Making Waves in a Community

Grade: 3rd

Subject: Science/Social Studies

Materials:

- Duct Tape At least 10 meters long (so that it may be doubled over for a 5 m machine)
- Kabob Skewers - about 100 and the longer the better. (Doesn't matter if one or both ends of skewer are sharpened)
- Extra inertia (weight) for the skewers (squishy pieces of candy like Jelly Babies or clothespins) need 2 per skewer.
- Science notebooks/journals

- Teacher needs all of the above and white board with markers

Technology Needed:

N/A

Instructional Strategies:

- ☐ Direct instruction
- ☐ Guided practice
- ☐ Socratic Seminar
- ☐ Learning Centers
- ☐ Lecture
- ☐ Technology integration
- ☐ Other (list)
- ☐ Peer teaching/collaboration/ cooperative learning
- ☐ Visuals/Graphic organizers
- ☐ PBL
- ☐ Discussion/Debate
- ☐ Modeling

Guided Practices and Concrete Application:

- ☐ Large group activity
- ☐ Independent activity
- ☐ Pairing/collaboration
- ☐ Simulations/Scenarios
- ☐ Other (list)
- ☐ Hands-on
- ☐ Technology integration
- ☐ Imitation/Repeat/Mimic

Explain:

Standard(s)

PS2.A: Forces and Motion -The patterns of an object's motion in various situations can be observed and measured; when that past motion exhibits a regular pattern, future motion can be predicted from it.
C.3_5.6 Compare and contrast personal and civic responsibilities and explain why they are important in community life.

Objective(s)

By the end of the lesson, students will analyze the cause and effect of forces on the wave machine to make predictions on its movement and relate this to the impact of major or minor causes and their effects in relationship they have to life in the community.

Bloom's Taxonomy Cognitive Level: Analyze

Differentiation

Below Proficiency:
Students will be paired with emerging proficient students and can be given extra guidance by the teacher during exploration after the wave machines are made.

Above Proficiency:
Students can be more specific on the sizes of wavelengths and determine how many wavelengths they can make with a certain amount of force.

Approaching/Emerging Proficiency:
Students can follow the lesson plan.

Modalities/Learning Preferences:

- **Visual** – Ripple effect picture and pictures from the story
- **Auditory** – Directions from the teacher and vocal explanations of what's happening on the model wave machine
- **Kinesthetic** – Students interact with the wave machines
- **Tactile** – Students build the wave machines

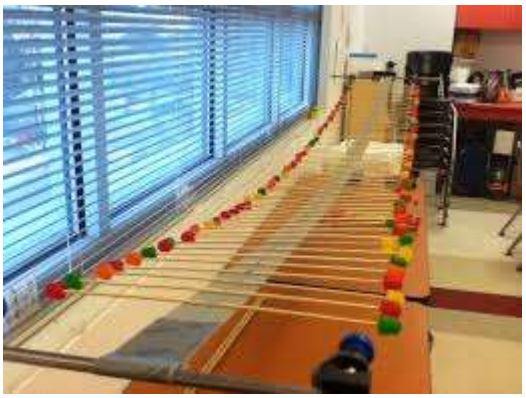
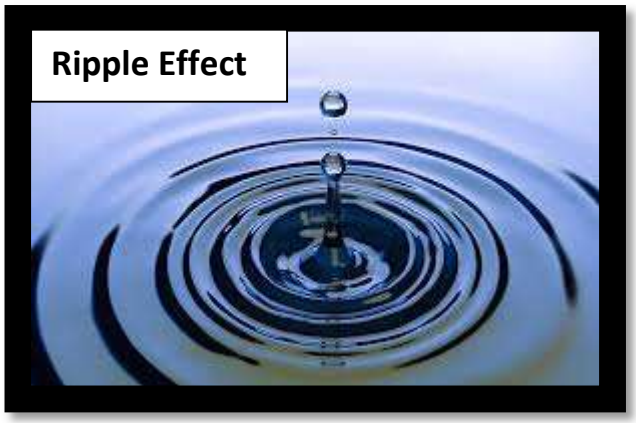
Classroom Management- (grouping(s), movement/transitions, etc.)

Engage: Students gather on the floor for the story.
Explain: Students will gather around the wave machine with science notebooks. One student will hold the other end of the wave machine.
Explore: Students will be in groups up to three or four in teacher-designated groups with the intent to put advanced students with struggling students to support

Behavior Expectations- (systems, strategies, procedures specific to the lesson, rules and expectations, etc.)

- Students will be respectful of one another, the materials used, and the classroom environment.
- Students will not talk during Read alouds unless prompted by the teacher.
- Students will take turns causing motion to the wave machines and holding the ends.

learning. Review: Students will roll up their wave machines and place them in designated area in the classroom.	

Minutes	Procedures
10?	**Set-up/Prep:** • Teachers may choose whether or not to make the large wave machine in advance or to have students help make it, especially those students who may need more guidance from the teacher in learning. Example of wave machine: 
5	**Engage: (opening activity/ anticipatory Set – access prior learning / stimulate interest /generate questions, etc.)** • Read "What if Everybody Did That? By Ellen Javernick • Chorus read with the students the recurring question throughout the story, "What if everybody did that?" • Today, we are going to look at the cause and effect that we have in our community and connecting that to our learning about patterns of motion in science.
15	**Explain: (concepts, procedures, vocabulary, etc.)** A. Community • "From the book we just read, let's do a true and false question. Everyone prepare your thumb! Thumb up is true; thumb down is false. Does everything you do affect only you? (students point thumbs) • Let's think about examples of what some positive and negative causes and effects (consequences) we can have in our classroom community and outside community. Student examples – write down on the white board • *Emphasize that the consequences, whether good or bad, can affect everyone. Some affect people in large ways, and others in smaller ways. • This is like the ripple effect. Here's an example (Show picture) Let's ask ourselves in our heads if we've heard that term before… ripple effect. Maybe it sounds familiar? (wait a few seconds) Turn and talk with a partner about what you think the ripple effect could be. • Anyone willing to share an idea of their own or something they heard? (discussion) • Model prediction of ripples – caused by someone throwing a rock or something into water, effect being that the ripples will continue outward and the difference between the ripples of a big rock vs. a little rock • Ripple Effect is the continuing effect of an action or something that happens. 

Waves

I have a wave machine here that we're going to use our observation skills to predict what will happen to the machine when we act on it in different ways. We'll write or draw what we'll do, make a prediction, and what we observe in our science journals. Here we go….

*Teacher has the option to choose a few procedures to demonstrate so that the students can discover more ways to maneuver their wave machine on their own as well.

- Vocabulary: up-pulse (looks like a hill shape), down-pulse (looks like a U shape),

Procedure 1: With the tape taut, grab ahold of one of the skewers just in front of a handle and give it a small twist. Let go and watch how the twist "disturbance" moves toward the other end of the wave machine. Maintaining a grip on the first skewer, send multiple small pulses down along the wave machine.

- Discuss with the students what we'd expect to see: (prediction)
- What we actually see: (observe)
- The twist disturbances, waves, will move at the same speed.
- The pulses will pretty much maintain their shape and will move independently of one another.

Procedure 2: Watch how a pulse reflects (or begins to return) from the end of the wave machine. Try different sizes and shapes of pulses. Do this first while holding the handle (the duct tape along the center of the skewers) and then again while holding both the handle – to maintain tension – and the first one or two skewers at the other end of the wave machine.

- What you expect to see: (prediction)
- What we actually see: (observe)
- The pulses still return (reflect). When only the handle is held and the last skewer is free to twist, then an up pulse reflects back as an up. When the handle and the last skewer are held tightly, an up pulse reflects back as a down.

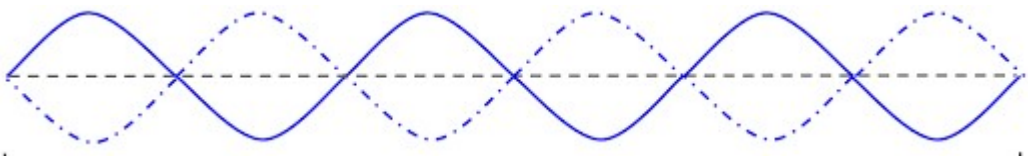
Show me thumbs, up is I get it, I can make observations and predictions about the wave machine; in the middle is I might be able to do that, thumb down is I need some more examples first. (see student thumbs, if there are only a few thumbs, go through making the wave machines and gather those students who would like to do more examples with the teacher afterward when the rest of the class is exploring)

Procedure 3: Make an up-pulse and, just as it reflects (starts to come back from other end), send another pulse. Watch carefully how the two pulses interact. Do this with a variety of different sizes, shapes, and orientations of pulses. And consider doing this with the reflecting end skewer(s) free to move or fixed.

- What you expect to see: (prediction)
- What you actually see: (observe)
- The individual waves, or pulses, pass through each other, etc. according to variations

Procedure 4: Gently twist the end skewer back and forth to a steady beat until a standing wave appears (skewers move opposite of their neighbors at a constant rate).

- What you expect to see:
- What you actually see:



Explore: (independent, concreate practice/application with relevant learning task -connections from content to real-life

25	**experiences, reflective questions- probing or clarifying questions)** Students are split into designated groups and build their own miniature wave machines by following the teacher step by step. 1. Lay out a strip of duct tape about five meters long, sticky side up. Do this on tables or a counter rather than the floor for convenience and cleanliness. 2. With a bit of an offset at the ends (say 20 or 30 cm, so as to make handles), place skewers sideways and centered on the tape. Arrange them to be 5 to 7 cm, or so, roughly two of their fingers apart. 3. Once the skewers are all placed, apply another piece of tape over them (sticky side down) so as to hold them firmly in place. 4. With the bits of doubled tape (no sideways skewers) at the two ends, make loops, or knots, or fashion into handles for holding. 5. Have the handles held by two people (or one person and an anchor) and pull the tape somewhat tight so that the skewers remain off of the ground. Take your extra inertia bits, say candies, and spear pairs onto the ends of each of the kabob skewers. ASIDE: If your skewers are sharp only on one end, you may have to use a sharp end to make pilot holes in the candy to accommodate the blunt end. If you elect to use clothespins instead, clip a pair to opposite ends of the skewers. Ensure that each skewer is approximately balanced. • Pull the tape tight so that it doesn't sag very much. Alternatively, you could support the tape in the middle as well as at the ends, but this might interfere somewhat with the operation of the wave machine. Students have time to explore and play with the wave machines and record at least two causes, predictions, and the actual effects they observed when acting upon the wave machine in their science journals that the teacher initials at the end.
10	**Review (wrap up and transition to next activity):** **(higher order questions)** • Students will roll up their wave machines and place them in designated area in the classroom • They will answer in as many sentences as they need: "How is your part in the community like predicting your wave machine's cause and effect?" Students will write their answer in their journals accompanied by a drawing if they so choose to help explain their understanding.

Formative Assessment: (linked to objectives) **Progress monitoring throughout lesson- clarifying questions, check-in strategies, etc.** • Formative assessments are highlighted throughout lesson plan.	**Summative Assessment (linked back to objectives)** **End of lesson:** • "How is your part in the community like predicting your wave machine's cause and effect?" • Students write their answer in as many sentences as they need and may include a drawing to help explain their understanding. Criteria **Below Proficiency:** Students write and/or draw that waves and their part in the community are connected or not, but don't allude to large or small cause and effects being predicted. **Approaching Proficiency:** Students demonstrate understanding in their writing and/or drawing that waves are connected to community and connect one predicted effect from either a large or a small cause. **At Proficiency:** Students demonstrate understanding in their writing and/or drawing that, depending on how large or small the cause is, the predicted effect will be large or small by connecting waves to community. **Above Proficiency:** Students demonstrate understanding in their writing and/or drawing that, depending on how large or small the cause is, the predicted effect will be large or small by connecting waves to community. They give multiple examples and connections.

Reflection (What went well? What did the students learn? How do you know? What changes would you make?):