What is a Wave? Lesson 1

London Bridge is Falling Down

Grade Level	9th – 10th Grade	**Time Frame**	130 minutes
Subject	Science	**Duration**	3 Periods
Course	Physical Science, Physics		

Essential Question

What are waves? How does the behavior of waves differ from that of other objects?

Summary

In this introductory lesson to the unit Introduction to Waves, students recall information they already know about waves. They explore with Slinkies to recognize types of waves, then create an anchor chart in groups with key concepts about waves and complete an exit ticket to assess their learning.

Snapshot

Engage Part 1 (Entire Unit)

Students view a video and complete an I Notice, I Wonder chart.

Engage Part 2 (Lesson 1)

Students participate in a Always, Sometimes, or Never True activity about waves.

Explore

Students conduct experiments with Slinkies.

Explain

Students create anchor charts in groups with information about waves.

Extend

Students are presented with academic vocabulary about waves.

Evaluate

Students complete an exit ticket to assess their learning.

Standards

Oklahoma Academic Standards (Physics)

PH.PS3.3 : Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.*
PH.PS3.3.DCI.1: At the macroscopic scale, energy manifests itself in multiple ways, such as in motion, sound, light, and thermal energy.
PH.PS3.3.DCI.2: Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them.
PH.PS3.3.DCI.3: Modern civilization depends on major technological systems. Engineers continuously modify these technological systems by applying scientific knowledge and engineering design practices to increase benefits while decreasing costs and risks.
PH.PS4.1 : Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.
PH.PS4.1.DCI.1: The wavelength and frequency of a wave are related to one another by the speed of travel of the wave, which depends on the type of wave and the medium through which it is passing.

Attachments

- Always-Sometimes-Never-True-London-Bridge-is-Falling-Down.docx
- Always-Sometimes-Never-True-Teacher-s-Guide-London-Bridge-is-Falling-Down.docx
- Exploring-Waves-London-Bridge-is-Falling-Down.docx
- Exploring-Waves-Teacher-s-Guide-London-Bridge-is-Falling-Down.docx
- I-Notice-I-Wonder-London-Bridge-is-Falling-Down.docx
- Lesson-Slides-London-Bridge-Is-Falling-Down.pptx

Materials

- Slinky for each pair of students (included in classroom supply kit available through K20 Center)
- Poster paper (one per group)
- Lesson Slides (attached)
- I Notice/I Wonder handout (one per student, attached)
- Always, Sometimes, Never True handout (one per student, attached)
- Exploring Waves handout (one per student, attached)
- Exploring Waves Teacher Guide (attached)

30 minutes

Engage Part 1 and 2

Begin the lesson by displaying the title slide from the attached **Lesson Slides** as the students are entering the classroom.

Engage Part 1 (Entire Unit)

Show **slide 5** and introduce students to the I Notice, I Wonder strategy. Provide each student with a **I Notice, I Wonder** handout or have students use notebook paper. Show **slide 6** and tell students to complete the I Notice, I Wonder handout as they view the video. They should record anything that they notice (observe) or wonder (question) on the handout. This is a good time for you to see what your student's prior experience is related to anything they observed or had questions about during the video. After viewing the video, show **slide 7**, and have students share their observations and questions with a partner. Ask for volunteers to share an observation or question and have a class discussion about the video. Introduce students to the Driving Question Board strategy. Show **slide 8** and have each pair of students create one question about waves and post the questions in one area of the classroom to refer back to during the unit, this will be the Driving Question Board.

Embedded video

https://youtube.com/watch?v=Q3oItpVa9fs

Engage Part 2 (Lesson 1)

Next, show slide 9 and introduce students to the Always, Sometimes, or Never True to students. Provide each student with an **Always, Sometimes, or Never True** handout or have students use notebook paper. Tell students to read each statement and determine if the statement is always true, sometimes true, or never true about waves. Students should explain their reasoning after giving their determination. Show **slides 10-19** one at a time and provide time for students to read the statement and think of their response. See the attached **Always, Sometimes, or Never True Teacher Guide** for possible student responses. Ask for a volunteer to share their thoughts for each statement and have a class discussion. This is a good time to address any misconceptions students might have about waves. After a discussion, show **slides 18 and 19** and review the unit essential questions and the lesson learning objectives with students.

20 minutes

Explore

Show slides 21 and 22, tell students next they will work in pairs to examine how Slinkies create waves. Provide each pair of students with the **Exploring Waves** handout. Tell students to find a place on the floor or table to stretch out the Slinky, then use the Slinky to create different types of waves. As they move the slinky to create waves, have students record their observations on the Exploring Waves handout. After students have had time to experiment with the Slinky, have a class discussion about student's observations. See the attached **Exploring Waves Teacher's Guide** for possible student responses.

Explain

After allowing for time to complete the slinky activity from day one, students will work in groups of four for the next activity. Next provides students with one piece of poster paper for each group and show **slide 23**. Tell students to create an Anchor Chart by putting the information they have observed from the Slinky activity onto the poster paper. Possible concepts for students to include on the anchor chart include:

- Some understanding that they had to put energy into the Slinky in order to make a wave.
- Some understanding that they could make 2 kinds of waves, either by squeezing/stretching the Slinky, or by wiggling the Slinky.
- Some understanding that they could control the height of the waves and the number of waves by how widely or how quickly they manipulated the Slinky.
- Some understanding that they could make either a single wave pulse, or a continuous wave depending on how they manipulated the Slinky.
- Some understanding that the slinky moved as it carried the wave, but when energy input (a continuous shake or a single pulse) ended, the Slinky returned back to its normal position.

Monitor students as they complete their anchor charts.

30 minutes

Extend

Show **slide 24** and tell students they will now associate academic vocabulary about waves to the content on their anchor chart. Show **slides 25-32** and explain each vocabulary word to students. Students should notate on their anchor chart where they observed the vocabulary word when they completed the Slinky activity. If students do not have the concept on their anchor chart, provide time for them to add it at this time. Refer back to the Driving Question Board and review the questions with students. Ask students if there are any questions that can be answered at this time, and if so, ask for a volunteer to write a response to the question and add it to the question on the board.

10 minutes

Evaluate

For the final activity, students respond to a question using the Point Of Most Significance strategy. Students should imagine their friend was absent for class during the lesson, what is the most important thing they missed from the lesson? Show **slide 34** and have students complete the question on notebook paper. Collect the responses and assess for student learning. The Exploring Waves handout and anchor charts can also serve as assessments for the lesson.

Next Lesson Preparation

To prepare for the next lesson, introduce students to the What Do You Meme? strategy. Tell students to create a meme that demonstrates their learning from the lesson and be ready to share and explain their meme the next time class meets. Students can draw their meme by hand or use an online meme generator such as https://imgflip.com/

Resources

- Kamenícek, J. (2014, March 31). File:London Millennium Bridge from Saint Paul's.jpg. Retrieved July 07, 2021, from https://commons.wikimedia.org/wiki/File:London_Millennium_Bridge_from_Saint_Paul%27s.jpg
- K20 Center. (n.d.). Always, sometimes, or never true. Strategies. Retrieved from https://learn.k20center.ou.edu/strategy/d9908066f654727934df7bf4f50685d2
- K20 Center. (n.d.). Anchor Charts. Strategies. Retrieved from https://learn.k20center.ou.edu/strategy/64f2b35101a470dda36d44421900af08
- K20 Center. (n.d.). I notice, I wonder. strategies. Retrieved from https://learn.k20center.ou.edu/strategy/d9908066f654727934df7bf4f507d1a7
- K20 Center. (n.d.). Poms: point of most significance strategies. Retrieved from https://learn.k20center.ou.edu/strategy/101
- K20 Center. (n.d.). Driving question board. Strategies. Retrieved from https://learn.k20center.ou.edu/strategy/1511
- K20 Center. (n.d.). What do you meme?. Strategies. Retrieved from https://learn.k20center.ou.edu/strategy/984