GLOBE Training for Preservice and Inservice Teacher Education at Elizabeth City State University

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### Abstract

Global Learning and Observations to Benefit the Environment (GLOBE) is a K-12 environmental education program supported by National Aeronautics Space Administration (NASA), National Oceanic and Atmospheric Administration (NOAÁ), and National Science Foundation (NSF). GLOBE is a powerful teaching tool that enables students to use hands-on, inquiry-based methods to gather and interpret scientific data. Pathways in Mathematics Education and Remote Sensing (PiMERS) represents a joint effort between Elizabeth City State University (ECSU) and NASA Langley Research Center (LaRC) which held a hybrid regional teacher inservice and student preservice workshop on GLOBE Protocols at on the campus of ECSU located in Elizabeth City, North Carolina in the northeastern region of the state.

### Abstract cont.

A Protocol eTraining took place in January 2017 and the face-toface workshop was held in February 2017. Over a two-week period, students and teachers learned basic GLOBE protocols and formed questions concerning each of the assigned GLOBE topics. During the face to face workshop participants collected data in the field, performed data/laboratory analyses, and compared data submitted by various schools around the world on the GLOBE website. The participants learned about remote sensing and viewed/manipulated images using imageprocessing software, and were introduced to the study of GLOBE Protocols as applied in northeastern North Carolina as well. Teachers and preservice students were excited about this handson experience in GLOBE and stated that this new learning prepared them to pass on this newly acquired knowledge. GLOBE protocols used in the workshop were recommended for incorporation into the current preservice teacher education program at ECSU.

### Abstract cont.

As a result of the GLOBE training, the 2017 PiMERS Mathematics Team at ECSU established three environmental sites on the campus of ECSU. With these three established sites, the research team conducted investigations for the following GLOBE protocols: Clouds, Air Temperature, and Surface Temperature. For atmosphere investigations of air and surface thermometers; minimum, and maximum temperatures were recorded from the area located near the front of the Dixon/Patterson Hall building and the softball field on the campus of Elizabeth City State University. With the newly installed weather station loaned by LaRC, IRT207 Infrared Thermometers and digital multi-day max/min/current thermometers were used to record measurements of air and soil temperatures. For cloud investigations, the total cloud/contrail cover, sky color and visibility, cloud levels: high, mid, and low, and surface conditions were observed and recorded from the open area located near the front of Burnim Fine Arts Complex on the campus of Elizabeth City State University. All cloud observations were done visually.

### Abstract cont.

The collection of environmental data from these three sites around the ECSU campus that encompass these protocols were conducted by four preservice mathematics education students and one university mathematics instructor from the General Studies Program. The team gained a better understanding of Earth System Science, its relationship to mathematics, and interrelated cycles which comprise an integrated system. The mathematics team uploaded the collected environmental data to the GLOBE website and provided environmental data that enabled scientists to help in the study the earth's system. The PiMERS Mathematics Team collected and evaluated obtained data, and created graphical models to express data quantitatively using the GLOBE website data resources.

Keywords—Teacher Inservice Training, Preservice Education, GLOBE Protocols, Atmosphere, Clouds, Surface Temperature, Air Temperature, Remote Sensing, Chi Square Test

# Statement of Purpose

- This research was to teach the importance of GLOBE
- GLOBE training was provided for preservice education students and inservice teachers
- GLOBE training showed how to utilize protocols

# **Research Questions**

- How can preservice and inservice teachers utilize the GLOBE protocols?
- What are the benefits of GLOBE enhance critical thinking skills?
- In what role does GLOBE enhance critical thinking skills?
- Why is GLOBE important for global community?

# What is GLOBE?

- **GLOBE** is an international program that is provided for students, teachers, and the public.
- The program was launched in 1995 after being officially announced by the U.S. Government in 1994.
- GLOBE mission: "to promote the teaching and learning of science, enhance environmental literacy and stewardship, and promote scientific discovery."

# **GLOBE Training Part I**

- Conducted at ECSU with 14 participants and consisted of two sessions
- The first session was lead by Dr. Jessica Taylor from NASA-LaRC
- 3 inservice teachers and 4 preservice students participated in this workshop session



### **GLOBE Training Part I Curriculum**

K-5 Teachers	6-8 Teachers	9-12 Teachers	Pre-Service Teachers (ECSU Students)
Create GLOBE Teacher Account at:	Create GLOBE Teacher Account at:	Create GLOBE Teacher Account	Create GLOBE Pre-Service Teacher
http://www.globe.gov/join/become-a-g	http://www.globe.gov/join/become	at:	Account at:
lobe-teacher/create-a-globe-teacher-ac	-a-globe-teacher/create-a-globe-tea	http://www.globe.gov/join/bec	http://www.globe.gov/join/become-a-g
<u>count</u>	<u>cher-account</u>	ome-a-globe-teacher/create-a-g	lobe-teacher/create-a-globe-teacher-ac
		lobe-teacher-account	<u>count</u>
Conduct online GLOBE eTraining at:	Conduct online GLOBE eTraining at:	Conduct online GLOBE eTraining	Conduct online GLOBE eTraining at:
http://www.globe.gov/get-trained/prot	http://www.globe.gov/get-trained/	at:	http://www.globe.gov/get-trained/prot
<u>ocol-etraining</u>	protocol-etraining	http://www.globe.gov/get-train	<u>ocol-etraining</u>
		ed/protocol-etraining	
<ul> <li>Introduction to GLOBE</li> </ul>			
<ul> <li>Introduction to Atmosphere</li> </ul>			
Clouds	Clouds	Clouds	Clouds
<ul> <li>Surface Temperature</li> </ul>			
Review Elementary GLOBE Teacher	Air Temperature	Air Temperature	Air Temperature
Implementation Guide:			
http://www.globe.gov/documents/348			
830/348842/ElementaryGLOBE_Implem			
entationGuide_en.pdf			
Read Elementary GLOBE Aerosols	Read Dr. C's latest blog post on	Read Dr. C's latest blog post on	Read Elementary GLOBE Aerosols
Storybook:	Urban Heat Islands and his Surface	Urban Heat Islands and his	Storybook:
http://www.globe.gov/web/elementary	Temperature Measurement	Surface Temperature	http://www.globe.gov/web/elementary
-globe/overview/aerosols/story-book	Campaign: <u>http://bit.ly/2hnbLOs</u>	Measurement Campaign:	-globe/overview/aerosols/story-book
		http://bit.ly/2hnbLOs	
Review Elementary GLOBE Aerosols	Watch Recorded Webinar on X,	Watch Recorded Webinar on X,	Watch Recorded Webinar on X, helping
Learning Activities:	helping students and teachers	helping students and teachers	students and teachers prepare for the
http://www.globe.gov/web/elementary	prepare for the GLOBE Science	prepare for the GLOBE Science	GLOBE Science Symposium:
-globe/overview/aerosols/learning-activ	Symposium:	Symposium:	
ities			

# **GLOBE Training Part II**

- A GLOBE certified PiMERS Mathematics Education Team hosted a second session
- A total of 6 student and 1 professor participated in this workshop



### Topics that are associated with GLOBE



- Atmosphere
  - Air temperature
  - o Surface temperature
- Clouds
  - Types of clouds (i.e. high level, mid level)
    - Fog
    - Nimbostratus
    - Cumulonimbus
    - Stratus
    - Cumulus
    - Stratocumulus

### **Instruments Used for Each Protocol**





# Air Temperature

### Digital Multi-Day Minimum/ **Maximum Thermometer**

Data Sheet

\* Required Field

School Name: ECSU Group 2 Study Sile Dixon Hall, Thorpe

Observer names:

Date: Year\_2017\_Month\_3\_\_\_Day\_7\_\_\_Universal Time (hour:min):

Your Time of Reset in Universal Time (hour:min):

Note: If Min/Max Air and Soil Temperatures are being collected after your Time of Reset (e.g., if your Time of Reset is 12:00 and you are reading the thermometer at 12:15) then the date of D1 will be the same as the date you read your thermometer.

If MirvMax Air and Soll Temperatures are being collected before your Time of Reset (e.g., if your Time of Reset is 12:00 and you are reading the thermometer at 11:50) then the date of D1 will be the same as the date prior to when you read your thermometer.

### Multi-Day Min/Max Air Temperature

Label on Thermometer Display	Corresponding Date	Minimum Temperature (°C)	Maximum Temperature (°C)
D1	Dixon(front)	18	21
D2	Thorpe	19	20
D3	Dixon(back)	19	22
D4			
D5			
D6			

### Iti-Day Min/Max Soil Temperature





# Surface Temperature

### **Atmosphere Investigation**

Surface Temperature D	ata Sheet * Required Field
School Name:ECSU Group 2	Study Site: Dixon Hall, Thorpe
Observer names:	
Date: Year 2017 Month 3 Day	7 Universal Time (hour:min):

### \*Surface Temperature

Site's Overall Surface Condition (Select One): Wet Dry Snow

Sample	Temperature Measurement (°C)	Snow Depth (mm) ("if snow selected above)
1	Dixon(front): Grass-14.7	Zero Trace (<10 mm) Measureable (>10mm) mm
2	Dixon(front): Concrete-17.2	zero Trace (<10 mm)     Measureable (>10mm) mm
3	Thorpe: Grass-16.9	zero Trace (<10 mm)     Measureable (>10mm) mm
4	Thorpe: Concrete-17.5	zero Trace (<10 mm)     Measureable (>10mm) mm
5	Dixon(back): Grass-13.7	zero Trace (<10 mm)     Measureable (>10mm) mm
6	Dixon(back): Concrete-16.8	zero Trace (<10 mm)     Measureable (>10mm) mm
7		zero Trace (<10 mm)     Measureable (>10mm) mm
8		zero Trace (<10 mm)     Measureable (>10mm) mm
9		zero Trace (<10 mm)     Measureable (>10mm) mm

### Clouds



National Aeronautics and Space Administration S'COOL Cloud Identification Chart Altitude of Cloud Base Cirrus Cirrostratus Cirrocumulus Contrails CONVECTIVE CLOUDS Altostratus Altocumulus Cumulonimbus 8 Stratocumulus Stratus Nimbostratus Fog Cumulus Students' Cloud Observations On-Line http://scool.larc.nasa.gov

# **GLOBE Survey**

- The survey was completed by both groups of participants in the February and March workshops.
- The survey consisted of a series of 12 questions and was used to gauge what participants experienced from the workshop sessions.
- Responses were monitored using a 5 point likert scale from strongly disagree to strongly agree.

# GLOBE Survey cont.



### Table I

Survey Question	In what role does GLOBE enhance critical thinking?		
	Strongly Disagree/Disagree	Neutral	Strongly Agree/Agree
The learning objectives of the workshop/presentation were clear.	0	0	14
The content of the presentation was relevant.	0	0	14
The presentation setting was conductive to learning.	0	0	14
The presentation facility was clean and comfortable.	0	1	13

Chart I

In what role does GLOBE enhance critical thinking?



# Table II

Survey Question	What are the benefits of GLOBE in the classroom ?		
	Strongly Disagree/Disagree	Neutral	Strongly Agree/Agree
I can apply what I learned from this presentation	0	0	14
The use of technology and visual aids made the instruction easier to remember	0	0	14
I plan on using information from this session in my classes	0	1	13
The session raised my awareness in the STEM field	0	0	14

Chart II

### What are the benefits of GLOBE in the classroom and the community?



## Table III

Survey Question	How can preservice and inservice teachers utilize the GLOBE protocols?		
	Strongly Disagree/Disagree	Neutral	Strongly Agree/Agree
The facilitator was knowledgeable on the subject.	0	0	14
The facilitator exemplified commitment on the subject.	0	0	14
The facilitator kept me interested and attentive.	0	1	13
The facilitator seemed prepared and well organized.	0	0	14

### Chart III

How can preservice and inservice teachers utilize the GLOBE protocols?



# **Chi-Square Test**

 $Chi - square = Sum of \frac{(observed \times frequency - expected \times frequency)^2}{(expected \times frequency)}$ 

8.31529E-07	8.131529E-07	8.131529E-07
8.131529E-07	8.131529E-07	8.131529E-07
8.131529E-07	1.34802E-05	1.34802E-05
1.34802E-05	8.131529E-07	8.131529E-07

## Conclusion

- Participants in the GLOBE workshops and training sessions stated that GLOBE training tended to be beneficial to both preservice students and inservice teachers.
- GLOBE is not only for K-12 science classrooms, but for the purpose of educating the global community as well.
- This program has a variety of lessons that are flexible enough to be used on all grade levels. The online training aids provided a detailed description of each protocol on the GLOBE website.
- Participants of the GLOBE workshops were allowed to conduct research in activities associated with protocols with a positive insight to science, science education, mathematics education, and research techniques.

# Future Works

- The PiMERS Mathematics Education Team will use a weather station loaned from NASA LaRC to collect data that can be added to the GLOBE database.
- The weather station will be placed in a permanent location to conduct continual research.
- Annual events such as the PiMERS Middle School summer program, local school division training, and inservice teacher training will be conducted.
- The PiMERS Mathematics Team and other researchers will be able to monitor the local environment and observe seasonal or monthly changes.
- Presentation this research will be shared to the education department with the recommendation of GLOBE as a part of the curriculum.

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