



Grade 6 Science
Unit # 2 – Earth and Space Science
Topic 4 Thermal Energy – 14 Days

Unit Overview: Students make sense of phenomena as they explore the disciplinary core ideas through the lens of crosscutting concepts, such as Systems and System Models, Cause and Effect, and Matter and Energy. Students begin their discovery of the physical world with models and observable phenomena and move to explore the concept of energy and how it is needed to change matter. This leads to the study of thermal energy and heat transfer.

Topic Essential Question: What happens when heat flows from one object to another?

Lessons

- Topic Launch/Quest Kickoff
- Lesson 1 Temperature, Thermal Energy, and Heat
- Lesson 2 Heat Transfer
- Lesson 3 Heat and Materials
- Topic Close –Assessment, Quest Findings

NYSSLS Performance Expectations

MS-PS3-3. Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.* [Clarification Statement: Examples of devices could include an insulated box, a solar cooker, and a Styrofoam cup.] [Assessment Boundary: Assessment does not include calculating the total amount of thermal energy transferred.]

MS-PS3-4. Plan and conduct an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the temperature of the sample of matter. [Clarification Statement: Examples of experiments could include comparing final water temperatures after different masses of ice melted in the same volume of water with the same initial temperature, the temperature change of samples of different materials with the same mass as they cool or heat in the environment, or the same material with different masses when a specific amount of energy is added.] [Assessment Boundary: Assessment does not include calculating the total amount of thermal energy transferred.]

MS-PS3-5. Construct, use, and present an argument to support the claim that when work is done on or by a system, the energy of the system changes as energy is transferred to or from the system. [Clarification Statement: Examples of empirical evidence used in arguments could include an inventory or other representation of the energy before and after the transfer in the form of temperature changes or motion of object.] [Assessment Boundary: Assessment could include calculations of work and energy.]

MS-ETS1-3. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

Topic Opener

PE: MS-PS3-3

SEP: Constructing Explanations and Designing Solutions

DCI:

PS3.B – Conservation of Energy and Energy Transfer

- When the motion energy of an object changes, there is inevitably some other change in energy at the same time. (MS-PS3-5)

PS3.C – Relationship Between Energy and Force

CCC: Energy and Matter

Savvas

Highlighted labs are important to the understanding of the instructional concepts in this lesson and must be completed during Science instructional time.

- Topic Readiness Test
- ***uConnect Lab – How Cold is the Water?***
- Quest Kickoff Video – How can you keep hot water from cooling down?
- Quest Kickoff

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Lesson 1 – Thermal Energy, Heat, and Temperature

PE: MS-PS3-4

SEP: Planning and Carrying Out Investigations

DCI:

PS3.A – Definitions of Energy

- Motion energy is properly called kinetic energy; it is proportional to the mass of the moving object and grows with the square of its speed. (MS-PS3-1)
- A system of objects may also contain stored (potential) energy, depending on their relative positions. (MS-PS3-2)
- (NYSED) Temperature is a measure of the average kinetic energy of particles of matter. The relationship between the temperature and the total energy of a system depends on the types, phases (states), and amounts of matter present. (MS-PS3-3),(MS-PS3-4)

PS3.B – Conservation of Energy and Energy Transfer

- When the motion energy of an object changes, there is inevitably some other change in energy at the same time. (MS-PS3-5)

CCC: Scale, Proportion, and Quantity

Savvas

Guiding Objectives:

- Students will use text evidence to describe and explain: How the total thermal energy of a system depends on the types, states, and amounts of matter present; the relationship among thermal energy, temperature, and heat; how adding and removing heat energy affects the kinetic energy and thermal energy of matter; how changes in temperature can cause a change in state.

- Students will construct graphs to identify the proportional relationship between Celsius and Fahrenheit scales.

Literacy Connection

- Use Information

Vocabulary

- thermal energy
- heat
- temperature

Academic Vocabulary

- transfer
- absolute

Connect - TE/SB p. 140

- Connect It!
- Class Discussion – Warming Your Hands
- Quest Connection

Investigate - TE/SB pp. 141-144

- **Investigate Lab – Temperature and Thermal Energy**

- Video – Thermal Energy, Heat, and Temperature
- Interactivity – Flow of Thermal Energy
- Reading Checks (p. 141)
- Math Toolbox (p.142)
- Literacy Connection (p.143)
- Model It!

Synthesize - TE/SB pp. 145-146

- Interactivity – A Rising thermometer
- Reading Check (p.145)

Demonstrate – TE/SB pp. 146

- Lesson 1 Check
- Lesson Quiz 1

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Lesson 2 – Heat Transfer

PE: MS-PS3-4; MS-PS3-5

SEP: Planning and Carrying Out Investigations; Engaging in Argument from Evidence

DCI:

PS3.B – Conservation of Energy and Energy Transfer

- When the motion energy of an object changes, there is inevitably some other change in energy at the same time. (MS-PS3-5)

CCC: Scale, Proportion, and Quantity; Energy and Matter

Savvas

Guiding Objectives:

- Students will investigate and identify evidence to describe: How heat is transferred between substances.
- Students will identify evidence to explain: How heat flows from warmer to cooler objects; the law of conservation of energy.

Literacy Connection

- Conduct Research Projects

Vocabulary

- conduction
- convection
- convection current
- radiation

Academic Vocabulary

- transform

Connect - TE/SB p. 148

- Connect It!
- Write: Cooler and Warmer
- Quest Connection

Investigate - TE/SB pp. 148-152

- Video – Heat Transfer
- ***u*Investigate Lab – Visualizing Convection Currents**
- Interactivity – Methods of Thermal Energy Transfer
- Interactivity – Solar Oven Design
- Reading Check (pp. 150)
- Math Toolbox (pp.151)

Synthesize - TE/SB pp. 152-154

- Interactivity – Heat and Reheat
- Reading Check (p.152)
- Literacy Connection (p.153)
- Question It!
- Quest Check In – Interactivity – Contain the Heat

Demonstrate – TE/SB p. 154

- Lesson 2 Check
- Lesson 2 Quiz

<p><u>Lesson 3 – Heat and Materials</u> PE: MS-PS3-4; MS-PS3-5 SEP: Planning and Carrying Out Investigations; Engaging in Argument from Evidence DCI: PS3.B – Conservation of Energy and Energy Transfer</p> <ul style="list-style-type: none"> ● (NYSED) The amount of energy transfer needed to change the temperature of a matter sample by a given amount depends on the nature of the matter, the mass of the sample, and the environment. (MS-PS3-4) ● When the motion energy of an object changes, there is inevitably some other change in energy at the same time (MS-PS3-5) <p>CCC: Scale, Proportion, and Quantity; Energy and Matter</p>	<p>Savvas Guiding Objectives:</p> <ul style="list-style-type: none"> ● Students will explain: How different materials respond to heat; how changes in kinetic energy affect heat transfer. ● Students will use reasoning and evidence to evaluate: Differences in temperature and changes in temperature over time; how energy is transferred between materials and their surroundings. <p>Literacy Connection</p> <ul style="list-style-type: none"> ● Integrate with Visuals <p>Vocabulary</p> <ul style="list-style-type: none"> ● conductor ● insulator ● specific heat ● thermal expansion <p>Academic Vocabulary</p> <ul style="list-style-type: none"> ● contract <p>Connect - TE/SB pp. 158</p> <ul style="list-style-type: none"> ● Connect It! ● Poll – Too Hot to Handle ● Quest Connection <p>Investigate - TE/SB pp. 159-162</p> <ul style="list-style-type: none"> ● <u>Investigate Lab – Comparing How Liquids Cool</u> ● Interactivity – A Day at the Beach ● Video – Heat and Materials ● Math Toolbox (p.160) ● Model It! ● Reading Check (p.161) ● Literacy Connection (p.162) <p>Synthesize - TE/SB pp. 163-165</p> <ul style="list-style-type: none"> ● Interactivity – Matter and Heat Transfer ● Reading Check (p.163) ● Quest Check-In Lab – Keep the Heat In ● Quest Check-In Lab – Keep the Cold Out ● Quest Check-In <p>Demonstrate – TE/SB p.163</p> <ul style="list-style-type: none"> ● Lesson 3 Check ● Lesson 3 Quiz
<p>Topic Close</p> <ul style="list-style-type: none"> ● Topic 4 Assessment and Remediation TE/SB pp. 166-169 ● Quest Finding and Reflection TE/SB p. 169 	<p><u>Topic 4 Enrichment</u></p> <p>Topic 4 - Lesson 1 Enrichment</p> <ul style="list-style-type: none"> ● Enrichment Activity – Distributing Heat ● Virtual Lab – Choosing a Snack Food ● It’s All Connected – Science/Art-Glassblowing <p>Topic 4 - Lesson 2 Enrichment</p> <ul style="list-style-type: none"> ● Career Video – Firefighter ● Enrichment Activity – Drinks on Ice ● <i>u</i>Engineer It – Shockwave to the Future ● Case Study – Earth Power <p>Topic 4 - Lesson 3 Enrichment</p> <ul style="list-style-type: none"> ● Enrichment Activity – Probing the Sun

Grade 6 Unit 1 Physical Science

<p>English Language Learners (ELL) Enhancements To access hyperlinked material, you must be logged into your BPS Google Drive</p>	<p><u>Listening</u></p> <ul style="list-style-type: none">● <u>Cross- Linguistic Practices</u>: Gives students opportunities to make connections between what they hear and their home language (For example, allow students to listen to a passage and identify cognates).● <u>Activating Prior Knowledge</u> Activating prior knowledge means both eliciting from students what they already know and building initial knowledge that they need in order to access upcoming content.● <u>Visuals</u> - GIFs, pictures- will assist students in understanding what they are listening to. Use <u>visual thinking strategies</u> to set the lens for learning.● Video to review or introduce a topic – use <u>closed captioning</u> to help students see the words and pronunciations while they listen to the content.● <u>Word stretching / Vowel stretching</u> when instructing allows student to listen closely to the pronunciation of the word.● <u>Performance Level Descriptors</u> this document provides teachers with a description of what output they can expect from students based on earned NYSESLAT levels in the modality of listening. Scroll for grade 6. <p><u>Speaking</u></p> <ul style="list-style-type: none">● <u>Sentence Stems/Frames</u> - to begin a sentence - such as <i>Evolution is...</i> or <i>I think that evolution is...</i>● <u>Academic Conversation Starters</u>: Have a visual of a list of academic sentence starters that students can refer to in a discussion.● <u>Choral Reading</u> - To build fluency, self-confidence and motivation with reading/speaking.● Create <u>movement</u> to go with the word. Movement can be a motivating factor, as well as a kinesthetic tool for conceptualizing the rhythm and flow of fluent reading while triggering brain function for optimal learning.● <u>Performance Level Descriptors</u> This document provides teachers with a description of what output they can expect from students based on earned NYSESLAT levels in the modality of speaking. Scroll for grade 6. <p><u>Reading</u></p> <ul style="list-style-type: none">● Supplementary Text to help reinforce concepts.● <u>Visual Aids</u> - Pictures or models to support vocabulary words and concepts● Video to review or introduce a topic - use <u>closed captioning</u> to help students read along while they listen to the content.● <u>4 Square / Frayer models</u> to help students gain a deeper understanding of vocabulary.● <u>Highlighting</u> important text to assist students in answering questions after the reading.● <u>Chunking</u>-Break reading of text into chunks or paragraphs● <u>Vocabulary Morphology</u>- Morphology relates to the segmenting of words into affixes (prefixes and suffixes) and roots or base words, and the origins of words. Understanding that words connected by meaning can be connected by spelling can be critical to expanding a student’s vocabulary.● <u>Performance Level Descriptors</u> this document provides teachers with a description of what output they can expect from students based on earned NYSESLAT levels in the modality of reading. Scroll for grade 6. <p><u>Instructional Accommodations (depending on the student’s needs)</u></p> <ul style="list-style-type: none">● <u>Extended time</u> for tests in class, projects and assignments● <u>Directions read</u>. Broken down as necessary● <u>Model</u> how to complete the activity in the lesson● <u>Oral simplification</u> of directions or questions● <u>Translated version</u> of test when available. Student may have both version English and native language version● Use of <u>approved bilingual glossaries</u> from NYS in each subject
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Grade 6 Unit 1 Physical Science

<p>Special Education Modifications</p> <p>Special Education students must have accommodations as per Individual Educational Plan (IEP)</p>	<p><u>Instructional</u></p> <ul style="list-style-type: none"> ● Pre-teach vocabulary ● Use picture vocabulary ● Scaffold Depth of Knowledge questions ● Provide copy of notes/notes in “cloze” form ● Use of Think, Pair, and Share strategy to help process information ● Scaffold written assignments with the use of graphic organizers ● Allow for multiple ways to respond (verbal, written, response board) ● Provide model of performance task ● Modify informational text to fit the needs of the students ● Provide a digital or paper interactive notebook ● Present complex tasks in multiple ways ● Provide mnemonic strategies for scientific concepts <hr/> <p><u>Technology:</u></p> <ul style="list-style-type: none"> ● Audio reading of text ● Text to type functions ● Videos to clarify/visualize science concepts ● Record class lecture/discussions and make accessible to student ● Nearpod- interactive presentations of notes <hr/> <p><u>In Class Assessments</u></p> <ul style="list-style-type: none"> ● Provide multiple options for projects ● Use of timer in class ● Break all complex tasks into chunks
<p>Step Up to Writing</p> <p>Step Up to Writing Materials can be found in BPS Science K-12 Schoology Folder Grade 6 Resources Grade 6 SUTW materials</p>	<ul style="list-style-type: none"> ● Easy Two-Column Notes ● Breaking Down Definitions ● Paragraph Frame- What I Learned ● <u>Performance Level Descriptors</u> this document provides teachers with a description of what output they can expect from students based on earned NYSESLAT levels in the modality of writing. Scroll for grade 6.
<p>Culturally and Linguistically Responsive Teaching (CLRT) in the Science Classroom</p>	<ul style="list-style-type: none"> ● Materials, resources, and/or discussions address diverse cultural backgrounds and real-world applications ● Artifacts (posters, charts, etc.) in the science classroom are representative of the cultures of the student population ● All students are given an opportunity to engage in science discourse ● Teacher demonstrates high expectations for all students