Name: Elizabeth White **Date: 9/29/16**

School: Wetherbee **Grade: 1st Grade** **Subject: Science - Sound**

Title of Lesson: Sound by Sending Signals

Essential Question: (a. What overarching unit question is this lesson addressing? b. What supporting question is specific to this lesson?)

1. What factors, such as the height of the ramp or weight of the ball, affect the speed and distance of a ball?
2. What happens when a force is applied to an object, and not only on that force but also on all the other forces acting on that object?

Massachusetts NGSSs Covered:

1-PS4-4 Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance.

Clarification Statement:

- Examples of devices could include a light source to send signals, paper cup and string "telephones," and a pattern of drum beats.
    - Assessment Boundary: Assessment does not include technological details for how communication devices work.

Language Objectives (MA Common Core Language Arts and Literacy Frameworks):
(How will ELLs use/improve language skills in this lesson? Give an example.)
CCSS.ELA-Literacy.SL.K.1
Participate in collaborative conversations with diverse partners about *kindergarten topics and texts* with peers and adults in small and larger groups.
CCSS.ELA-Literacy.SL.K.1.a

Follow agreed-upon rules for discussions (e.g., listening to others and taking turns speaking about the topics and texts under discussion).
CCSS.ELA-Literacy.SL.K.1.b
Continue a conversation through multiple exchanges.
CCSS.ELA-Literacy.SL.K.3
Ask and answer questions in order to seek help, get information, or clarify something that is not understood.
CCSS.ELA-Literacy.SL.K.5
Add drawings or other visual displays to descriptions as desired to provide additional detail.
CCSS.ELA-Literacy.SL.K.6
Speak audibly and express thoughts, feelings, and ideas clearly.

Math Objectives (MA Common Core Mathematics) (What math skills will students utilize as a part of this lesson?) several measurable attributes of a single object.
CCSS.Math.Content.K.MD.A.2
Directly compare two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference. *For example, directly compare the heights of two children and describe one child as taller/shorter.*

How does this lesson fit into the sequence of your unit?
This lesson is the beginning of the students development of their understanding of how force and motion works. Through this lesson they are being given the opportunity to experiment and see how the different heights of ramps and different weights of the balls affects the speed and distance it travels.

ASSESSMENT

Assessment: (How will you determine if you and your students have achieved the lesson's objectives?)
Performance Task
How will learning be measured? What will students produce as acceptable evidence of understanding?

At the end of the lesson students will be asked the below questions. They will also be asked to draw a picture showing a ramp that makes the ball travel the farthest and a ramp that makes the ball travel the shortest distance.. Based on the students answers and drawings I will be able to determine their level of understanding.

- If you wanted to make an object go down the ramp more slowly, what would you do?

Draw and label the ramp that you would build.

- If you wanted to make an object go down a ramp more quickly, what would you do? Draw and label the ramp that you would build.

Content: (What is the content of the lesson?)

Force and motion is an important piece of information for people to know because it gives them an understanding of why and how objects move. “Interactions of an object with another object can be explained and predicted using the concept of forces, which can cause a change in motion of one or both of the interacting objects” (NGSS, 2012, p. 114). An individual force is described by its strength and directions, and is one that acts on one specific object. There are many forces acting on an object at once, so when a force is applied to one object, it depends on that force and all the other forces acting on that object as well. An object not in motion usually has multiple forces acting on it, but they equal to zero; however, if the sum is not zero the motion will change (NGSS, 2012). Newton’s third law determined the following is true for any pair of interacting objects, “the force exerted by the first object on the second object is equal in strength to the force that the second object exerts on the first but in the opposite direction” (NGSS, 2012, p. 114).

Newton’s second law of motion shaped the motion of an object subject to forces; the mathematical expression of Newton’s second law is F = ma (total force = mass times acceleration), and it predicts changes in the motion of a single object of a given mass due to the total force on it (NGSS, 2012). The second law does not apply to those objects moving at the speed of light, and objects at the molecular, atomic, and subatomic scares, or to an object whose mass and speed change at the same time (NGSS, 2012). For objects that travel at the speed of light, the momentum of the object is defined as its mass times its velocity. The total momentum within any system of interacting objects only changes due to transfer of momentum into or out of the system, which is due to either external forces acting on the system or because of matter flows (NGSS, 2012).

Force on an object arises from multiple types of interactions including gravity, electromagnetism, and strong and weak nuclear interactions (NGSS, 2012). Strong and weak nuclear interactions are short-range interactions that determine nuclear sizes, stability, and rates of radioactive decay, and are important inside atomic nuclei (NGSS, 2012). Gravitational interactions occur when two objects collide with one another forces between them are involved and can change their motion; any two objects in contact exert forces that are electromagnetic in

origin (NGSS, 2012). A pair of objects does not need to be in contact in order to have gravitational, electric, and magnetic forces between them; these forces are justified by force fields that contain energy and can transfer energy through space (NGSS, 2012). Gravitational forces are always attractive; objects with mass are sources of gravitational fields and the gravitational fields of other objects with mass effect it (NGSS, 2012). Electromagnetic interactions have two different aspects of force, electric force and magnetic force. These forces "can be attractive or repulsive, depending on the relative sign of electric charges involved, the direction of current flow, and the orientation of magnets" (NGSS, 2012, p. 117). All objects containing electrical charge of magnetization are sources of electric or magnetic fields, which can be affected by the electric or magnetic fields of other such objects (NGSS, 2012).

Energy and force have a strong relationship because when two objects interacting by force field come in contact, the energy within the force field changes (NGSS, 2012). For any pair of objects in this situation, "the force on each object acts in the direction such that motion of that object in that direction would reduce the energy in the force field between the two objects" (NGSS, 2012, p. 127). Patterns of motion, for example a weight bobbing on a spring, can be understood as forces at each instant or transformation of energy between the motion and one or more forms of stored energy (NGSS, 2012).

Classroom Environment and Management Conditions: (How you will arrange the classroom, facilitate student learning and minimize disruptions?)

For this lesson a large area of space will be created in order to allow students to have plenty of room to experiment with the ramps. In the setting we are in I would make sure to be secluded away from other groups as possible to try and create an environment where the students can listen and discuss ideas without being disrupted.

Safety Measures: (What steps do you need to take to ensure the safety of your students at all times?)

For this lesson the biggest safety measures to be taken would be to make sure nothing on the ramps can fall and hurt anyone, also that none of the objects are a tripping or slipping hazard.

Materials: (for both you as the teacher and the students)

- thin, stiff, wood board, 8-12 inches wide and 12-16 inches long
- 3 books, each 1 inch thick
- Ping pong ball
- stopwatch

- pencil
- paper

Diverse Learners

Learner Factors: Differentiation, Modifications, and Accommodations: (What will you do to allow students with different abilities, learning styles, 504, IEP, etc. to succeed during the lesson? Check off all that apply)

***** Adjust Grouping Formats** *****Oral, Pointing, Signed Responses** ***** Give Additional Examples** ¨ Write Homework List ¨ Give Daily Progress Report ¨ Use of Braille or Large Print ¨ Give Student Copy of Directions ¨ Provide an Alternate Reading Level for a Reading	¨ Extend Time of Selected Work *****Reread Directions** ¨ Use Assistive Devices to Respond ¨ Post visual picture or schedule ***** Give Verbal Reminders** ¨ Use of Interpreter ***** Give Verbal Cues to Emphasize Main Ideas** ¨ Use Page Markers	¨ **Give More Frequent Breaks** ¨ Handout Hard Copy of Board Notes ¨ Word Processor/Computer *****Seating Near Advanced Students** ¨ Use Graphic Organizer ¨ Increase the Number of Review Activities ***Pair Students

Specific Examples: (Choose 3 examples from the list above and elaborate on/explain in detail the accommodation, modification, or differentiation.)

Example 1: Adjust grouping formats: When creating groups for building the ramps I would try to pair students with learning difficulties or students who need extra help, with students who are more advanced in the class and would be able to support or clarify some ideas to the student who needs extra help.

Example 2: Give additional examples: Before the lesson I will be giving examples of different ramps and we will be exploring their purposes. After those questions I will prepare students to start the lesson but before letting everyone go to I will check in with every student especially those who may need clarification and provide any added examples or clarification they may need to understand fully the simple characteristics and purposes of a ramp and what they are doing.

Example 3: Give verbal reminders of instruction and verbal cues to emphasize main idea: Once the lesson has started I will be helping each student while they are experimenting but I will make sure to keep a special eye on the students I know need a little extra attention. To help them through the lesson I will make sure to keep giving verbal reminders of what they are supposed to do and and what we are testing. I will also give them verbal reminders along the way on what we are trying to accomplish and find so they are kept on track and are able to follow along and keep up with other students.

Related Misconceptions

1. The only "natural" motion is for an object to be at rest.
    a. Motions is not something an object does, it is a relationship or function existing between objects. Every object in the universe has a motion relationship with every other object.

LESSON DELIVERY

Opening: (How will you engage and prepare students for the lesson?)
Leading up to this lesson I would take a tour of the school to point out all the ramps we see around the school and have short discussions about what we use those ramps for and how they help us. Next students will be asked to identify ramps they have seen outside of school. Then to open this lesson I will first build my own ramp to demonstrate for the students what a ramp does and what it looks like. I would then allow them to experiment with mine before they construct their own.
After the students have a basic understanding of ramps I would ask these questions:

1. What do ramps help people do?
2. What tasks do they perform?
3. What problems would exist if we didn't have ramps?

Then after these questions I will introduce the activity:
"Today, we will build a simple ramp like the ones we have seen here at school and the ones we have discussed. We will use some books and a board to make the ramp. What are some things we can do to make the ball move?"

During Lesson: (Specific step-by-step details that would allow someone else to teach this lesson. Include specific instructional strategies, methods, student groupings, actions, and **questions you will ask.)**

Students will be put into small groups and each group will build their own ramps with the materials provided.

Procedure:

1. Clear a space about 10 feet long. This will be the runway.
2. First show the wood board flat on the floor to the students. Then place the ball on the board.
    a. Ask "How would we make the ball move?"
    b. "Let's try blowing on it" "Now touching it"
    c. "How else can we make the ball move?" "Lifting up the board like a ramp? Lets try it."
3. Stack one book at one end of the runway.
4. Lean one end of the board on the books, and place the other end on the floor.
5. Have students predict and draw how far they think the ball will travel.
    a. Ask "If I put this ball at the top of the ramp and let go what do you think will happen?"
    b. "How far do you think it will go?" "Let's test it."
    c. "We are going to try this three times because that is what scientists have to do."
6. Have a student place the ball at the top of the ramp.
7. Ask the student to release the object without pushing it.
8. Have a student mark how far the ball traveled and then measure the distance.
9. Repeat the above steps in three trials.
    a. Ask "Are all three trials the same distance? Why or why not?"
    b. "What can we do to change the distance the ball went?"
    c. "Raising the ramp? Why do you think that?" "Let's try it."
    d. "How many times should we test the new height?" "Three times because that's what scientists have to do."
10. Add one book to the pile that is supporting the ramp. Have students predict whether the ball will roll a longer or shorter distance than last time.
11. Have them draw their predictions.
12. Test the new height of the ramp three times and mark how far the ball traveled.
    a. "What happened now that we made the ramp taller?"
    b. "Why do you think that is?"
    c. "Did the ball go faster or slower?"
    d. "If I wanted the ball to go even further what would I do?" "Let's try it."
13. Add another book to the pile that is supporting the ramp. Have students predict what

they think will happen now they made the ramp higher.

14. Have students draw their predictions
15. Test the new height of the ramp and repeat the experiment three times. Have students record how far the ball traveled.
    a. "How much further did the ball roll?" "Why do you think that happened?"
    b. "Did we make the ball roll faster or slower?"
    c. "What are we doing to make the ball roll further each time?" "Why does the height make the ball go farther?"

Closing (How will you end the lesson? What potential claims, evidence statements can you create?)

To close this lesson I would gather each group and sit together as a class again to have a group discussion about what we found and what we learned. I would want to review all of the ideas we had learned through the experiment. I would ask the students to tell me:

- What difference does the height of the ramp make? Why do you think that is?
- Did you think that was going to happen?
- What happens to the speed of the objects when we make the ramp taller?
- What makes the ball travel farther? Why do you think that is?
- Did you expect that to happen?
- What else could we do to the ramp that would make the ball roll farther?

Hopefully all students will have the same answers and we can come to a conclusion of which height of ramp and weight of the ball creates the fastest speed which result in the ball traveling farther.

Preview Outcomes:

This lesson introduces students to ramps and how they function. Students may have seen ramps before outside of school and will now what forces are behind the function of ramps. Students are just being introduced to the force of pushing in the previous lesson. Through this lesson students experiment with these pushes and are able to observe the different forces acting on the ping pong ball making it roll down the ramp either a long or short distance. Students observe that the higher the ramp is the larger the push is put on the ball resulting in it traveling farther. This lesson transitions students into the next lesson which requires them to experiment with moving objects on different surfaces and seeing how it affects the objects motion and distance.

POST-TEACHING REFLECTION

Section A: Evaluation of Student Learning (approximately 2/3 page)

1. In terms of your students' understanding of the science ideas and/or science practices, what is one aspect that went well during the lesson? Why did you think that went well? How did this strength impact your student's learning?

2. In terms of your students' understanding of the science ideas and/or science practices, what is one aspect that did not go well during the lesson? Why did you think that did not go well? How would this have impacted your students' learning?

One aspect that went well during the lesson was the concept that if you put the ramp more inclined the ball would move faster and travel further. In the beginning when I put the board and the ball in front of them and asked how I could make the ball move, they all said to push it or blow on it. Then once I asked them how we could make a ramp so the ball would move they seemed to remember what they saw when we looked at a ramp in the school and they suggested we could lift one side up. After that we tested all different heights and I could ask questions such as "If I wanted to make the ball go really far what would I do?" "If I wanted the ball to go slow what would I do?". The students would then build me a steep ramp or a low ramp, showing me they understood how to make the ball go farther or stay closer. At the end I asked the students to draw me a picture of a ramp that would make the ball go far. All four students drew a really steep ramp with a lot of books stacked underneath it. From those drawings I could tell all of them had grasped the concept that the taller or steeper the ramp the farther the ball will travel. One aspect that did not go well was their understanding of speed and timing of speed. We had extra time at the end of the lesson so we tried to time the ball to see which height of the ramp made the ball go faster. This concept was understandable to students at first when we were just determining the speed by estimation. But when we tried to

time the ball with a stopwatch the students got confused of how to read time and determine which amount of seconds is faster than the other. The students thought that 6 seconds was faster than 2 seconds because it was a higher number. In result of this misconception students weren't grasping when the ball was going faster.

Section B: Plan for Next Week's Teaching (approximately 1/3 page)

Your plan for next week as informed by Section A should address the following questions:

1. What content are you and your partner planning on focusing on next week at Wetherbee? You should go beyond just listing a term (e.g. chemical reactions) to describe the concept (e.g. During a chemical reaction two or more substances are combined to create new substance(s) with new properties.).
2. What specific demonstrations, activities, investigations or other strategies are you thinking of using to help students learn the content? Use specific examples from websites from our STEM ED lib guide, your colleagues in class, NSTA etc. Explain why these would be useful to support your student learning.
3. How does your plan connect to what you have previously done and what you think you will be doing in the future?

In our next lesson at Wetherbee me and my partner are thinking of focusing on different ways we can manipulate the ramp to change the speed of the ball and make the ball not go as far. An example of this would be to have the same ramp but add a towel or carpet to the ramp to see if it affects how far the ball travels. An investigation we will use would be to compare the ramp from the previous lesson to the same ramp with carpet on it. This will show the kids how different surfaces can change the speed of the ball. I would also like to use more movement exercises we had learned from our guest speaker to refocus our students in the middle of the lesson. This would be useful because near the end of our last lesson our students were getting restless and rolling around on the floor. This plan includes what we have done previously and what I would like to change in the future for my lessons. From the last lesson I

have learned new tricks to keep students engaged such as assigning roles for the experiment to keep them involved. I also want to add the movement activities because I think it will really benefit my students and help them to recharge and refocus so they can really benefit from the lesson.