

MULTI STEM Fall 2018 Earth as a System-Denver

Auraria

JANELLE JOHNSON OCT 31, 2018 07:49AM

Introductions

JANELLE JOHNSON NOV 02, 2018 01:27PM

Please click on this link and introduce yourself here

Make sure to add your focal students please!

MULTI STEM Community 2018-2019

Our community!

PADLET



International Virtual Science Symposium Webinar:

<https://www.youtube.com/watch?v=8wy-etTYkul&feature=youtu.be> — ANONYMOUS

The 2019 IVSS Timeline: Informational Webinar: 25 October

2018 Reports Accepted: 01 January 2019 to 10 April 2019 Due

Date for Student Reports: 10 April 2019 Judging Webinar: 25

April 2019 Judging Period: 26 April to 05 May 2019 Feedback and

Virtual Badges Shared: 17 May 2019 Drawing for Stipends: 17

May 2019 — ANONYMOUS

JANELLE JOHNSON OCT 31, 2018 07:49AM

Our definition of STEM

From Outlier Research: "In all cases, it is clear that some of the most valued components of STEM schools are not STEM-discipline specific, but relate to broader, transferrable, lifelong skills...Educational philosophers such as Dewey, Piaget, Vygotsky, and Bruner have advocated for inquiry and constructivist approaches for over a century. They argued for student autonomy, relevance, collaboration with peers, and learning-by-doing."

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MULTI

Funded by NSF

Community based approach

Focus on teacher PD to more effectively engage underserved students

Earth systems science based learning activities--GLOBE (Global Learning & Observations to Benefit the Environment)

Workshops & research on implementation

Our research: STEM content, 21st century skills, career pathways

Questions about follow up?

Paperwork — JANELLE JOHNSON

JANELLE JOHNSON OCT 31, 2018 07:49AM

Quick look at Padlet

How to find other resources

Remaking the modules

"Like" the padlet for ease

Other questions?

JANELLE JOHNSON NOV 03, 2018 10:11AM

GLOBE: Earth as a System

Perceiving Earth as a system begins when we first feel warmth from sunshine or get wet standing in the rain. Understanding Earth as a system – Earth System Science – requires a quantitative exploration of the connections among all parts (atmosphere, hydrosphere, lithosphere, and biosphere) of the system. The measurements of The GLOBE Program provide students with the means to begin this exploration for themselves.

The processes comprising the global environment are interconnected. Many of the major environmental issues of our time have driven scientists to study how these connections operate on a global basis – to understand Earth as a system.

Introduction

Why Study Earth System Science?

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Studies of the stratospheric ozone layer involve questions about the processes which create and destroy ozone. Scientists have learned that ozone, a chemical primarily found in a layer centered about 25 km above Earth's surface, is connected to biological activity happening in the soil on Earth's surface. Different chemicals, present in the air in trace amounts, control the abundance of ozone in the atmosphere. The sources of these trace constituents include microorganisms in the soil and water, land plants, and even some animals along with human activity.

Scientists studying climate change are also interested in the connections among the different Earth processes. Some of the trace gases in the atmosphere make it more difficult for heat (infrared radiation) to escape from Earth's surface to space. The amounts of these greenhouse gases found in the atmosphere are tied to the physical, chemical, and biological processes taking place in soil and water and on land. They are also influenced by the circulation of the oceans and atmosphere. To predict the future course of the climate we need to understand this detailed fabric of connections.

Ecologists study the way in which the living and non-living components of an ecosystem interact. Individual organisms and species compete and cooperate with one another. In some cases, interdependence is so strong that different plants and animals cannot

reproduce or even exist without each other. There is a web of life with extensive recycling of nutrients, and each organism plays a role. If one component of the ecosystem is changed the effects ripple through the system.

Scientists do not know all the Earth system connections yet, but they keep working to gain a more complete understanding. GLOBE students can help through data collection and student research. GLOBE students and scientists working together will improve our understanding of the Earth system. As students conduct a wide range of GLOBE measurements (perhaps spread over several school years in multiple grades), they should gain a perception that the environment is the result of an interplay among many processes that take place locally, regionally, and globally on time scales ranging from seconds to centuries. This is a key GLOBE lesson. The learning activities in this chapter help students learn this as they study annual variations in environmental parameters (the *Seasons* section) and examine the connections among the various phenomena measured in GLOBE on local, regional, and global spatial scales (the *Exploring the Connections* section).

The Big Picture

The planet we call Earth is made up of five 'spheres', the atmosphere, hydrosphere, lithosphere, cryosphere, and biosphere, connected to each other in a complex web of processes. See Figure EA-I-1. The atmosphere consists of the gases and particles suspended in the air. The oceans, inland water bodies, ground water, and ice sheets (cryosphere), comprise the hydrosphere. The lithosphere refers to the solid earth; the core, mantle, crust, and soil layers (pedosphere). The places on Earth where organisms live are collectively known as the biosphere. Instead of focusing on the individual parts of Earth, Earth system scientists use chemistry, biology, and physics to study the cycles that connect these spheres with each other and with the energy from the sun, which ultimately drives almost all of these processes.

GLOBE® 2014

Introduction - 1

Earth System Science

Earth_as_a_System_Introduction.pdf

PDF document

PADLET DRIVE

JANELLE JOHNSON NOV 02, 2018 01:25PM

What happened to the scientific method?

"This approach often obscures or distorts the processes of inquiry as they are practiced by scientists. Practices, such as reasoning carefully about the implications of models and theories; framing questions and hypotheses so that they can be productively investigated; systematically analyzing and integrating data to serve as evidence to evaluate claims; and communicating and critiquing ideas in a scientific community are vital parts of inquiry. However, they tend to be missed when students are taught a scripted procedure designed to

obtain a particular result in a decontextualized investigation. Furthermore, these higher-level reasoning and problem-solving practices require a reasonable depth of familiarity with the content of a given scientific topic if students are to engage in them in a meaningful way. Debates over content versus process are not in step with the current views of the nature of science.... Science is seen as a fundamentally social enterprise that is aimed at advancing knowledge through the development of theories and models that have explanatory and predictive power and that are grounded in evidence. In practice this means that content and process are deeply

intertwined."(NRC, 2012b, p. 127)

TERRI_LIRA1 NOV 03, 2018 12:24PM

Terri Lira 6th Grade teacher

Just finished a week long water study with MESO team

TERRI_LIRA1 NOV 03, 2018 12:24PM

Robin Staker

We have are weather Station up!!! Good times ahead.

What's the phenomenon/problem?

JANELLE JOHNSON NOV 02, 2018 01:18PM

Essential questions or statement of problem

Example: The amount of carbon entering the earth's atmosphere continues to increase. What are some possible actions we can take to address the problem?



The Earth System

by GeoScience Videos

YOUTUBE

JANELLE JOHNSON NOV 03, 2018 10:07AM

NGSS

Science and Engineering Practices: Constructing Explanations and Designing Solutions:

- Apply scientific ideas, principles, and/or evidence to construct, revise and/or use an explanation for real-world phenomena, examples, or events
- **DCI: ESS3.D: Global Climate Change** Human activities, such as the release of greenhouse gases from burning fossil fuels, are major factors in the current rise in

Earth's meansurface temperature (global warming). Reducing the level of climate change and reducing human vulnerability to whatever climate changes do occur depend on the understanding of climate science, engineering capabilities, and other kinds of knowledge, such as understanding of human behavior and on applying that knowledge wisely in decisions and activities. (MS-ESS3-5)

- **Cross Cutting Concept: Cause and Effect** Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-ESS3-4)
- **Working towards Performance Expectation: MS-ESS3-3** Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.

Fixing Colorado's forests with the help of 'citizen science'

FRISCO - The pine beetle came to Summit County in 2005, turning scores of trees red and creeping higher up the mountainsides each year. Twelve years later, nearly every stand of lodgepole pines has been affected, and they stand in gray, dead clusters, creating headaches for firefighters, forest managers and concerned residents.



DURANGO HERALD

JANELLE JOHNSON NOV 02, 2018 01:17PM

Washington Post story

On sizzling summer days, Northeast D.C. heats up the most, NOAA analysis shows

October 15 Temperatures were off to the races in late August when cars whizzed around Washington and Baltimore, armed with digital sensors, scoping out which parts of these sweaty cities swelter the most. Data was logged every second, 75,000 measurements were processed and then mapped, and now we know Northeast Washington and central Baltimore are afflicted by the most punishing heat on hot summer days.

WASHINGTON POST

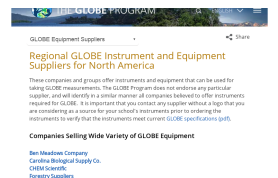
JANELLE JOHNSON NOV 02, 2018 01:15PM

GLOBE Resources

GLOBE Resources

This list of links and notes are resources from GLOBE that may be helpful to your overall GLOBE work.

PADLET



JANELLE JOHNSON OCT 31, 2018 12:48PM

Plants effect on heat islands

Does Plant Selection Influence the Urban Heat Island

The primary cause for the UHI is that humans have replaced vegetated surfaces with hardscapes such as roads, parking lots, and rooftops.



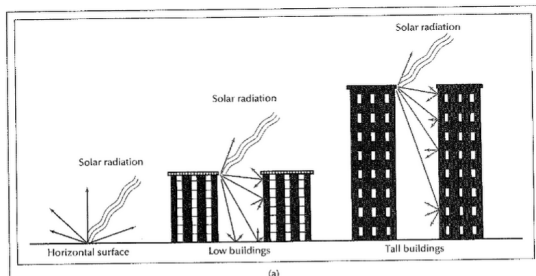
LIVING ARCHITECTURE MONITOR

RICHARD WAGNER NOV 03, 2018 08:59AM

Urban Heat Island Slides

Urban Heat Island Effect

Buildings and pavement absorb and hold heat. Tall buildings prevent heat from dissipating and restrict air flow.



Urban_Heat.pptx

Powerpoint presentation

PADLET DRIVE

Information & resources

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The role of citizen science

Physics model

Computer model picks which roofs to make green - Physics World

Some roof temperatures in Chicago could drop by 8 °C, reducing urban heat island

PHYSICS WORLD



https://www.amazon.com/gp/product/B00837ZGRY/ref=oh_aui_detailpage_o02_s01?ie=UTF8&psc=1 — JULIE PITZ

Here is where you can find an inexpensive infrared thermometer to have your students take part in this campaign.

— JULIE PITZ

JANELLE JOHNSON NOV 03, 2018 10:22AM

GLOBE Earth as a System learning activity

Connections at study site

JANELLE JOHNSON NOV 02, 2018 01:41PM

What are communities doing to alleviate heat islands?

<https://www.epa.gov/heat-islands/what-communities-are-doing-reduce-heat-islands>

JANELLE JOHNSON NOV 03, 2018 11:55AM

DCI card sort

by conduction, convection and radiation.

Heat moves from warmer to colder objects.

Sun is a major source of energy for changes on the Earth's surface.

Energy is conserved.

Chemical reactions take place in every

Weather changes from day to day and over the seasons.

The sun is the major source of energy at Earth's surface.

Solar insolation drives atmospheric and ocean circulation.

Each element moves among different reservoirs (biosphere, lithosphere,

earth_as_a_system_DCI_card_sort.docx

Word document

PADLET DRIVE

Data Collection to Measure Impact of Heat Island Locally

JANELLE JOHNSON NOV 03, 2018 10:08AM

GLOBE Heat Island campaign

<https://www.globe.gov/es/web/surface-temperature-field-campaign/overview>

Local Connections: Earth Systems in the Local Study Site

LC1: Connecting the Parts of the Study Site



Purpose

To help students articulate and integrate their existing knowledge about the air, water, soil, and living things by viewing them as interacting parts of a system

Overview

Students visit a study site, where they observe and recall their existing knowledge of air, water, soil, and living things to make a list of interconnections among the four Earth system components. They make predictions about the effects of a change in a system, inferring ways these changes affect the characteristics of other related components.

Student Outcomes

Students will be able to,

- identify the major components of the Earth system, and give examples from their local study site;
- infer connections among the atmosphere, hydrosphere, biosphere, and pedosphere by describing connections among examples at the study site; and
- predict some ways that changes in one component of the study site might affect the changes in other components.

Science Concepts

Earth and Space Sciences

Weather changes from day to day and over the seasons.
The sun is the major source of energy at Earth's surface.
Solar insolation drives atmospheric and ocean circulation
Each element moves among different reservoirs (biosphere, lithosphere, atmosphere, hydrosphere).

Physical Sciences

Heat is transferred by conduction, convection and radiation.

Heat moves from warmer to colder objects.
Sun is a major source of energy for changes on the Earth's surface.
Energy is conserved.

Life Sciences

Organisms can only survive in environments where their needs are met.
Earth has many different environments that support different combinations of organisms.
Organisms' functions relate to their environment.
Organisms change the environment in which they live.
Humans can change natural environments.
Plants and animals have life cycles.
Ecosystems demonstrate the complementary nature of structure and function.
All organisms must be able to obtain and use resources while living in a constantly changing environment.
All populations living together and the physical factors with which they interact constitute an ecosystem.
Populations of organisms can be categorized by the function they serve in the ecosystem.
Sunlight is the major source of energy for ecosystems.
The number of animals, plants and microorganisms an ecosystem can support depends on the available resources.
Atoms and molecules cycle among the living and non-living components of the ecosystem.
Energy flows through ecosystems in one direction (photosynthesis-herbivores-carnivores-decomposers).

Local_Connections__earth_systems_in_the_Local_Study_Site_LC

PDF document

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Data collection on atmospheric conditions

ANONYMOUS OCT 31, 2018 07:49AM


Earth as a System: Using Graphs to Explore Connections - Coming soon

RICH WAGNER OCT 31, 2018 07:49AM

GLOBE Earth as a System

Local Connections: Earth Systems in the Local Study Site

LC3: Using Graphs to Show Connections



Purpose
To show how graphs of GLOBE data over time display the interconnectedness of Earth's system components at the local level.

Overview
The class explores interconnections among Earth system components by creating graphs of GLOBE student data on air and soil or water temperatures. More advanced students can create graphs with other connected variables, such as precipitation and soil moisture. The class analyzes and interprets these graphs, in response to guidance questions. Each student writes a description of the major interconnections and other variables they have detected in the graphs.

If the school has not yet collected 12 months of its own GLOBE data for this activity, the class should use data and graphs from Reynolds Jr. Sr. High School, a GLOBE school in Greenville, Pennsylvania, USA.

Student Outcomes
Students will be able to:

- Analyze and interpret a graph of GLOBE data that shows air and soil or water temperatures over a year;
- Explain how graphs of GLOBE data can show relationships among components of an Earth system.

Science Concepts
Physical Sciences
Heat is transferred by conduction, convection and radiation.
Heat moves from warmer to colder objects.
Sun is a major source of energy for changes on the Earth's surface.
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Local_Connections_earth_systems_in_the_Local_Study_Site_LC3_Using_Graphs_to_Show_Connections.pdf
PDF document
PADLET DRIVE

Earth as a System Atmosphere Connections

September 29, 2018
Powerhouse Science Center
Durango , Colorado

Climatologist Richard Wagner
Metropolitan State University of Denver



shutterstock.com · 640413589

Local_Connections_earth_systems_in_the_Local_Study_Site_LC3_Using_Graphs_to_Show_Connections.pdf
PDF document
PADLET DRIVE

RICH WAGNER OCT 31, 2018 07:49AM

The ATMOSPHERE and its connections in the Climate System

RICH WAGNER OCT 31, 2018 07:49AM

GLOBE Earth as a System Learning Activity LC1: Connections at Local Field Site

Career Connections

WRENTWEET OCT 31, 2018 07:49AM

GLOBE International STEM Network Members (GISN)

The GLOBE International STEM Network (GISN) is an international network of STEM professionals (Science, Technology, Engineering, Mathematics) that work with GLOBE students around the world conducting science. STEM professionals mentor students and teachers, present scientific ideas, and/or collaborate on scientific research. Each relationship between a STEM professional and a GLOBE school is unique, and is determined by the STEM professional and the school.

Check Out The Website for Career Connections:
<https://www.globe.gov/web/globe-international-stem-network/overview/gisn-members>

WRENTWEET OCT 31, 2018 07:49AM

National Center for Atmospheric Research (NCAR)

At NCAR, they don't forecast the weather. They get inside the weather, climate, and surrounding environment to understand it better. They study the Sun, air chemistry, how the atmosphere interacts with the land and oceans, and how we change and are changed by weather and climate.


Check Out Their Website:
<https://www.youtube.com/watch?v=PVNDI29n8kl>

JANELLE JOHNSON NOV 02, 2018 01:29PM

NGSS Appendix C

College & Career Readiness

Welcome, Janelle Johnson [[Log Out](#)]


(L)

Appendix C: College and Career Readiness

Postsecondary education is now seen as critical to ensure the nation's long-term economic security, to respond to the transformation in both the nature and number of current and projected jobs, and to enable social mobility. Yet, alarmingly, the United States has fallen from ranking 1st among industrialized nations in both high school completion rates and the percentage of adults with a 2- or 4-year degree, to 22nd in high school graduation and 14th in the percentage of 25- to 34-year-olds with a 2- or 4-year degree (OECD, 2012a, p. 26). On the 30th anniversary of the *Nation at Risk* report, key indicators point to our nation being more at risk than ever (Kirwan, 2013):

- Sixty percent of U.S. jobs are predicted to require some form of postsecondary education by the end of the decade (Georgetown University Center on Education and the Workforce, 2013).
- The U.S. Department of Labor notes that companies have reported more than three million job openings every month since February 2011 because of an absence of applicants with the skills to fill these positions (Woelfert, 2012). The National Science Foundation also reports that there are currently between two and three million unfilled positions in the STEM areas of science, technology, engineering, and mathematics.
- The shortfall in STEM employees is likely to increase. The Department of Commerce shows that in the past 10 years, STEM jobs grew at three times the rate of non-STEM jobs, a trend likely to continue and accelerate (Langdon et al., 2011).

Postsecondary education also increases an individual student's chances for a decent, well-paying job. The unemployment rate for recent high school graduates without a college degree was more than 30 percent, while for recent college graduates, it was under 6 percent (Shierholtz et al., 2012). And in terms of earnings, a holder of a bachelor's degree is likely to realize a million dollars more over a lifetime than an individual with only a high school diploma. More troubling is a grim reality underlying these statistics: a child born into a family in the lowest quartile of income has a less than 8 percent chance of earning a postsecondary degree. The Organisation for Economic Co-operation and Development (OECD) observes that children of less-educated parents in the United States have a tougher time climbing the educational ladder than in almost any other developed country (OECD, 2012a, p. 102). The American dream that one's birth circumstances do not control one's destiny is fast slipping away.

The last decade has seen an emerging consensus that effective preparation for student success in postsecondary education and careers includes a strong background in science. In particular, the best science education seems to be one based on integrative, rigorous content with the practices that scientists and engineers routinely use in their work—

NGSS_appendix_C_college_and_career_readiness.pdf
PDF document

PADLET DRIVE

CTDAHLE OCT 31, 2018 07:49AM

Know your biases...Know that you ARE biased!

We all have biases and they color our interactions with kids. We can't avoid having them, they are a product of our upbringing, our education, and the environment in which we live and teach. So the critical thing is to be aware of them and to seek to mitigate any negative impacts they may have on students. It is critical to be aware of student's backgrounds and family situation. Is the family indifferent or hostile to the school, or are they afraid of/intimidated by the school, or perhaps embarrassed?

SAROGERS328 OCT 31, 2018 07:49AM

As a student still in practicum teaching, I interact with many students in many different classrooms. The data collection activity is applicable to many students with difficulties reading, but will also engage students who can read at higher levels. Using collected data will give students a "buy in" to the activity, as they need all of the steps to complete the activity. In my experiences so far, a physical and applicable activity encourages participation and curbs behavioral issues.

My focal student is a boy who is new to our school. He has a language processing disorder and really struggles with reading and writing. He does great in math but does not really try in any other subject if he has to read or write. I think he will be very engaged in the surface temperature activity. He loves any activity that is hands on and active. I am hoping to have him help me to input the data into the website to give him an opportunity to practice some of his literacy skills. — JULIE PITZ

TERRI_LIRA1 NOV 03, 2018 11:50AM

Focal students

ELL and special needs students will both benefit from hands on data collection. With the cloud chart and app, students are able to work independent. This is a big factor for middle school children who do not want a para helping them throughout the day.

TERRI_LIRA1 NOV 03, 2018 12:27PM

Robin Staker

I have two students on IEPs that need to have more hands-on activities to comprehend concepts. The Globe cloud and temperature protocols meet these requirements. I could use the IR thermometer to collect data of various surfaces around our school.

KAY BOLERJACK NOV 03, 2018 12:41PM

Application with Focal Students

STEM

As a student still in practicum teaching, I interact with many students in many different classrooms. The data collection activity is applicable to many students with difficulties reading, but will also engage students who can read at higher levels. Using collected data will give students a "buy in" to the activity, as they need all of the steps to complete the activity. In my experiences so far, a physical and applicable activity encourages participation and curbs behavioral issues.

Feedback & Evaluation

JANELLE JOHNSON OCT 31, 2018 07:49AM

What useful connections did you make during the workshop?

JANELLE JOHNSON NOV 03, 2018 05:46AM

Evaluation

<https://www.surveymonkey.com/r/MULTI-Nov-3-2018>

JANELLE JOHNSON NOV 02, 2018 01:32PM

Upcoming sessions

Save the date!

GLOBE IVSS & SRS

Electrical circuits--STEAM Nov. 17

Earth as a System II--Dec. 1

Discover STEM Career Expo-March

Two day summer institute