Weather Watch

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Core Content: Structure of the Earth System and Earth in the Solar System

SC-M-2.1.7: Earth's weather and climate are a product of several factors: global patterns of atmospheric movement, cycling of water through the atmosphere, atmosphere, atmospheric pressure changes, and variations in temperature. These characteristics can be used to predict local weather.

SC-M-2.3.4: Seasons result from variations in the amount of the Sun's energy hitting the Earth's surface, due to the tilt of the Earth's axis and the length of the day.

Academic Expectation: 2.1 Scientific Ways of Thinking and Working; 2.2 Patterns of Change; 2.3 Systems

Skills: gather, analyze, and interpret data, use evidence and logic to develop scientific explanations, Interpreting weather maps, predicting

Tasks:

1. Data Analysis	SC-M-2.1.7
2. How correct is the weather forecast?	SC-M-2.1.7
3. Patterns in Weather	SC-M-2.1.7
4. There's a jet in the stream	SC-M-2.1.7
5. Number of daylight hours	SC-M-2.3.4
6. Earth's tilt and movement	SC-M-2.3.4
7. A yard of sunlight	SC-M-2.3.4

Materials: weather data sheets, cumulative weather data tables, graph paper, flashlights, Styrofoam balls, markers, overhead projector, overhead transparency of graph paper, light color notecard, large white ball, calculators, weather map clippings from newspaper

Weather Watch
Pre-test

Name _____
Class _____ Date _____

Daily High Temperature

Date October	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
	74	74	76	78	80	81	81	80	72	74	74	75	76	74	78	78	79	72	72	74	75	72	73	73	69	72	74	74	71	72	74

1. Find the mode and median daily high temperature for the above data.

2. Calculate the mean daily high tempertature.

3. Make a line graph on graph paper of the daily high temperature for the month of October.

4. Look at the weather map provided by your teacher. What areas of the United States are likely to have rain?

5. In what general direction do weather systems usually move and explain two reasons or forces that cause them to move in this direction.

6. Describe how the number of daylight hours changes through out the year. Estimate the number of day light hours (or times of sunrise and sunset) during each season of the year.

7. Explain how Earth's axis tilts and what effects this tilt has on the weather and seasons.

Pre-test answer key

1. mode = 74, median =74
2. mean rounds to 75
4. You can get an weather map from the internet or clip one from the newspaper. A map with just the warm and cold fronts is best without rain type graphics is best.
5. Weather systems move from the west toward the east. The rotation of the Earth and the jet stream cause this general movement.
6. In the summer there are more daylight hours. June has the longest day of approximately 15 hours of daylight. After this the day gets shorter in September the number of daylight hours in 12. The day continues to shorten until December with approximately 9 hours of daylight and then the daylight hours increase. By March the number of daylight hours is up to 12 and continues to increase until June.

Important notes about this unit

1. Start very near the beginning of the school year (or before) clipping the weather report with a weather map from the newspaper everyday, including weekends. You will use these clippings for several tasks in both units. You may wish to laminate your clippings.

2. Students will need a small 3 ring binder or a section of a binder to keep the weather data they collect during the school year. They will use this data for both units.

3. While you could collect the data yourself and then give completed data tables to the students when you wish to begin teaching these units, the students get a better appreciation of the tedious nature of data collection if they must record the data daily.

4. While data collection should begin by September and continue daily and the data analysis can occur monthly, the mail body of this unit should not be taught until after January or February. (after the March equinox is best)

Data Collection

1. Everyday have students fill in a Daily weather Data Sheet. Once students get use to the process it will take less that 5 minutes. On Mondays you may choose to have students do a daily weather data sheet for the previous Saturday and Sunday.

2. Times for sunrise and sunset should be converted to standard time during September and October before the time change.

3. On the Daily Weather Data Sheet, in the boxed for difference in precipitation (yes or no) and difference in sky cover have students indicate correct forecast with a check mark and incorrect forecast with an X.

Performance Tasks:

Task 1: Data Analysis

1. Have students calculate the mean, median, mode, and range of actual high and actual low for each month. Have students make a double line graph with mean temperature on the vertical axis and the months on the horizontal axis. Ask students if there is a relationship between the high and the low. (Students can also compare this graph to their graph of sunrise and sunset)
2. Have students make a bar graph to show the amount of precipitation each month.
3. Tell students that warm air can hold more water vapor that cool air. Ask them to compare the temperatures with the amount of precipitation. Is there a relationship?

Task 2: How correct is the weather forecast?

1. Have students calculate the mean, median , mode, and range of difference of high and difference of low for each month. Then have students calculate the percent correct for each month of sky cover and precipitaion. (#correct divided by total # of days times 100)
2. Ask students is sky cover, temperature or precipitation more easy to predict correctly? Which months have the highest percent correct? Which have the least? Is ther a pattern? Do you think the percents we calculated this year will be similar to next year's? Do you think they were about to same 20 years ago?
3. Point out to students that scientists ability to predict the weather correctly has greatly improved in the last 20 years. Ask them why? Discuss the role technology plays in weather forecasting.

Task 3: Patterns in the Weather

1. Each group will need 14 days of consecutive weather report clippings. Remove the seventh and thirteenth day from each set to give to students later. If you have enough clippings divide students into groups of two or three. If you don't have enough clippings make the groups as small as possible.
2. Give each group a set of clippings ans the worksheet Patterns on Weather. Have students read and follow the directions while you assist them.
3. Ask students how their forecast correctness compare the newspaper's correctness for the last task.

Task 4: There's a jet in the stream

1. On the internet have students go to the National Weather Service site. This site not only has a great deal of information on weather, it also has maps that show the daily position of the jet stream. Have students study these maps.
2. Either on the net or using other resource matials have students research how the jet stream affects the movement of fronts.

Task 5: Number of daylight hours

1. Either monthly or when you begin teaching the main body of this unit, have students fill in the cumulative weather data tables for sunrise and sunset and then make line graphs for sunrise and sunset. It is more dramatic if you have the students put time on the vertical axis and the date on the horizontal axis so that the students can link their monthly graphs together to make one long graph for each.

   Note: For the sunset graph number the vertical axis from the top. Begin with 3:00 p.m. (or the earliest sunset) and go down to 8:00 p.m. (or latest sunset) For the sunrise grap number the vertical axis from the top with your earlist sunrise and go down to your latest sunrise. This way you can attach the sunrise graph over the top of sunset graph. This will give a dramatic picture of the changes in the amount os daylight hours during the course of the year.

2. In science journal or to assess have students write a description of the complete graph and have them hypothesis about why they think the length of the day changes throughout the year.

Task 6: Earth's Tilt and Movement

1. Divide students up into groups of three or four. Give each groups a Styrofoam ball, flashlight and markers. Have students color one half of the ball red and the other half blue.
2. Next have students put a pencil or pen all the way through the ball so that the red represents the northern hemisphere and the blue represents the southern hemisphere and the pen represents the Earth's axis.
3. One person holds the flashlight and represents the sun. Since sunlight goes out in all directions from the sun, but the flashlight does not, the Sun person will have to turn around to always face the Earth.
4. One person will hold the Styrofoam ball that represents the earth. Show the students the approximate tilt of the earth. Tell them the Earth does not change the tilt. It is always about 23 degrees. The Earth person must hold the earth at the tilt as they go around the sun.
5. The Earth person will walk another the sun person. They should stop at four points for the group to make and record observations. Those points are where the tilt toward and away from the sun is the greatest and where it is the least.
6. From this model the students should conclude that the tilt of the Earth causes the change in the number of daylight hours.

Task 7: A Yard of Sunlight

1. Set up an overhead projector with a transparency of graph paper showing on a screen or other flat surface.
2. Hold up the note card and tell the students this is your yard. The light from the overhead represents the sun and each square of the graph paper represents an energy unit of light.
3. Show the students the big with ball. Tell them this is the Earth and your yard is located on the equator. Hold the note card in front of the ball with the graph being projected on to it.
4. Have students count and record the number of squares (energy units of light) that hit your yard.
5. Tell the students you also have a yard in the U.S. Move your card about half way up. Have students count and record the number of squares on the card.
6. Tell students Santa has a yard at the North Pole. Move the card to the top. Have students count and record the number of squares on the card.
7. Discuss the amount of energy units of light different places on Earth receive. Relate this and the number of daylight hours to the seasons.

Open Responses:

SC-M-2.1.7 Give students a copy of a weather map

You have won an all expenses paid trip to one of the following theme parks: Six Flags over Kentucky in Louisville, Six Flags over Texas in Dallas, or Six Flags over Georgia in Atlanta. The weather map is for the day you travel to the park.

a. Predict the weather conditions at each park.
b. Based on the weather, which theme park would you choose? Explain your choice.

SC-M-2.3.4

Explain how Earth's position in space causes the four seasons. Make a drawing to illustrate your answer.

Scoring Guides:

SC-M-2.1.7

4 Above and beyond a 3 answer

3 Considers two weather factors(temperature, precipitation, sky cover, wind, etc.) and uses weather related reasons for choice.

2 Considers one weather factor and may or may not use weather related reasons for choice.

1 Does not consider any weather factors.

SC-M-2.3.4

4 Above and beyond a 3 answer

3 Explains correctly both length of daylight and the tilt of the earth causes differences in the amount of energy the Earth recieves.

2 Explains one reason correctly, but explains the other incorrectly or does not mention a second reason.

1 Does not explain either reason correctly

Daily Weather Data Sheet for ____________________

	High	Low	Precipitation Yes/No	Amount precipitation	Sky Cover
Today's Forecast					
Today's Actual					
Difference					

Today's Sunrise ______________ Today's Sunset ______________

Daily Weather Data Sheet for ____________________

	High	Low	Precipitation Yes/No	Amount precipitation	Sky Cover
Today's Forecast					
Today's Actual					
Difference					

Today's Sunrise ______________ Today's Sunset ______________

Daily Weather Data Sheet for ____________________

	High	Low	Precipitation Yes/No	Amount precipitation	Sky Cover
Today's Forecast					
Today's Actual					
Difference					

Today's Sunrise ______________ Today's Sunset ______________

Daily Weather Data Sheet for ____________________

	High	Low	Precipitation Yes/No	Amount precipitation	Sky Cover
Today's Forecast					
Today's Actual					
Difference					

Today's Sunrise ______________ Today's Sunset ______________

Name _____ Class _____ Date _____

Patterns in Weather

1. Arrange your weather maps in order by date. You will be missing two dates. Look at the day to day changes that occur between each map. Describe the general movement of weather.

2. Draw what you think the first missing map will look like.

3. Obtain the missing map from your teacher and compare it to your drawing. What did you have correct and what was not?

4. Compare the maps to the written forecast. What is the connection between fronts, high, lows, etc. shown on the maps and the written forecasts?

5. Write a forecast for the second missing weather report.

6. Obtain the missing weather report from your teacher. What things were correct and what was not?

Cumulative Weather Data Table

Actual High

Date/Month	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
1							
2							
3							
4							
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29							
30							
31							
total							
mean							
median							
mode							
range							

Actual Low

Date/Month	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
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30							
31							
total							
mean							
median							
mode							
range							

Cumulative Weather Data Table

Difference of High

Date/Month	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
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30							
31							
total							
mean							
median							
mode							
range							

Difference of Low

Date/Month	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
1							
2							
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7							
8							
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31							
total							
mean							
median							
mode							
range							

Cumulative Weather Data Table

Sky Cover Correctness

Date/Month	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
1							
2							
3							
4							
5							
6							
7							
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#							
# of days							

Precipitation Correctness

Date/Month	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
1							
2							
3							
4							
5							
6							
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# of days							

Cumulative Weather Data Table

Sunrise

Date/Month	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
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5							
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mean							
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mode							

Sunset

Date/Month	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
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Cumulative Weather Data Table

Amount of Precipitation

Date/Month	September	October	November	December	January	February	March
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