

## 1.7 GLOBAL CHANGE AND REMOTE SENSING SUMMER TEACHER WORKSHOP AND OBSERVATION PROGRAM

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### 1. INTRODUCTION

Although the United States is the most technologically advanced country in the world and technology helps support our high standard of living, the number of students proficient in science and pursuing careers in science is not high enough to meet the needs of our country (Gehring 2001 and Hoff 2001). A specific shortcoming in students' knowledge is in their understanding of Global Warming since students often having misconceptions about Earth Science (DeLaughter et al. 1998).

A team of researchers at the University of Toledo have addressed this issue by developing an educational outreach program to middle and high school teachers and their students. Our program consists of three levels of involvement (Figure 1). To date, 50 teachers have attended a summer workshop. These teachers have

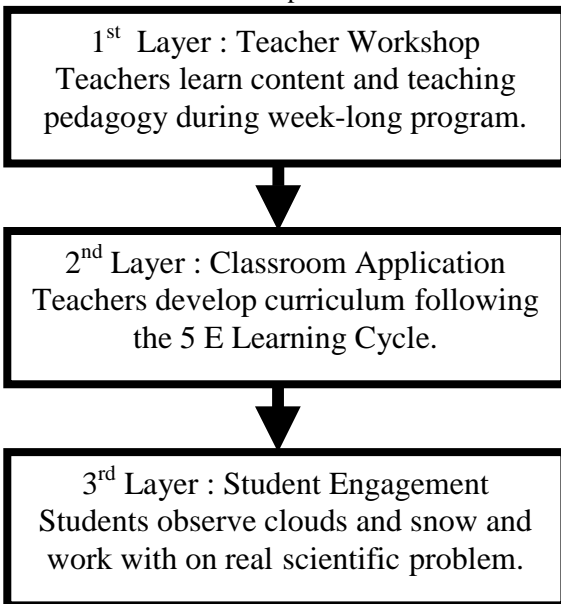


Figure 1. Flowchart of Learning Activities.

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developed and implemented hands-on curriculum. Their students participate in a Meteorological observation program to validate satellite imagery.

### 2. Summer Workshop

The University of Toledo has hosted a NASA sponsored workshop during both the summers of 2000 and 2001 called "Global Change and Remote Sensing Seminar" for teachers in grades 4-12. Thus far, fifty teachers from Ohio, Michigan and Pennsylvania with varied backgrounds have participated in the workshops. This included teachers with science as their major to teachers that did not have any science in college. The teachers expanded their science content knowledge on topics such as the electromagnetic spectrum, solar radiation, energy budget, weather observing techniques and analysis, greenhouse gases and their effects, satellite imagery, Global Warming issues, and human dimensions of global change.

The seminar was held at the University of Toledo's Lake Erie Center (LEC). The seminar was funded by two grants: a New Investigator Program from NASA and the OhioView Consortium, allowing the teachers to attend at no cost to them. In addition, 15 of the teachers each of the years received scholarships from the OhioView Consortium for 3 graduate credits. The teachers investigated curriculum and pedagogical issues. A university educator and teaching consultants from the Ohio Geographic Alliance modeled good, effective science and geography teaching. In addition, a local TV meteorologist spoke to the participants about weather and weather forecasting.

### 3. Curriculum Development

The teachers explored education pedagogical issues, such as the national standards for science and geography, constructivist theory, and the 5 E Learning Cycle (Engage, Explain, Explore, Extend and Evaluate). Each teacher developed three lesson plans

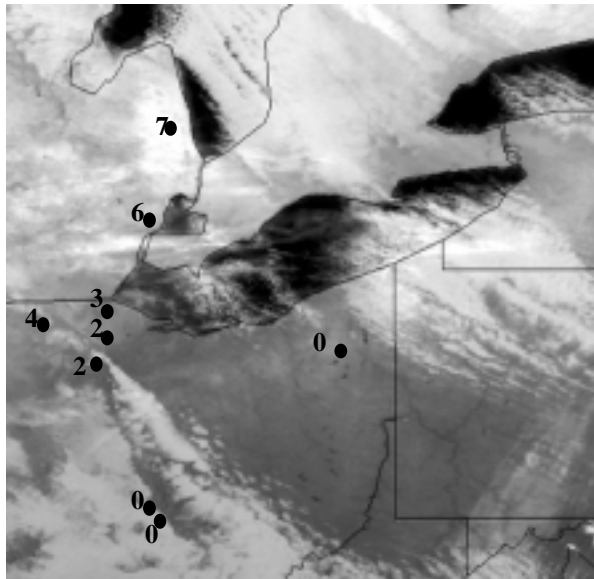
using the 5E model that addressed a topic covered in the workshop. Then these lessons were implemented and revised. After each lesson is reviewed, it will be posted on the department's Global Change and Remote Sensing website making them accessible to all teachers. The teachers also participated in a web course receiving up-to-date information from the university, discussing pedagogical issues and sharing their strategies on what is being done in their classes.

#### 4. Student Observations

The third phase of the program has engaged students as scientists through an observation program in which the students took cloud and snow observations from December 4-12, 2000 Jan. 29 to February 9, 2001, and December 3-7, 2001 to develop a validation data set for cloud/snow distinction. Teachers had their students identify cloud type and percent sky cover, 24 hour snow accumulation and snow water equivalent and total snow depth and snow water equivalent. An example of comparison between student observations and imagery from the Advanced Very High Resolution Radiometer (AVHRR) is shown in Figure 2. The students reported or will report their observations to scientists at The University of Toledo via the Internet. In addition, scientists from UT visited many schools in the program accompanied by a local television meteorologist. This follow-up visit helped disseminate the information about issues like global warming and related a personal commitment of this project to the students. In addition, the a larger part of the community was involved by having two meteorologists from local television stations (Robert Shiels, meteorologist from WTOL-Channel 11 and Andrew Humphrey from Fox Toledo) These meteorologists engaged the students in cloud identification, related this to weather, and added a sense of excitement to the whole project. Over 800 students took part in this first year of observation and we anticipate another 800 this coming year. The scientists are in the process of comparing the data collected, to satellite imagery, to assist in the validation of remote sensing algorithms. have been imported into ArcView and then displayed with AVHRR and MODIS satellite imagery for each day of the observation period. The results are posted on the university's web site for the students to look at. [http://www.utoledogis.org/student\\_observations.html](http://www.utoledogis.org/student_observations.html).

#### 5. Schools Involved

School	City, State
5th Ave. Alternative	Columbus, OH
Amelia High School	Batavia, OH
Bedford High School	Temperance, MI
Bowling Green High School	Bowling Green, OH
Bryant Middle School	Dearborn, MI
Canal Winchester High School	Canal Winchester, OH
Cathedral Christian Academy	Sylvania, OH
Central Catholic High School	Toledo, OH
Clay High School	Oregon, OH
Cleveland Heights High School	Cleveland Heights, OH
Cros-Lex High School	Croswell, MI
Dorr Elementary	Toledo, OH
Drexel Hill Middle School	Drexel, PA
Eastwood Middle School	Pemberville, OH
Everett High School	Lansing, MI
Evergreen High School	Metamora, OH
Findlay High School	Findlay, OH
Hamler Elementary	Hamler, OH
Immaculate Conception School	Columbus, OH
Ingomar Middle School	Pittsburgh, PA
Jackson High School	Massillon, OH
Maumee High School	Maumee, OH
Northgate Elementary School	Columbus, OH
Oak Harbor Jun. High School	Oak Harbor, OH
Oakmont Elementary	Columbus, OH
Ottawa Hills Ele. School	Toledo, OH
Peebles High School	Peebles, OH
Penta Career Center	Perrysburg, OH
Perry High School	Massillon, OH
Pierce Middle School	Grosse Pointe, MI
Regina Coeli	Toledo, OH
Rossford High School	Rossford, OH
Sacred Heart School	Toledo, OH
St. Andrew Middle School	Milford, OH
St. Joseph School	Sylvania, OH
St. Mary's Elementary School	Clyde, OH
St. Ursula Academy	Toledo, OH
Strong Vincent High School	Erie, MI
Terra Community College	Fremont, OH
Thomas Ewing Jr. High	Lancaster, OH
Toledo Academy of Learning	Toledo, OH
Valley View High School	Germantown, OH
Whitmer C.T.C.	Toledo, OH
Worthington High School	Worthington, OH



**Figure 2.** Student observations of snow depth (inches) for Dec. 12, 2000 overlaid on an AVHRR image from the same date and time.

## 6. Acknowledgements

This work is sponsored by a NASA New Investigator Program grant, #NAG-5-8671, an OhioView grant from the NASA Glenn Research Center and the Northwest Regional Professional Development Center (NW RPDC).

## 7. References

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