SNOWSCHOOL

Science of Atmospheric Snow Crystals

This program guide was compiled by Kerry McClay, Winter Wildlands Alliance National SnowSchool Director. For more information about SnowSchool or WWA contact Kerry at **kmcclay@winterwildlands.org**

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 volunteer 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 this addendum outlines a specific project to help connect SnowSchool learning back to the elementary school classroom.

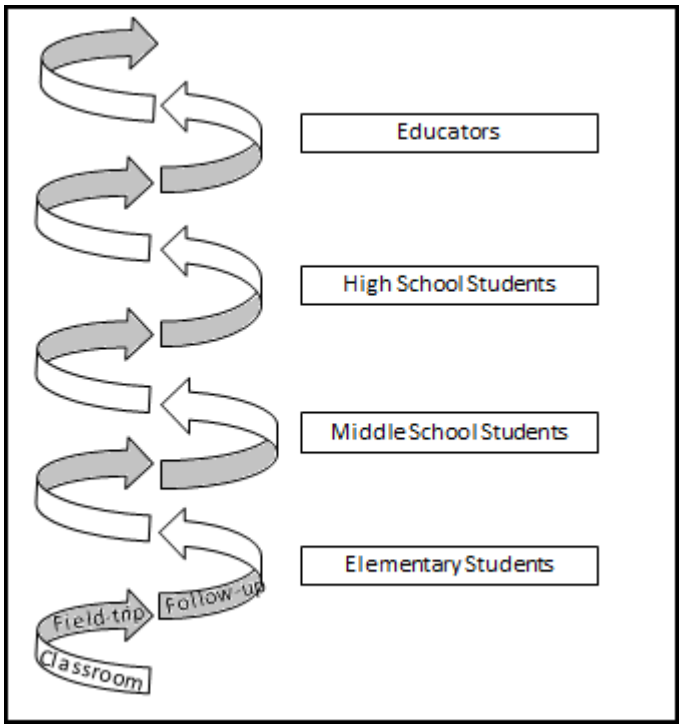


Figure 1: SnowSchool's spiraling curriculum model enables students at a variety of grades levels to explore snow science and ecology in a manner that connects classroom study, field excursions and follow-up extension projects. Eventually SnowSchool students might one-day become volunteer SnowSchool educators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

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 near the end this document.

Make Some Snow

Explore how snow crystals are formed in the atmosphere!

How to do it:

This activity models visually and kinesthetically how snow crystals form in a cloud. A good way to start is to ask the group if they would like to help you "make some snow". Have them stand in a circle and tell everybody that you have just made "a cloud." Ask for three volunteers who are extremely resilient to the cold. You will need one dust particle and two water droplets. These volunteers clasp hands and stand inside the circle. The rest of the group must keep the formation of the circle. Say to the group:

> *On the count of three we are going to create a snow crystal. We (students in the cloud) must create wind and freezing temperatures. We are going to do this by using our hands to "splash" powder-snow into the middle of the circle. This will simulate turbulent wind and freezing temperatures that will bond the water to the dust particle in the cloud. On three your job (students who are dust and water) is to hold hands and bond together in the cloud for about 5 seconds.*

At this point it may be necessary to lay down some ground rules about "splashing" powder snow (no throwing snowballs, ice chunks, etc). Have the kids splash using only their finger tips and show them how to do it. After the dust and water particles have endured their 5 seconds of freezing temperatures have them become part of the snow pack by jumping into the snow. Repeat the process until all snow crystals have been made.

Curriculum Connection:

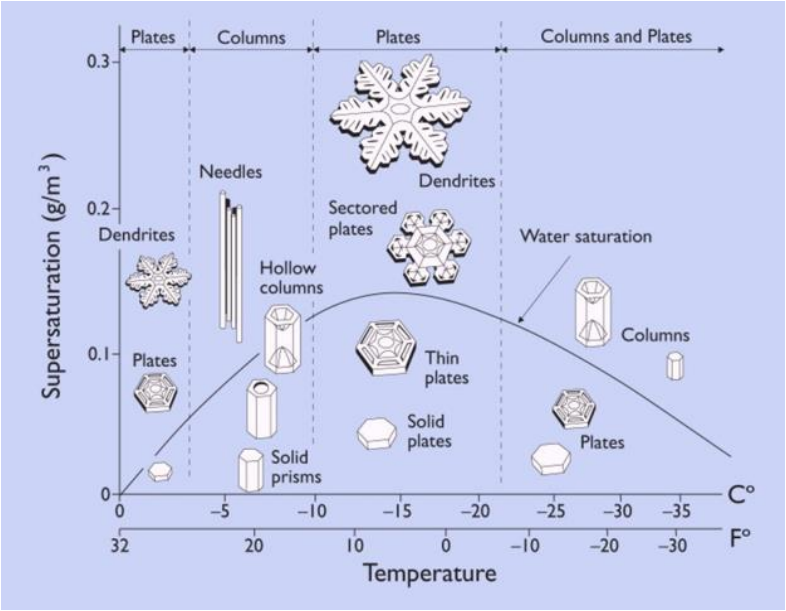
NGSS (3-ESS2-2) Obtain and combine information to describe climates in different regions of the world.

Snow Crystal Cards

Evoke a sense of wonder in your elementary 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. After a while discuss with the kids how super-saturation and temperature affect what types of snow crystals form in the atmosphere (see graph).

Timing: Anytime it is snowing
Duration: 10-15 minutes
Age: 3rd-6th Grade
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

The **Desert Research Institute (DRI)** is a recognized world leader in investigating the effects of natural and human-induced environmental change and advancing technologies aimed at assessing a changing planet. DRI's innovative citizen snow science project is a perfect extension of the activities described above. The information that appears below is taken from DRI's Stories in the Snow webpage https://www.dri.edu/stories-in-the-snow

"DRI is pioneering an exciting and unique approach to the science of snow. The Stories in the Snow project engages community members as "citizen scientists" in real data collection and research throughout the Sierra Nevada.

Every snowflake is unique, and the shape of the freshly-fallen crystals can tell us about real-time atmospheric conditions. Using smartphone technology, you can help track the path a snowflake has taken through the atmosphere. The science of snowflakes is nearly as intricate as the shapes of the snowflakes themselves.

Here's a step by step guide to getting started with Stories in the Snow:

1. Obtain a "Stories in the Snow" kit with a macro lens and snow crystal card via our crowdfunding campaign. Subscribe to our email list for updates!

2. On your smartphone, search "Citizen Science Lake Tahoe" and download the App from either the Apple Store or Google Play

3. Like "Stories in the Snow" on Facebook and follow @StoriesintheSnow on Instagram.

4. Watch the How-to video on our website to learn how to collect snow crystal images.

5. Take a picture with your phone and macro lens, and upload it to the app!"

To get involved visit the website:

https://www.dri.edu/stories-in-the-snow