1.8 DATASTREME: A DISTANCE-LEARNING TEACHER ENHANCEMENT MODEL THAT WORKS!

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1. INTRODUCTION

The DataStreme Project is a unique teacher enhancement program that is based on a partnership of the American Meteorological Society, the National Weather Service, State University of New York at Brockport, and the Cooperative Program for Operational Meteorology, Education and Training (COMET). DataStreme is in its seventh year, well beyond its original design period of five years! (Weinbeck *et al.*, 2001, Weinbeck *et al.*, 2000, Weinbeck *et al*., 1999, Geer *et al*., 1998, Geer *et al*., 1997). DataStreme, supported primarily by the National Science Foundation (NSF), prepares teachers nationwide to become weather education resource teachers in their schools, school districts, and communities. The goal of the Project is to assist the improvement of science education in K-12 classrooms through implementation of the National Science Education Standards (National Research Council, 1996). The keystone of DataStreme is a semester-long, distance-learning course that introduces precollege teachers to a systematic study of the atmospheric environment utilizing real-time weather data delivered via the Internet along with associated learning activities. Following course participation each teacher functions as a weather education resource person for his/her colleagues.

2. RESULTS TO DATE

As described in Weinbeck *et al*. (1999), the DataStreme course was nationally implemented during the 1996-1997 academic year. Figure 1 shows the number of participants enrolled in DataStreme through the Local Implementation Teams (LITs) for each semester and the total number of DataStreme participants successfully trained to become weather education resource teachers through six years of offering. Through Fall 2001, about 5700 precollege teachers will have successfully completed the DataStreme course. Initial projections were to train 4140 teachers.

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Beyond the number of teachers successfully completing DataStreme, impact of the course has been assessed in three different ways. First, evaluations are given to participants at the completion of each semester to gauge their satisfaction with the course, their opinion of the value of the course to their teaching, and their ability to train other teachers. Second, evaluations were sent to selected teachers at least one semester after completing the course to assess the impact the training has had on their weather education enhancement activities. Finally, beginning with the Fall 1997 semester, surveys were given to course participants at the beginning and ending of the term to assess (a) the change in their perception of their ability to be weather education resource teachers and (b) their improvement in level of content understanding.

2.1 *Semester Participant Surveys*

Participant course satisfaction from end-of-semester evaluations over the past ten semesters of national implementation has remained extremely high. An average of 95 percent of respondents rated the course as "Good", the most positive of three possible choices. The averages of most positive response for the science content was 98% while the study materials and Internet course delivery were both 91%. The course's teacher enhancement value was rated "good" by 90% and comparing DataStreme to other teacher enhancement programs, 99% of participants rated it "better" or "equal to". One further indication of course satisfaction is the low dropout rate, an average of only 3.5% over the ten semesters.

Participant reports of the numbers of fellow teachers and students impacted immediately by their course experience averages 3.9 teachers and 147 students each. Total reported teacher interactions have been 15,395 and student impacts were 605,691. It should be noted that these were reported during the term the course was being taken, before many felt they would be most effective not having had time to “digest” the material and coordinate inservice training with their colleagues.

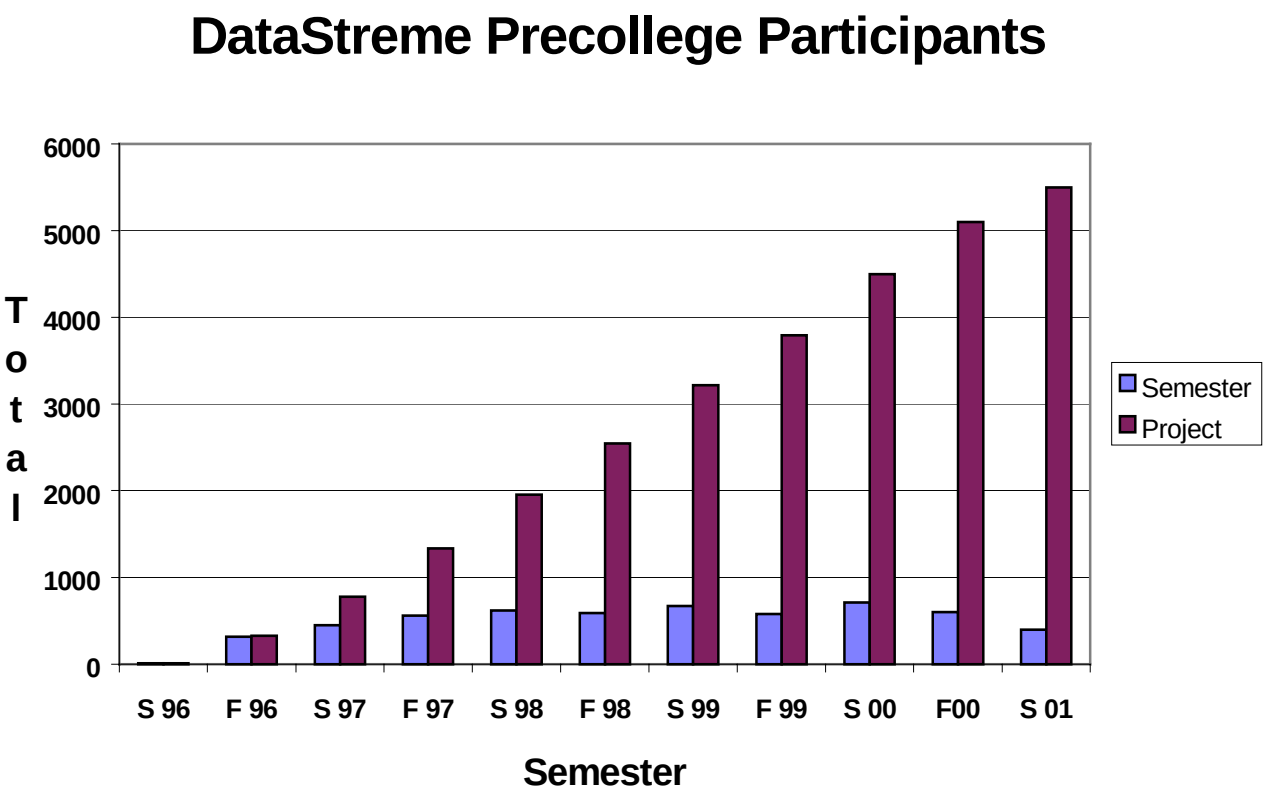

Figure 1. DataStreme precollege participant completions each semester and Project total.

2.2 *Participant Follow-Up Surveys*

Follow-up surveys were sent in Spring 1998 and 1999 to participants who had previously taken the DataStreme course. These longer-term impacts of the course through interactions with colleagues and students indicated the total number of teachers impacted was 8,984, an average of 21 per participant. The total number of students impacted was 96,385, averaging 224 students per participant. (The survey response rate was approximately 50%.)

2.3 *Semester Content Surveys*

Beginning with the Fall 1997 semester, surveys were given to DataStreme participants at the beginning and the end of the semester as a direct measure of the course impact on mastery of science content. Surveys consisted of four pedagogical attitude questions concerning participants' ability to be weather education resource persons and eleven science content questions.

Pedagogical items requested the participant to assess his/her ability to: (1) "use weather to meet student needs", (2) "use meteorology to teach science", (3) "manage learning using Internet sources of weather information", and (4) "assist colleagues to teach weather with the Internet". (A five-category response scale was used.) In the four areas, the average assessment of individual ability had increased 1.5 categories, from “rudimentary” to “adequate"/"superior”, as a result of having taken DataStreme. The content questions showed the difference in the average number of correct responses between the beginning and ending surveys to be 19 percent, from 55% to 74%. Both increases are statistically significant at $p = 0.5$.

3. PROJECTED IMPACTS

The DataStreme Project will train over 5800 teachers directly, about 140% of the initial grant goal. Based on 20 colleague and 225 student interactions per participant, the DataStreme Project will eventually affect 115,000 teachers and about 1,300,000 students. This places DataStreme well on its way to significantly impacting the teaching of science, mathematics and technology in the nation’s schools by using the excitement and immediacy of current telecommunicated data.

4. AMS LEADERSHIP DEVELOPMENT MODEL

The empirical AMS Leadership Model (Geer et al., 1999) describes the steps of training, assertion, and empowerment shown by precollege teachers who have been involved with AMS education programs for several years. DataStreme participants progress through these steps as they peer-train their colleagues and share their

scientific understandings with fellow teachers, administrators, and other educational professionals. DataStreme "alumni" have gone on to develop weather curricula and impact teacher training, standards and assessment at local and state levels. These impacts and achievements will grow over time.

In addition to the demonstrated success of the DataStreme distance-learning course, a compelling argument for its use is the efficiency of scale. A teacher training experience can be provided for one-fifth the cost of the traditional NSF two-week resident workshop. Also, it would need over 200 years of summer AMS resident workshop programs (at 25 participants each) to train the teachers who have taken DataStreme. The use of distance-learning courses coordinated through LITs for AMS teacher enhancement in science, mathematics and technology has provided the model for the AMS' new Water in the Earth System (WES) course (Geer *et al*., 2001).

5. CONCLUSIONS

Through June 2001, almost 5500 teachers were introduced to the fundamentals of meteorology via an innovative, online, distance-learning course, the DataStreme Project. The national course is locally implemented via collegial learning teams consisting of master precollege teachers and undergraduate science faculty along with professional meteorologists who assist participants in developing a content mastery and pedagogical approach to becoming weather education resource teachers in their schools, districts, and communities.

Results of participant questionnaires and surveys, both during and following completion of the course, demonstrate that thousands of teachers have benefited substantially from the experience. DataStreme has developed their confidence to apply their newly acquired knowledge in their own classrooms and to work with their colleagues to improve science education in their schools. Through these first- and second-tier trained teachers, over one million students have had improved science training for careers and life.

6. ACKNOWLEDGMENTS

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