Feb. Grade 7 Unit 2A: Transmission and Absorption

Content Area: **Science**
Course(s):
Time Period: **February**
Length: **3 Weeks**
Status: **Published**

Unit Overview

Light can move through empty space and clear air easily, but it gets absorbed by translucent and opaque materials. In this concept, you will learn how light is transmitted and absorbed.

Enduring Understandings

Lesson Objectives

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

- Design an experiment to observe the transmission and absorption of light in a solar oven and sketch and design a solar oven.
- Describe how light is transmitted by different materials.
- Describe how light is absorbed by different materials.
- Describe how the thermal energy of a material is affected by the absorption of light.

Essential Questions

- **Overarching Question**
    - How are waves used to transfer energy and information?
- **Focus Question**
    - How can one explain the varied effects that involve light?
- **Lesson Questions**
    - What is transmission of light and how does it relate to reflection?
    - How does the absorption of light affect the thermal energy of the absorbing material?
- **Can You Explain?**

- How can you predict if an object is more likely to transmit light or absorb light?

Instructional Strategies & Learning Activities

DISCOVERY TECHBOOK LESSONS:

- 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 the phenomena of how light interacts differently with different substances. Students begin to formulate ideas around the Can You Explain? (CYE) question.

- Explore (135–180 minutes)

  Students investigate questions about light transmission, reflection, and absorption by using evidence from text and media assets. Students complete a Hands-On Activity and create a solar cooker.

- Explain (45–90 minutes)

  Students construct scientific explanations to the CYE question by including evidence of how light is transmitted, absorbed, and reflected by matter.

- Elaborate with STEM (45–135 minutes)

  Students apply their understanding of transmission and absorption as they learn about new energy-efficient technologies, design and test a solar cooker, and research emerging technologies related to light transmission.

- 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.

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Integration of Career Readiness, Life Literacies and Key Skills

In the radio wave communication activity, students learn the history of the radio and how that changed so many aspects of our society.

The students work as teams to design, build, and test a solar oven. They collect data on their experiement and present their results. Each student has a job and responsibility to complete a portion of the group project.

9.2.5.CAP	Career Awareness and Planning
9.4.8.CI	Creativity and Innovation
	An individual's passions, aptitude and skills can affect his/her employment and earning potential.
	Gathering and evaluating knowledge and information from a variety of sources, including global perspectives, fosters creativity and innovative thinking.
9.2.5.CAP.1	Evaluate personal likes and dislikes and identify careers that might be suited to personal likes.
9.4.8.CI.2	Repurpose an existing resource in an innovative way (e.g., 8.2.8.NT.3).
9.2.5.CAP.2	Identify how you might like to earn an income.
9.4.8.CI.3	Examine challenges that may exist in the adoption of new ideas (e.g., 2.1.8.SSH, 6.1.8.CivicsPD.2).
9.2.5.CAP.3	Identify qualifications needed to pursue traditional and non-traditional careers and occupations.
9.2.5.CAP.4	Explain the reasons why some jobs and careers require specific training, skills, and certification (e.g., life guards, child care, medicine, education) and examples of these requirements.
9.4.8.CI.4	Explore the role of creativity and innovation in career pathways and industries.
9.4.8.CT	Critical Thinking and Problem-solving
	An essential aspect of problem solving is being able to self-reflect on why possible solutions for solving problems were or were not successful.
9.4.8.GCA.1	Model how to navigate cultural differences with sensitivity and respect (e.g., 1.5.8.C1a).
9.4.8.GCA.2	Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal.
9.4.8.IML	Information and Media Literacy
9.4.8.IML.3	Create a digital visualization that effectively communicates a data set using formatting techniques such as form, position, size, color, movement, and spatial grouping (e.g., 6.SP.B.4, 7.SP.B.8b).
CRP.K-12.CRP1	Act as a responsible and contributing citizen and employee.
CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP3	Attend to personal health and financial well-being.
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.CRP10	Plan education and career paths aligned to personal goals.
CRP.K-12.CRP11	Use technology to enhance productivity.
CRP.K-12.CRP12	Work productively in teams while using cultural global competence.

Technolgy and Design Integration

Radio wave communication activity

Solar Oven Project

Online interactives

Lab instrumentation

TECH.8.1.8.A.1	Demonstrate knowledge of a real world problem using digital tools.
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.D.1	Design and create a product that addresses a real world problem using a design process under specific constraints.
TECH.8.2.8.D.2	Identify the design constraints and trade-offs involved in designing a prototype (e.g., how the prototype might fail and how it might be improved) by completing a design problem and reporting results in a multimedia presentation, design portfolio or engineering notebook.
TECH.8.2.8.D.3	Build a prototype that meets a STEM-based design challenge using science, engineering, and math principles that validate a solution.
TECH.8.2.8.D.CS1	Apply the design process.

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.

Differentiation Strategies

Struggling Students

1. Post a diagram of the electromagnetic spectrum on the classroom wall for students to look at before beginning this concept.
2. Provide students with examples of materials with different opacities and a flashlight. Encourage students to experiment with shining light through the materials and to describe their observations.

ELL

1. Assist students in distinguishing the terms reflect, refract, transmit, and absorb. Have them create a word triangle for each term.
2. Encourage students to demonstrate their understanding by drawing concepts. For example, they can create their own diagram of an atom with electrons and electron shell.

Accelerated Students

1. Challenge students to explain how underwater animals' vision may be different than the vision of land animals.
2. Challenge students to describe how incandescent lights use thermal energy to produce light. Compare this method of light production to that used in LED lights.

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 December 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

Students will also be give teacher-made assessments on paper and through Google Classroom.

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

Students will also be give teacher-made assessments on paper and through Google Classroom.

Instructional Materials

See materials located in Unit above.

Discovery Techbook

Teacher made materials

Google Classroom and Google applications

Nearpod

Standards

MS-LS1	From Molecules to Organisms: Structures and Processes
MS-LS1-8	Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories. Assessment does not include mechanisms for the transmission of this information.
MS-LS3	Heredity: Inheritance and Variation of Traits
MS-LS3-2	Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation. Emphasis is on using models such as Punnett squares, diagrams, and simulations to describe the cause and effect relationship of gene transmission from parent(s) to offspring and resulting genetic variation.