P.1.12 WEATHER EDUCATION FOR ELEMENTARY AND MIDDLE SCHOOL TEACHERS: USING AMS EDUCATION MATERIALS AS A PROFESSIONAL DEVELOPMENT TOOL

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With the release of the National Science Education Standards by the National Resource Council, professional development became an area of focus for educators across the country. The Standards presented the need for students to become scientifically literate, but also pointed out that teachers of science are responsible for their own professional development. To quote the National Standards, four assumptions about the nature of professional development experiences should be considered when choosing professional development [1]:

- Professional development for teachers of science is a continuous, lifelong process.
- The traditional distinctions between "targets," "sources", and "supporters" of teachers development activities are artificial.
- The conventional view of professional development for teachers needs to shift from technical training for specific skills to opportunities for intellectual professional growth.
- The process of transforming schools requires that professional development opportunities be clearly and appropriately connected to teachers' work in the context of the school.

Many other professional organizations have standards that require hours of professional development, and the teaching profession should be no different. Increasing effectiveness in the classroom is critical to insure the quality of a student's education.

Relevance to real-world applications is a key to helping students understand why a concept is an essential part of the material being taught. Often textbooks only offer a glimpse into how current data or technology can enhance a concept that is introduced in a unit. Being able to access real time data or show how data can be acquired can help a student focus on the real challenges of being a scientist.

Elementary science curricula introduce weather as a concept to be taught at a lower grade level. Elementary teachers are comfortable in allowing children observe the weather, making charts of weather events over a period of time, making cloud books, and reading stories about clouds. Young children are excited about events that relate to weather. Storms, lightning, and snow excite, not only children, but also many adults. People are fascinated about why these events occur. A teacher should be able to explain these events to her students in terms that would expand their curiosity about science and encourage more exploration of weather phenomena. Showing students various weather instruments and how weather data is measured is a start when introducing weather. These instruments are simple to make, and students get excited when they actually work. Drawing clouds and talking about what the clouds tell about the weather encourage writing and observational skills in students. Explaining what each type of cloud means brings realism to their understanding of the appearance of these clouds. Weather has been made real, informative, and applicable in the lives of the younger student. But more important, the teachers need to know the background of each of these concepts. They need to know more than their students.

The middle school curriculum includes concepts ranging from studying high and low pressure systems, analyzing basic cloud information and investigating tornadoes and hurricanes. Students get excited about big events and what happens to the area around them. Tornadoes in Arkansas are big events. Students are always inquisitive about severe weather events, and they always want to know about snow events. When teaching these concepts, teachers should take the opportunity to expand their knowledge and the student's knowledge. Weather can be explained by accessing data provided on the internet. Weather is real. It affects the daily lives of everyone. Explaining and demonstrating how the data can be interpreted can open the doors for students. Weather studies should be taken off the paper and into the world surrounding the student. Incorporating real weather data from sites of the National Weather Service or the National Hurricane Center can heighten the awareness of the importance of having current information to make wise decisions about weather related activities. Another important aspect is to interpret this information so a student can understand what they are seeing on the computer screen. Here again, the teacher is the key to the interpretations. Professional development offered through the Education Division of the AMS has provided these outstanding opportunities. This professional development has opened doors for teachers in the area of weather education and has given them avenues into the professional world of meteorology.

One of the first on-line weather education, profes-

sional development courses was *DataStreme*. The course introduced the basic weather concepts needed to understand clouds, fronts, pressure systems, winds, severe weather, and the interpretation of weather data. Elementary teachers, as well as, middle level and high school teachers took this course to enrich their background in weather. The professional development opportunity was a joint effort of the AMS and the National Science Foundation. This course allows learning to be continuous. Weather is an on-going event, ever-changing and creating new variables. Opportunities for professional growth were provided by *DataStreme*. A team composed of National Weather Service personnel, a public school teacher, and a university instructor led the class. By partnering with the National Weather Service and/or a local university, teachers had the opportunity to see the professional aspect of how weather is important to an individual as well as the community. *DataStreme* was clearly connected to the teacher and the teaching responsibilities they had to their class. The class also provided the opportunity to receive graduate credit in meteorology. These are all important characteristics of professional development.

Another on-line course, recently developed by partnering with AMS, NSF, and NOAA, is *Water in the Earth System (WES).* WES incorporates information about the effects of water in all parts of the Earth's systems: the hydrosphere, the lithosphere, the atmosphere, the biosphere, and the cryosphere. The course challenges teachers to apply data in various ways that can be used for enrichment of their own understanding of ideas such as the water budget, how water vapor flows in the atmosphere, as well as, currents in the ocean, and how vegetation is affected by water vapor. Concepts about water are addressed in ways that give application examples that probably haven't been introduced to students in any textbook. Problems relating to modern events are also discussed in the program. The instructors for this course included NWS personnel or other professionals whose jobs are water related and two public school teachers. Graduate credit was also given for the WES class.

Other AMS publications from *Project Atmosphere* and the *Maury Project* can be used to provide professional development for teachers. These publications can be used to design specific concept development opportunities around the existing curriculum. *Project Atmosphere* modules such as High and Lows, Clouds, Weather in the Newspaper, Severe Weather, and Doppler Radar introduce teachers to specific concepts that can be directly applied to their classroom teaching experiences. These modules provide concept development with objectives, examples, and immediate application of the material in a real-time setting. Understanding of the concepts is tested and mastery can be determined. This type of professional development can impact the classroom competencies immediately.

The *Maury Project* modules can be used in much the same way as the other modules. These modules cover concepts like the Coriolis effect, Measuring Sea Level from Space, Upowelling and Downdwelling, El Nino, and Wind Driven Currents. These modules also provide teachers with access to information and how to apply it to concepts seen in many textbooks. This information contains activities that can be used to enhance the understanding of often-misunderstood information. Again, this material provides an excellent opportunity for professional development that allows a teacher to enhance their knowledge and apply to learning for their students.

The education division of the AMS has provided excellent material for teachers. It has given teachers opportunities to gain deeper understanding of atmospheric and oceanographic concepts. The area of Earth and Space science is often short changed in professional development opportunities for teachers. These courses and modules have certainly opened the door for many teachers to expand their horizons, both literally and figuratively.

[1] National Education Science Standards, National Science Council, 1996, p. 56-57, National Academy Press. Washington, D. C.

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