Holyoke Public Schools

Science Curriculum Map

Grade 5

Weather and Climate Unit

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Holyoke Public Schools

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Overview of Curriculum Maps

Goals:

1. To ensure that students are exposed to a rigorous curriculum in every school and every grade
2. To have consistent instruction and assessment district wide
3. To prepare students for the MCAS test
4. To explain what is expected to be covered in each Science unit of study

Expectations:

The district's expectation is for students to successfully meet the Massachusetts Science and Technology/Engineering Standards, through the use of the English Language Proficiency Benchmarks and Outcomes (ELPBO) to support instruction for English Language Learners (ELLs). Strategies for teaching ELLs are good teaching practice for all learners. In order to help facilitate this teachers are required to follow curriculum maps.

Accountable Talk:

To promote learning, explore solutions, and justify reasoning, conversations between students and students or students and teacher must be accountable – accountable to the learning community, to the science discipline, and to rigorous thinking.

Feedback to Students:

Feedback needs to happen daily in the classroom. There are many ways to give feedback. Conferencing, observations, questions asked during the workshop, and written responses to students' work and notebook entries.

FIVE ESSENTIAL PRACTICES FOR TEACHING ENGLISH LANGUAGE LEARNERS

The five essential practices for teaching English language learners are practices developed by America's Choice to support the literacy needs of ELL students. These practices are a result of current second language acquisition research, literacy development, and effective classroom practices. *(America's Choice: Teaching English Language Learners: Literacy)*

Essential Practice 1	**Classroom Applications**
Develop Oral Language through Meaningful Conversation and Context. Oral language is the foundation of literacy and a main tool for learning and interacting in both academic and social settings. Natural exposure and planned experiences with oral language facilitates increases expression and understanding of the second language. Oral language also supports vocabulary development in context, paving the way for better comprehension and production. Exposure to rich oral and written language environments is vital for developing literacy and language skills.	• Develop oral language through meaningful conversation by planning language experiences and building consistent time to engage conversation. • Enunciate and rephrase difficult works allow extra time for practice and repetition. • Demonstrate and orally explain activities step-by step. Rephrase difficult instructions • Use think-alouds. Verbally share the comprehension thought process. • Provide opportunity for practice: allow extra time for practice and repetition in oral, reading, and writing activities with appropriate feedback. • Allow students to respond through Turn and Talk activities, oral, choral reading and re-reading. • Use audio recording of a text to provide extended to provide extended literacy opportunities where students listen to the reading of a text independently while developing fluency, accuracy, and language acquisition. • Plan daily read-alouds to model literacy strategies and to scaffold fluency, accuracy, and independent reading.

Essential Practice 2	Classroom Applications
Teach Targeted Skills through Contextualized and Explicit Instruction Full literacy is a fluid combination of oral, reading, and writing skills. These skills must be taught through explicit and contextualized instruction that scaffolds learning. Contextualized instruction provides students with extra linguistic clues that support understanding not only of the content but also of the language being used in the lesson. Combining contextualized practices with the knowledge of phonemic awareness, phonics skills, language structures and functions, text patterns, and literary devices such as metaphors, analogies, figurative language, and unfamiliar cultural concepts, will aid students in achieving stronger literacy skills. Explicit skills give the students the tools they need to comprehend increasingly complex literacy demands.	• Use clues of context to make instruction meaningful. Teach skills and strategies ;using materials, books or writing that students know and understand • Use Big Books or shared reading to teach phonics, vocabulary and language features. • Use student or teacher writing models to teach craft, spelling, and language use conventions. • Teach phonemic awareness within a context. ELL children must attach meaning and experience to phonemes they may never have heard before. Teach phonemic awareness while explicitly teaching vocabulary, meaning, or within-a-story context. • Understand the linguistic background native language and address these issues specifically. • Pay special attention to sounds of letters. Languages have different linguistic features. For example, while the vowel sounds in English vary, Spanish vowel sounds are consistent. Students will transfer what they know about one language and automatically, and sometimes incorrectly, apply it to English. • Use meaningful activities to teach phonemic awareness, such as language games, Word Walls, word banks, songs, poems, and rhymes that focus on particular sounds or letters.

Essential Practice 3	Classroom Applications
Build Vocabulary through Authentic and Meaningful Experiences with Words Developing and deepening a student's understanding of new words is essential for English language learners. Building vocabulary in the context of literature, experiences, and modeled writing ensures that students will own the new words they encounter. Vocabulary building is a lifelong process and students must learn ways to integrate and approach new and challenging words. Discussing, playing with, and using new words allows students to gain new vocabulary through meaningful, and therefore memorable, experiences.	• Vocabulary development must be taught intentionally. Since word knowledge correlates with reading comprehension and meaning-making strategies used in decoding, it must be a focus for instruction. • Vocabulary development must be taught in context. Connect word knowledge with background knowledge and instructional context. ELL students need both meaning and context to acquire new vocabulary. • Facilitate and plan activities that support the three main ways vocabulary is learned: 1. Through meaningful conversations with adults and other students. 2. Listening to adults read at slightly higher levels than the student's independent level. 3. Read extensively on their own at their reading level. • Pre-teach vocabulary words, prefixes/suffix, context clues, and cognates. Build students' skill box with vocabulary and give them tools to understand and connect new vocabulary. • Use content Word Walls or word webs. Support cognitive structuring for ELLs by connecting new vocabulary to themes, ideas, or generalizations. • Explicitly focus on and teach academic language. Students need to be consistently exposed to formal or content specific language and vocabulary. • Explicitly teach the building blocks of language. Students need to learn the connecting and transition words of the English language ("however," "in conclusion", etc.)Teach them in context and teach them explicitly. • Focus teaching Tier 2 words, as well as essential Tier 1 words. Although most explicit vocabulary instruction should focus on Tier 2 words (words with a high frequency in the written language, example: examine), ELLs need instruction around Tier 1, or basic spoken words as well.

Essential Practice 4	Classroom Applications
Build and Activate Background Knowledge Learning is based on establishing neural connections in the brain, drawing on previous experience, background knowledge, and prior and current environments. It is both the teacher's and the student's job to facilitate these connections in order to construct meaning and understand new ideas and concepts while expanding on their own world knowledge. Actively fostering these connections will enable students to more easily interpret their surroundings and assign meaning to new concepts while expanding their own	• Elicit student's experience and comments. Connect school, literary and personal events through talking, writing, and reading. • Consider the cultural background of students when selecting literacy materials such as books and poems. Support language development of Ell students by giving them new English words for experiences that are close to home. Using materials that represent their cultural background increases motivation and supports participation. • Discuss and build language around universal themes. Connect new language to universal experiences. • Build content-based word banks and webs. Connect new language to other known words, experiences, and ideas to support cognitive structuring. • Use native language and value home culture. View home cultures as a resource, rather thn a liability. • Use hands-on experience based instruction in all academic areas. Language can be built upon common classroom experiences. • Encourage students to make connections before, during and after reading/ • Find out what students know, and build on their experience.

Essential Practice 5	Classroom Applications
Teach and Use Meaning-Making Strategies Intentionally teaching meaning-making strategies provides students with a toolbox to approach future learning challenges. Meaning-making strategies vary from helping students comprehend text to various strategies students can use to understand English-dependent lessons. Modeling appropriate behaviors to students gives them the tools to be autonomous learners and supplies them with options they can use to interpret environmental input, both academically and socially.	• Explicitly teach student meaning-making strategies. Model for students how to visualize, make connections, monitor for meaning, determine importance, etc. • Provide opportunities for practice. Sustain daily work periods in reading and writing for students to practice these strategies. • Systematically assess students and adjust instruction. Monitor progress and use data to adjust the focus of mini-lessons, conferences and small-group instruction. • Model activities and thinking for certain skills. Students need to see and experience what is expected of them before they perform a task. • Beginning ELLs need more than just phonics and English Language Development instruction. EXPOSE STUDENTS RIGHT AWAY TO COMPREHENSION STRATEGIES. Waiting to address skills in chronological order hinders academic growth and English proficiency. • Teach students how to help themselves in English-dependent lessons. Model your thinking and how you approach problems. Build students cognitive toolbox by explicitly teaching the ways to help themselves during difficult language situations.

Resources: Weather Forecasting Delta Kit, Water Planet FOSS Kit, and Matter and Energy FOSS kit.

- Weather and Climate Workshop Plan created by Enchanted Circle Theater and the Hitchcock Center (see attached document)

Following are suggested books that would be useful to have in your classroom for students to refer to.

- *Weather Forecasting*. by Gail Gibbons. 28 pp. Simon and Schuster. 1999. ISBN: 0-02-737250-2. Introduces the reader to meteorologists and the various instruments used to gather information to predict future weather.
- *Wicked Weather* from the Discovery Channel. Discover weather facts and fascinating information.
- *Guide to Weather* by Michael Allaby. This guide reveals the natural forces that lie behind the weather.
- *Wonderful Weather* by Shar Levine & Leslie Johnstone. Includes suggested science activities and accurate information.
- *Wild About Weather* by Ed Brotak. Fun projects and activities that bring weather to life.
- *Eye Wonder Weather*: Open your eyes to a world of discovery by DK. Facts, text, and dramatic, atmospheric photography, Eye Wonder are perfect education starter for young children.
- *The Kid's Book of Cloud and Sky*, by Frank Staub. ISBN 1-4027-2806-9. Illustrated with hundreds of captivating photographs, and written in a kid-friendly style, this informative guide answers the dozen of questions children ask about the sky and weather.

This unit should take 10 weeks to complete…this is assuming that the class meets 5 days per week with a class period of 60 minutes/day.

Big Idea #1: The water cycle describes the continuous movement of water on, above, and below the surface of the Earth. (3 weeks)

Big Idea #2: Air temperature, moisture, wind speed and direction, and precipitation make up the weather (3 weeks)

Big Idea #3: Global patterns such as the Jet Stream and Gulf Stream influence our local weather (2 weeks)

Unit Project (~2 weeks)

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Students write an illustrated story about a drop of water going through the water cycle. The story should include some of the following vocabulary terms: solid, liquid, gas, weather, temperature, wind speed, moisture, condensation, evaporation, precipitation, cloud, heat, rain, snow, ice, hail, sleet, ocean, ocean currents, lake, river, steam, mountains, glacier, melting, boiling, freezing and runoff. (see rubric below)

Sample story (see following website and/or the appendix)
http://www.gma.org/Tidings/drop/moving.html

POINT 4 – MEETS STANDARD	POINT 3 – NEEDS REVISION	POINT 2 – NEEDS INSTRUCTION	POINT 1 – NEEDS SUBSTANTIAL SUPPORT
Has a lead that engages the reader (such as): • Description • Setting • Interesting or unique facts • Questions • Point of view	**Has a lead that attempts to interest the reader**	**Begins with a rote beginning such as "I am writing about…" and provides little information around it**	**Attempts to introduce the topic**
Maintains the controlling idea by: • Tapping what the writer knows firsthand • Reporting relevant facts, details and information • Elaborating on significant thoughts or ideas with specific facts, details, quotations, numbers, names, explanations, and other information • Excluding extraneous and inappropriate information	**States the controlling idea and then:** • Taps what the writer knows firsthand • Includes some details • Uses strategies such as proving facts, details, explanations, connections, and names but does not adequately elaborate	**Develops general information about the topic; may not tap what the writer knows firsthand or may seem like a paraphrase of secondhand information**	**Develops general information about the topic through a list like structure**
Creates an appropriate organizing structure that makes sense to the reader and: • Puts together big ideas with facts, details, thoughts, ideas, and other appropriate information • May include paragraphs with topic sentences that summarize the main idea or organize the content • Organizes information in groups as a series of related concepts.	**Clusters details in an organizing structure and has a beginning, middle and end**	**Clusters details in an organizing structure**	**May have a simple list or loose organizing structure May have illustrations that match the text.**
Has the stance of the writer as an expert with a specific focus, straightforward tone of authority supported with adequate and specific information, and specialized vocabulary that is defined in context	**Has a stance of the writer as an expert with a straight forward tone of authority, appropriate details and information, and vocabulary related to the subject**	**Has a straight forward tone, with some details and vocabulary related to the subject**	**Uses everyday vocabulary and has little specific information**
Conclusions provide a sense of closure that develops from the information presented earlier in the piece. May summarize, answer earlier questions or refer back to the beginning (circular ending).	**Conclusion provides a sense of closure but may not adequately develop from earlier information presented in the piece**	**Conclusion provides a sense of closure but may be sudden**	**Conclusion uses a rote or inappropriate formulaic ending**

Big Idea: The water cycle describes the continuous movement of water on, above, and below the surface of the Earth./ El ciclo del agua describe el movimiento continuo de agua en, sobre y debajo de la superficie de la Tierra. (3 weeks)

Massachusetts Science and Technology Learning Standards

PSS # 2. Compare and contrast solids, liquids, and gases based on their basic properties of each of these states of matter.

MCAS item analysis (What do students need to know?)

- ✓ Know how to read a graduated cylinder
- ✓ Know the temperature at which water turns to a solid and a gas
- ✓ Recognize that when a solid object melts it changes shape
- ✓ Know that air is made of a mixture of gases
- ✓ Know that air takes up space
- ✓ Know that solids have a definite shape and volume
- ✓ Know that liquids have a definite volume but can change shape

PSS #3 Describe how water can be changed from one state to another by adding or taking away heat.

MCAS item analysis (What do students need to know?)

- ✓ Know that heat is responsible for causing melting and freezing
- ✓ Know that heat causes water to evaporate

ESS #10. Describe how water on earth cycles in different forms and in different locations, including underground and in the atmosphere.

MCAS item analysis (What do students need to know?)

- ✓ Be able to draw a diagram of the water cycle and label evaporation, condensation, and precipitation. Be able to explain what happens during each process.
- ✓ Recognize that clouds and fog are made of water

ESS #11. Give examples of how the cycling of water, both in and out of the atmosphere, has an effect on climate.

MCAS item analysis (What do students need to know?)

- ✓ Recognize that cities near the ocean have more moisture in the air than cities inland

Guiding Questions:

- **What are the three states of matter?/ ¿Cuáles son los tres estados de la materia?**
- **What is the water cycle?/¿Qué es el ciclo de agua?**

Engage:

- o Water Cycle Demonstration. Pour hot water into a clear plastic jar, filling it about 1/3 of the way. Add several drops of food coloring to simulate dissolved material. Place lid (or smaller plastic container) on jar and fill with ice. Observe and discuss what is going on. Discuss the three **states of matter/** estados de la materia: **solid/** sólido, **liquid/** líquido, and **gas/**gas. (see following website and/or appendix) http://bcn.boulder.co.us/basin/learning/watercy.html

*Employ vocabulary essential for grade-level content learning. (S.1.5)

***From the Massachusetts English Language Proficiency Benchmarks and Outcomes for English Language Learners (ELPBO) June 2003**

Explore:

- Students work with the different states of matter, measure mass and volume using metric standards and tools, and solve problems using their knowledge of metric system. Matter Activity: Matter and Energy FOSS kit, section 3. Students develop a set of defining characteristics for **states of matter/** estados de la materia.
  *Summarize data gathered through research. (R.6.2)

- Students work collaboratively with peers to determine how temperature and surface area affect evaporation of water. Water Planet FOSS kit, Investigation 2: Water Vapor, see pages 73 to 112 in the Teacher Guide. This investigation has 4 parts. Students learn that 1) **evaporation/** evaporación is a process by which liquid water changes into water vapor, a gas; 2) temperature affects the rate of evaporation; 3) the surface area of a volume of water affects the rate of evaporation; and 4) **condensation/** condensación occurs when water vapor touches a cool surface and changes into a liquid, and evaporation and condensation contribute to the movement of water through the **Water Cycle/** El Ciclo del Agua.
  *Employ words, phrases, and sentences in social interactions in everyday topics. (S.2.10)
  *Support a conclusion or finding by stating facts or logical reasons. (S.3.64)

- Students add the following vocabulary terms to their glossaries: **states of matter/** estados de la material**, solid/** sólido**, liquid/** líquido, **gas/**gas, **evaporation/** evaporación, **condensation/** condensación, **Water Cycle/** El Ciclo del Agua.
  *Identify words in English that are frequently used in the student's first language. (S.1.8)
  *Clarify meanings of words, using dictionaries, glossaries, and other resources. (S.1.24)

- The Incredible Journey: Students will become water molecules and move through the water cycle. Students' role dice to determine what station to go to: cloud, river, soil, lake, ground water, plants, ocean, glacier or animal. (See appendix for lesson plan, this activity requires some teacher preparation).
  *Recount prior experiences and events of interest, using familiar sentences. (S.2.9)

Explain:

- Students draw and label the parts of the water cycle.
  *Organize information to be expressed in writing in a way that makes sense for the purpose and audience. (W.1.3)

Extend:

- The **Water Cycle/** El Ciclo del Agua Activity: Students will understand the parts of the water cycle: **evaporation/** evaporación, **condensation/** condensación, and **precipitation/** precipitación. (See the following website and/or the appendix)

http://teachingtoday.glencoe.com/lessonplans/the-water-cycle

- If possible, students should measure various forms of precipitation. Bring a measured sample of snow into the classroom, allow it to melt, and compare the amount of water that results with the original measurement.
- Teach The Water Cycle Song: (to the tune of She'll Be Coming 'Round the Mountain) "Water travels in a cycle, yes it does. Water travels in a cycle, yes it does. It goes up as evaporation, the clouds make condensation, it rains down precipitation, yes it does."
- Get a diagram of the Water Cycle (see the following website and/or the appendix) http://ga.water.usgs.gov/edu/watercycleprint.html
- In this game, you become water. You'll travel through different stages to see all of the different places where water goes. http://colquitt.k12.ga.us/wjwpg1/watercycle/savb/stationfiles/clouds.htm
- Animation of the water cycle http://www.epa.gov/ogwdw/kids/flash/flash_watercycle.html
- **The Hazen Paper fieldtrip** (for all grade 5 students) covers the water cycle, and the states of matter: solids, liquids and gases.

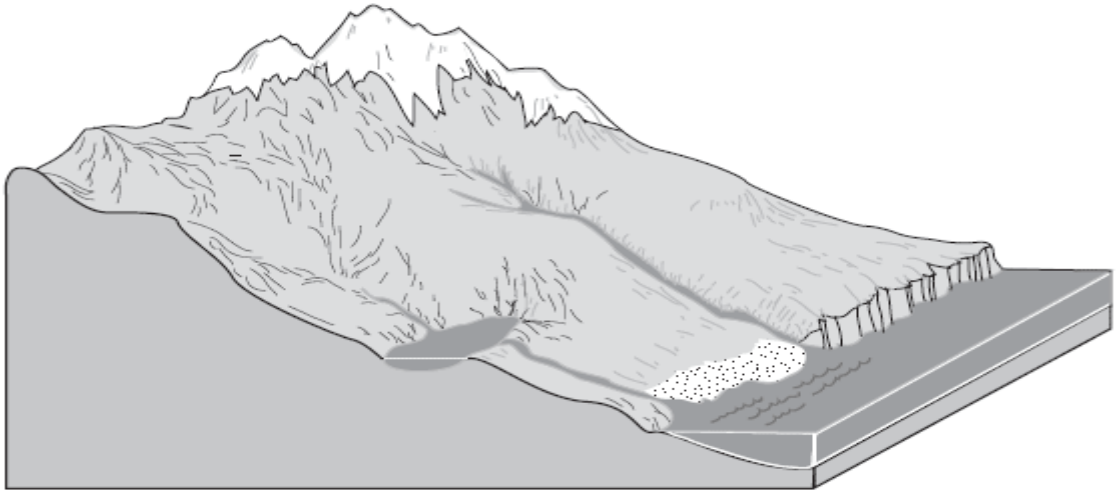
*Demonstrate comprehension of vocabulary essential for grade-level content learning using pictures, actions and/or objects. (S.1.3)

Evaluate: MCAS released questions

- The questions may be used as a pre/post test, to help students practice MCAS questions, to help students learn how to answer multiple choice questions and/or open-response questions.
  - *Respond to factual and inferential questions that are based on academic content. (S.3.39)
  - *After writing or dictating a composition, identify words and phrases that could be added to make the thought clearer (W.3.4)

Students answer the MCAS open response question below. Have students score their own answers using the released rubric. Then, have students score the 5 samples of student work released (white out the score points) using the rubric. This activity will help students understand what is required to get a 4 on this type of question. Have students retake the MCAS question to find out how many are now able to get a perfect score. (see appendix for rubric and samples of students work)

Q. Marco is studying how natural processes cause water on Earth to move in different forms in different locations. The picture below shows an area with a snow-covered mountain near an ocean. (ESS #10)



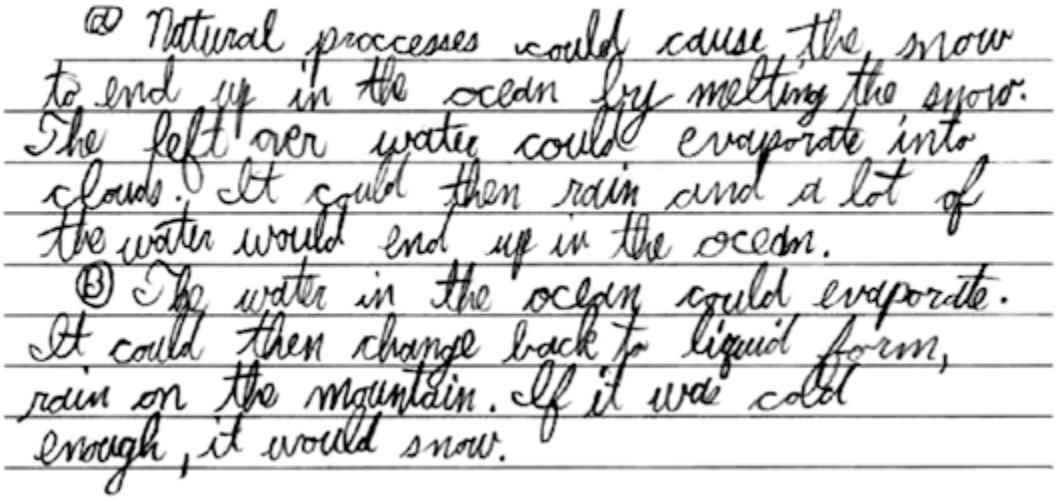
a. Describe how natural processes can cause snow on the top of the mountain to someday end up as water in the ocean.

b. Describe how natural processes can cause some of the water in the ocean to someday fall as rain or snow on the mountain.

Scoring Guide and Sample Student Work

Score	Description
4	The response demonstrates a thorough understanding of how water on Earth cycles in different forms and in different locations. The response clearly describes how natural processes can cause snow on the top of the mountain to someday end up as water in the ocean. The response clearly describes how natural processes can cause some of the water in the ocean to someday fall as rain or snow on the mountain.
4	
3	The response demonstrates a general understanding of how water on Earth cycles in different forms and in different locations.
2	The response demonstrates a limited understanding of how water on Earth cycles in different forms and in different locations.
1	The response demonstrates a minimal understanding of how water on Earth cycles in different forms and in different locations.
0	The response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.

2008 MCAS: Grade 5 Science and Technology/Engineering
Question 18 - Score Point 4



A. A natural process that can cause Snow on a top of a mountain near the ocean to Someday be water in they ocean is called melting. How it will travel from the top to the bottom of the mountain is it will form Small creeks. and will travel Slowly down the mountain into the ocean. By causing Small creeks this will cause a ongoing cycle.

B. The way that the water in the ocean can Soon fall from the Sky is first evaporation, then condensation, and last Precipitation witch is rainfall. This is all apart of the water cycle. See evaporation is when water evaporates into the air, then condensation is when it condenses into a clound, and precipitation is a tipe of Snow, Sleet, rain, or hail falling from the Sky.

2008 MCAS: Grade 5 Science and Technology/Engineering
Question 18 - Score Point 3

A.) Mother nature causes snow on the tip of the mountin then the sun comes out and melts the snow and turns it in to water. Then the water goes into a stream and the stream follows into the ocean.

B.) The ocean water turns into rain or snow because of the water cycle. First comes Evaporation, Condensation, and Precipatation.

2008 MCAS: Grade 5 Science and Technology/Engineering
Question 18 - Score Point 2

A. How the snow from the top of the hill can processes to the water in the ocean is becaus the heat from the sun melts it into water so it flows down the moutian.

B. The clouds carrie it up into the sky and then it starts all over again.

2008 MCAS
Grade 5 Science and Technology/Engineering
Question 18 - Score Point 1

A Snow could end up as water because it melts into water.

B by it melting.

2008 MCAS: Grade 5 Science and Technology/Engineering
Question 18 - Score Point 0

A) weather can make the mountain get snow on it and there could be erosion to get the snow off.

B) The Mountain is so high up that it gets all of the rain, and snow.

Q. In the water cycle, rain, snow, or sleet falling to the ground is a form of (ESS #10)

A. precipitation.

B. condensation.

C. evaporation.

D. transpiration.

Q. During which of the processes below does water vapor change to liquid water? (ESS #10)

A. melting

B. freezing

C. evaporation

D. condensation

Q. Clouds and fog are made up of (ESS #10)

A. water.

B. heat.

C. light.

D. helium.

Q. Which habitat on Earth would **probably** add the greatest amount of water to the water cycle through evaporation? (ESS #10)

A. cold lake

B. desert sand

C. warm ocean

D. mountain rock

Q. Clouds are formed from tiny drops of water that are light enough to float in the air. As these drops bump into each other, they form larger drops. What happens when these drops become too heavy to float in the air? (ESS #10)

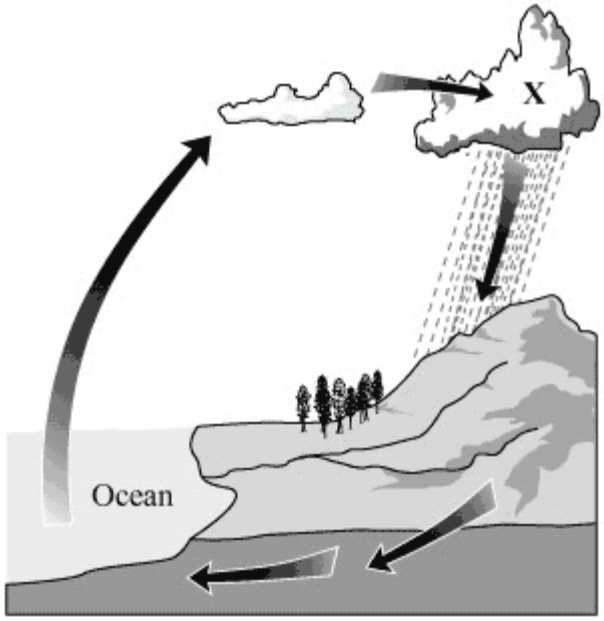
A. The drops form fog.

B. The drops evaporate.

C. The drops fall as rain.

D. The drops become air.

Q. The picture below shows the water cycle. (ESS #10)



Water on Earth cycles in different forms and in different locations. Which process occurs at the location labeled X on this diagram of the water cycle?

A. condensation

B. evaporation

C. runoff

D. transpiration

Q. During most of the year, the air over Boston, Massachusetts, contains a high amount of moisture. Which of the following **best** explains why there is a high amount of moisture in the air? (ESS #11)

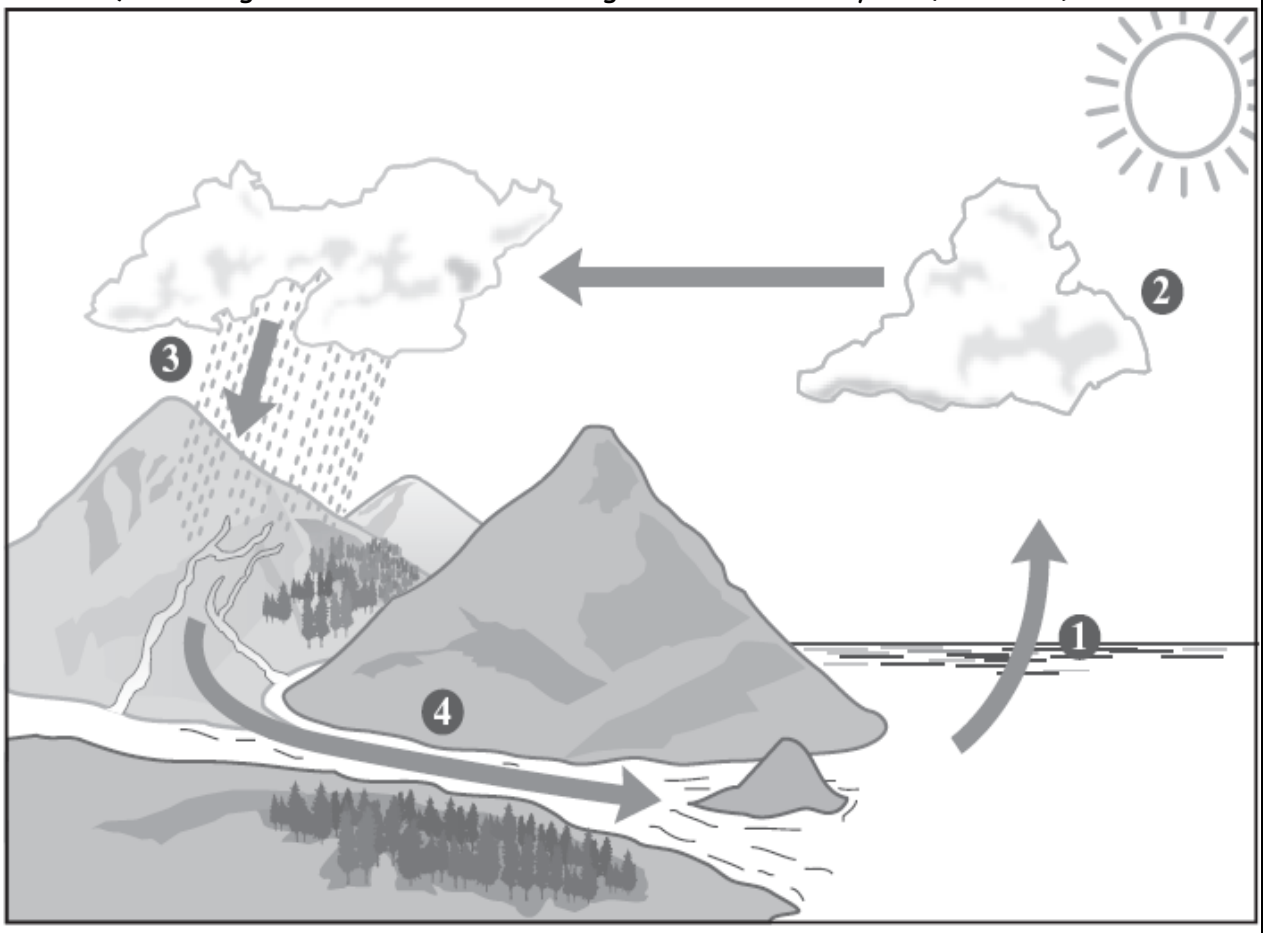
A. Boston is close to an ocean.

B. Boston is at a low elevation.

C. Boston is near many mountains.

D. Boston is far north of the equator.

Q. The diagram below shows four stages of the water cycle. (ESS #10)



Which change is occurring at stage 1 in the diagram?

A. Water is changing from a gas to a solid.

B. Water is changing from a liquid to a gas.

C. Water is changing from a liquid to a solid.

D. Water is changing from a solid to a liquid.

Q. Why does a town in the desert rarely experience early morning fog as compared to a town along the coast? (ESS #11)

A. There is less rainfall in the desert.

B. Temperatures vary more in the desert.

C. There is less water vapor in the desert air.

D. There are fewer plants in the desert.

Q. Air has no color and cannot be seen, yet it takes up space. What could be done to show that air takes up space? (PSS #2)

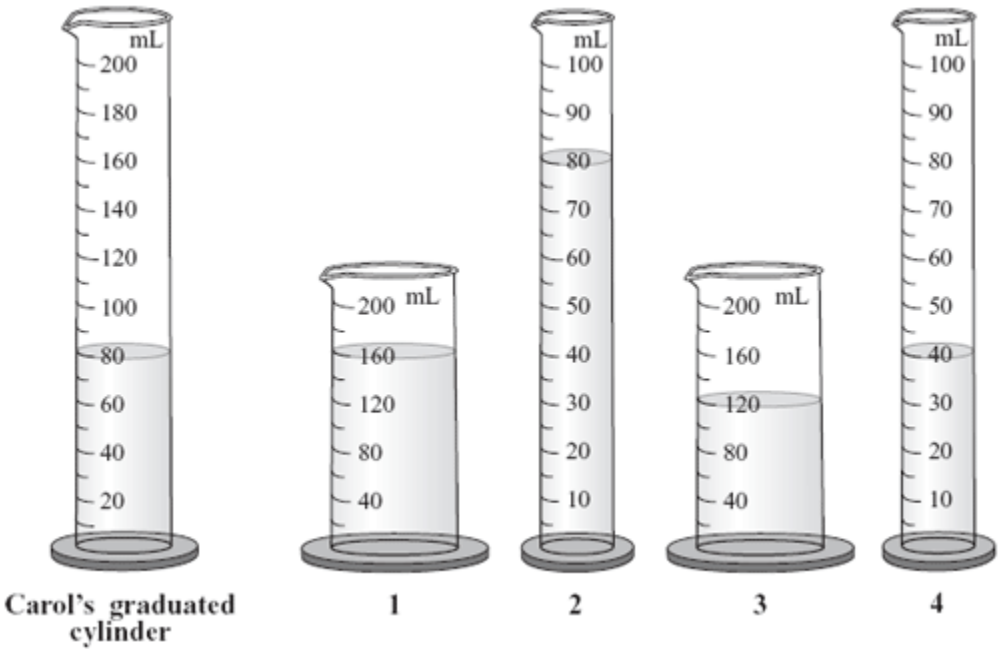
A. observe clouds forming

B. measure the air temperature

C. blow up a beach ball or balloon

D. weigh a glass before and after it is filled with water

Q. Carol poured some water into a 200-milliliter (mL) graduated cylinder. Pictured below are Carol's graduated cylinder and four numbered graduated cylinders. (PSS #2)



Which numbered graduated cylinder contains the same volume of water as Carol's graduated cylinder?

A. graduated cylinder 1

B. graduated cylinder 2

C. graduated cylinder 3

D. graduated cylinder 4

Q. Which glass contains only a gas? (PSS #2)

A. 

B. 

C. 

D. 

Q. The picture below shows a solid floating in a liquid. (PSS #2)

Which of the following statements describes one way that solids are different from liquids?

A. Solids have weight and liquids do not.

B. Solids take up space and liquids do not.

C. Solids have a definite shape and liquids do not.

D. Solids have a definite volume and liquids do not.

Q. The picture below shows a frozen juice bar. (PSS #2)

The frozen juice bar was placed in a bowl and left to melt. Which of the following properties of the juice bar changed the **most** once it melted?

A. color

B. mass

C. shape

D. volume

Q. Which of the following is **least likely** to change from a solid state to a liquid state when heat is applied? (PSS #3)

A. butter

B. paper

C. ice

D. candle wax

Q. The picture below shows the Sun shining on an open jar with some water in it. (PSS #2 & 3)

Justin put the jar of water on a picnic table outside in the sunlight. Which of the following pictures shows what Justin would observe after all of the water had turned into a gas?

A. 

B. 

C. 

D. 

Q. When the temperature of a sample of water is –5°C, the water is (PSS# 3)

A. a gas.

B. a liquid.

C. a solid.

D. a vapor.

Q. If enough heat is taken away from a container of water, what will happen to the water? (PSS #3)

A. It will begin to boil.

B. It will become a solid.

C. It will turn into a gas.

D. It will increase in weight.

Q. Freda always hangs her wet swimsuit outdoors after getting out of the swimming pool. Which of the following is **least likely** to affect the rate at which Freda's swimsuit dries? (PSS #3)

A. the heat of the Sun

B. the speed of the wind

C. the temperature of the water in the pool

D. the amount of water vapor in the air

Q. Delilah put a container of water in the freezer and left it there overnight. The next morning she saw that the water in the container had changed to ice. (PSS #3)

Which of the following statements **best** explains why the water changed to ice?

A. The water gained energy.

B. The water absorbed light.

C. Mass was released from the water.

D. Heat was taken away from the water.

Open Response Questions

Q. A cook notices a teakettle full of water on a stove. There is a cold window close to the spout of the kettle. The water begins to boil and water droplets begin to form on the window. (PSS #3)

a. Describe in detail what is happening to the water inside the kettle.
b. Why do the water droplets form on the window? Be sure to explain in detail.

Q. Water is commonly found on Earth in three states of matter: solid, liquid, and gas. In everyday life, water often changes from one form to another form. (PSS #3)

a. Describe **one** example of water changing from a liquid to a solid.
b. For the example you gave in part (a), explain what caused this change.
c. Describe **one** example of water changing from a liquid to a gas.
d. For the example you gave in part (c), explain what caused this change.

Big Idea: Air temperature, moisture, wind speed and direction, and precipitation make up the weather/ La temperatura del aire, humedad, velocidad y dirección del viento y las precipitaciones constituyen el clima (3 weeks)

Massachusetts Science and Technology Learning Standards

ESS #6. Explain how air temperature, moisture, wind speed and direction, and precipitation make up the weather in a particular place and time.

MCAS item analysis (What do students need to know?)

- ✓ Be able to use data from a table to determine weather conditions
- ✓ Be able to use a weather map to describe the weather
- ✓ Know the names of different types of instruments that are used to measure weather (such as barometer, thermometer, anemometer, and rain gauge)

ESS #7. Distinguish among the various forms of precipitation (rain, snow, sleet, and hail), making connections to the weather in a particular place and time.

MCAS item analysis (What do students need to know?)

- ✓ Recognize the conditions that form rain, snow, sleet and hail

ESS #9. Differentiate between weather and climate.

MCAS item analysis (What do students need to know?)

- ✓ Know that the word weather is used to describe locate conditions while the word climate is used to describe weather over a larger area
- ✓ Recognize that some plants and animals only live in certain types of climates

Vocabulary terms: (use word walls, word rings and/or word splash). Students create a weather glossary.

Guiding Questions:

- **What kinds of data are collected to determine the weather?/ ¿Qué tipo de datos se reúnen para determinar el clima?**
- **How does data help us forecast the weather?/ ¿En qué datos nos ayudan a pronosticar el tiempo?**

Engage:

- o Ask students about the worst **weather/** tiempo event they can remember. Ask students how they know what kind of weather is heading our way? (elicit prior knowledge)

  *Recount prior experiences and events of interest, using familiar sentences. (S.2.9)

- o Invite a meteorologist to the classroom. Brandon Butcher from CBS Channel 3 news is available and has come to many classrooms in Holyoke to speak about his job as a weatherman.

Explore:

- Create a classroom **weather station/** estación meteorológica and have students collect data about the weather on a daily basis for a few months. Weather Forecasting Activity 1, Weather Forecasting kit, page 13 in the teachers' manual. Students are introduced to the role of weather stations, construct weather stations, and create sections for recording data on local and national weather.
  *Demonstrate comprehension of the main points of classroom discussions (S.3.32)

Extend:

- On-line Activity: In class, have students watch the weather forecast for a week, use the following website http://www.wwlp.com/ Have students write down terms used in the weather report in their journals.
  *Obtains information for research from a variety of print and non-print resources (R.6.4)

Engage:

- Introduce the term **meteorology/** meteorología and have students write about, talk about, draw about, and read about what meteorologist do.
  *Select words that suit the audience and purpose of a writing task (W.1.4.c)

Explore:

- Students collect **temperature/** temperatura, **rainfall/** lluvia, and **wind/** viento data, discover how data collection aids in **forecasting/** previsión, and add daily weather data to the weather stations. Weather Forecasting Delta kit: Activity 3: Collecting Weather Data? See page 25 to 32 in the Weather Forecasting Teachers' Guide.
  *Support a conclusion or finding by stating facts or logical reasons. (S.3.64)

- Students add the following vocabulary terms to their glossaries: **weather/** tiempo, **forecasting/** prevision, **wind/** viento, **rainfall/** lluvia, **temperature/** temperature, **meteorology/** meteorología, **weather station/** estación meteorológica.
  *Clarify meanings of words, using dictionaries, glossaries, and other resources. (S.1.24)

- Student use a collection of weather instruments including **thermometer/** termómetro, **barometer/** barómetro, **rain gauge/** pluviómetro, **hygrometer/** higrómetro, **and anemometer/** anemómetro, and learn the principle that makes them work. Have students draw or cut out pictures of weather instruments and glue to an index card, on the back of the index card have students explain what the weather instrument does.
  *Select and use words to increase detail in writing. (W.3.3)

- Students read about weather instruments, in the Delta Science Reader: Weather Instruments in the Weather Forecasting Delta kit.
  *Identify main event from story that is heard. (S.3.5)
  *Demonstrate comprehension of main points of a discussion. (S.3.32)

- Students add the following vocabulary terms to their glossaries: **thermometer/**

termómetro, **anemometer/** anemómetro, **barometer/** barómetro, **rain gauge/** pluviómetro, **hygrometer/** higrómetro,

*Clarify meanings of words, using dictionaries, glossaries, and other resources. (S.1.24)

Extend:

- Students work in groups to perform a skit about a weather instruments. They can not talk during the skit they must use their bodies to demonstrate what their chosen weather instrument does. (integrating the arts)

  *Demonstrate comprehension of vocabulary essential for grade-level content learning using pictures, actions and/or objects. (S.1.3)

Explain:

- Students do a quick write to answer the following questions: How do you think your life might be different if there were no meteorologists to forecast weather?

  *Identify and use words and phrases to make ideas clearer or more logical. (W.3.2)

Explore:

- Students work collaboratively with peers to inventory Earth's water and learn that the **water cycle** redistributes water worldwide. Water Planet FOSS Kit, section 5: Weather. Students investigate weather, learning the causes and effects of **severe/** grave weather, and learn how to make weather maps and use them to forecast the weather.

  *Summarize data gathered through research. (R.6.2)

Explain:

- Students write and illustrate a poem about their favorite weather scene and how it makes them feel.

  *Selects words that add variety and detail to a writing task. (W.3.9)

Extend:

- Have students make a list about songs about **weather/** tiempo. Have students learn different songs about weather and have them share out with the class.
- Students will record today's weather for their own location and the weather from another location using the Internet and compare their findings with their own measurements for their city. This activity serves two purposes: to orient the students to the weather web site so they know how to enter a city, read and record the weather information, and access archived data for previous days and to introduce them to some of the graphs used to compare and analyze weather data http://www.ciese.org/curriculum/weatherproj2/en/lesson2.shtml

  *S.1.3. Demonstrate comprehension of vocabulary essential for grade-level content learning, using pictures, actions, and/or objects.

Guiding Question:

- **What is the difference between weather and climate?/ ¿Cuál es la diferencia entre el tiempo y el clima?**

Engage:

- Organize students in groups of three to four. Conduct a class discussion by asking students to make a two-column chart on a piece of notebook paper. The first column will be labeled "Weather" and the second column will be labeled "Climate." Allow students to discuss and record their ideas of what environmental and natural factors comprise weather and climate. Give them about five minutes to brainstorm. Ask each group to share their ideas with the class. Record responses on a piece of chart paper or board as a class chart. Ask the class to come up with a definition for each term: weather and **climate/ clima**. This may be difficult but accept any reasonable answers. Summarize and record the class answers on the class chart. Explain that this will begin our search to determine the difference between weather and climate and the factors that affect them. http://oceanservice.noaa.gov/education/lessons/which_location.html

  *Demonstrate comprehension of main points of a discussion. (S.3.32)

Explore:

- Students keep a weather log for an extended period of time. Students collect daily **temperature/** temperatura and **precipitation/** precipitación data, preferably by observation, at school. At the same time students should use the Internet or a newspaper to collect the same data for a nearby city and a city on the west coast of the U.S. After three months, students calculate the various averages of the daily data for the three locations. Students graph the data. Students discuss how the long-term daily weather averages begin to describe each **climate/** clima.

  *Summarize data gathered through research. (R.6.2)

- Students add the following vocabulary terms to their glossaries: **climate/** clima, **precipitation/** precipitación

  *Clarify meanings of words, using dictionaries, glossaries, and other resources. (S.1.24)

- Students make a list of questions to ask a relative or older friend about memories of some **severe/**grave weather. Students should find out how the weather affected them personally, and how it affected the community, and state or province. They should find out what weather technology was available at the time and how informed people were during the event.

  *Select and use words to increase detail in writing. (W.3.3)

Extend:

- Make a game: Use MCAS and/or NAEP science questions. Are you smarter than a fifth grader? Review for MCAS test.

  *Explain the thinking processes used in academic content areas. (S.3.51)

- Students play weather bingo to help them review weather vocabulary.
  *S.1.3. Demonstrate comprehension of vocabulary essential for grade-level content learning, using pictures, actions, and/or objects.
- Read *Peak* by Roland Smith out loud and discuss with students. Students write notes in their own words in their notebooks. *This book helps students make connections to everyday life.*

  After Peak Marcello is arrested for scaling a New York City skyscraper, he's left with two choices: wither away in Juvenile Detention or go live with his long-lost father, who runs a climbing company in Thailand. But Peak quickly learns that his father's renewed interest in him has strings attached. "Big" strings. He wants Peak to be the youngest person to reach the Everest summit--and his motives are selfish at best. Even so, for a climbing addict like Peak, tackling Everest is the challenge of a lifetime. But it's also one that could cost him his life. Roland Smith has created an action-packed adventure about friendship, sacrifice, family, and the drive to take on Everest, despite the incredible risk. "Peak" is a novel readers won't be able to put down.

  The hook here is irresistible — Peak will try to become the youngest person ever to scale Everest — overcoming Chinese bureaucrats, resentment of his father, rivalry with a Nepalese teen who has the same goal, avalanches, icy crevasses, howling winds, searing cold and many, many frozen corpses to reach the 29,028-foot summit.

  Suggested questions to discuss that connect to weather and climate unit:
  1) What kind of weather is found on Mount Everest?
  2) How much precipitation does Mount Everest get each year?
  3) What kinds of wind patterns are found on Mount Everest?
  4) Describe the climate around Mount Everest.

  *R.5.9.a. Identify text features (such as *preface, glossary, table of contents, appendix, index, chapter summary, footnotes, bibliography*) as sources for specific information.

Explain:

- **Students write about their favorite weather:** Think about the weather. What kind of weather do you like? In what climate would you find that weather in? Where do you find that kind of climate and why? Write down your answers to these questions in complete sentences. Explain why you like the weather you chose, and what you'd do if you moved to a climate with your favorite weather.
  * List new words and phrases related to the topic of a writing task. (W.1.5.b.)
  *Organize information to be expressed in writing in a way that makes sense for the purpose and audience. (W.1.3)

Extend:

- Hi everybody! I'm Meteorologist Crystal Wicker and welcome to Weather Wiz Kids®. I'm a television meteorologist for the ABC affiliate in Indianapolis, Indiana. I designed this website especially for kids to allow them to learn more about the fascinating world of weather. It's also a wonderful educational website for teachers

and parents that gives them the right tools they need to explain the different types of weather to children. http://www.weatherwizkids.com/

- National Oceanographic Atmospheric Administration's: National Weather Service http://www.nws.noaa.gov/
- Weather Activities: Learn how to report and predict the weather at the underground W.H.E.D. weather caves! http://www.edheads.org/activities/weather/
- For Kids Only (NASA) http://kids.mtpe.hq.nasa.gov/
- USA Today Weather http://www.usatoday.com/weather/default.htm
- Weather Station Symbols http://www.state.nj.us/dep/seeds/wssym.htm

*S.3.9. Identify important information about academic content, using prior knowledge and/or visual cues as needed.

Evaluate:

Use released MCAS questions and/or NAEP questions throughout the unit as a form of formative assessment. The questions may be used as a pre/post test, to help students practice MCAS questions, to help students learn how to answer multiple choice questions and/or open-response questions.

http://www.doe.mass.edu/mcas/search/intro.html
http://nces.ed.gov/nationsreportcard/

Q. Ruben is using a compass to find out which direction the wind is blowing. Which of the following would be **best** for him to observe to help him find the direction of the wind? (ESS #6)

A. a flag on a pole

B. the temperature on a thermometer

C. birds flying above the trees

D. the shadow of a building

Q. Which form of precipitation is **most likely** to cause damage when hitting the roof of a car? (ESS #6)

A. hail

B. rain

C. sleet

D. snow

Q. Which weather instrument measures air pressure? (ESS # 6)

A. thermometer

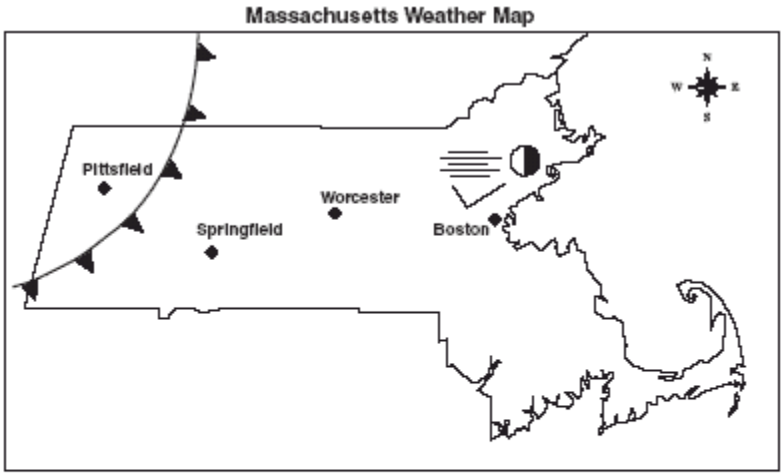
B. anemometer

C. rain gauge

D. barometer

Open Response Question

Q. The map below shows information about the weather in Massachusetts on an April day. (ESS #6)



Key:

Cloud Cover	Precipitation	Wind Speed/Direction	Fronts
no cover	fog	1 – 2 miles/hr	cold
quarter cover	snow	3 – 8 miles/hr	warm
half cover	rain	9 – 14 miles/hr	stationary
full cover	t-storm	15 – 20 miles/hr	

Use the weather map to describe the weather in northeast Massachusetts on the day illustrated. Be sure to include information from all four columns of the key in your answer.

Open Response Question

Q. A geology club is planning to go on a trip to the coast to observe rock formations. Based on the club's calendar, they can schedule the trip in either May or September. The table below shows the average weather conditions at the coast for May and September. (ESS #6)

Average Weather Conditions at the Coast

Condition	May	September
high temperature (°F)	55	63
number of days with precipitation	12	9
number of days with sunshine	16	22
wind speed (mi. per hr)	14	10

a. Which month has the highest average wind speed? Include data from the table to support your answer.

b. Based on the information in the table, which month would **most likely** have the best weather conditions for a trip to the coast to observe rock formations? Include data from the table to support your answer.

c. When the geology club finally went on their trip to the coast, it was 60°F with cloudy skies, and the wind speed was 5 mi. per hr. Explain why it is not unusual that the weather conditions on the day of the club's trip were different from those shown in the table for either month.

Scoring Guide and Sample Student Work

Score	Description
4	The response demonstrates a thorough understanding of how air temperature, moisture, wind speed and direction, and precipitation make up the weather in a particular place and time. The response correctly identifies May as the month with the highest average wind speed and includes data from the table to clearly support the answer. The response identifies which month would have the best weather conditions and includes data from the table to clearly support the answer. The response also clearly explains why the weather conditions that the club experienced were different from the weather conditions shown in the table.
4	
3	The response demonstrates a general understanding of how air temperature, moisture, wind speed and direction, and precipitation make up the weather in a particular place and time.
2	The response demonstrates a limited understanding of how air temperature, moisture, wind speed and direction, and precipitation make up the weather in a particular place and time.
1	The response demonstrates a minimal understanding of how air temperature, moisture, wind speed and direction, and precipitation make up the weather in a particular place and time.
0	The response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.

Note: There are 2 sample student responses for Score Point 4.

a.) Based on data from the table, May had the highest average windspeed. September's wind speed of 10 is less than May's average of 14.

b.) Based on information on the table, September would be a better choice. September had more day's with high temperatures, which is good when on the coast where it's cooler. September also had an average number of days with precipitation 3 days lower than in May. This helps because you'd prefer to be in sunny weather while on the coast and field trip. September had 22 days of sunshine, rather than May's 16. September also has a lower wind speed, which means that the water will be less choppy and gusty, so they can get close up to the rocks to study. c.) Weather conditions are always changing. It isn't unusual that the weather was different on the chart than the time they went. Weather moves, and the table had numbers averaged together. That means that not EVERY day has the same wind speed or temperature. This is why it isn't so unusual.

a. May has a higher wind speed average than September. May averages 14 miles per hour and September averages 10 miles per hour.

b. September would **most** likely have had the best weather conditions for a trip. Based on the chart May averages 16 days of sunshine. September averages 22 days of sunshine therefore September would **most likey** have had the best weather conditions.

c. It isn't unusual that the weather conditions on the day of the club's trip were different from those shown in the table because the information on the table is average. (for example in the wind speed in September might 15 days 15 miles per hour and 15 days 5 miles per hour. It would average out to be 10 miles per hour.)

a. May has the highest average wind speed. I know this because the table says that May's average wind speed is 14 miles per hour, and September's is 10 miles per hour. Since 14 is greater than 10, May has the highest average wind speed.

b. September would most likely have the best weather conditions for a trip to the coast to observe rock formations. I know this because the table says that in September the high temperature is 63°F, the number of days with percipitation is 9, the number of days with sunshine is 22, and the wind speed is 10 miles per hour. However, in May the table says the high temperature is 55°F, the number of days with percipitation is 12, the number of days with sunshine is 16, and the wind speed is 14 miles per hour. That is why September would most likely have the best weather conditions.

c. It is not unusual that the weather conditions on the day of the club's trip were different than those shown in the table for either month. This is because the table shows the <u>average</u> weather conditions for either month, and the average weather conditions of the month aren't always happening every day.

2007 MCAS: Grade 5 Science and Technology/Engineering
Question 38 - Score Point 2

A. May because May has 14, and September has 10.

B. September because it has great weather condition. The wind speed is not to windy Just perfect.

C. Mabye because they went in the afternoon sometimes the weather changes in the afternoon.

2007 MCAS: Grade 5 Science and Technology/Engineering
Question 38 - Score Point 1

A) September has the higest because if you add them together September has more.

B) September because September has more days with sunshine and has a higher temperature.

C) because they were in the mounth of may at the begining.

2007 MCAS: Grade 5 Science and Technology/Engineering
Question 38 - Score Point 0

A. High temperature (°F) has the moset wind speed.
B. High temperature (°F) hat the moset best weather.
C. The weather was like that because it was mabe going to rain a lot.

Q. The table below shows the average monthly temperatures for Massachusetts over a 30-year period. (ESS #6)

Month	Temperature
January	–1°C
February	0°C
March	3°C
April	?
May	15°C
June	20°C
July	23°C
August	22°C
September	18°C
October	13°C
November	7°C
December	1°C

The average temperature for April is missing. Which is the **best** estimate of the average temperature for April?

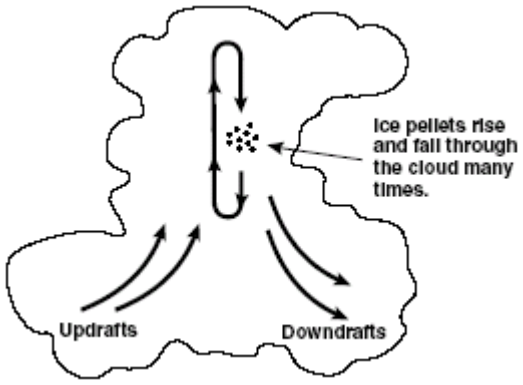
A. 1°C

B. 10°C

C. 16°C

D. 20°C

Q. The diagram below shows precipitation forming in a large cloud. (ESS #7)



The ice pellets grow larger each time they rise and fall through the cloud. What type of precipitation is this process producing?

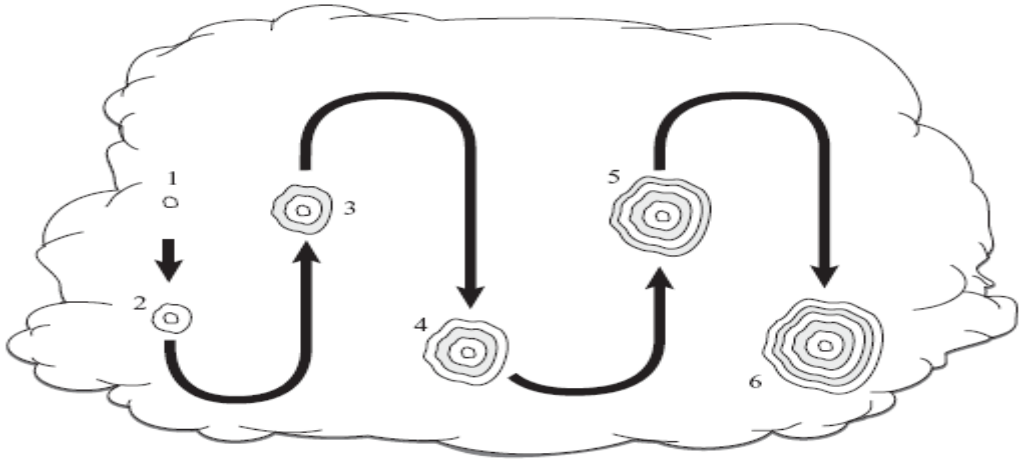
A. hail

B. rain

C. sleet

D. snow

Q. The diagram below represents the formation of one type of precipitation in a cloud. (ESS #7)



Which type of precipitation is formed as shown?

A. hail

B. rain

C. sleet

D. snow

Q. Which of the following climates has cold winters and hot summers? (ESS # 9)

B. polar

B. subtropical

C. temperate

D. tropical

Q. Some plants grow only in specific places in the world. Some cacti, for example, grow only in deserts. Which of the following is **most** important in determining where a plant can grow and survive? (ESS #9)

A. animals

B. climate

C. tides

D. wind

Big Idea: Global patterns such as the Jet Stream and Gulf Stream influence our local weather/ Los patrones mundiales tales como la corriente en chorro y la Corriente del Golfo influyen en nuestro clima local (2 weeks)

Massachusetts Science and Technology Learning Standards
ESS #8. Describe how global patterns such as the jet stream and water currents influence local weather in measurable terms such as temperature, wind direction and speed, and precipitation.
MCAS item analysis (What do students need to know?)

- ✓ Recognize the direction of the Jet Stream influences weather across the United States
- ✓ Recognize that the Gulf Stream affects the climate of Massachusetts

Guiding Questions:

- **What causes wind?/ ¿Qué causa el viento?**
- **What causes water currents in the oceans?/¿Qué causa las corrientes de agua en los océanos?**

Engage:

- Ask students: What causes wind? (elicit prior knowledge)
  *S.2.5. Ask and answer concrete questions about familiar content.

- Demonstration: Using a toaster (or a hotplate) and a pinwheel, students observe and discuss that wind is created by raising heat. The term for rising air is **convection/** convección. (see appendix and/or the following website) http://www.srh.noaa.gov/jetstream//global/ll_toast.htm
  *S.3.9. Identify important information about academic content, using prior knowledge and/or visual cues as needed.

- Ask students: What is the source of heat on Earth that produces wind?
  *S.2.5. Ask and answer concrete questions about familiar content.

- Demonstration: Melts in your bag, not in your hands. Using 2 small pieces of chocolate and 2 small re-sealable plastic bags. The students will learn how the sun transfers heat to the earth through **radiation/** radiación. (see appendix and/or the following website) http://www.srh.noaa.gov/jetstream//atmos/ll_melts.htm
  *S.3.9. Identify important information about academic content, using prior knowledge and/or visual cues as needed.

- Students add the following vocabulary terms to their glossaries: **radiation/** radiación, **convection/** convección
  *Identify words in English that are frequently used in the student's first language. (S.1.8)

Explore:

- Students create a model of an **ocean currents/** corrientes oceánicas. Freeze a dark solution of food coloring and water in an ice cube tray. Fill a jar halfway with warm water. Float a colored ice cube in the warm water. Sprinkle some pepper into the water to represent particles in the **ocean/** océano. Discuss what happens, and how it is connected to convection in both liquid and gas. This activity illustrates **convection/** convección (essential in transferring both **heat/** calor and **moisture/** humedad around the world; drives both **wind currents/** corrientes de aire and **ocean currents/** corrientes oceánicas.) Students draw and describe their observations.

  *S.1.3. Demonstrate comprehension of vocabulary essential for grade-level content learning, using pictures, actions, and/or objects.

- Students add the following vocabulary terms to their glossaries: **ocean currents/** corrientes oceánicas, **ocean/** océano, **heat/** calor, **moisture/** humedad, **wind currents/** corrientes de aire

  *Identify words in English that are frequently used in the student's first language. (S.1.8)

- Demonstrate the effect of the weight of air over our heads. Since we do not normally "feel" **air pressure/** la presión de aire, students will see the effect of air pressure on two sheets of paper. Students will discover the newspaper was much harder to lift than the printer paper. (see appendix and/or the following website) http://www.srh.noaa.gov/jetstream//atmos/ll_engagement.htm

  *S.3.9. Identify important information about academic content, using prior knowledge and/or visual cues as needed.

- Students add the following vocabulary terms to their glossaries: **air pressure/** la presión de aire

  *Identify words in English that are frequently used in the student's first language. (S.1.8)

- Students learn about uneven heating by monitoring the temperature of water and soil in the sunshine. Activity #4: Heating Earth, Water Planet FOSS kit. They discover how uneven heating can cause convection currents. Students use syringes to investigate air pressure.

  *W.2.2.e. Write brief summaries of information gathered through research.

- Students explore the concept of air pressure, observe that air pressure is exerted in all directions, and relate air pressure to wind and weather forecasting. Activity #4: High and Low Pressure, Weather Forecasting Delta Science kit.

  *W.2.2.e. Write brief summaries of information gathered through research.

- Students read and discuss information about global patterns such as the Jet Stream and Gulf Stream.

  *R.5.9.a. Identify text features as sources for specific information.

- Students make a Beaufort Scale Spinner to help them learn how hard the **wind/** viento is blowing. (see appendix and/or the following website) http://www.miamisci.org/hurricane/windscale.html

  *S.3.9. Identify important information about academic content, using prior knowledge and/or visual cues as needed.

Extend:

- Ocean Streams. We can to some extent simulate the ocean turnover in the North Atlantic using a water filled transparent dish (here a lasagne dish was used), a lamp, a plastic bag with ice and some ink in order to color the water. http://www.atmosphere.mpg.de/enid/3b80e57167338b55bbd94cd930f7e042,0/2_The_Oceans/Experiment_ocean_circulation_6f3.html
- The **Gulf Stream/** Corriente del Golfo Voyage is an online multidisciplinary project which utilizes both real time data and primary source materials to help guide students to discover the science and history of the Gulf Stream. http://www.ciese.org/curriculum/gulfstream/index.shtml
- What causes the Gulf Stream? This video segment adapted from *NOVA* uses satellite imagery to illustrate the Gulf Stream's path and animations to explain how atmospheric phenomena cause it to move. http://www.teachersdomain.org/resource/ess05.sci.ess.watcyc.gulfstream/
- Examine **Global Surface Currents/** Global Corrientes superficiales. This visualization from McDougal Littell/TERC illustrates the patterns of **ocean currents/** las corrientes oceánicas and the **global wind patterns/** los patrones globales de viento that drive them. http://www.teachersdomain.org/resource/ess05.sci.ess.earthsys.globalsurf/
- Ocean Temperatures and Climate Patterns. This animation from The New Media Studio explains precipitation patterns by illustrating how differences in ocean surface temperatures create wind, and how wind patterns can in turn affect ocean surface temperatures. http://www.teachersdomain.org/resource/ess05.sci.ess.watcyc.oceancur/
- The Changing Gulf Stream. The Gulf Stream, first mapped by Timothy Folger, Benjamin Franklin's cousin, brings warm water to the north Atlantic and especially to England. http://zfacts.com/p/190.html
- The primary focus of this site is the near real-time presentation of sea surface temperature imagery for research and educational purposes. http://fermi.jhuapl.edu/avhrr/

  *S.3.9. Identify important information about academic content, using prior knowledge and/or visual cues as needed.

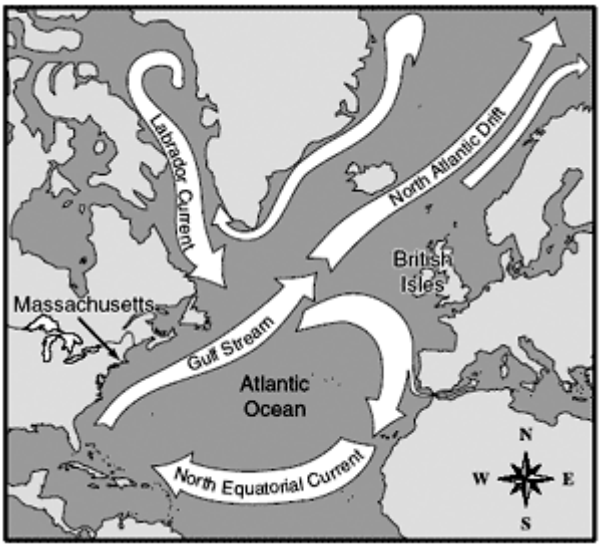
Evaluate: (MCAS released questions)

- The questions may be used as a pre/post test, to help students practice MCAS questions, to help students learn how to answer multiple choice questions and/or open-response questions.

  *Respond to factual and inferential questions that are based on academic content. (S.3.39)

  *After writing or dictating a composition, identify words and phrases that could be added to make the thought clearer (W.3.4)

Q. The map below shows Atlantic Ocean currents. (ESS #8)



Surface currents in the ocean affect the climate of the land areas nearby. Which of the currents **most** affects the climate of Massachusetts and its surrounding states?

A. Gulf Stream

B. Labrador Current

C. North Atlantic Drift

D. North Equatorial Current

Q. The map below shows the continental United States and four arrows representing wind directions. (ESS #8)

Which arrow **best** represents the direction of the jet stream that influences weather across the continental United States?

A. arrow 1

B. arrow 2

C. arrow 3

D. arrow 4

Massachusetts Cultural Council Creative Schools Program
Holyoke Public Schools
Enchanted Circle Theater/Hitchcock Center for the Environment
2007
Weather and Climate Workshop Plan

Day 1 – Introductions

Explain topic for workshop and our approach that combines science content with theater – movement, speaking, writing, props, instruments

Movement warm-up: Weather improvisation circle

- Several students are selected to act like it is (raining, snowing, slippery with ice, etc.) as they have to cross the circle to the other side
- This activity is done several times selecting different weather events and different students until all students have had a chance to participate

Essential Questions (T will ask for student comments and P will write down comments, on a notepad for future reference, in a group poem):

- What are the parts that make up weather?
- How does weather affect our Earth? (mudslides, floods, tornados)
- How does weather affect us? (snow days, rainy days, heat…)
- What is climate?

Students work in groups to pantomime how we behave in different weather conditions. Students are given a short amount of time (5 minutes) to plan and practice together. Create a stage area for students to perform their skits. No talking during skits. After the skit is over, fellow students have to guess what the weather and activity are:

- Packing up a picnic when a downpour hits
- Making s snowman when a snowstorm hits
- Standing in line in 95 degree heat waiting to get into 6 Flags Water Park
- Driving your new car when a hailstorm hits
- Working in the garden when a thunder and lightning storm hit

Closing – Last Tree Standing

Day 2 – Weather Instruments

Group warm up

Students will learn information about weather instruments and then work in groups to act them out – what it is, how it works and what it measures. Students will develop a narration for their skits.

- Barometer
- Anemometer
- Thermometer
- Rain gauge
- Wind vane

Closing

Days 3 – Weather makers

Group warm-up

Group Weather Charades – students work in groups to learn information about a significant factor in creating our weather. Then groups create a skit to teach fellow students about it. Skits will include props, percussion instruments, and student-written narration. These are the topics:

- Jet Stream
- Gulf Stream
- El Nino
- Warm Front/Cold Front
- Lake Effect Snow

Closing -

Day 4 – CULMINATING EVENT– Open class, parents and community invited

Group warm up

Students share their two skits from Days 2 and 3 to reinforce their learning

Read group poem from day 1

Closing – Beaufort Wind Scale improvisation

TW/PKH, 9 Jan 07

Books about the Water Cycle

The Drop in My Drink: The Story of Water on Our Planet / By Meredith Hooper and Chris Coady. New York: Viking: 1998.
An interesting book that follows the path of one drop of water from the creation of Earth up to the present day. Focuses on the concept that all the water that has been and is on the planet is all the water we will ever have. Gr. 3-5.

The Magic Schoolbus at the Waterworks / By Joanna Cole and Bruce Degen. New York: Scholastic: 1986.
Ms. Frizzle takes her class on a trip to the city waterworks that is anything but normal. She drives the magic schoolbus into a cloud, and the children fall like raindrops and are processed as part of the city's water supply. Ingenious. Gr. Preschool-2.

A Drop of Water: A Book of Science and Wonder / By Walter Wick. New York: Scholastic: 1997.
Walter Wick's photographs of water in all its fantastic forms are the highlight of this book that seeks to explain concepts like surface tension, adhesion, capillary attraction, molecular motion, freezing, evaporation, and condensation from a visual perspective. Gr. 3-6.

Re-Cycles / By Michael Elsohn Ross and Gustav Moore. Brookfield, Conn.: Millbrook Press: 2002.
The life cycle of a tree and a drop of water are used to explain the changes that the Earth's soil and water go through over time. This book also contains information on composting. Gr. K-3.

Drip Drop: Water's Journey / By Eve Stwerktka and Albert Stwerktka. Englewood Cliffs, N.J.: Julian Messner: 1991.
Drip Drop traces water's journey from tap, through the sewers, to the treatment plant, and beyond! This book features many simple water-related experiments for kids. Gr. 3-6.

The Water Cycle / By Theresa Greenaway. Austin, Texas: Raintree Steck-Vaughn: 2001.
This well-illustrated look at water is a valuable teaching tool as it features sections on the water cycle and water properties, conservation and pollution. Gr. 3-6.

The Water Cycle / By Trudi Strain Trueit. New York: F. Watts: 2002.
An in-depth look at the ways in which water is essential to life on our planet. Includes interesting subsections on water in space, the ocean's effect on climate, artesian well water, and more. Gr. 4-7.

The Water Cycle / By Robin Nelson. Minneapolis, Minn.: Lerner Publications Company: 2003.
From cloud vapor to oceans, the cycle of water on Earth is shown in vivid images and simple sentences that will have younger readers thinking about what goes on in the world around them. Gr. K-2.

What Is the World Made Of? All About Solids, Liquids and Gases / By Kathleen Weidner Zoehfeld. New York: HarperCollins Publishers: 1998.
This addition to the Let's-Read-and-Find-Out Science series introduces the youngest readers to an important science concept: the differences between solids, liquids, and gases. Gr. K-3.

Water Dance / By Thomas Locker. San Diego: Harcourt Brace & Company: 1997.

Beautiful illustrations accompany a poem about the different roles of water on our planet. Explanations are given at the end of the story about each particular phase in the water cycle. Truly a "marriage of art and science." Gr. K-4.

Water / By Frank Asch. San Diego: Harcourt Brace: 1995.
Simple sentences accompany magnificent watercolor illustrations in this book that stresses the importance of water in everyday life. A lovely introduction to water in its various forms. Gr. Preschool-2.

Water / By Francois Michel and Yves Larvor. New York: Lothrop, Lee & Shepard Books: 1993.
Readers will have an interactive experience with pop-ups, pull-tabs, and lift-the-tab pages in this book. Abundant with facts for older children and entertaining for pre-readers this book has wide appeal. Each section deals with a different aspect of water-for life, underground, in the city, water power and the seacoast. Gr. Preschool-5.

A drop of water / By Gordon Morrison. Boston : Houghton Mifflin Co.: 2006.
A child crouches beside a meadow brook, and a drop of water collects and falls from the child's fingertip to continue on its journey. Where does that journey begin? High in the sky, rain clouds are parting. Water trickles and flows down the mountain, collecting in an upland bog, seeping through a beaver's dam, rushing over rocks, passing many plants and animals along its winding way--each dependent on water and the different environments it shapes to live. Author and illustrator Gordon Morrison has captured a single moment in time, revealing the course and influence of water, and inviting readers to pause and consider the world around them in this beautiful and lyrical appreciation of nature and the resource that makes it all possible--a drop of water.

The Water's Journey / By Eleanor Schmid. New York: North-South Books: 1990.
Appreciation for water as a resource is at the heart of this book, which follows water flow from a snowy mountaintop down to the sea to explain the water cycle and show who uses water and for what purposes. Gr. Preschool-2.

The Snowflake: A Water Cycle Story / By Neil Waldman. Brookfield, Conn.: Millbrook Press: 2003.
The beautiful illustrations in this book help the reader visualize the changes in water through the four seasons--and understand the water cycle. Gr. K-3.

Down Comes the Rain / By Franklyn M. Branley. New York: HarperCollins Publishers: 1997.
A straightforward explanation of how the water cycle works, detailing what happens at each step. Includes both text and cartoon-bubble dialog. Gr. 1-4.

Follow the water from brook to ocean / By Arthur Dorros. New York, NY : HarperCollins: 1991.
Explains how water flows from brooks, to streams, to rivers, over waterfalls, through canyons and dams, to eventually reach the ocean.

One well : the story of water on Earth / By Rochelle Strauss. Toronto : Kids Can Press: 2007.
Looking at all the water on Earth—in the atmosphere, the oceans, lakes, ponds, rivers, and rain as "One Well" into which all life dips to survive—Strauss presents a timely discussion of the use and abuse of a not-so-limitless resource. Liberally sprinkled with interesting facts—"It took about 130

L (34 U.S. gal.) of water to make your bike"—the readable text informs children of growing demands on a finite supply; increasing pollution; and the intensifying urgency for the conservation, preservation, and protection of a unique chemical combination more essential to all life than the air we breathe. Illustrated by Rosemary Woods.(Grade 4–6)

A Drop Around the World by Barbara Shaw McKinney [Dawn Publications, 1998] follows a drop of water around the world from place to place as it evaporates, condenses, freezes, and moves along various paths of the water cycle.

Books about Weather

Global Warming: The Threat of Earth's Changing Climate / By Laurence Pringle. New York: SeaStar Books: 2001.
Award-winning science and nature writer Laurence Pringle describes the cause of global warming, exploring its past, present, and potential future damage to our climate, ecology, and economy. He also offers solutions that may help avert a global disaster. Gr. 4-8.

Come On, Rain / By Karen Hess. New York: Scholastic Books: 1999.
Young Tess very much wants it to rain in the sweltering city where she lives so she can put on her swimsuit and dance…and the clouds do not disappoint her. Neither will Karen Hess' book disappoint readers who understand that wishing can make things happen. Gr. 1-4.

Bringing the Rain to Kapiti Plain / By Ramoń Carmona. New York: Puffin Books: 1981.
Young Ki-pat, an African cattleman, must assist the rains in coming to end a terrible drought. This cumulative rhyme about how he doe so is beautifully illustrated and sure to dazzle young readers. Gr. 1-4.

Cloudy with a Chance of Meatballs / By Judi Barrett. New York: Antheneum Books: 1978.
This classic account of what would happen to the world if our food fell from the sky instead of rain is full of imaginative situations and unpredictable consequences. Not one to miss! Gr. K-3.

Winter Eyes: Poems & Paintings / By Douglas Florian. New York: Greenwillow Books: 1999.
An enjoyable collection of poems and paintings about winter and winter activities. Any child in a snowy climate will be able to relate to poems about icicles and snowball fights as well as a runny nose and frozen toes. Gr. K-4

Snowmen at Night / By Caralyn Buehner and Mark Buehner. New York: Dial Books for Young Readers: 2004.
If your snowman has ever looked different the morning after building it you may wonder what do snowmen do at night? Read this book to find out about their adventures. Gr. Preschool-2.

Snowballs / By Lois Ehlert. Harcourt Brace and Co.: 1995.
Children put on their mittens and head outside to create a whole family (including pets) out of snow. The young will enjoy the bold and funny illustrations and even learn how snow is formed. Gr. Preschool-3.

Rain play / By Cynthia Cotten. New York : Henry Holt and Company: 2008.
Most people leave the park when rain begins to fall, while others enjoy the sights, sounds, and feel of the cool water--until thunder and lightening come near. Illustrated by Javaka Steptoe.

Storm boy / By Paul Owen Lewis. Hillsboro, Or. : Beyond Words Pub.: 1995.
A story drawn from Haida Indian literary tradition in which a boy falls from his canoe into a world of eighteen-foot tall human-like creatures who welcome him and eventually return him to his village.

Time to Sleep / By Denise Fleming. New York: Henry Holt: 1997.
A chill is in the air and Bear knows it is time for her winter nap, but she must first tell Snail. And Snail must tell Skunk. And Skunk must tell Turtle. Each animal who tries to put off going to sleep just a little longer sees, smells, hears, or tastes the signs of the impending season. A perfect bedtime story. Gr. Preschool-2.