March: Grade 7 Unit 2B: Beyond visibility

Content Area: **Science**
Course(s):
Time Period: **March**
Length: **2 Weeks**
Status: **Published**

Unit Overview

We rely on microwaves to cook food, radio waves to hear music and infrared frequencies to feel heat. In this concept, you will learn about gamma rays, ultraviolet rays, and other frequencies.

Enduring Understandings

Lesson Objectives

By the end of the lesson, students should be able to:

- Identify the different types of electromagnetic waves.
- Describe the properties of different electromagnetic waves.
- Explain the benefits of using electromagnetic waves to encode and transmit information.

Essential Questions

- **Focus Question**
    - What other forms of electromagnetic radiation are there?
- **Lesson Questions**
    - How are waves organized on the electromagnetic spectrum?
    - How do electromagnetic waves that we cannot see compare to visible light waves?
    - Why are digital signals sent as wave pulses a reliable way to encode and transmit information?
- **Can You Explain?**
    - What are the properties of the different types of electromagnetic waves?
- **Overaching Question**
    - How are waves used to transfer energy and information?

Instructional Strategies & Learning Activities

DISCOVERY TECHBOOK LESSONS:

The Five Es

- The Five E Instructional Model

  Science Techbook follows the 5E instructional model. As you plan your lesson, the provided Model Lesson includes strategies for each of the 5Es.

- Engage (45–90 minutes)

  Students are presented with X-rays as an example of light waves the human eye cannot detect directly. Students begin to formulate ideas around the Can You Explain? (CYE) question.

- Explore (135 minutes)

  Students learn to describe waves and their properties and use this knowledge to compare visible and nonvisible light. They explore the use of nonvisible light waves as a mean of communicating over long distance.

- Explain (45–90 minutes)

  Students construct scientific explanations to the CYE question by including evidence of how the properties of different types of electromagnetic waves differ when comparing different wavelengths of light in the electromagnetic spectrum.

- Elaborate with STEM (45–135 minutes)

  Students apply their understanding of nonvisible light as they learn about X-ray crystallography, consider how these waves are used in global positioning systems, and how these waves are used in their daily lives.

- Evaluate (45–90 minutes)

  Students are evaluated on the state science standards, as well as Standards in ELA/Literacy and Standards in Math standards, using Board Builder and the provided concept summative assessments.

Integration of Career Exploration, Life Literacies and Key Skills

Students work together in groups to research how our understanding of the electromagnetic spectrum has

changed human civilization for the better locally and globally. The students will research the history of inventions that utilize different parts of the electromagnetic spectrum: microwaves, television, x-rays, etc...

	An individual's strengths, lifestyle goals, choices, and interests affect employment and income.
	Increases in the quantity of information available through electronic means have heightened the need to check sources for possible distortion, exaggeration, or misrepresentation.
	Digital tools make it possible to analyze and interpret data, including text, images, and sound. These tools allow for broad concepts and data to be more effectively communicated.
	Some digital tools are appropriate for gathering, organizing, analyzing, and presenting information, while other types of digital tools are appropriate for creating text, visualizations, models, and communicating with others.
9.4.8.TL.3	Select appropriate tools to organize and present information digitally.
CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP5	Consider the environmental, social and economic impacts of decisions.
CRP.K-12.CRP6	Demonstrate creativity and innovation.
CRP.K-12.CRP7	Employ valid and reliable research strategies.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP9	Model integrity, ethical leadership and effective management.
CRP.K-12.CRP11	Use technology to enhance productivity.
CAEP.9.2.8.B.1	Research careers within the 16 Career Clusters ® and determine attributes of career success.
CAEP.9.2.8.B.4	Evaluate how traditional and nontraditional careers have evolved regionally, nationally, and globally.

Technolgy and Design Integration

-Google Chromebooks

-Google appliations

-Discovery education

-Scientific lab instrumentation provided by the teacher

TECH.8.1.8.A.CS1	Understand and use technology systems.
TECH.8.1.8.A.CS2	Select and use applications effectively and productively.
TECH.8.2.8.E.1	Identify ways computers are used that have had an impact across the range of human activity and within different careers where they are used.

Interdisciplinary Connections

LA.RST.6-8.1	Cite specific textual evidence to support analysis of science and technical texts.
LA.RST.6-8.2	Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.
LA.RST.6-8.3	Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
LA.RST.6-8.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics.
LA.RST.6-8.5	Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic.
LA.RST.6-8.6	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text.
LA.RST.6-8.7	Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
LA.RST.6-8.8	Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.
LA.RST.6-8.9	Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.
LA.RST.6-8.10	By the end of grade 8, read and comprehend science/technical texts in the grades 6-8 text complexity band independently and proficiently.
LA.WHST.6-8.1	Write arguments focused on discipline-specific content.
MA.7.EE.B	Solve real-life and mathematical problems using numerical and algebraic expressions and equations.
LA.WHST.6-8.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
LA.WHST.6-8.4	Produce clear and coherent writing in which the development, organization, voice, and style are appropriate to task, purpose, and audience.
LA.WHST.6-8.5	With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.
LA.WHST.6-8.6	Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.
LA.WHST.6-8.7	Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.
LA.WHST.6-8.8	Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.
LA.WHST.6-8.9	Draw evidence from informational texts to support analysis, reflection, and research.

Differentiation

See differentiation suggestions in the above lessons.

Struggling students

1. Encourage students to stop the video segment “Television,” included in the Hands-On Activity: Television Signals at intervals and add information to their sketch of the broadcast process before resuming play.
2. Provide students with an image of a wave with all its descriptive features labeled. Leave these images up throughout the videos to give students a visual reference while they are learning about different wave propertie

1. ELL

1. Remind students that they can use the closed captioning function to help them understand the narration as they view the video segments.
2. Encourage students to demonstrate their understanding by drawing concepts. For example, they can draw lights of different wavelengths to compare the differences in frequency.

Accelerated Learners:

1. Challenge students to discover other uses of waves (such as radio waves) for communicating information.
2. Challenge students to research other animals, such as bats, that use nonvisible waves such as sonar to echolocate.

Differentiation in science can be accomplished in several ways. Once you have given a pre-test to students, you know what information has already been mastered and what they still need to work on. Next, you design activities, discussions, lectures, and so on to teach information to students. The best way is to have two or three groups of students divided by ability level.

While you are instructing one group, the other groups are working on activities to further their knowledge of the concepts. For example, while you are helping one group learn the planet names in order, another group is researching climate, size, and distance from the moon of each planet. Then the groups switch, and you instruct the second group on another objective from the space unit. The first group practices writing the order of the planets and drawing a diagram of them.

Here are some ideas for the classroom when you are using differentiation in science:

- Create a tic-tac-toe board that lists different activities at different ability levels. When students aren't involved in direct instruction with you, they can work on activities from their tic-tac-toe board. These boards have nine squares, like a tic-tac-toe board; and each square lists an activity that corresponds with the science unit. For example, one solar system activity for advanced science students might be to create a power point presentation about eclipses. For beginning students, an activity might be to make a poster for one of the planets and include important data such as size, order from the sun, whether it has moons, and so on.

- Find websites on the current science unit that students can explore on their own.

- Allow students to work in small groups to create a project throughout the entire unit. For example, one group might create a solar system model to scale. Another group might write a play about the solar system. This is an activity these groups can work on while they are not working directly with you.

Differentiation in science gets students excited to learn because it challenges them to expand their knowledge

and skills, instead of teaching the whole group concepts they have already mastered.

Modifications & Accommodations

Refer to QSAC EXCEL SMALL SPED ACCOMMOCATIONS spreadsheet in this discipline.

Modifications and Accommodations used in this unit:

In addition to differentiated instruction, IEP's and 504 accommocations will be utilized.

Benchmark Assessments

Benchmark Assessments are given periodically (e.g., at the end of every quarter or as frequently as once per month) throughout a school year to establish baseline achievement data and measure progress toward a standard or set of academic standards and goals.

Schoolwide Benchmark assessments:

Aimsweb benchmarks 3X a year

Linkit Benchmarks 3X a year

Additional Benchmarks used in this unit:

Benchmark assessments will be given Deceember and June.

Formative Assessments

Assessment allows both instructor and student to monitor progress towards achieving learning objectives, and can be approached in a variety of ways. **Formative assessment** refers to tools that identify misconceptions, struggles, and learning gaps along the way and assess how to close those gaps. It includes effective tools for helping to shape learning, and can even bolster students' abilities to take ownership of their learning when they understand that the goal is to improve learning, not apply final marks (Trumbull and Lash, 2013). It can include students assessing themselves, peers, or even the instructor, through writing, quizzes, conversation, and more. In short, formative assessment occurs throughout a class or course, and seeks to improve student achievement of learning objectives through approaches that can support specific student needs (Theal and

Franklin, 2010, p. 151).

Formative Assessments used in this unit:

See assessments located in the unit link above

-Teacher-made assessments will be used as well

Summative Assessments

Summative assessments evaluate student learning, knowledge, proficiency, or success at the conclusion of an instructional period, like a unit, course, or program. Summative assessments are almost always formally graded and often heavily weighted (though they do not need to be). Summative assessment can be used to great effect in conjunction and alignment with formative assessment, and instructors can consider a variety of ways to combine these approaches.

Summative assessments for this unit:

See assessments located in the unit link above

-Teacher-made assessments will be used as well

Instructional Materials

See materials located in Unit above.

Discovery Techbook

Teacher made materials

Standards

MS-PS4	Waves and Their Applications in Technologies for Information Transfer
MS-PS4-3	Integrate qualitative scientific and technical information to support the claim that digitized

signals are a more reliable way to encode and transmit information than analog signals.

Emphasis is on a basic understanding that waves can be used for communication purposes. Examples could include using fiber optic cable to transmit light pulses, radio wave pulses in wifi devices, and conversion of stored binary patterns to make sound or text on a computer screen.

Assessment does not include binary counting. Assessment does not include the specific mechanism of any given device.

Obtaining, Evaluating, and Communicating Information

Obtaining, evaluating, and communicating information in 6–8 builds on K–5 and progresses to evaluating the merit and validity of ideas and methods.

Integrate qualitative scientific and technical information in written text with that contained in media and visual displays to clarify claims and findings.

Digitized signals (sent as wave pulses) are a more reliable way to encode and transmit information.

Structure and Function

Structures can be designed to serve particular functions.