



High School Students Monitoring Weather Hazards from Space:

Hands-on Training of Weather Hazard Assessment with ArcGIS Explorer

Project: NASA EPO 06-682

Annual and Final Report 2010

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Background

The High School Students Monitoring Weather Hazards from Space Hands-on Training of Weather Assessment with ArcGIS Explorer was a NASA LEWS outreach opportunity in collaboration with NASA, USGS and the Sioux Falls School District.

We proposed to integrate a remote sensing training exercise with High School AP Environmental Science course. Students and teachers were exposed to fundamentals of remote sensing and develop hands-on experience in a decision-making process for identifying drought and flood hazards. An instruction manual and spatial data sets were prepared using ArcGIS Explorer to display and explore data that are used to prepare weekly Weather Hazard polygons by Famine Early Warning System Network (FEWS NET) partners (NASA, NOAA, USGS, etc). At the end of a 5/6-class training session, students were able to draw their drought and flood polygons and compare their results with that produced by a team of FEWS NET partner scientists.

Goal:

To introduce high school students to the concepts, application and value of remotely sensed data for monitoring and assessing the impacts of real hydrologic events on people and the environment.

Year 2010 Activity

For 2010, the one-week training was conducted in parallel for all three schools in the week of May 12-18. The training was conducted over a 3-year period (2008-2010) for a length of 6 days in the first year and 5 days the following 2 years. The first year, Washington High School participated. The following 2 years Roosevelt and Lincoln High Schools were included. The hands-on training was integrated as part of the Advanced Environmental (AP) Science course in the Sioux Falls School District.

A brief overview of each day's topic:

Day 1: Introduction to Remote Sensing – PowerPoint presentation

Day 2: Introduction to ArcGIS Explorer software/data types to be used during the training

Day 3: Weather Condition Indicators (rainfall, runoff, lake level): hands-on

Day 4: Vegetation Condition Indicators (NDVI): hands-on

Day 5/6: Final Weather Hazard Assessment Document preparation by students: hands-on

The pre- and post-self assessment evaluation shows that students gained knowledge about Remote Sensing and GIS, how to interpret remotely sensed data and come up with decisions about drought/flood areas. Also because of the good progression in the 1st year, Day 5 and 6 were combined for the last two years. The following table shows the evaluation results (1-very poor, 5-excellent)

The following table shows the results of 2009 and 2010 side by side.

Summary of Training Evaluation	2009	2009	2010	2010
All Schools: Number of Participants	104	94	89	68
	Pretest	posttest	pretest	posttest
General Training Evaluation:				
How much practical knowledge have you gained from this training?		3.50		3.51
Were the training objectives clear to you?		3.49		3.86
Was the provided course material helpful?		3.62		3.78
Rate the level of your involvement in the activities of this training?		3.78		3.96
What overall rating would you give the training?		3.78		3.81
Specific Training Evaluation:				
Do you have a clear understanding of Principles and Applications of Remote Sensing?	1.94	3.51	1.41	3.45
Can you explain how we get an image from a satellite?	2.41	3.70	2.02	3.71
Are you familiar with ArcGIS Explorer?	1.34	3.87	1.09	3.91
Can you identify a raster value in ArcGIS Explorer?	1.29	3.76	1.00	3.86

Do you know the difference between a shapefile and a raster image?	1.36	3.95		1.05	3.69
Can you explain a Rainfall Estimate Graphic?	1.99	3.89		1.72	3.85
Do you understand what NDVI stands for?	1.34	3.34		1.00	3.20
Can you identify flood/drought areas by looking at raster images?	2.69	3.96		2.18	4.01
Are you familiar with Mircosoft Pro Photo Tools?	1.96	3.06		1.67	2.99
Do you know the meaning and the purpose of the Weather Hazard Document?	1.87	3.50		1.56	3.31
AVERAGE	1.82	3.66		1.47	3.60

On both years (2009 and 2010), the students responded a favorable improvement in their understanding of the basic concepts of remote sensing and GIS. The pre- and post-test evaluations showed that a more than 100% improvement for basic-concept understanding. The average score jumped from 1.82 to 3.66 in 2009 and from 1.47 to 3.6 in 2010 in a scale of 1 to 5. Improvement is calculated as percent-deviation from the pre-test score.

Over the 3-year period, the teachers and students continued to show interest in the hands-on training. The overall result from the 3 years is shown below, highlighting a 120% improved performance with the training. The score changed from 1.65 to 3.63.

Summary of Training Evaluation

All Schools, all 3 years **pretest: 1.65** **posttest : 3.63**

During the 3rd and final year, two (Washington and Roosevelt) of the 3 High Schools conducted the training by themselves with minimal guidance from EROS scientists after holding a one-day workshop with the teachers. Because of a new teacher, support was provided to the Lincoln High School teacher.

To further advance the training opportunity to more schools in South Dakota, the High School teachers put a short introductory course together at the 2010 annual Educator Summer Symposium organized by the Sioux Falls School District, June 3, 2010, Sioux Falls, South Dakota.

Website

Interested parties can download the training manual from the following site:

http://earlywarning.usgs.gov/adds/pubs/NASA_EPO_EROS_PR_TRAINING.zip

Skill and Material Transfer

All three schools have received a training manual (hard copy) and CD files for their use in the future, even after the project is completed. Each of the schools is also provided with a color printer to print digital maps for reports and better communications among students.



The following pictures were taken during the training showing students' active participation on a hands-on exercise with ArcGIS Explorer and during the joint decision-making process for the Weather Hazard Document. The map on the left hand side was created by the students, highlighting drought polygons by different groups representing agencies such as NASA, USAID, USGS etc.

Thank You Letter

Included in this report is a letter of appreciation from the Cheryl O'Brien, High School Curriculum Coordinator. Similar letter were received in the previous two years.



Kent Alberty, President
Darin Daby, Vice President
Debbie D. Hoffman, Member
Doug Morrison, Member
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Dr. Pamela J. Homan, Superintendent

June 30, 2010

To Whom It May Concern:

I am writing to thank the U.S. Geological Survey (USGS) and Earth Resources Observation and Science (EROS) Center for the opportunity to participate in the NASA grant for our high school environmental science students. The grant began with a conversation between one of our District science teachers and a scientist at EROS. Due to the professional interest of the EROS scientist and dedication of our District science teacher we were awarded a grant opportunity which created a partnership between the Sioux Falls School District and EROS Data Center.

The grant provided a unique instructional experience for our high school students. It required them to view and analyze real-time data and make recommendations which impacted people in Africa. In the process, they collaborated together and were independent in much of their learning. These are skills that we work to develop daily in our classrooms.

Our District environmental science teachers benefited from this grant. Their time on-site at EROS Data Center working along side the professionals was beneficial to their development and the skills that they used in the classroom. Ongoing communication through email and with lesson development was an incredible asset to our teachers and students.

I want to thank you for including our District in this grant opportunity and the positive impact it has had on our District high school students and their school communities.

Sincerely,

A handwritten signature in cursive script, appearing to read "Cheryl O'Brien".

Cheryl O'Brien, High School Curriculum Coordinator

Sioux Falls School District