COMMON CORE STATE STANDARDS

DELAWARE

GRADE 8

SCIENCE

CLOSE READING

COHORT 1

CLOSE READING LESSON for TOE
Reviewed by T Mead, T Bennett, and J. Moyer
(Transformation of Energy Unit Lesson 3)
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Making Sense of Energy in Lesson 3 in the Transformation of Energy Unit used in 8th grade
Text written by John Moyer and Pat Gleeson in TOE unit

Lexile: 1000

Goal for the Lesson:

The goal of this exemplar is to give students in Grade 8, the opportunity to recognize that energy can be transformed from one form to another and transferred from one object to another. When this transfer of energy takes place, the motion of both objects involved usually changes. By reading and re-reading this passage closely, combined with classroom discussion, students will synthesize their understanding of Labs 1,2 and 3 in the Transformation of Energy Unit and finalize their definitions of kinetic, potential, transfer and transformation. Students will begin to understand that energy cannot be lost but in fact is transferred and/or transformed.

Connection to the CCSS:

6 -8 RS1: Cite specific textual evidence to support analysis of science and technical texts.

RS2: Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.

RS3: follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

RS4: 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*.

RS7: 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).

RS10: By the end of grade 8, read and comprehend science/technical texts in the grades 6–8 text complexity band independently and proficiently.

WS2a: Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.

b. Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.

c. Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts.

d. Use precise language and domain-specific vocabulary to inform about or explain the topic.

e. Establish and maintain a formal style and objective tone.

f. Provide a concluding statement or section that follows from and supports the information or explanation presented.

WS4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

WS5: 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.

WS6: Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.

WS10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Note: Teachers can use google doc to have students publish writing and share ideas and comments among students in the class. This would address standard WS5 and 6

Content Standards:

3.1.a: Energy from the Sun takes the form of electromagnetic waves such as infrared, visible, and ultraviolet electromagnetic waves. The radiation from the sun consists of a range of energies in the electromagnetic spectrum.

3.1.b: Mechanical energy comes from the motion (kinetic energy) and position (potential energy) of objects. Gravitational potential energy and elastic potential energy are important forms of potential energy that contribute to the mechanical energy of objects.

3.2.b: Gravity is a force that acts between masses over very large distances. Near the Earth's surface, gravity pulls objects and substances vertically downward.

3.3.a: Energy can be transformed from one form into another. Energy transformation often takes place while energy is being transferred to another object or substance. Energy transformations and energy transfers can be used to explain how energy flows through a physical system.

Days for the Lesson:

The close reading and discussion portion of the exemplar is brief enough to be completed in a single day, though teachers may want to include the informative/explanatory writing as a second day of instruction.

Investigation 3, pp. 5-6 (Teacher Guide)	Vocabulary[1]
In the last investigation, we looked at the energy of motion, called Kinetic Energy (KE). We also discovered that the higher the ball is released, the greater its kinetic energy will be at the bottom of the ramp. We have not yet formally addressed why this is true. When the ball is lifted to the top of the ramp, the energy you use to lift it is stored. As the ramp gets higher and higher, the golf ball's stored energy at the top of the ramp gets larger also. If the 'stored' energy at the top of the ramp gets larger, the kinetic energy of the ball at the bottom of the ramp will get larger too. Where did the 'stored' energy come from? It came from you, or whoever lifted the ball to the top of the ramp. The ball will not roll up the ramp by itself. It must be lifted upwards to the top of the ramp, because gravity pulls downward on everything. The lifting process requires energy, and the energy you use to lift the ball is stored by gravity. We call this energy stored by gravity Gravitational Potential Energy (GPE). Where did you get the energy needed to lift the ball? From the energy stored in the food you recently ate. This 'food' energy is another form of stored energy, and our muscles use it to move objects by pushing and pulling on them. You have to use more of your energy to lift the ball higher. We can think of the energy in our food being transferred to the ball by our muscles, and transformed by gravity into stored energy. When the ball is released, this stored energy is transformed into kinetic energy, and the ball begins moving down the ramp with greater and greater speeds. **In Summary, two important forms of energy are:** Kinetic Energy (KE), the energy an object has because of its motion, which is determined by the object's mass and speed. Gravitational PE(Potential Energy), the stored energy an object has because it was lifted to some height. This potential energy is determined by the object's mass and its height above the ground. **Two important properties of energy are:** Energy transfer is the passing of energy from one object to another. Energy transformation is the changing of energy from one form to another.	**Energy**-ability to bring about a change **Motion**-the state in which one objects distance from another is changing **Gravity**-a pulling force **Transfer**-passing energy from one object to another but remaining in the same form **Transformation**-changing of energy from one form to another

[1] Underline = words which cannot be discovered in context by students. **Boldface** words are tier 2 that can be determined in context.

Close Reading Exemplar for Lesson 3 Transformation of Energy Grade 8

Summary of Activities

1. Teacher introduces the days reading called Making Sense of Energy with minimal commentary (teacher will define the underlined words in passage that are not defined in context). Students read the passage independently.
2. Teacher reads paragraph 1 aloud and students complete graphic organizer(Compare and Contrast graphic organizer)
3. Teacher reads paragraph 2 and students answer text dependent questions.
4. Students read the entire passage with partner and trace the flow of energy by creating a drawing.
5. Teacher asks students to write an informative/explanatory essay documenting the transfers and transformations of energy in a ball drop included the passage.
6. Optional extension activity

Text under Discussion	Directions for Teachers/Guiding Questions for Students
Entire Text In the last investigation, we looked at the energy of motion, called Kinetic Energy (KE). We also discovered that the higher the ball is released, the greater its kinetic energy will be at the bottom of the ramp. We have not yet formally addressed why this is true. When the ball is lifted to the top of the ramp, the energy you use to lift it is stored. As the ramp gets higher and higher, the golf ball's stored energy at the top of the ramp gets larger also. If the 'stored' energy at the top of the ramp gets larger, the kinetic energy of the ball at the bottom of the ramp will get larger too. Where did the 'stored' energy come from? It came from you, or whoever lifted the ball to the top of the ramp. The ball will not roll up the ramp by itself. It must be lifted upwards to the top of the ramp, because gravity pulls downward on everything. The lifting process requires energy, and the energy you use to lift the ball is stored by gravity. We call this energy stored by gravity Gravitational Potential Energy (GPE).	1. *Introduce the passage and students read independently. Other than giving brief definitions offered to words students would likely not be able to define from context. Avoid giving background context or any other instructional guidance. Let students read text silently. This close reading approach focuses students to rely on the text to make sense of energy. It is crucial to have students grapple with the text.* 2. *Before teacher reads paragraph 1: Have students focus on the following question:* *Q1. What are the differences between the energy of motion (kinetic energy) and stored energy (potential energy)?* *a. The teacher hands out the graphic organizer from LFS called Compare and Contrast and explains how to fill it out using Kinetic and Potential energy. The teacher reads the first paragraph aloud to the students. Students fill out graphic organizer on how Kinetic and Potential Energy are alike and different while the teacher is*

Where did you get the energy needed to lift the ball? From the energy stored in the food you recently ate. This 'food' energy is another form of stored energy, and our muscles use it to move objects by pushing and pulling on them. You have to use more of your energy to lift the ball higher. We can think of the energy in our food being transferred to the ball by our muscles, and transformed by gravity into stored energy. When the ball is released, this stored energy is transformed into kinetic energy, and the ball begins moving down the ramp with greater and greater speeds.	*reading.* *b. Students may not be able to complete the graphic organizer just by listening to the teacher read the passage.* *c. Have students go back and re read paragraph 1 and complete the graphic organizer.* *d. Students then share their graphic organizer notes with a partner.* *Students share graphic organizer notes with the class.* *3. Teacher asks the following question:* *Q2. What type of energy is needed to lift the ball? Explain where you get the energy needed to lift the ball.* *a. Teacher reads paragraph 2 for the students.* *b. Students share answer to question 2 with their partner/* *c. Students share answer with class.* *Teacher asks the following question:* *Q3. Based on what you have read,* *a. Give your own example of energy transfer and provide evidence from the text supporting your conclusion that it is an energy transfer.* *b. Give your own example of an energy transformation and provide evidence from the text supporting your conclusion that it is an energy transformation.* *Students share answer to question 3 a and b with partner.* *Students share answer to question 3 a and b with class.* *Teacher asks the following question:* *Q4: Explain how energy transfer is different from energy transformation. Many students do not understand that both energy transfer and transformation can occur at the same time. Energy transfer is when energy passes from one object to another. Energy transformation is when energy changes forms.*

The entire passage	*Both can happen at the same time. For example: When energy from food (chemical energy) is used by a person to place a ball at the top of a ramp, energy is being transferred from the person to the ball and transformed from chemical to GPE energy. This is often confusing to both teachers and students. Be sure to review transfer and transformation and give examples.* *Students share answer to question 4 with partner.* *Students share answer to question 4 with class.* *NOTE: We want the students to gradually accept that the energy must go somewhere. It cannot just disappear. We want to accomplish this goal by convincing the students that the energy always goes somewhere. We can be successful, but we must trace the flow of energy.* *4. Students read the entire passage with partners and trace the flow of energy from the example in the reading from start to finish. This should include the following:* *a. Start with food energy (person eating)(chemical potential energy or stored food energy)* *b. Energy gives person ability to lift ball to top of ramp(chemical potential energy or stored food energy)* *c. Ball is at the top of the ramp(Gravitational Potential energy)* *d. Ball is rolled down the ramp (Kinetic Energy)* *Students will draw each step above and include the type of energy involved in each step of the process.*

MAKING SENSE OF ENERGY …

In the last investigation, we looked at the energy of motion, called Kinetic Energy (KE). We also discovered that the higher the ball is released, the greater its kinetic energy will be at the bottom of the ramp. We have not yet formally addressed why this is true. When the ball is lifted to the top of the ramp, the energy you use to lift it is stored. As the ramp gets higher and higher, the golf ball's stored energy at the top of the ramp gets larger also. If the 'stored' energy at the top of the ramp gets larger, the kinetic energy of the ball at the bottom of the ramp will get larger too. Where did the 'stored' energy come from? It came from you, or whoever lifted the ball to the top of the ramp. The ball will not roll up the ramp by itself. It must be lifted upwards to the top of the ramp, because gravity pulls downward on everything. The lifting process requires energy, and the energy you use to lift the ball is stored by gravity. We call this energy stored by gravity Gravitational Potential Energy (GPE).

As the climber pulls himself higher and higher up from the ground. he has more stored Gravitational Potential Energy (GPE)

Where did you get the energy needed to lift the ball? From the energy stored in the food you recently ate. This 'food' energy is another form of stored energy, and our muscles use it to move objects by pushing and pulling on them. You have to use more of your energy to lift the ball higher. We can think of the energy in our food being transferred to the ball by our muscles, and transformed by gravity into stored energy. When the ball is released, this stored energy is transformed into kinetic energy, and the ball begins moving down the ramp with greater and greater speeds.

In summary, two important forms of energy are:

Kinetic Energy (KE), the energy an object has because of its motion, which is determined by the object's mass and speed.

Gravitational PE, the stored energy an object has because it was lifted to some height. This potential energy is determined by the object's mass and its height above the ground.

Two important properties of energy are:

Energy transfer is the passing of energy from one object to another.

Energy transformation is the changing of energy from one form to another.

In the next few investigations we will explore both forms of energy and how the energy gets changed from one form to another form

MAKING SENSE OF ENERGY … FOR TEACHERS

The concept of energy is introduced slowly over the course of several grades. The 5th grade ***Motion & Design*** uses energy in vague terms. For example, the elastic potential energy of the stretched rubber band is simply called "rubber band energy". Although the teacher background notes discuss the ideas of gravitational potential energy and kinetic energy, teachers are cautioned on using these terms at the 5th grade level. Several of the questions preceding the investigations ask students to begin to formulate ideas about energy.

In 6th grade, the ***Force & Motion*** course asks students to identify forces responsible for the motion of objects. Later in the 6th grade ***Simple Machines,***

mechanical energy and the concept of energy transfer is highlighted during the investigations of the simple machines. It is in this unit students recognize a pattern involving the force needed to lift an object, and the distance through which this force must be exerted.

Should We Drill? (Formative Assessment #1}

While reading this article, make note of the arguments that are presented. Upon completion of this graphic organizer, you will be asked to explain the positions articulated in the article, using supporting evidence from the article.

The article can be found here: http://www.scholastic.com/content/collateral resources/pdf/s/snonline/SN56-DRILLDECISION-042610.pdf

Argument 1:
Supporting Evidence:
Supporting Evidence:
Supporting Evidence:

Argument 2:
Supporting Evidence:
Supporting Evidence:
Supporting Evidence:

5. Type of writing (Explanatory/Informative)

Instructions: Students will be asked to respond to a writing prompt with a paragraph summarizing the transfers and transformations of energy in the ball drop from the reading passage.

Writing Prompt: Using the information provided in the reading, describe what happens to energy that you gave the ball when lifted it to the top of the ramp and allowed it to roll down the ramp. Be sure to include the transfers and transformations of energy at each step in the process.

Writing Science Standards 6-8 (Standard 2)

1. Write a science Explanatory/Informative essay that describes a science technical process.
   a. Introduce the topic clearly and organize the relevant ideas to answer the prompt.
   b. Develop the topic with relevant, well-chosen facts, definitions, details and other information from the passage to support the answer to the prompt.
   c. Use transitions to create cohesion when describing the energy transfers and transformations in the ball drop.
   d. Use appropriate vocabulary to inform and explain the process.
   e. Establish and maintain a formal style.
   f. Provide a concluding statement that supports the explanation and/or information presented in the essay.

Answer: What should teachers see in student writing?

Essays should include a step by step explanation of how energy transforms and transfers in the ball drop process. Students will start with the energy gained from food (stored chemical energy/potential energy) which then transfers and transforms to the ball at the top of the ramp. This is both a transfer of energy to the ball and a transformation of energy to GPE (gravitational potential energy) This stored energy (gravitational potential energy) is transformed into kinetic energy as it rolls down the ramp. Students will provide ample explanation of each type of energy and why they chose transfer and/or transformation of energy in each step of the process. If students include how the ball could hit a cup and move the cup, this is a transfer of kinetic energy from the ball to the cup.

6. Extension Activities: Have kids trace the flow of energy in another real life example such as a person holding and dropping a book to the floor.

Questions for students: Lesson 3 Transformation of Energy Grade 8

Q1. What are the differences between the energy of motion (kinetic energy) and stored energy (potential energy)? Students complete the graphic organizer.

Q2. What type of energy is needed to lift the ball? Explain where you get the energy needed to lift the ball.

Q3. Give your own example of energy transfer and provide evidence from the text supporting your conclusion that it is an energy transfer.

Give your own example of an energy transformation and provide evidence from the text supporting your conclusion that is an energy transformation.

Q4. Explain how energy transfer is different from energy transformation.

Draw an energy chain tracing the flow of energy for a person eating, placing a ball on top of a ramp, ball rolling down the ramp and hitting a cup.

Explanatory/Informative Writing: Using the information provided in the reading, describe what happens to energy that you gave the ball when lifted it to the top of the ramp and allowed it to roll down the ramp. Be sure to include the transfers and transformations of energy at each step in the process.

Sample 3-point Reading Rubric (Grades 3 – 11)	
3	The response: • Gives sufficient evidence of the ability to [fill in with key language from the intended target]. • Includes specific [inferences, opinions, identification, etc.) that make clear reference to the text. • Fully supports the [inferences, opinions, identification, etc.] with clearly relevant [details, examples, information] from the text.
2	The response: • Gives some evidence of the ability to [fill in with key languages form the intended target]. • Includes some specific [inferences, opinions, identification, etc.] that make reference to the text. • Adequately supports the [inferences, opinions, identification, etc.] with relevant [details, examples, information] from the text.
1	The response: • Gives limited evidence of the ability to [fill in with key language from the intended target]. • Includes [inferences, opinions, identifications, etc.] but they are not explicit or make only vague references to the text. • Supports the [inferences, opinion, identifications, etc.] with at least one [detail, example] but the relevance of that [detail, example] to the text must be inferred.
0	A response gets no credit if it provides no evidence of the ability to [fill in with key language from the intended target] and includes no relevant information from the text.

* If applicable

Student Sample 1

Compare / Contrast

Concept 1	Concept 2
Gravitational Potential Energy	Kinetic Energy

How Alike?

Forms of Energy

Kinetic Energy is energy of Motion determined by mass and speed. Gravitational Potential Energy is stored energy an object has b/c it was lifted to same height. Both determined by mass factor.

How Different?

Mass & Height	With Regard To	Mass & Speed
Stored Energy	Determined by Energy	Energy of Motion
GPE	Relationship between	Kinetic Energy
GPE	the 2 at one time	Kinetic Energy
Student Score = 3	transforms.	

Student Sample 2 – *Transformation of Energy*

During lunch, I ate food and gained chemical energy transferred to my muscles. The energy transferred to the golf ball and transformed into GPE. I released the ball and it transformed into Kinetic Energy. The KE transferred to the cup.

Student Score = 3

Student Sample 3 – *Transformation of Energy*

The energy from the lab came from the CE in the food we ate. Then that energy transformed into GPE and transferred to the ball as we lifted it up to the top of the ramp. Then that ball rolled down the ramp, and the GPE transformed into KE. At the bottom of the ramp, the KE transferred to the cup and the cup used that energy to move across the floor.

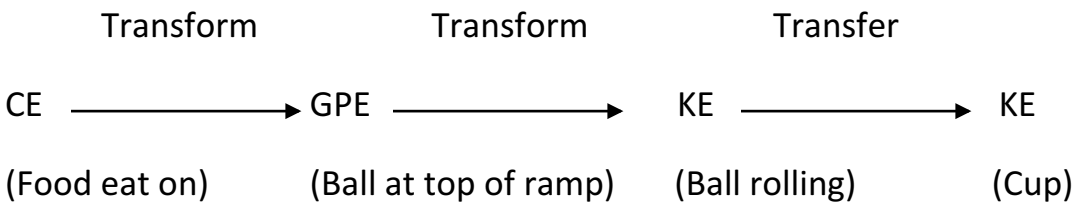
Student Score = 3

Student Sample 4 – *Transformation of Energy*

First you get your energy from the food you eat which is called chemical energy. Then, you use that energy to put the ball at the top of the ramp that is called GPE. Then when the ball rolls down, the energy transforms to KE. When it hits the cup it then transfers the KE energy to the cup.

Student Score = 2

Student Sample 5 – *Transformation of Energy*



The food that we ate turned into Chemical Energy. We use that energy to put the ball onto the top of the ramp turning into GPE. The ball rolls down the hill, thus turning into KE. Then it hits the cup transferring into the cup displaying as KE.

Student Score = 2

Student Sample 6 – *Transformation of Energy*

Use your energy chain to describe in 4-5 sentences what happened to the energy in Lab #3. Include all transfers/transformations.

First, your energy comes from the food you've eaten. Then you use the energy to put the balloon on the ramp and release it. Those are energy transformation. You release the ball and it hits the cup, so you'd have an energy transfer between the ball and cup.

Student Score = 1

Student Sample 7 – *Transformation of Energy*

Kinetic & Potential Energy	Similarities	Differences
	• Both energies • Important types of energy	• KE – speed • GPE – Height One is based on mass & speed. The other is based on mass & height.
	Food (CE) → Wall at top of Ramp (GPE) → Ball rolling bottom of ramp (KE)	
	When you eat the food you store the energy and then when you lift something up you use some energy.	

Student Score = 1