. I can identify a material as a solid or a liquid
2. I can use properties of a material to label it as either a solid or a liquid

Assessment

Have students draw and label a picture of two liquids and two solids in their science journals.

WIDA Language Objectives

(Dependent on the needs of your ELL students)

Key Vocabulary

Tier 2: Observe

Tier 3: Solid, Liquid

RESOURCES AND MATERIALS

Quantity	Item	Source
1	**Mystery Bag filled with laminated pictures of solids and liquids**	**Bin**
1 per group	**Container A (Bowl)**	**Bin**
1 per group	**Container B (Irregular shaped container like a vase or tube)**	**Bin**
1 per group	**Container C (Cup)**	**Bin**
1 per group	**Measuring cup with handle**	**Bin**
	Water	Classroom Teacher
1 per group	**Marble**	**Bin**
1 per group	**Rock**	**Bin**
1	Bag of marshmallows	Bin
1 container	Corn syrup	Bin
1 bottle	Apple juice	Bin
1 per group	**Muffin Tin**	**Bin**
3 per group	"Solid" labels	Binder
3 per group	"Liquid" labels	Binder
1	**Bartholomew and the Oobleck Book By Dr. Seuss**	**Bin**
1	**Cornstarch**	**Bin**

****Items in bold should be returned for use next year****

LESSON DETAILS

Lesson Opening/ Activator

Share with the students that they are beginning an exploration focused on liquids and solids. Gather the students in a circle and place the mystery bag in the middle of the circle, the mystery bag will be filled with laminated pictures of liquids and solids. Ask the students "*Does anyone know what a solid or a liquid is?*" If no one responds, give them examples such as "*Water is a liquid.*" and "*A rock is a solid.*" Discuss this with the students for a short period of time before moving onto the mystery bag.

Now have a student volunteer pull a picture from the mystery bag. Ask the student if they know what the picture is and if they think it is a solid or a liquid, if they don't know, ask the rest of the class to help the student answer the question. Guide the discussion to the correct answer. You can continue to pull out as many or as few pictures as you'd like.

During the Lesson

1. **Container Shapes: Notes: Be sure to demonstrate each step to students before they try themselves, particularly the pouring water step.**
    a. Place the students in groups of 4-5. Give each group three containers, labeled a, b, and c, a cup of water and a marble. Tell the students to pour the water into container a. Ask the students "*How did the shape of the water change when it was poured into container a?*"

    b. Now tell the students to pour the water from container a to b. Ask the students "*How did the shape of the water change from container a to container b?*".

c. Now tell the students to pour the water from container b to c. Ask the students "*How did the shape of the water change from container b to container c?".*

d. Now instruct the students to put the marble into container a. Ask the students "*Did the shape of the marble change when you put it into container a?"*

e. Now instruct the students to put the marble into container b. Ask the students "*Did the shape of the marble change when you put it into container b?".*

f. Now instruct the students to put the marble into container c. Ask the students "*Did the shape of the marble change when you put it into container c?".*

g. Ask the students "*Why did the shape of the water change from one container to the next container but the shape of the marble stayed the same?"* Lead the discussion to the conclusion that the shape of the water change because it is a liquid and liquids take the shape of whatever area they are place in; the shape of the marble stayed the same because it is a solid and solids maintain their form. **[SP 3: Planning and Carrying Out Investigations]**

2. Keep the students in the same groups for the following activity and tell them that they will be observing different substances. Give each group a muffin tin with the following ingredients- water, rock, marble, marshmallow, apple juice, and corn syrup. Give each group six labels, three that say solid and three that say liquid. Tell the students that they need to figure out which materials are solid and which materials are liquid. The classroom teacher will walk around and help the students as necessary. Once all the groups have classified their materials, review as a class. **[SP 8: Obtaining, Evaluating, and Communicating Information]**

Assessment

Have students draw and label a picture of two liquids and two solids in their science journals.

Lesson Extension: Making Oobleck

Oobleck is a material that can have properties of both a solid and a liquid. You can read the Dr. Seuss book "Bartholomew and the Oobleck" and create the oobleck after reading the book.

Oobleck Recipe

- 1 part water
- 1.5~2 parts cornstarch

Begin with the water in the bowl or container and add the cornstarch a little at a time to get the right slimy/squishy consistency. When you squish it in your hand it should firm up but when you hold it, it should run through your fingers. Let the students experiment with the oobleck and ask them to explain how it feels when they squish it between their hands and when they just let it sit on their palm.

Lesson 8: Temperature, Solids, and Liquids

BACKGROUND

Overview of the Lesson

Students will observe two objects undergo a change. The two objects the students will observe are wax and ice, these objects will be exposed to heat. Students will need to pay close attention to see what changes these items undergo.

Focus Standard

K-PS1-1(MA). Investigate and communicate the idea that different kinds of materials can be solid or liquid depending on temperature.

Learning Targets

1. I can observe and describe matter (wax/water) at different temperatures
2. I can predict what will happen to an ice cube in presence of a heat source
3. I can identify why a liquid changes to a solid

Assessment

Have the students complete the Solid and Liquid observation worksheet, students can draw pictures or use words to describe the changes they observe.

Key Vocabulary

Tier 1: water, ice, refrigerator, freezer, change

Tier 2: melt, heat, warm, hot, cool, cold, wax

Tier 3: freeze, solid, liquid, temperature, compare, attribute

RESOURCES AND MATERIALS

Quantity	Item	Source
1	**Wax warmer**	**Bin**
1 set	Wax melt cubes	Bin
1	**Ice cube tray**	**Bin**
	Ice cubes	Classroom Teacher
	Solid and Liquid Observation Worksheet	Binder

****Items in bold should be returned for use next year***

LESSON DETAILS

Lesson Opening/ Activator

Review some examples of solids and liquids and ask students what makes a solid different from a liquid.

During the Lesson

1. Review the attributes of liquids and solids and refer back to the previous lesson and ask the students to recall what they observed and learned about liquids and solids.
2. Ask the students: *"Can a solid become a liquid, or a liquid become a solid?" "Have you ever wondered why you can skate on a lake in the winter, or swim in that very same lake in the summer? Have you ever made a snowman and wondered why he/she didn't live in your yard all year long? Have you ever had a popsicle or ice cream on a hot day? What happened to your treat?"* Spend a few minutes talking about these questions.

3. First, set up the wax station, this is done by putting a cube of wax onto the wax warmer and turning on the wax warmer. Show the children the wax and ask if it is a liquid or solid, then explain that you are going to leave it on the warmer and

come back to see the results. Ask the students *"When we return, what do you think we will find? Do you think the wax will change? How? Why?"* Ask students to draw a quick sketch of the wax in their science journals.

4. Next, present the ice cubes to the students, and ask them, "*What is ice? A liquid? A solid? Let's predict what will happen to the ice if we take it out of the freezer, or hold it in our hands. What causes ice to melt?*" Ask students to draw a quick sketch of the ice in their science journals.

5. Now pass around a few ice cubes and let the kids observe what happens. Ask student to draw the results of the handling of the ice from liquid to solid in their journal.

6. Now return to the wax and ask the students, *"What happened to the wax? Why? Is it still a solid? What caused it to melt and become a liquid?"*

7. Turn off the wax warmer and return the ice tray (with a few cubes that have melted a bit) back to the freezer, visit both objects after they've returned to their original state (may want to revisit later in the day or the following day) and discuss how the cold temperature has now returned both substances to a solid.

Lesson Closing

Ask the students to give an example of a liquid that can become a solid, and a solid that can become a liquid.

Assessment

Have the students complete the Solid and Liquid observation worksheet, students can draw pictures or use words to describe the changes they observe.

Lesson 9: Making Ice Cream: Putting it All Together!

Note: This lesson requires days of prep to allow for enough ice for every student to participate. Each student will need a full tray of ice. Buying bagged ice is also a good option if prep time is limited. Teachers should bring in a backup gallon of ice cream just in case the activity does not work, or the teacher can make a batch of the ice cream the students are making in advance to have on hand.

BACKGROUND

Overview of the Lesson

Students will create a frozen treat during this lesson. Students will need to rely on their knowledge of matter and motion to think critically about they will make ice cream. Students will make predictions about how they might go about making the ice cream, then they will make the ice cream following the provided instructions. Be sure to revisit the students' predictions at the end of the lesson.

Focus Standard

K-PS1-1(MA). Investigate and communicate the idea that different kinds of materials can be solid or liquid depending on temperature. Clarification Statements: Materials chosen must exhibit solid and liquid states in a reasonable temperature range for kindergarten students (e.g., 0–80°F), such as water, crayons, or glue sticks. Only a qualitative description of temperature, such as hot, warm, and cool, is expected.

Learning Targets

1. I can predict the result of a change in temperature
2. I can identify why the liquid changed to a solid

Assessment

Teacher will gauge (via discussions) that students can identify the change from a liquid to a solid based on the temperature getting colder, therefore forming ice cream.

WIDA Language Objectives

(Dependent on the needs of your ELL students)

Key Vocabulary

Tier 1: ice cream, sugar, up, down, circle
Tier 2: cream, vanilla, motion, zigzag, pitcher, freeze, melt, salt
Tier 3: ingredients, consistency

RESOURCES AND MATERIALS

Quantity	Item	Source
4-6 Containers	Half and Half (1 cup half and half per serving)	Contact Sue Beauchamp
1 bag	White sugar (2 tablespoons per serving of ice cream)	Bin
1 container	**Vanilla Extract (½ teaspoon vanilla per serving of ice cream)**	**Bin**
6 containers	**Salt**	**Bin**
8-10	**1 pound coffee can**	**Bin**
1 per student	**Quart ziploc freezer bags**	**Bin**

4	**Ice cube trays**	**Bin**
	Ice cubes (enough for each student to have a large handful)	Classroom Teacher
1 Container	**Plastic spoons**	**Bin**

****Items in bold should be returned for use next year****

LESSON DETAILS

Lesson Opening/ Activator

Ask students how they think ice cream is made, what ingredients are used, how is it prepared? Then share with the students that they will be making their own ice cream today.

During the Lesson

It is important to have students wash their hands both before and after the lesson because of sticky fingers and messes. Also be sure to check if your students have any dietary restrictions or allergies and plan accordingly.

Show the students the materials they will be using to make their ice cream. Explain to them that they will be putting the liquid ingredients in a bag and that the ice will be cooling it down.

For each student you will need:

- 1 cup half and half
- 2 tablespoons white sugar
- ½ teaspoon vanilla extract
- A 1 pound coffee can
- 1 quart ziploc freezer bag
- ½ cup salt (ice cream salt, rock salt, or kosher salt)
- Ice (handful- the equivalent to a tray of ice)

1. The teacher should will combine the ingredients in a large bowl in the front of the class, noting that the cream, and the vanilla are liquids, and that the sugar is a solid. You may need to make two-three batches of this mixture to prepare enough for all the students to have their own individual serving- or you can have the students work in groups and therefore would need fewer servings.

2. The teacher will then pour equal amounts into each quart bag for making sure to press the air out of the bag and seal the bag well to make sure that it will not leak while being shaken and to ensure the melted salty water doesn't get into the ice cream.

3. Into the coffee can, put the quart sized bag of ice cream ingredients and then layer the ice and salt around the quart size bag. Make sure to fill the coffee can with as much ice as possible while still leaving room to move the quart bag around in the ice.

4. Give students a can and have them shake it in the different ways (up and down, in a circle, zig zag). This step should take about 10-15 minutes. **Note: This may be a long time for students to be shaking the cans, if they perform the activity in groups then they can switch off when one gets tired.** During this part of the lesson have students each volunteer to name a kind of motion and demonstrate it to the rest of the class and have the class copy, similar to Simon says. Remind them that they need to be moving their cans the whole time **[SP 8: developing and using models]**

5. After the ice cream reaches a soft serve consistency, it should be done and ready to eat.

Lesson Closing

Now, you can let the students enjoy their ice cream. After the students have eaten their ice cream, ask them to discuss why the cream changed from a liquid to a solid. Be sure that the students understand that the liquid became solid because it was cold enough for it to begin to freeze.

Assessment

Teacher will gauge (via discussions) that students can identify the change from a liquid to a solid based on the temperature getting colder, therefore forming ice cream.

Science Talk and Oracy in T2L Units

Science talk is much more than talking about science. In line with the science and engineering practices, students are expected to make a claim that can be supported by scientific evidence. The MA STE Standards (and the NGSS) value the importance of engaging in an argument from evidence. NGSS defines how this practice takes form in the real world: *"In science, reasoning and argument are essential for identifying the strengths and weaknesses of a line of reasoning and for finding the best explanation for a natural phenomenon. Scientists must defend their explanations, formulate evidence based on a solid foundation of data, examine their own understanding in light of the evidence and comments offered by others, and collaborate with peers in searching for the best explanation for the phenomenon being investigated."*

Students are asked to participate in articulate and sensible conversations in which they are able to communicate their ideas effectively, listen to others to understand, clarify and elaborate ideas, and reflect upon their understanding. These forms of talk can be developed using scaffolds such as the A/B Talk protocol (below) and strategies for class discussions (from the Talk Science Primer, link below). Oracy is developed in the physical, linguistic, cognitive, and social-emotional realms; each of these realms can be expanded upon over time in order to develop a thoughtful speaker. Being able to display appropriate body language, use proper tone and grammar, be thoughtful and considerate thinkers, and allow space for others thoughts and opinions are all important facets of oracy to work on and through with students. Incorporating the appropriate scaffolding is an important aspect of fostering these skills. Techniques for teaching effective science talk often include modeling, discussion guidelines, sentence-starters, and generating roles, while gradually putting more responsibility on students to own their thinking and learning.

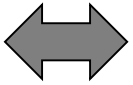
Part of creating a safe school environment for students is allowing them a space that is comfortable enough for them to express ideas and ask questions, while being validated for their thoughts and questions; students should be feel comfortable and confident when speaking and listening for understanding. Effective talk is an important part of being an active, intelligent member of a community and society. Successful development in oracy is important for future employability and general well-being of adults.

The following resources should be helpful examples of how to employ effective use of progressive oracy and science talk in your classrooms.

- Oracy in the Classroom: https://www.edutopia.org/practice/oracy-classroom-strategies-effective-talk
- Science Talk Primer: https://inquiryproject.terc.edu/shared/pd/TalkScience_Primer.pdf

A/B Talk Protocol

Adapted from https://ambitiousscienceteaching.org/ab-partner-talk-protocol/

1. Share your ideas **Partner A**  • I think _____ happened because… • Evidence that supports my idea is… • The activity we did with _____ helps me know more about _____ because… • One thing I'm wondering about is…	2. Listen to Understand **Partner B**  • I heard you say _____. What makes you think that? • I heard you say _____. What if _____? • Can you explain the part about _____ again? • What do you mean when you say _____?
3. Clarify and elaborate **Partner A**  Answer partner's questions or ask for clarification in order to understand a question.	4. Repeat steps 2 & 3 until all questions are answered  
5. Switch roles and repeat steps 1-4   	6. Reflect on your understanding in writing • My idea about _____ changed when my partner said _____. • I will add _____ to my idea about _____ because… • I still have questions about… • I may be able to answer my question(s) if I could investigate _____.

Master List of Unit Resources/Materials

Lesson 1

Quantity	Item	Source
	Scientist PowerPoint	CMC Website
1	**Hand held mirror**	**Bin**
1	**Cloth to cover the mirror**	**Bin**
	Craft supplies (glue sticks, crayons, pencils, safety scissors)	Classroom Teacher
	Chart Paper	Classroom Teacher

Lesson 2

Quantity	Item	Source
	Movement Song (https://youtu.be/LfR_Nn9dmmw)	CMC Website
	Laptop	Classroom Teacher
5	**Jump Rope**	**Bin**
5	**Ball**	**Bin**
5	Hula Hoops	Borrow from P.E. Teacher
1	**"From Head to Toe" by Eric Carle**	**Bin**
1	Shaving Cream	Bin
1 per student	Booklet (7 pages total to be completed over lessons 2-5)	Binder (Classroom Teacher to copy)
3	Ropes (optional)	Borrow from P.E. Teacher

Lesson 3

Quantity	Item	Source
1 per student	Matching picture cards	Binder
1 per student	Matching labels worksheet	Binder

1 per student	Matching assessment worksheet	Binder
5	Scooter (optional)	Borrow from P.E. Teacher

Lesson 4

Quantity	Item	Source
10	**Hacky sacks**	**Bin**
1	Hula Hoops	Borrow from P.E. Teacher
1	**Rope**	**Bin**
1	**Ball**	**Bin**

Lesson 5

Quantity	Item	Source
10	**Marbles**	**Bin**
1	**Target sheet (laminated)**	**Bin**
1	**Box of Dominoes**	**Bin**
1	**Bowling set**	**Bin**
1	**Newton's Cradle**	**Bin**
1	**Wooden Ramp**	**Bin**

Lesson 6

Quantity	Item	Source
20	**Toy Cars**	**Bin**
4 per student pair	Books or blocks	Classroom Teacher
20	**Ramp board (flat piece of wood or sturdy cardboard)**	**Bin**
10	Pencil	Classroom Teacher

1 roll	Masking tape	Bin
10 small, medium, and large	**Different sized balls**	**Bin**
40-50	**Metal Washers**	**Bin**

Lesson 7

Quantity	Item	Source
1	**Mystery Bag filled with laminated pictures of solids and liquids**	**Bin**
1 per group	**Container A (Bowl)**	**Bin**
1 per group	**Container B (Irregular shaped container like a vase or tube)**	**Bin**
1 per group	**Container C (Cup)**	**Bin**
1 per group	**Measuring cup with handle**	**Bin**
	Water	Classroom Teacher
1 per group	**Marble**	**Bin**
1 per group	**Rock**	**Bin**
1	Bag of marshmallows	Bin
1 container	Corn syrup	Bin
1 bottle	Apple juice	Bin
1 per group	**Muffin Tin**	**Bin**
3 per group	"Solid" labels	Binder
3 per group	"Liquid" labels	Binder
1	**Bartholomew and the Oobleck Book By Dr. Seuss**	**Bin**
1	**Cornstarch**	**Bin**

Lesson 8

Quantity	Item	Source
1	**Wax warmer**	**Bin**
1 set	Wax melt cubes	Bin
1	**Ice cube tray**	**Bin**
	Ice cubes	Classroom Teacher
	Solid and Liquid Observation worksheet	Binder

Lesson 9

Quantity	Item	Source
4-6 Containers	Half and Half (1 cup half and half per serving)	Contact Sue Beauchamp
1 bag	White sugar (2 tablespoons per serving of ice cream)	Bin
1 container	**Vanilla Extract (½ teaspoon vanilla per serving of ice cream)**	**Bin**
6 containers	**Salt**	**Bin**
8-10	**1 pound coffee can**	**Bin**
1 per student	**Quart ziploc freezer bags**	**Bin**
4	**Ice cube trays**	**Bin**
	Ice cubes (enough for each student to have a large handful)	Classroom Teacher
1 Container	**Plastic spoons**	**Bin**