C:\Users\Local PC Account\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.IE5\QGRYGZHT\MC900104438[1].wmf **Waves Unit:**

**Sound and Light**

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**Waves Unit**

**Big Questions:**

* How do transverse and longitudinal waves travel?
* How does sound allow us to hear?
* How does light allow us to see?

**Massachusetts Science and Technology Learning Standards**

**Physical Science**

**Disciplinary Core Ideas**

1. Waves, which are regular patterns of motion, can be made in water by disturbing the surface. When waves move across the surface of deep water, the water goes up and down in place; there is no net motion in the direction of the wave except when the water meets a beach.
2. Similarities and differences in patterns can be used to sort and classify natural phenomena.
3. Develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move.
4. Waves of the same type can differ in amplitude (height of the wave) and wavelength (spacing between wave peaks).
5. Recognize that sound is produced by vibrating objects and requires a medium through which to travel. Relate the rate of vibration to the pitch of the sound.
6. Generate and compare multiple solutions that use patterns to transfer information.
7. Digitized information can be transmitted over long distances without significant degradation. High-tech devices, such as computers or cellphones, can receive and decode information--convert it from digitized form to voice-- and vice versa.
8. Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.
9. An object can be seen when light reflected from its surface enters the eyes.

**Science and Engineering Practices**

1. Science findings are based on recognizing patterns.
2. Develop a model using an analogy, example, or abstract representation to describe a scientific principle.
3. Develop a model to describe phenomena.

**Crosscutting Concepts**

1. Cause and effect relationships are routinely identified.
2. Knowledge of relevant scientific concepts and research findings is important in engineering.
3. Engineers improve existing technologies or develop new ones.
4. Science affects everyday life.
5. Similarities and differences in patterns can be used to sort and classify natural phenomena.
6. Similarities and differences in patterns can be used to sort and classify designed products.

**Technology/Engineering**

**Disciplinary Core Ideas**

1. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.
2. Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered.
3. Testing a solution involves investigating how well it performs under a range of likely conditions.
4. At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs.

**Crosscutting Concepts**

1. People's needs and wants change over time, as do their demands for new and improved technologies.

**General Teaching Tips**

**PLEASE READ!**

* Make sure to develop a good working relationship with your classroom teacher. Communication is vital. Plan when you will meet to discuss the next lesson and how you will let each other know about schedule conflicts.
* Read the lessons well ahead of time (at least about 1 week before) so that you are prepared when you get to the classroom. Some lessons require additional materials or videos or apps (4th grade only) so you will need to make sure you are aware of these additional items in time to make arrangements or familiarize yourself in advance.
* Your feedback is very valuable to your fellow teachers in different classes and future teachers or curriculum writers. These lessons are living documents subject to change and your input is valued. Please keep your comments on GLOW up to date with your lessons.
* Asking good questions and getting students to ask good questions or make connections from different units of study or previous lessons is one of the most important parts of science education. Ask your students meaningful questions about the science activities they are doing. Encourage curiosity by giving your students the opportunity to ask their own questions. If you don’t know the answer, work together to find more information. Review questions or questions meant to have students restate the important ideas of the lessons are very valuable. Students should be encouraged to vocalize their thoughts and questions whenever possible.
* The lessons should act as guides. Your teaching experience will be more successful if you incorporate your own style to the lessons. Within the conceptual framework provided, make changes as you and your classroom teacher see fit.
* That being said, each of these lessons was carefully created to fulfill state education requirements. So while the format of the activities may be flexible and additional activities can be valuable, the activities in each lesson are necessary to cover minimum curriculum requirements. If you choose to use other interactive or visual explanations to support the basic concepts of the lessons that you teach, apply these ideas as you see fit, and please share your ideas on the GLOW thread for that lesson.
* Each lesson includes an estimated time frame. Some classes may go slower and some may go faster. As you get to know your class, pace the lessons accordingly. This may involve cutting, restructuring, or adding certain activities. Alternatively, some lessons may span 2-3 days instead of only 1 day.
* Written student work is often used to teach students good habits about following steps of the scientific method. The worksheets provided are meant to teach students what sort of information is relevant. Some students may finish written work and some may not. It is more important to focus on the main concepts of the lesson.