



Rain, Rain, Go Away?

Unit Summary

Man has been trying to modify the weather for centuries. *Can the current technological advances allow us to do this? Should we?*

Students will attempt to answer these questions by first understanding the elements that affect the weather. Using weather instruments, students will learn to collect weather data. Through collaborative work, class discussions, and Internet research, the students will gain skills that will allow them to analyze patterns in the data. The new insight that the students gain will be applied to the study of weather disturbances.

As a culminating activity, students will break up into groups to do research on current trends and issues on weather modification. Each group must decide if they are for or against weather modification. For groups who are in favor of weather modification, they will pretend to be a company that offers weather modification services, while groups not favoring weather modification will act as environmental advocates and will promote the negative effects of modifying the weather. They will publish these supporting information on a web site which they will develop for their group. Each group will be given 15 minutes to report to class and present their web site.

Curriculum-Framing Questions

- **Essential Question**
Just because we can, should we?
- **Unit Questions**
Is weather modification good or bad?
How do advances in technology allow us to control the weather?

At a Glance

Grade Level: 7 (1st year high school)

Subject: Science

Time Needed: About 2 weeks (10 one hour class periods) and some extra time when the students are free to do research work.

Things You Need

[Standards](#)
[Resources](#)

- **Content Questions**

How accurately can we predict the weather?

What are the possible means of weather modification?

What are the factors that affect the weather?

Instructional Procedures

Check [implementation plan](#) (DOC 28KB) for things to do prior to and during unit implementation.

Day 1 (Activities on Basic Weather Elements)

- This day is devoted to lessons and activities on the basic weather elements and how these are measured. Students will use actual weather instruments such as barometer, hygrometer, and anemometer in doing the activities. The operating principles of these instruments will be explained using animations and simulations. Students will also visit web sites provided by the teacher, for more detailed information on the operating principles of these instruments. To assess, if students understood how these instruments work, they will submit a report describing the operating principle of a particular weather instrument assigned to their group. This will be submitted the following meeting.

Required output (which will be one of the bases for assessing student learning):

- Report describing the operating principle of a weather instrument.

Days 2 to 4 (The Interrelationships of the Basic Weather Elements)

- Each group submits their report on the operating principle of a weather instrument assigned to them.
- Working in groups, the students will do an [activity](#) (DOC 28KB) where they will explore how the different weather elements affect each other (e.g. pressure and RH are affected by temperature changes, properties of a rising parcel of air change as it rises). The students will be working with a combination of simulations and Microsoft Excel* spreadsheet templates.

Provisions for different learning styles and skill levels.

- For the visual learners, the activities will be in the form of simulations.
- Advanced students will be provided with Microsoft Excel* templates to allow them to experiment with different variables where simple formulae are provided for some weather elements that students can transform.

Required output (at least one of the following, which will be one of the bases of assessing student learning):

- Group [presentation](#) (PPT 122KB) that illustrates the effects of weather elements on each other.
- Microsoft Excel* spreadsheet illustrating numerical relationships between different weather elements or a graph of two different weather elements.

Days 5 to 6 (Weather Disturbances)

- Detailed discussions on weather disturbances (such as thunderstorms, [hailstones](#) (PPT 174KB), tornadoes and typhoons) and how the weather elements change during these phenomena. The teacher will also distribute copies of a teacher-made [newsletter](#) (PDF 393KB) that will inform students about hailstones and how they are made.

Days 7 to 8 (Research on Weather Modification)

- Research on weather modification using a combination of library and Internet research. Groups can do research at home or in school. At the conclusion of the research period, the students have to decide whether they are for or against weather modification.

Days 9 to 10 (Report Preparation and Sharing)

- One day will be allotted for the preparation of the report. Each group develops a [web site](#) (PDF 173KB) to promote the information that supports the stand of their group. The teacher will be available for consultation.

The students will be encouraged to be creative in their report. The groups may use props and additional equipment that will help them in their presentation.

Check [implementation plan](#) (DOC 28KB) for things to do after unit implementation.

Prerequisite Skills

- Use of MS-Office applications (Microsoft Word*, Microsoft PowerPoint*, Microsoft Excel*, Microsoft Publisher*)
- Use of web browsers and search engines.
- Basic graph interpretation skills.

Differentiated Instruction

Resource Student

A different set of materials with more detailed discussions will be provided. Links to additional information on the Internet for access at home.

Gifted Student

Gifted students will be provided with Microsoft Excel* templates to allow them to experiment with different variables. Simple formulae for some weather elements that the students can transform into a Microsoft Excel* template.

Additional work on weather modification focusing on the following topics may also be given to gifted students:

- Evaluation of commercial methods for hail suppression.
- Proposals for small-scale weather modification, e.g. preventing thunderstorms, tornadoes, etc.

Visual Learners

For the visual learners, the activities will be in the form of simulations.

Student Assessment

Group outputs will be evaluated using the following evaluation tools:

- [Multimedia Evaluation Tool](#) (DOC 39KB) - will be used to assess the group's multimedia presentation and
- [Report Evaluation Tool](#) (DOC 39KB) - will be used to assess the group's report in Web site format supporting their stand on whether to modify the weather or not.

Key Word Search

- Changes in the atmosphere
- Cloud formation
- Cloud seeding
- Rain
- Weather
- Weather modification

Credits

Alvin Flores, a former staff of UP NISMED who participated in the Intel® Teach to the Future Training last March 2003, developed this Unit Plan. This is the enhanced version of Mr. Flores' training output.

Note: The hyperlinked support documents are not part of the PDF. They can be downloaded and printed individually.

Designing Effective Projects: Rain, Rain, Go Away?

Content Standards and Objectives

Targeted Philippine Basic Education Curriculum Competencies

This unit covers the following BEC learning competencies in Integrated Science for the topic:

Precision and Accuracy in Data Gathering

- Measuring Instruments

Changes in the Environment

- Demonstrate understanding of the changes in the atmosphere.
 - Explain how changes in different atmospheric factors affect the weather.
 - Discuss how weather is predicted.

Student Objectives/Learning Outcomes

At the end of the unit, the students should be able to:

General Objectives:

- analyze the interrelationship of factors that affect weather
- make simple weather predictions based on analysis of weather data
- illustrate techniques used in weather modification and
- present arguments in support of or against weather modification.

Technology-Related Objectives:

- prepare presentations that clearly illustrate how the different weather elements affect the weather
- use a spreadsheet program in the graphing and analysis of collected data
- work collaboratively in coming up with group presentations and documents
- apply Internet research skills to gather raw materials for use in the reports and presentations and
- summarize results of research work and present the information as a presentation, webpage or a newsletter.

Designing Effective Projects: Rain, Rain, Go Away?

Resources

Materials and Resources

Printed Materials

Activity Sheet on Measuring Dew point

Supplies

- Bond paper
- Ink cartridge or toner for printing
- CDs or floppy disks

Internet Resources

- Costulis, Kay P. "Clouds". September 30, 2002. NASA. February 26, 2003.
http://asd-www.larc.nasa.gov/edu_act/clouds.html*
- Cotton, William R. "Weather Modification by Cloud Seeding". April 21, 1997. Colorado State University. February 26, 2003.
<http://rams.atmos.colostate.edu/gkss.html>*
- Hail Formation.
<http://www.islandnet.com/~see/weather/elements/hailform.htm>*
- Interpreting Weather Satellite Images.
<http://www.bom.gov.au/info/leaflets/satellites.pdf>* (PDF 385KB).
- Lecture Notes on Precipitation.
<http://apollo.lsc.vsc.edu/classes/met130/notes/chapter8/index.html>*
- Spotts, Peter N. "Tinkering With Clouds". The Christian Science Monitor. January 2, 2003. The Christian Science Monitor. February 26, 2003.
<http://www.csmonitor.com/2003/0102/p10s02-sten.html>*

- The source for the hygrometer illustration. Downloaded last February 2003.
<http://www.mtc.com.my/publication/library/drying/ch21.htm>*
- WW2010, The Weather World 2010 Project.
[http://ww2010.atmos.uiuc.edu/\(Gh\)/home.rxml](http://ww2010.atmos.uiuc.edu/(Gh)/home.rxml)*
- Udelhofen, Petra. "Precipitation". November 14, 2001. Atmospheric Sciences at Stony Brook. February 26, 2003.
<http://www.sparc.sunysb.edu/atm205/fall2001/lecture14/index.htm>*

Others

- "Conduction", Microsoft® Encarta® Encyclopedia 2001. © 1993-2000 Microsoft Corporation. All rights reserved.
- "Humidity", Microsoft® Encarta® Encyclopedia 2001. © 1993-2000 Microsoft Corporation. All rights reserved.

Technology – Hardware

- Camera
- Computer(s)
- Digital Camera
- Internet Connection
- Printer
- Projection System
- Scanner

Technology – Software

- Database/Spreadsheet
- Web Page Development
- Image Processing
- Encyclopedia on CD-ROM
- Multimedia
- Microsoft Word* Processing
- Web Browser
- Desktop Publishing