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Assessing with Learning Progressions in Science

MATTER AND ENERGY

Instructional Tools | **Contributors: Tracie Martin, Zan Peterson-Moens, Anjeannette Hammer**

Northwest Educational Service District 189
Together We Can

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MATTER AND ENERGY

Big Idea: *Measuring quantities can provide evidence.*

Formative Assessment Task Cover Sheet

Learning Target #1	
Assessment Task Details	**Teacher Background**
Brief Description of the Assessment Task: Science Notebook sheet #18, "*Opinion and Evidence Questions,*" question #2, "Why did Teasha and Kim repeat their experiments?" **Measuring Mass:** Science Notebook sheet #16 Students measure the mass of a variety of objects and determine the most-accurate measurement for each object through repeated measurements	**Administration Tips:** *Investigation 3, part 2; Investigation 4, part 1* **Suggestions for Instructional Adjustments:**
Learning Target: Investigations involve collecting and recording data	
Success Criteria: I can repeat measurements to increase the accuracy of my recorded data.	
Student Task Sheet Included: no Student Work Samples Included: no	

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Learning Target #2	
Assessment Task Details	**Teacher Background**
Brief Description of the Assessment Task: **Measuring Volume:** Science Notebook sheet #19: Students measure the volume of a variety of objects and determine the most-accurate measurement for each object through repeated measurements Survey/Posttest, p.1 em2. Determine the mass of a given object Survey/Posttest p.2 em5. Determine the correct unit of measurement to use.	**Administration Tips:** *Investigation 3, part 2 & 3; Investigation 4, part 2* **Suggestions for Instructional Adjustments:** *A good extension to this activity is to have students look for real-life examples from home that weighed approximately one kilogram.* *For p.1 em.2 and em.5: Have students generate additional questions for which unit to use.*
Learning Target: Mass and volume are ways to measure and describe objects	
Success Criteria: I can repeat measurements to increase the accuracy of my recorded data	
Student Task Sheet Included: no Student Work Samples Included: no	

MATTER AND ENERGY

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Learning Target #3	
Assessment Task Details	**Teacher Background**
Brief Description of the Assessment Task: **Melting:** Student Notebook sheet #21 Students determine that heating can melt a solid causing it to change to a liquid	**Administration Tips:** *Investigation 4, part 2* **Suggestions for Instructional Adjustments:**
Learning Target 3: Heating can change matter from one state to another	
Success Criteria: I can explain that heating matter changes it from one state to another	
Student Task Sheet Included: no Student Work Samples Included: no	

MATTER AND ENERGY

Big Idea: *Measuring quantities can provide evidence.*

Learning Target #4	
Assessment Task Details	**Teacher Background**
Brief Description of the Assessment Task: Page Keeley probe: "Ice Cubes in a Bag," *Uncovering Student Ideas in Science,* Vol. I, p. 49 Students explain that the total amount of matter stays the same when it changes from one form to another.	**Administration Tips:** *Investigation 4, part 3* **Suggestions for Instructional Adjustments:**
Learning Target #4: Investigations involve systematic collections and recordings of relevant observations and data	
Success Criteria: I can explain what happens to the total mass of matter when it changes from one form to another	
Student Task Sheet Included: no Student Work Samples Included: no	

MATTER AND ENERGY

Big Idea: *Energy has many forms that can be transformed (changed) and transferred (moved).*

Formative Assessment Task Cover Sheet

Learning Target 1	
Assessment Task Details	**Teacher Background**
Brief Description of the Assessment Task: Exit Ticket: Students identify the forms of energy in a given system and note them on a card.	**Administration Tips:** *Investigation 1, part 1* **Suggestions for Instructional Adjustments:** This assessment requires forethought and planning on the teacher's part to have examples ready for students to reflect on form of energy.
Learning Target: Energy has many forms	
Success Criteria: I can identify different forms of energy in a system	
Student Task Sheet Included: no Student Work Samples Included: no	

MATTER AND ENERGY

Big Idea: *Energy has many forms that can be transformed (changed) and transferred (moved).*

Learning Target #2	
Assessment Task Details	**Teacher Background**
Brief Description of the Assessment Task: Response Sheet - - Energy: Science Notebook Sheet #5 Students describe energy transformations in a given scenario	**Administration Tips:** *Investigation 1, part 2* **Suggestions for Instructional Adjustments:** This is a good point to show the Energy video: "All About the Transfer of Energy"
Learning Target: Energy can be changed from one form to another form (transformed)	
✓ **Success Criteria:** I can describe how energy can be changed from one energy form to another energy form.	
Student Task Sheet Included: no Student Work Samples Included: no	

MATTER AND ENERGY

Big Idea: *Energy has many forms that can be transformed (changed) and transferred (moved).*

Learning Target #3	
Assessment Task Details	**Teacher Background**
Brief Description of the Assessment Task: Students choose one energy system from their completed Science Notebook Sheets #6-7, "How does energy travel?" and construct an energy diagram from the chosen system.	**Administration Tips:** *Investigation 1, part 3* **Suggestions for Instructional Adjustments:** *Providing additional pictures that depict real life examples may be a good extension for students.*
Learning Target 3: Energy can be moved from one place to another (transferred)	
Success Criteria: I can draw and label diagrams that show how energy can be transferred from one place to another	
Student Task Sheet Included: no Student Work Samples Included: no	

MATTER AND ENERGY

Big Idea: *Scientific evidence can be used to develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.*

Formative Assessment Task Cover Sheet

Learning Target 1	
Assessment Task Details	**Teacher Background**
Brief Description of the Assessment Task: *Mirror Challenges B*, Science Notebook sheet 10, question 6 Students record observations of reflected light to answer the question, "How can you change the direction light travels?"	**Administration Tips:** *Investigation 2, part 1.* **Suggestions for Instructional Adjustments:** *Encourage groups of students to write thoughtful and challenging "mirror challenges" for their peers.*
Learning Target: Scientific investigations involve asking questions and gathering evidence	
Success Criteria: *I can gather evidence to help answer a question.*	
Student Task Sheet Included: **no** Student Work Samples Included: **no**	

MATTER AND ENERGY

Big Idea: *Scientific evidence can be used to develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.*

Learning Target #2	
Assessment Task Details	**Teacher Background**
Brief Description of the Assessment Task: Given a drawing of a light source, an object, and an eye, the student completes the drawing to model what happens when light hits an object. Page Keeley probe: "Apple in the Dark," Uncovering Student ideas in Science, Vol. 1, p. 31 Page Keeley probe: "Mirror, on the Wall," Uncovering Student Ideas in Science, Vol. III, p. 51	**Administration Tips:** *Investigation 2, part 1* **Suggestions for Instructional Adjustments:** *After giving the probe, arrange for a dark room (paper on windows or windowless room) experience so that students understand that light is needed in order to see objects.* *The "Mirror, on the Wall" probe is critical in addressing students' misconceptions with scientific testing and evidence. One idea for implementation is a human scatterplot (Page Keeley's Science Formative Assessment book, pages 109-111).* *Another good extension is a Page Keeley probe, "Can It Reflect Light," Vol. I, pages 25-30. One idea for implementation is a card sort. With this probe, you can use a flashlight on waded foil or smooth foil and bounce a ball on cement and grass. This simulates how smooth and rough objects reflect light.*
Learning Target: *Light can reflect from surfaces*	
Success Criteria: *I can use words and pictures to accurately describe what happens when light hits an object.*	
Student Task Sheet Included: **no** Student Work Samples Included: **no**	

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Big Idea: *Scientific evidence can be used to develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.*

Learning Target 3	
Assessment Task Details	**Teacher Background**
Brief Description of the Assessment Task: **Unknown Colors**, Science Notebook sheet #11; support conclusions with evidence Draw a model showing how reflected light affects the color of an object. Write a new question you could answer with a light tube investigation	**Administration Tips:** *Investigation 2, part 2* **Suggestions for Instructional Adjustments:** *Additional Resource:* 'How Light Travels' from PBS. It is a portion of "Shedding Light on Science" and "Law of Light and Reflection" from the Harvard-Smithsonian Center for Astrophysics (available online)
Learning Target: *Scientific models are supported with evidence*	
✓ **Success Criteria:** I can use evidence from observations to describe a model of light interacting with an object.	
Student Task Sheet Included: no Student Work Samples Included: no	

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Big Idea: *Scientific evidence can be used to develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.*

Learning Target 4	
Assessment Task Details	**Teacher Background**
Brief Description of the Assessment Task: Throw a Little Light on Sight Science Notebook sheet #13 Dylan Wiliam formative assessment: "ABC Cards," *Embedded Formative Assessment,* pp.90-92. Use I-check question em32. Inv. 2, Part 2: "Which of the following objects would appear black in a room lit with only red light?" A. a white block; B. a blue chair; C. a red ball? "How do we know white light is made of more than one color?"	**Administration Tips:** *Investigation 2, part 2* **Suggestions for Instructional Adjustments:** *Have students read science story, "Throw a Little Light on Sight" before completing Science Notebook sheet #13* *This is a good point at which to show the "All About Light" video.*
Learning Target 4: Color depends on how objects reflect light	
Success Criteria: I can use the terms color, absorption, and reflection to describe why objects appear different colors in different colors of light.	
Student Task Sheet Included: no Student Work Samples Included: no	

Matter & Energy Unit Plan with Formative Assessment (NW ALPS)

Lesson		Learning Targets & Success Criteria	Assessment	Vocabulary	Materials
Before Kit: Administer Reflective Prompt					
Investigation 1: Energy					
Inv. 1-1 *Energy Sources*	**Energy**	◎ Energy has many forms. ✓ I can identify different forms of energy in a system	Exit Ticket: Students identify the forms of energy in a given system and note them on a card.	○ Energy ○ Energy Source ○ Stored Energy ○ Convert ○ Form of Energy	○ Flashlight ○ AA-cells ○ Flashlight demonstration ○ ***Energy Source & Action*** Sheets ○ ***Instruction Cards*** for Energy Stations ○ *Masking Tape* ○ *Basins* ○ *Energy Station Materials*
Inv. 1-2 *Converting Energy*	**Energy**	◎ Energy can be changed from one form to another form (transformed) ✓ I can describe how energy can be changed from one energy form to another energy form.	Response Sheet - - Energy: Science Notebook Sheet #5 Students describe energy transformations in a given scenario	○ Chemical Energy	○ Energy Card Sets ○ Masking Tape ○ Demo Energy Cards ○ No. 5 Response Sheet - Energy

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Lesson		Learning Targets & Success Criteria	Assessment	Vocabulary	Materials
Inv. 1-3 *Energy on the Move*	**Energy**	◎ Energy can be moved from one place to another (transferred). ✓ I can draw and label diagrams that show how energy can be transferred from one place to another	Students choose one energy system from their completed Science Notebook Sheets #6-7, "How does energy travel?" and construct an energy diagram from the chosen system.	○ Energy Transfer ○ Waves	○ *How Does Energy Travel? Sheet* ○ *Instruction Cards for Energy Transfer* ○ Basins ○ Table-tennis balls ○ Piece of cardboard ○ Ziplock bag ○ Masking tape ○ Water ○ Video, *All about the Transfer of Energy* ○ Energy-transfer materials

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Lesson		Learning Targets & Success Criteria	Assessment	Vocabulary	Materials
Investigation 2: Light					
2-1 *Reflected LIght*	**Scientific Evidence**	Scientific investigations involve asking questions and gathering evidence ✓ I can gather evidence to help answer a question	**Mirror Challenges B,** Science Notebook Sheet #10, question #6 Students record observations of reflected light to answer the question, "How can you change the direction light travels?"	○ Light Source ○ Ray ○ Mirrors	○ Mirrors ○ Mirror Clips ○ Index Cards ○ Book ○ Flashlight ○ Formative Assessments
	Light	Light can reflect from surfaces. ✓ I can use words and pictures to accurately describe what happens when light hits an object.	Given a drawing of a light source, an object, and an eye, the student completes the drawing to model what happens when light hits an object Page Keeley probe: "Apple in the Dark," *Uncovering Student Ideas in Science, Vol. I, p. 31* Page Keeley probe: Mirror, on the Wall," *Uncovering Student Ideas in Science, Vol. III, p. 51*		

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Lesson		Learning Targets & Success Criteria	Assessment	Vocabulary	Materials
2-2 *Colored Light*	**Scientific Evidence**	Scientific models are supported with evidence ✓ I can use evidence from observations to describe a model of light interacting with an object.	**Unknown Colors**, Science Notebook sheet #11; support conclusions with evidence Draw a model showing how reflected light affects the color of an object. Write a new question you could answer with a light tube investigation.	○ White Light ○ Shadows ○ Absorb ○ Appearance ○ Color	○ Cardboard tubes with caps ○ Gels, red and green ○ Flashlights ○ AA-cells ○ Bag of gram pieces ○ *Unknown Colors* ○ Lamp ○ 1L bottle, red ○ Video, *All About Light*
	Light	Color depends on how objects reflect light. ✓ I can use the terms color, absorption, and reflection to describe why objects appear different colors in different colors of light.	**Throw a Little Light on Sight** Science Notebook sheet #13 Dylan Wiliam formative assessment: "ABC Cards," *Embedded Formative Assessment,* pp.90-92. Use I-check question em32. Inv. 2, Part 2: "Which of the following objects would appear black in a room lit with only red light?" A. a white block; B. a blue chair; C. a red ball? "How do we know white light is made of more than one color?"		

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Lesson		Learning Targets & Success Criteria	Assessment	Vocabulary	Materials
Investigation 3: Matter					
3-2 *Weighty Matter*	**Measuring Quantities**	◎ Investigations involve collecting and recording data ✓ I can repeat measurements to increase the accuracy of my recorded data.	Science Notebook sheet #18, "*Opinion and Evidence Questions,"* question #2, "Why did Teasha and Kim repeat their experiments?" **Measuring Mass:** Science Notebook sheet #16 Students measure the mass of a variety of objects and determine the most-accurate measurement for each object through repeated measurements	○ Mass ○ Gram ○ Kilogram ○ Balance	○ Balance ○ Plastic cups ○ Set of mass pieces ○ Metal disk ○ Wood square ○ Plastic chip ○ Sponge ○ Paper clips, large ○ Paper clips, regular ○ Ziplock bags, small & medium ○ Bag of gravel ○ Apple or orange ○ Tape ○ Water
		◎ Mass and volume are ways to measure and describe objects. ✓ I can repeat measurements to increase the accuracy of my recorded data.	Science Notebook sheet #16 (from above)		
		Adminster Reflective Prompt			

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Lesson		Learning Targets & Success Criteria	Assessment	Vocabulary	Materials
3-3 *A Matter of Volume*	**Measuring Quantities**	◎ Mass and volume are ways to measure and describe objects. ✓ I can repeat measurements to increase the accuracy of my recorded data.	**Measuring Volume:** Science Notebook sheet #19: Students measure the volume of a variety of objects and determine the most-accurate measurement for each object through repeated measurements Survey/Posttest, p.1 em2. Determine the mass of a given object Survey/Posttest p.2 em5. Determine the correct unit of measurement to use.	Prediction Volume Capacity Liter Milliliter Graduated Cylinder Syringe	○ Beaker ○ Plastic Cup ○ Basin ○ 1L container ○ Graduated cylinder ○ Syringe ○ Vials ○ Spoon ○ Beaker ○ Meter tape ○ Pitchers ○ Water

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Lesson		Learning Targets & Success Criteria	Assessment	Vocabulary	Materials
Investigation 4: Flippers					
4-2 *Converting Energy*	**Inquiry**	◎ Investigations involve collecting and recording data. ✓ I can repeat measurements to increase the accuracy of my recorded data.		Melting Evaporation Particles	○ Plastic cups ○ Containers ○ Thermometer ○ Toothpicks ○ Chocolate chip ○ Birthday candle ○ Pebble ○ Margarine ○ Hot water ○ Vacuum bottle ○ Syringe ○ Graduated cylinder ○ Clip-on lamb with bulb
	Matter	◎ Heating can change matter from one state to another ✓ I can explain that heating matter changes it from one state to another.	**Melting:** Student Notebook sheet #21 Students determine that heating can melt a solid causing it to change to a liquid		
4-3 *Energy on the Move*	**Inquiry**	◎ Investigations involve systematic collections and recordings of relevant observations and data. ✓ I can explain what happens to the total mass of matter when it changes from one form to another	Page Keeley probe: "Ice Cubes in a Bag," *Uncovering Student Ideas in Science,* Vol. I, p. 49 Students explain that the total amount of matter stays the same when it changes from one form to another.	Substance Reaction Carbon Dioxide	○ Balance ○ Plastic cups ○ Mass set ○ Spoons ○ Craft sticks ○ Syringes ○ Containers ○ Baking soda ○ White vinegar ○ Video, *All about Solids, Liquids, and Gases*
		Adminster Reflective Prompt			

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MATTER AND ENERGY

Liquid: A state of matter that flows and fills its container to a level

Liter (L): The standard in the metric system for measuring volumes of fluids

Mass: A measure of how much stuff is in an object.

Matter: The stuff everything is made of

Melting: The change of state from so.id to liquid as a result of heating

Milliliter (mL): 1/1000 of a litter; 100 milliliters equal 1 litter

Mirrors and other surfaces **reflect** light

Particles: All matter on Earth is made of tiny bits called **particles**

Prediction: A guess based on experience and information

Ray: Light travels through space in a form called **rays.** Light rays travel in straight lines

Reaction: Occurs when two or more substances are mixed and form a new substance that has properties that are different form the original substances

Shadows: Created when objects block light

Solid: A state of matter that keeps a definite shape

State: A form of matter, such as solid, liquid, or gas

Stored energy: Can be used to do work as needed; Energy can be stored in **batteries, food,** and **fuel**

Substance: A material that has unique, describable properties

Syringe: A cylinder and piston system used to draw up, measure, and transfer liquids

Temperature: A measure of how hot or cold something is

Thermometer: A tool used to measure temperature

Volume: The three-dimensional space occupied by something

Wave: A repeating movement, like up-and-down or back-and-forth. Waves carry energy from one place to another

White Light: A mixture of all colors of light

Additional Information

Matter & Energy Vocabulary

Absorb: Objects can **absorb** or reflect different colors of light

Appearance: The **appearance** of an object depends on the color of light striking it

Balance: A tool used for weighing objects; when the balance beam is level, the objects on either side are equal in mass.

Capacity: The volume of fluid (such as water) a container can hold when full

Carbon Dioxide: A gas

Chemical Energy: Energy is stored in food in the form of **chemical energy,** which organisms convert into heat, motion, and responses.

Color: Depends upon how objects reflect light and how they appear to our eyes

Convert: Energy can be changed or **converted** from one form to another

Degree Celsius (0°C): The metric unit of temperature

Energy Source: Where the energy comes from

Energy Transfer: The movement of energy from one thing to another or the change of energy from one form to another

Energy: Makes things happen and does work

Evaporation: The change of state from liquid to gas as a result of heating

Forms of Energy: Electricity, Heat, and **Motion** are forms of energy

Gas: A state of matter that fills all parts of a container

Graduated Cylinder: A transparent cylinder marked with evenly spaced lines for determining the volumes of liquids

Gram (g): The standard unit of mass in the **metric system**

Kilogram (kg): 1000 grams

Light Source: Light is made by a **light source**

MATTER AND ENERGY

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