



SNOWSCHOOL

Kindergarten Activities for Schools *Surrounded by Snow!*

About this Guide:

The SnowSchool program was created in 2001 to introduce America's youth to the joy of exploring winter wildlands. Since those early beginnings the program has grown into national network of dozens of sites. Today many SnowSchool sites are located in nature centers, Nordic centers, national forests, national parks and ski areas that engage thousands of participants each winter. This model has worked effectively for reaching students in urban areas, but in many rural mountainous areas students don't need to get on a bus and drive to a nature center to explore the wilds of winter-- they have public land right out the front door of their school. To take better advantage of this opportunity, SnowSchool is now collaborating with schools that are "surrounded by snow" to develop a new program model designed especially for this context. This represents one critical approach in an increasingly diverse array of strategies that WWA is using to connect kids with nature and help them understand the importance of our nation's public lands. By combining our nationally recognized snow science curriculum with fun outdoor exploration, SnowSchool participants gain both an emotional connection to winter wildlands and a greater understanding of their important ecological role.

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The SnowSchool Curriculum

The SnowSchool program aims to inspire a lifelong interest in exploring the wonders of our winter wildlands. Thus the curriculum that accompanies the program is designed to match the interest and abilities of individuals as they grow through life. SnowSchool has been around long enough that, in some places, the first generation of students have now grown up and become educators!

SnowSchool also strives to be much more than a limited “one-and-done” field trip program. Research conducted on the SnowSchool model and field-trips in general demonstrates that in order to maximize student benefits these learning experiences must extend over time and connect classroom study to the field-trip itself. We’ve designed a spiraling curriculum model (right) to do just this, and the details of how to make it happen at your site are captured here in this guide.

Additionally the SnowSchool curriculum is designed to align with existing state science standards, the newer Next Generation Science Standards and the Common Core State Standards. This is important component of the program because SnowSchool is intended contribute to K-12 students’ overall learning and academic achievement. Also, when field-trips are aligned with teachers’ required curriculum it makes it much easier for them to justify their students’ participation. Details regarding this curriculum alignment appear throughout this document.

Between 2012 and 2017 Winter Wildlands Alliance conducted a series of evaluations of the program’s science curriculum. For this evaluation hundreds of students completed pre and post SnowSchool science quizzes. The results showed that when students participated in three simple and specific experiential snow-science/water-cycle activities during the SnowSchool program, dramatic increases in student science learning occurred. These “three essential” activities are fun, help students learn through firsthand experience and encapsulate an important theme of ecological interconnectedness between snowpack, watershed systems and human use of water. To fit into the context of a K-12 school that is surrounded by snow, the SnowSchool three essential activities (snowpack depth assessment, snow/water equivalency experiment and watershed map) have been modified to help students explore these topics each year during their entire K-12 career (hence the spiraling curriculum). Together these activities combine to create a powerful learning experience that solidifies the connection between nature, science and the students’ own lives.

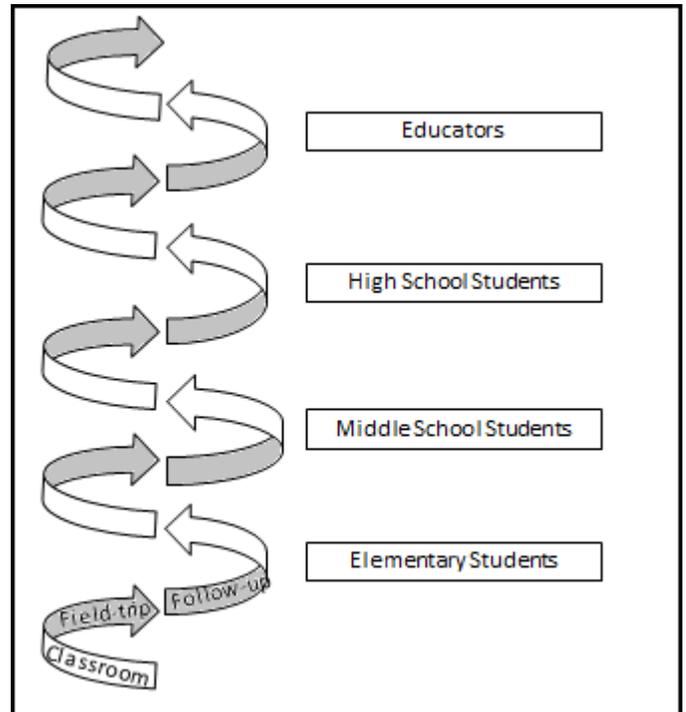


Figure 1: SnowSchool's spiraling curriculum model enables students at a variety of grades levels to explore snow science and ecology in a manner that connects classroom study, field excursions and follow-up extension projects. Eventually SnowSchool students might one-day become volunteer SnowSchool educators and continue their learning through teaching, self-guided study and ongoing SnowSchool trainings.

Snow Science Background Information:

To better understand the relevance of the SnowSchool curriculum you may want to review some of these foundational science concepts.

- **Snow science** is a current field of science exploring questions in three main realms- Water Supply (*How much water do we get from snow?*), Avalanche Forecasting (*What types of snow conditions produce avalanches?*) and Climate Science (*How is annual snowfall and global snow distribution changing over time?*) The SnowSchool program focuses primarily on exploring snow science in the context of Water Supply and Climate Science.
- Snow is part of the **Water Cycle**. Water cycles through the Earth's landscape in an endless process and goes through many changes along its way from the ocean to the mountains and back again. The sun heats the liquid water in oceans and lakes causing the liquid to **evaporate**, or turn into a gas. The water molecules then rise on warm air currents into the atmosphere where they begin to cool which causes **condensation**. Condensation of water molecules from a gas to a liquid usually occurs around a dust particle. When enough molecules condense clouds begin to form. If the condensation process occurs at temperatures below 32 degrees F then ice crystals begin to grow from the water and form **snow crystals** or flakes. Once enough water molecules condense either as a liquid (rain) or as a solid (snow) and join together, they get heavy enough to fall back to the earth. This is called **precipitation**.
- A watershed is an area of land where all the water drains to the same place. Most watershed are named by the river or stream to which they drain. The start of the watershed is located high above at the tops of the surrounding mountains.
- Accumulated mountain snow, usually referred to as the **snowpack**, is a critical component of many watersheds. When it melts it provides liquid **runoff** water for plants, animals and fish in streams and rivers, as well as for human needs such as irrigation and drinking water. In the Western US, for example, snow provides 75-80% of the annual water supply (that's eight out of every 10 glasses students drink at home)! Domestic and commercial use, irrigation supply and recreation are a few of the social and economic impacts that snowpack has on a region. Understanding the important ecological connection between a local community and its snowpack is an essential SnowSchool goal.
- **Depth** is an important measurement of the snowpack that is monitored closely by scientists. Because of factors like elevation, sunlight, shade, plants, temperature and wind the depth of the snowpack varies immensely.
- **Density** is another important measurement of the snowpack that is monitored closely by scientists. Because of factors like melting/freezing temperatures, crystal size/shape, snowpack weight and wind loading, the density of snow can vary greatly within the snowpack. Because the density of water never changes, the density of snow is synonymous with water content. For example, if you melted a container of snow and discovered it was half water, you could say that the density of the snow was 50%.
- **Snow water equivalent** is the depth of water that would result if you instantaneously melted all the snow on the ground in a specific location.

Kindergarten One-Page Curriculum Outline

Group: Classroom of students from Adams Elementary Kindergarten

Focus: Snow and Science

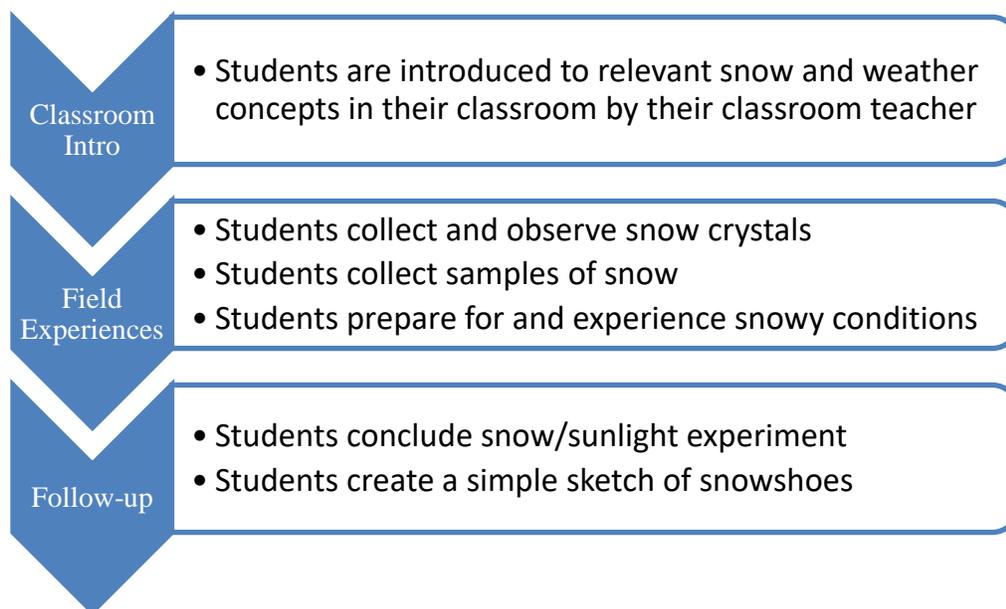
Objectives (what we want the students to learn):

- Students will learn about the basic properties of snow.
- Students will learn about the relationship between snow, sunlight and water
- Students will learn about preparing themselves to be out in snowy weather

Outcomes (how we will know the students learned):

- Students will have the opportunity to collect snow crystals and snow samples
- Students will make observations to determine the effect of sunlight on snow
- Students will prepare for being outside in winter weather and for walking in snow

Three Phases of the SnowSchool experience:



Preparing for Snow

How to do it:

#1 Introduce the Forecast: On a day when it is likely to snow talk with the students about the forecast. Why do we have a forecast? How does it help us prepare? How should we be prepared for a snowy forecast? Discuss appropriate clothing for cold and snowy weather.

#2 Introduce Snowshoes: Describe for the students why people use snowshoes- *Humans have the ability to use tools like snowshoes to help them travel in harsh weather. Snowshoes help people stay afloat and on top of the snow. With snowshoes people sink in the deep soft snow, this makes walking much more difficult.* You can help the students experience this phenomenon by first walking out in the deep snow without snowshoes. Then after a minute or two, put on the snowshoes with the students. *What is the difference? Did they help you stay afloat?* Afterwards have the students draw pictures in the classroom of the snowshoes to explain how they work.

Curriculum Connection:

NGSS (K-ESS3-2): Ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, severe weather.*

NGSS (K-2-ETS1-2): Engineering Design- Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem

Snow Crystal Cards

Evoke a sense of wonder in your students through observing snow-crystals!

How to do it:

This activity works well during times when there is falling or freshly fallen snow. The basic premise is to wait until it is snowing and then produce a bag of pictures/hand-lenses. The pictures should each illustrate a different type of snow crystal. Laminate the cards to protect them from the snow. Attach a hand lens to each card for making closer observations. Tell the kids they need a partner. Start handing out the beautiful snow-crystal cards with the hand lenses attached. With their partner the students can use the hand lenses and look at the shapes of the snow-crystals falling from the sky and piling up on the ground. Encourage the kids to find as many as they can and call out the crystal types as they find them.

Timing: Anytime it is snowing

Duration: 10-15 minutes

Materials: Pre-made (laminated) crystal cards with hand lenses attached

Curriculum Connection: National Education Standards
National Science Education Standards (Earth Science) - Students should develop an understanding of changes in earth and sky

Sunlight on Snow

How to do it: This is a very simple activity that challenges the students' knowledge about the nature of snow and sunlight. Go outside with the students when there is snow present. A couple of clear plastic containers are necessary. Have the students collect equal amounts of snow in each container.

Version 1: Place the containers on a sunny windowsill. Make sure one container is in the sun and the other is shaded (use a piece of cardboard etc to block the shade). **Ask a question:** *How will the sun vs shade affect the snow in the two containers?* Get a hypothesis from every student. **Run the test:** Let the sun shine on the container for a couple hours and see what happens. **Discuss the results.** *What happened? Was there a difference/ What did the sun do to the snow?* When you're back outside on the snow with the kids have them hunt for spots where the sunlight has melted the snow.

Version 2: This activity can be done very similar to the activity described above, except have the student design and build the shade structure. If each student has a cup of snow and a shaded structure you can see which one take the longest to melt.

Materials: Clear plastic cups or other containers. Sun. Pieces of cardboard.

Curriculum Connection:

National Science Education Standards (Physical Science) - Students should develop an understanding of properties and changes of properties in matter.

NGSS (K-PS3-1): Make observations to determine the effect of sunlight on Earth's surface.

NGSS (K-PS3-2): Use tools and materials to design and build a structure that will reduce the warming effect of sunlight on an area.