

Teacher's Guide For

Core Meteorology: Weather

For grade 7 - College

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MATERIALS IN THE PROGRAM

Teacher's Guide -This Teacher's Guide has been prepared to aid the teacher in utilizing materials contained within this program. In addition to this introductory material, the guide contains the following:

- Suggested Instructional Notes
- Student Learning Goals
- Test Questions on Blackline Masters 1A for duplication and handout to students

INSTRUCTIONAL NOTES

It is suggested that you preview the program and read the related Student Goals and Teacher Points. By doing so, you will become familiar with the materials and be better prepared to adapt the program to the needs of your class. You will probably find it best to follow the program in the order in which it is presented in this Teacher's Guide, but this is not necessary. The program can be divided into chapters accessed through the DVD's Menu Screen under Chapter Selects. It is also suggested that the program presentation take place before the entire class and under your direction. As you review the instructional program outlined in the Teacher's Guide, you may find it necessary to make some changes, deletions, or additions to fit the specific needs of your students. After viewing the program you may wish to copy the Test Questions on Blackline Master 1A and distribute to your class to measure their comprehension of the events.

INTRODUCTION AND SUMMARY OF PROGRAM

All of the Earth's weather happens in a six to ten mile thick bottom layer of the atmosphere called the troposphere. Weather dynamics is the study of the changes in temperature, air pressure, moisture, and wind direction in the troposphere. Presented in an effective format designed to promote successful student learning, *Core Meteorology: Weather* examines the key concepts and principles of weather beginning with an examination of weather and what produces weather, then ending with weather forecasting.

Below is a list of the program and its chapters. Using this program, teachers can create a lesson plan to cover the specific concepts and themes discussed.

Core Meteorology: Weather

- Introduction – What is Weather
- Measuring Weather Variables
- What causes weather
- Moisture
- Weather Forecasting
- Hazardous Weather
- Global Warming and Weather

LINKS TO CURRICULUM STANDARDS

The design for this program includes the following curriculum correlations: National Science Educations Standards, Content Standard Grades (6-12) California State Board of Education Content Standards for Earth Sciences (Grades 6-12) and the State of New Jersey Department of Education Core Curriculum Content Standards for 5.8 Earth Science, section B, (Grades 7 – 12); and 5.10, Environmental Studies, Sections A and B, (Grades 7 – 12). The content of this program presents the foundational discoveries and principles of core meteorology, weather in an easy to follow, step-by-step format.

SUMMARY OF PROGRAM

Core Meteorology - Weather

This program on *Core Meteorology* presents the key concepts of what determines weather.

Chapter one introduces viewers to what the weather is.

Chapter two examines the three ways weather information is gathered – satellite, weather balloon and weather stations.

The causes of weather are discussed in chapter three.

The importance of moisture in creating weather is shown in chapter four.

Chapter five looks at the science of weather forecasting.

The dangers associated with hazardous weather are described in chapter six.

Chapter seven looks at the impact of global warming on weather.

Chapter 1 Core Meteorology: Weather – Introduction, What is Weather

Student Goals - In this *Core Meteorology: Weather* chapter the students will learn:

- Weather is what's happening right here, right now in the atmosphere
- There are 6 fundamental weather conditions – temperature, wind, barometric pressure, relative humidity, cloud cover and precipitation

Chapter 2 Core Meteorology: Weather – Measuring Weather Variables

Student Goals - In this *Core Meteorology: Weather* chapter the students will learn:

- Weather information is gathered in three ways today - satellite, weather balloons and surface weather stations
- Meteorologists measure temperature, precipitation, cloud cover, relative humidity, barometric pressure, and wind speed and direction
 - Using computers, all of this data from all the sources can be plotted on a

map

- As a result, a picture of the weather across a region can then be displayed on a computer screen.

Chapter 3 Core Meteorology: Weather – What Causes Weather

Student Goals - In this *Core Meteorology: Weather* chapter the students will learn:

- The principal driving force behind weather - all weather on Earth is ultimately produced by the uneven heating of the Earth's surfaces by the sun
 - The spinning earth on its axis in relationship to the sun contributes in a major way to our constantly changing weather conditions
- The planet's surface near the equator is more highly heated than the surfaces near the poles
 - This produces a large-scale air circulation that flows from the equator to the poles and back
 - Because the Earth spins faster at the equator than at the poles, it produces an effect known as the Coriolis Effect, which means that air also moves in East-West patterns
- What makes weather really complex is moisture: cloud cover, relative humidity and precipitation

Chapter 4 Core Meteorology: Weather - Moisture

Student Goals - In this *Core Meteorology: Weather* chapter the students will learn:

- Water- H₂O- the most miraculous chemical on our planet is essential for life
 - The largest reservoir of water is contained in rivers, lakes and oceans
 - Water is also stored in snow, ice sheets and glaciers
 - The smallest reservoir of water is in the atmosphere in the form of water vapor
 - Through the hydrological cycle, water moves from one reservoir to another and back again
- In the atmosphere, the behavior of water vapor has some interesting properties
 - The amount of water vapor in any given parcel of air is limited by temperature
 - When the maximum amount of water vapor is present in a parcel of air, the air is said to be saturated.
 - What is most important for weather is that the saturation value changes quickly as the temperature goes up or down
 - At 90 degrees Fahrenheit air can contain 13 times more water vapor than at 20 degrees Fahrenheit
 - When warm air rises, it expands and cools
 - When cooler air sinks, it heats up and compresses
- The mechanism that produces clouds is the relationship between moisture and small particles in the atmosphere
 - As water evaporates in rising warm air, it enters air that has a lower saturation point
 - When it hits cooler air with a lower saturation point, the water condenses
 - And from clouds we get precipitation: rain or snow

- Weather is driven by heat energy from the sun, the spinning of the earth on its axis, the differential heating from equator to poles, the differential heating of the various surfaces found on the earth, the rising and falling of heated parcels of air, and finally the distribution relative humidity or water vapor in the atmosphere
- All of these factors must be taken into account when attempting to predict the weather

Chapter 5 Core Meteorology: Weather – Weather Forecasting

Student Goals - In this *Core Meteorology: Weather* chapter the students will learn:

- Weather forecasting today is done by gathering weather data from satellites, radar, weather balloons and ground weather stations
 - This combination of real weather data and computer generated data is called the initial state of the atmosphere
 - At weather forecasting facilities the values for the initial state of global weather are fed into a computer where the laws of physics are applied using a complicated set of interconnected equations
- There are inherent difficulties in predicting weather which can be broken down into three principles
 - The first general principle is that the further into the future a weather prediction goes the less accurate the forecast becomes
 - The second principle relates to size and time: predicting a particular atmospheric phenomenon depends upon the size of the phenomenon and how long it lasts
 - The third principle is the shorter the time of the forecasts the smaller the area that needs to be taken into account to make a prediction

Chapter 6 Core Meteorology: Weather – Hazardous Weather

Student Goals - In this *Core Meteorology: Weather* chapter the students will learn:

- All hazardous weather phenomena are weather extremes
- There are many types of hazardous weather phenomena, which include
 - Thunderstorms, perhaps the most common type of hazardous weather extremes
 - Floods
 - Hurricanes, the most spectacular of the hazardous weather phenomena
 - Ice storms and snowstorms
 - Extreme heat and cold
 - Drought
- Preparing for these weather extremes has become an important part of governmental planning and of risk management in economics

Chapter 7 Core Meteorology: Weather – Global Warming

Student Goals - In this *Core Meteorology: Weather* chapter the students will learn:

- In the 21st century, meteorologists have been tracking the pushing of weather extremes brought about by climate change

- Climate change that has resulted in a general warming of lower atmosphere as a result of added greenhouse gases produced by excessive burning of fossil fuels: coal and oil
- In general high impact weather events will become more frequent and damaging
 - It has been predicted that weather extremes will become more extreme
 - Storms will become more powerful
 - Heat waves will be more frequent and last longer
 - Drought will spread into areas that have not experienced drought before
 - More precipitation will fall in the form of rain rather than snow affecting water supplies

Answers to Blackline Master 1A Quiz

1-a, c, d, f, g, & h; 2-a, d & e; 3-b; 4-a; 5-d; 6-c; 7-b; 8-d; 9-a