P1.16   DATASTREME COURSES: TEACHER ENHANCEMENT UTILIZING CURRENT ENVIRONMENTAL DATA AND THE INTERNET

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1.   INTRODUCTION

The American Meteorological Society's (AMS) Educational Program seeks to assist the improvement of science education in K-12 classrooms through implementation of the *National Science Education Standards*. This goal is being accomplished through the offering of three teacher enhancement courses via blended instruction methods. Following course participation each teacher functions as an Earth system science education resource person for his/her colleagues.

2.   DATASTREME PROJECT

In 1995 the National Science Foundation provided funding for The DataStreme Project, a national teacher enhancement course on the basics of weather and climate created by the AMS Education Program. The DataStreme course was offered through Local Implementation Teams (LITs) led by master precollege teachers along with professional meteorologists and college science educators. Partially delivered via the Internet, the DataStreme course proved to be a highly motivational and effective introduction to meteorology for K-12 teachers across the nation. Custom designed course learning materials include a carefully tailored textbook and study guide. The study guide contained the first part of 24 investigations to be finished with activities written by AMS Education Program staff to near-realtime data and delivered twice weekly via the course homepage. Also delivered via the course homepage were daily national weather summaries and supplemental information files in addition to custom designed meteorological data products that are updated as frequently as hourly. The course covers twelve weeks with a chapter of the text setting the principal theme for each week's work. LITs meet at the beginning, middle and end of the semester with all participants, while assigned team mentors maintain weekly contact with each participant. Teachers

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completing the course earn three hours of graduate credit from the State University of New York College at Brockport.

3.   THE DATASTREME MODEL

The effectiveness and success of the DataStreme course was initially evaluated by surveys completed by the participants near the end of the semester in which they were enrolled. After an initial offering, surveys of pedagogical attitude and content acquisition were included at the beginning and end of each term. Evaluations were also given to LIT leaders and members. After several semesters, a survey was given to participants who had taken the course at least one semester previously to assess long-term satisfaction. The high level of satisfaction for the course and its delivery system led to the formalization of the empirical DataStreme Model of teacher enhancement.

The DataStreme weather course, presently termed DataStreme Atmosphere, has been offered each semester since 1995 and has been joined by two additional DataStreme distance-learning, teacher enhancement courses utilizing environmental investigations based on near-realtime telecommunicated data to provide authentic science experiences in an exciting and motivating setting. The blend of several course meetings with personalized weekly mentoring complements the asynchronous course materials. This blend of learning methods has proven to be very popular and successful.

4.   DATASTREME ATMOSPHERE

Evaluations completed by course participants at the end of the term have rated the course as "good" by 95%, the most positive of the three options. They have rated science content as 98% and materials and Internet course delivery approach as 92%. Peer impacts regarding weather content in their teaching even while taking the course averaged 3.8 for a total of 17,800 teachers while the total number of students impacted was almost 700,000.

Pedagogical attitude was assessed by surveys given at the beginning and end of the course, using a 5-category scale from "minimal" to "exemplary" in four

areas. They were the ability to use of weather to meet student needs, to teach science, to manage learning with Internet-delivered data, and to assist colleagues. The course increased the average of individuals' perceived category responses by 1.5 levels, from "rudimentary" to "adequate"/"superior".

General mastery of course topics was also assessed by the number of correct responses to eleven science-content questions. The percentage of correct answers increased by an average of 19%, from 55% to 74%. Both the attitude and content increases were statistically significant at 95% levels (Weinbeck et al. 2002).

As shown in Figure 1 (following page), through the Spring 2003 term, 6238 teachers have been trained in the DataStreme Atmosphere course. Following the course they become weather education resource teachers in their school districts for their peers. Results of a follow-up survey given to alumni at least one-semester after their enrollment indicated that each teacher had approximately 20 interactions with colleagues and impacted 225 students. Employing these averages along with numbers of participants completing the course each year (allowing some attrition of effort with time), we estimate that approximately 225,000 teachers and over 6 million students have benefited from the teachers completing the DataStreme Atmosphere course. For more information, see: *http://www.ametsoc.org/dstreme/index.html*.

5. DATASTREME WATER IN THE EARTH SYSTEM

The success of DataStreme Atmosphere inspired the development of another teacher enhancement course, Water in the Earth System (WES) with NSF support. DataStreme WES focuses on the global water cycle as a vehicle to explore Earth system science. First offered in Spring 2001, WES utilizes the delivery model of DataStreme Atmosphere (i.e., Local Implementation Teams, text and study guide, Internet delivery, several meetings with weekly mentoring). The DataStreme WES course homepage delivers a Weekly Water News file that is continually updated with water-related items from around the world, a supplemental water information file, the second half of twice-weekly learning investigations (delivered each Tuesday and Thursday during the term), and many site links to water topics and environmental information regarding water.

DataStreme WES semester evaluations and beginning/ending surveys follow the same format as DataStreme Atmosphere. Results show the same high participant satisfaction with the most positive response being 97% for the course overall, 98% for science content, and 95% for materials and 94% Internet delivery. DataStreme WES participants' confidence in the pedagogical utility of using water topics for classroom instruction increased by 1.4 categories (same scale as DataStreme Atmosphere noted above). They also improved their content knowledge by 14%, also 95% statistically significant values (Geer et al. 2003).

Figure 2 shows that through the Spring 2003 semester, the WES course had trained 1101 teachers.

Course alumni are also acting as peer trainers on environmental data usage and water cycle understandings for their colleagues. By the same reasoning as that for DataStreme Atmosphere, DataStreme WES participants can have been expected to have impacted over 28,000 teachers and nearly 400,000 students. The DataStreme WES course has received additional support from the National Aeronautics and Space Administration. For more information, see: *http://www.ametsoc.org/amsedu/WES/index.html*.

6. DATASTREME OCEAN

Based on the success of DataStreme Atmosphere and DataStreme WES, and with support from the National Oceanographic and Atmospheric Administration (NOAA), the AMS proceeded to develop and pilot test DataStreme Ocean. DataStreme Ocean is a teacher enhancement course on oceanography. During the Fall 2003 semester, 22 LIT members went through the course materials in a semester schedule arrangement (Geer et al. 2004). Results from that pilot are reported elsewhere in these Symposium preprints. For more information, see: *http://www.ametsoc.org/amsedu/DS-Ocean/Join.html*.

7. AMS/NOAA CPESE

NOAA's long-term and strong support of AMS educational activity in the atmospheric and oceanic sciences by way of summer teacher workshops, together with volunteer employee participation on DataStreme Atmosphere, DataStreme WES and DataStreme Ocean LITs (more than 200), led to the initiation of the Cooperative Program for Earth System Education (CPESE) by AMS.

NOAA is providing support to the AMS Education Program to (a) continue DataStreme Atmosphere beyond its NSF-funded phase, (b) to develop and implement the DataStreme Ocean teacher enhancement distance-learning course, and (c) to encourage greater minority participation by training greater numbers of teachers who are members of groups underrepresented in the sciences and/or teach in schools with large minority student populations.

8. CONCLUSIONS

The AMS Education Program through its DataStreme Atmosphere, DataStreme WES and DataStreme Ocean courses is developing thousands of resource teachers and peer-trainers who in turn interact with hundreds of thousands of their colleagues. Master precollege teachers trained in the AMS Education Program have also been active in the implementation of the National Science Education Standards at their state levels, by writing local state frameworks and assessment materials. They have provided leadership that can be documented as impacting the teaching of science, mathematics and technology in almost 40 states.

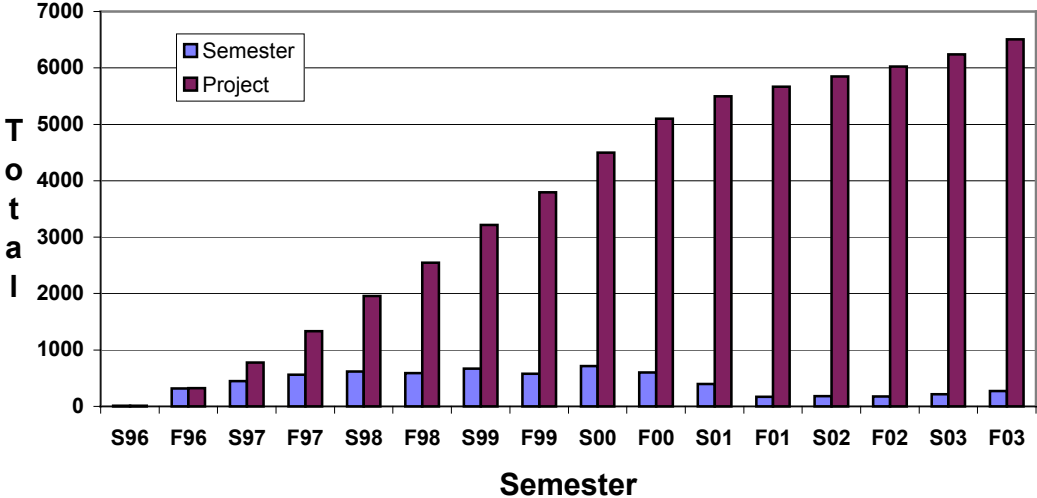# DataStreme Atmosphere Precollege Participants

Figure 1. DataStreme Atmosphere precollege participant completions.
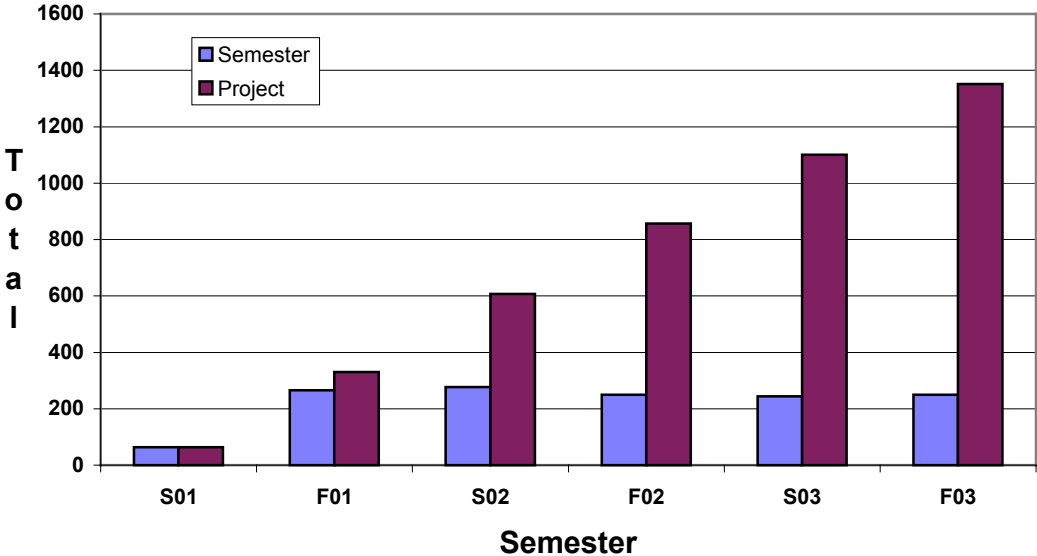
DataStreme WES Precollege Participants

Figure 2. DataStreme Water in the Earth System (WES) precollege participant completions.

9. REFERENCES

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