EIC Model™
School

Arabia Mountain High

The EIC Model™

using the
Environment as an Integrating Context
for improving student learning

A Guide for Students and Teachers
2013-2014 School Year

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The EIC Model™

http://www.seer.org/pages/eicdetail.html

The Environment as an Integrating Context for learning or EIC, is an educational framework that promotes student interest and achievement in environmental concerns at the local natural level by providing a scientific viewpoint and community surroundings to understand these environmental issues through hands-on interactions. It further provides a systemic context to problem solving as the student's chosen investigation and their subsequent research, writing, and presentation integrate across the curriculum standards. Each student group is responsible for revealing new and differing perspectives and scopes, and then implementing service learning projects and solutions to produce an integrated final project.

EIC days on Tuesday and Thursday of the following weeks 8:00 - 9:32

B-Schedule (Block Schedule)	
First Semester Beginning the week of…	**Second Semester Beginning the week of…**
September 9 September 23 October 14 October 28 November 11 November 18 December 2(EIC pres) December 16 (finals week)	January 20 February 3 February 17 March 10 March 17 April 14 April 28(EIC Pres) May 5(AP/EOCT testing) May 12(AP/EOCT testing) May 19(finals week)

Grade 9

Theme: Ecosystems and Plant/Animal Life

BASIS: *(How do I interact with/affect nature?)*

Essential Question:

How does the reciprocal interaction of biotic and abiotic factors sustain and change local life forms at different organizational levels?

Possible topics:

- Biome/Ecosystem/Community/Population Interactions (identifying significance of)
- Habitat Destruction(identifying locations, causes, and solutions)
- Watershed (what is ours, pos. & neg. issue that affect our watershed, importance of)
- Water Quality (effect on biotic and/or abiotic)
- Invasive Plant Species (Identifying, accessing damage, removal)
- Native Plant History Use (Edible and/or Pharmacia)
- Native Plant Restoration (Identifying & replanting & marking native species)
- Human/Local Species Reciprocal Interactions (Prevention of unwanted organisms/What to do if?)
- Local indicator Species (Ex Lichen for Air quality)(Identification & Monitoring)
- Identifying potential key stone species (Identification & Monitoring)
- Organism perceptions & Human interpretation (identification of a local organism, how they perceive the world via their senses, and how (if) we out able to understand their perception)
- Organism Adaptations-Genetics/Epigenetics/Behavior (identification of amazing local organism adaptations that have allowed their survival in a changing environment)
- Organism Identification (dichotomous key, song/auditory libraries)
- Local Cooperation (local intraspecies behaviors that allow survival)
- Local Symbiosis (concentration on specific type)
- Cooperation vs. Competition (critical comparison of one local organism's intraspecies cooperation and competition behaviors that allow survival, and a final assessment of which behavior type allows more organism success)

A. Research Processes and Design

Ninth grade students would be taught research processes and design. This would include the scientific method, literature search, abstract development, methodology and scientific report.

Culminating Activity: Each student would be required to write a scientific paper on a topic selected from the list provided above using research processes and design, as well as correct MLA or APA style references. No experimental laboratory work will occur, but simple observation based data collection is allowed. Students will prepare an electronic poster or power point suitable for presentation in front of a large audience.

Culminating Activity Fall: Student submission of parts of written paper & power point presentation of

Introduction- relevant background information, the question, the hypothesis, the DV and IV
Methodology- operational definitions, Research strategies
References- Correct Citations of sources

Culminating Activity Spring: Student submission of written paper and research poster presentation of

Abstract, introduction, methodology, results, discussion, references

B. 9th Grade Grading Scale per Semester

Assignments	Point Value	Percent of Score
Deliverables (see excel sheet)	100	30
Midterm work and research	100	20
Final paper and presentation	100	50
TOTAL	**300**	**100**

C. 9th Grade Tentative Schedule (subject to change)

Fall 2013

**Note that underlined dates are student deadlines for submission

Week 1

Sep. 10 - What is EIC?; What is the Scientific Method; What is an Ecosystem? Presentations

Sep. 12 – Review observation with Sci Meth presentation; Outside Scavenger Hunt

Week 2

Sep. 24 – Introduce students to the classroom topic and discuss project expectation by giving and going over their schedule (emphasize due dates) and fall final presentation rubric

Sep. 26 –Refresh class topic, then review questioning with Sci Meth presentation; outside questioning activity

Week 3 no school Monday

Oct. 15 – formulating questions based on observations and inference; all students research to determine if questions are testable

Oct. 17- questions and research con't, 3 questions per group must be submitted by end of EIC to give to coordinators for approval

Note: Submitted questions are the midterm grade

Week 4

Oct. 29- review hypothesis with sci meth presentation; groups choose one approved question to turn into a hypothesis; research focus narrow and con't

Accept research questions to give to coordinators, but will be considered late (11 point deduction)

Oct. 31- Students continue research and record references

Week 5

Nov. 19- Students begin to write up their introduction, methods & citations (references)

Nov. 21- write up continued

Week 6

Nov. 27-Students work on presentations

Nov. 29- Students work on presentations/ Practice Presentations are encouraged

Week 7

Dec. 3- start group paper submissions & presentations on their work of the semester.

Dec. 5- All group papers & presentations must be complete.

D. Service Learning

Each student would be required to complete (10) documented hours of service learning each semester, for a total of 20 hours. See Service Learning Ideas Below. Service learning documentation sheets will be distributed by coordinators as needed.

Service Learning Ideas

Art in the Park

Study significant public artists, focusing on the environmental and cultural impact of their work.
Create art (murals, sculpture, etc.) reflecting pride in the community or region. Arrange to place the art in a local park or public space.

Arabia Mountain Nature Preserve office

A Cookbook of Native Plants

Research native edibles and herbs, and compile and publish a recipe book highlighting native species.
Learn about plant structure and growth, the local environment, local and regional history, and personal health. Draw connections between the environment and human inhabitants.

Edible plants of Georgia

Organism Identification and Census

Learn to identify local birds, and participate in a national or locally-sponsored bird count project. Share this information with local environmental agencies, helping to assess the health of native bird species.

Ga. Native Plant Society
http://www.gnps.org/indexes/Plant_Gallery_Index.php

Bat Houses

Study the life cycle of bats and the natural pest control benefits to the environment that they provide.
Construct bat houses simulating their natural habitat and hang them in a nearby park. Inform local community members about your project and the importance of bat habitat preservation.

Free Bat House Plans
http://www.eparks.org/wildlife_protection/wildlife_facts/bats/bat_house.asp

Why Bat Houses May Fail
http://www.batmanagement.com/Batcentral/batboxes/whyfail.html

Building a Bat House / National Wildlife Federation
http://www.nwf.org/backyard/bathouse.cfm

Interpretive Signs for Trails

Create signs to mark points of interest along a nearby trail. Research the history of the area and learn to identify plants in the region.

National Park Service Lesson Plans
http://www.nps.gov/archive/grsa/resources/curriculum/elem/lesson39.htm

Plant Identification
http://www.amnh.org/education/resources/biocounts/plant_id.php

Invasive Plant Removal

Learn about invasive plants and the challenges of controlling them. Learn to identify and remove the invasive plants found near your school or throughout the community.

Protecting Native Plants and Animals
http://www.nature.org/initiatives/invasivespecies/

Local watershed councils
Local soil and water conservation districts

Prepare a Catalogue of Native Medicinal Plants

Research and identify native plants with medicinal properties. Learn about plant structure and growth, the chemical properties of medicinal plants, and the local environment. Draw connections between the environment and its human inhabitants to create a written catalog and collection of native medicinal plants.

Medicinal Plant Working Group
http://www.nps.gov/plants/medicinal/plants.htm

Plant Identification
http://www.amnh.org/education/resources/biocounts/plant_id.php

Local native plant nurseries

Problem based game design

Use research process, conclusion, and what has been learned to inform and teach others in a motivating and fun way.

Game Design
http://www.kathleenmercury.com/index.html

Reduce School Cafeteria Waste

Use math and science skills to calculate how much food is discarded in your school cafeteria and to find ways to reduce this waste. Share this information with the school board and attempt to implement food waste reduction programs.

Organizing Cafeteria Recycling Programs:
http://ladpw.org/epd/envdef/Teacher-PrincipalPacket.pdf

Rethinking School Lunch Guide
http://www.ecoliteracy.org/programs/pdf/rethinking_waste.pdf

Can We Really Reduce Our Cafeteria Waste? Lesson Plan
http://www.monreocounty.gov/Image/LESSON13.pdf

Tree Identification Project

Learn to identify both native and non-native trees found within the school grounds and community.
Share this information with local government and community agencies to assist in the development of citywide tree plans or other tree-related projects.

Arbor Day Foundation
http://www.arborday.org/trees/whattree/

What Tree Is It?
http://www.oplin.org/tree/

Plant Identification
http://www.amnh.org/education/resources/biocounts/plant_id.php

Overview of the Research Project

The goal of this research project is to teach how to apply a scientific approach to thinking about the world around you. This project is an opportunity for students to immerse themselves in a topic that they are passionate about. Students will conduct independent research that will require creativity, critical thinking, brainstorming, collaboration and organization.

Here is an overview of the research process:

1. Choose an environmental topic. Be creative! A broad range of topics have been researched in the past. See the list of possible research projects ideas.

2. Identify the major issues, problems, or questions surrounding the topic. This process will require that you do background research on the topic using internet and library resources such as books and scientific journal articles.

3. Formulate a research question and a hypothesis about your topic based on your background research. The goal of your research will be to confirm or reject this hypothesis.

4. Your research will require secondary data sources (e.g., information from reliable and valid websites and databases), conduct a preliminary data search to determine what data are readily available for your research.

5. Develop the research methods that you will use to support or reject your hypothesis. Your methods could include one or some combination of field measurements, surveys, questionnaires, online database analysis, and reviews of primary literature publications.

6. Research and record references

7. Gather all resource data, synthesize and analyze the information, Ask yourself (and others): What do the collective data show? Make a chart, table, or diagram to show and to help others understand what was found.

8. Explain/interpret your results. What does it all mean? Ask yourself (and others): Do the collective data support or not support the hypothesis, or is the data inconclusive.

Your final research project report will be written in the format of a scientific paper.

It will include the following sections: abstract, introduction, methods, results (with tables and figures), discussion, conclusion, acknowledgements, and literature cited.

Types of Research Projects

As you begin the challenging process of developing your research project, you will have to decide on the type of research that you would like to conduct. Would you prefer to observe invertebrates in a stream of conduct interviews at a local mall? The type of research that you select will depend on your research question; however, it is possible that you will use multiple types of research to investigate your research question.

I. Primary research

Investigate your research question by collecting new data from the field. This type of research requires that you go to the location you are researching and collect data by recording observations, collecting samples, distributing surveys, or conducting interviews. Ninth grade student are not conducting experiments, but can collect measureable and observable data.

Examples:

Observational

• What species of soil invertebrates do you find in different types of soil?

• What birds over-winter in this area and what types of food do these birds prefer?

Survey/Interview

• Examine local land use practices. Work closely with a farmer to analyze his/her practices and devise a plan to implement more sustainable practices.

• Survey 100 people in town/city of various age ranges. Calculate an average "ecological footprint" for a certain group of people (www.myfootprint.org).

Resource Analysis

• Do an energy audit of your school/home and identify ways to reduce energy consumption.

• Analyze the composition and quantity of the high school waste stream. Identify ways to reduce the quantity of garbage.

II. Secondary research

Investigate your research question using data that was previously collected by an outside source. For this type of research, also known as data mining, you gather secondary data from online databases, publications, or experts. This allows you to examine changes in space and time over a larger scale than if you were to collect the data yourself. You can also download digital maps to use in geographical information systems (GIS).

Examples

Database Research

• Identify whether there is a relation between sea surface temperatures in the Gulf of Mexico and hurricane frequency and intensity.

• Examine trends over time and correlations between economic development indicators and deforestation in Indonesia

• Determine if there is a relation between cereal production and fertilizer consumption over time in the U.S.

GIS Research

• Conduct a spatial analysis of a town to identify the areas suitable for wind mills.

• Use soil maps to identify areas suitable for a specific plant species.

• Examine the changes in land use in a watershed over time.

Research Paper Outline

Abstract

• Brief summary of each section of your paper

Introduction

• Organize your introduction in a logical order.

• Start with the big picture then narrow down to your topic.

• Use the background information from your proposal as a starting point.

• Include many references to convince the reader why this study is important.

• State your objective and hypothesis at the end of the introduction.

Methods

• Use subheadings for each section of your methods (*e.g.,* literature review, field research, statistical analysis).

• State your assumptions (*e.g.,* "Population will grow at the same rate as in 2007").

• State your sources if using secondary data sources such as databases.

• Provide the steps of your research procedure.

• Describe any statistics you use (*e.g.,* averages, standard deviation, regression).

• Use references if you are using methods from a previously published study.

Results

• Use the similar subheadings as in the methods section.

• For each section, state the major result you found.

• Refer to your figures and tables.

• No references

Discussion

• Use subheadings that emphasize the implications of your research

• Interpret your results by referring to other studies. Why did you find these results?

• Use references to other studies to explain the implications of your research results.

• If appropriate, include policy recommendations using references.

• Conduct critical self evaluation. Highlight any methodological or experimental errors that may have influenced the results. Are there any issues that the reader needs to be aware of in order to properly interpret your data?

Conclusions

• Restate the major findings and implications of your research.

• What future research needs to be done to more fully answer your question?

Acknowledgements

• Who helped to guide your research? Who provided materials and funding?

References

- List all references that you cite.

Final Paper Checklist

- ☐ Is the Title specific and informative?
- ☐ Does the Abstract and Table of Contents include all relevant parts of the paper?
- ☐ Have you included enough information in the Materials and Methods section to enable someone else to repeat your study?
- ☐ Have you explained in Materials and Methods the procedures for collecting all the data presented in the Results?
- ☐ Are figures and tables numbered consecutively in separate series?
- ☐ Is every figure and table cited correctly in the text?
- ☐ Do the data in each figure or table agree with your in-text discussion?
- ☐ Do any figures or tables present conflicting data or the same data?
- ☐ Are data in related figures or tables shown in a consistent manner?
- ☐ Is each table and figure understandable apart from the text?
- ☐ Are any important results missing from the Results section?
- ☐ Have you used enough headings and subheadings to guide the reader?
- ☐ Does the Discussion section address the major implications of your findings?
- ☐ Have you considered problems, inconsistent results, and counter-evidence?
- ☐ Have you cited all necessary sources?
- ☐ Are all sources cited in the text listed in the Literature Cited section?
- ☐ Does the Literature Cited section include any sources not cited in the text?

Sample Research Guide:

How to Find Primary Scientific Literature

Locating primary, peer-reviewed literature is a critical step in the research process; however, searching for useful articles can take some practice. Here are several ways you can locate and download primary literature:

Google Scholar (http://scholar.google.com)

• Enter key words related to your topic. The search engine will find relevant primary literature references.

•**IMPORTANT**: Google Scholar will provide you with a link to the article reference but NOT a link to the actual article, because many journals require a subscription to view and download their articles.

Open Source Journals

• Open source journals do not charge readers to access its content. You may search, view, print and save articles for no cost or subscription.

• Examples include: Applied Ecology and Environmental Research, Ecology and Society,

Urban Habitats, Atmospheric Chemistry and Physics, American Journal of

Environmental Sciences, and many more (over 2000 peer-reviewed journals available).

• *Beware*, some journals may not be peer-reviewed.

Websites to Locate Open Source Journals:

Open J-Gate http://www.openj-gate.com

Directory of Open Access Journals http://www.doaj.org

High Wire Press, Stanford University http://highwire.stanford.edu/

BioMed Central- http://www.biomedcentral.com

Scitopia- http://www.scitopia.org/scitopia

Sciru- http://scirus.com

Public Library of Science- http://www.plos.org

Search Tips:

• Search for the article in Google. Click on advanced search, select file format PDF.

• If you can't find any articles immediately, try different combinations of key words.

• Skim the abstract of an article first to decide whether it is relevant to your research.

• Find one really good paper and then look for more articles in the works cited page

• These papers are more likely to be well written and well reviewed.

Secondary Data Sources for Research

What is secondary data research?

• Research that uses, describes, interprets, analyzes and evaluates the primary sources of data.

• Research that assesses, comments on, and discusses the evidence provided by primary sources.

• Research that is one or more steps removed from the event or information they refer to, being written after the fact, with the benefit of hindsight.

Why use secondary data sources?

• Not all research questions require the collection of data in the field. Secondary data is entirely **appropriate** and wholly adequate to draw conclusions and answer the question or solve the problem. Sometimes primary data collection is simply not necessary.

• It is far **cheaper and faster** to collect secondary data than to obtain primary data.

For the same level of research budget a thorough examination of secondary sources can yield a great deal more information than can be had through a primary data collection exercise.

• The **time** involved in searching secondary sources is much less than that needed to complete primary data collection.

• Secondary sources of information can be as **accurate** as primary research. Large databases using large sample sizes can often yield far more accurate results than custom designed surveys from small sample sizes.

• It should not be forgotten that secondary data can play a substantial role in the **exploratory** phase of the research when the task at hand is to define the research problem and to generate hypotheses. The assembly and analysis of secondary data will always improve the researcher's understanding of the problem, the various lines of inquiry that could or should be followed, and the alternative courses of action which might be pursued.

Problems with using secondary data sources

Although the benefits of secondary sources are considerable, their shortcomings have to be acknowledged. There is a need to evaluate the quality of both the source of the data and the data itself. The main problems may be categorized as follows:

Definitions

The researcher must understand the definitions and units of measurement found in secondary data. Suppose, for example, researchers are interested in rural communities and their average family size. If published statistics are consulted, then a check must be done on how terms such as "family size" have been defined. They may refer only to the nucleus family or include the extended family. Definitions may change over time and where this is not recognized, erroneous conclusions may be drawn. Geographical areas may have their boundaries redefined, units of measurement and grades may change and imported goods can be reclassified from time to time for purposes of levying customs and excise duties.

Measurement error

When a researcher conducts fieldwork she/he may estimate inaccuracies in measurement by calculating the standard deviation and standard error. These numbers are often unavailable when using secondary data. The only solution is to try to contact the individuals who collected the original data to obtain information on the level of accuracy.

Source bias

Researchers have to be aware of vested interests when they consult secondary sources. Those responsible for their compilation may have reasons for wishing to present a more optimistic or pessimistic set of results for their organization.

Reliability

The reliability of published statistics may vary over time. It is not uncommon, for example, for the systems of collecting data to have changed over time but without any indication to the reader. Geographical or administrative boundaries may change or the basis for stratifying a sample may have altered. Other aspects of research methodology that affect the reliability of secondary data are a change in the sampling equipment, sample size, response rate, questionnaire design, or modes of analysis.

Time scale

Most censuses take place at 10 year intervals, so data from this and other published sources may be out-of-date at the time the researcher wants to make use of the statistics. The time period during which secondary data was first compiled may have a substantial effect upon the nature of the data.

Online Databases for Secondary Research

Databases with global, national, state, and local data are available online for free and can be used by students to conduct research. These databases are ideal for students who want to examine changes over time or conduct regional comparisons.

Global Databases

Name: EarthTrends: World Resource Institute (WRI)

Link: http://earthtrends.wri.org/#

Description: An online collection of information regarding the environmental, social, and economic trends that shape our world. EarthTrends gathers data from the world's leading statistical agencies, along with WRI-generated maps and analyses, into a single database for rapid searching and retrieving.

Name: International Energy Agency

Link: http://www.iea.org/Textbase/stats/index.asp

Description: The database includes global energy production, import, export, and consumption statistics for different sectors by country.

Name: United Nations (UN) Database

Link: http://data.un.org/

Description: All major UN databases and those of several international organizations are pooled into a single internet environment. Currently, there are 14 databases and 6 glossaries containing over 55 million data points and covering a whole range of statistics including population, industry, energy, trade and national accounts by country.

Name: UN Food and Agriculture Organization (FAO) Statistics

Link: http://faostat.fao.org/

Description: Time-series and cross sectional data relating to food, agriculture, fisheries, forestry production, consumption, trade, prices, and inputs for some 200 countries.

Name: UN FAO Aquastat

Link: http://www.fao.org/nr/water/aquastat/dbase/index.stm

Description: A global information system on water and agriculture. Its aim is to provide users interested in global, regional and national analyses with comprehensive information related to water resources and agricultural water management across the world, with emphasis on countries in Africa, Asia, Latin America and the Caribbean.

Name: UN World Health Organization Data and Statistics

Link: http://www.who.int/whosis/en/index.html

Description: An interactive database that brings together core health statistics for the 193 WHO Member States. It comprises more than 70 indicators, which can be accessed by way of a quick search, by major categories, or through user-defined tables.

Online Databases for Student Research

Name: United States Central Intelligence Agency (CIA) World Factbook

Link: https://www.cia.gov/library/publications/the-world-factbook/

Description: Provides summaries of the demographics, geography, communications, government, economy, and military of countries around the world.

United States Databases

Name: AIRNow

Link: http://airnow.gov/

Description: Contains historical air quality measurements from sites across the U.S.

Name: AWS Truewind Navigator

Link: http://navigator.awstruewind.com/

Description: Interactive mapping tool from AWS Truewind, a wind energy company. The online mapping tool depicts the approximate annual average wind speed across a 2.5-km_2 wide grid across the United States created by using atmospheric models and historical weather data. The map is intended to provide a general indication of the wind resource over large areas, and should not be used to design specific wind projects or to estimate energy production.

Name: Major Land Resource Areas (MLRA) Explorer

Link: http://www.cei.psu.edu/mlra/

Description: Interactive map-based tool queries U.S. physiography, geology, land use and other data to generate reports. Provides specific subsets of the USDA Agriculture Data.

Name: NestWatch

Link: http://watch.birds.cornell.edu/nest/export/index

Description: NestWatch is a continent wide citizen-science project and nest-monitoring database of the Cornell Lab of Ornithology, funded by the National Science Foundation and developed in collaboration with the Smithsonian Migratory Bird Center. Of note is the ability to use Google Maps to explore nest data.

Name: North American Breeding Bird Survey (BBS)

Link: http://www.pwrc.usgs.gov/BBS/

Description: The BBS monitors the status and trends of North American bird populations.

Data are collected by thousands of participants along thousands of randomly established roadside routes throughout the continent. Population data and population trend analyses are available on more than 400 bird species.

Name: Starkey Project

Link: http://www.fs.fed.us/pnw/starkey/index.shtml

Description: Long-term data sets available from a 10-year study in Oregon designed to measure the population response of deer and elk to the intensively managed forests and rangelands.

Name: U.S. Census

Link: http://www.census.gov/

Description: Economic and demographic statistics by area for populations in the U.S.

Name: U.S. Center for Disease Control National Center for Health Statistics

Link: http://www.cdc.gov/nchs/

Description: The Nation's principal health statistics agency. Data are collected from birth and death records, medical records, interview surveys, and through direct physical exams and laboratory testing.

Name: U.S. Department of Agriculture (USDA) Plants

Link: http://plants.usda.gov/

Description: Contains data on plants such as range, nativity, invasive status, wetland indicator status, ethnobotanical uses, wildlife value, and species life history information.

Name: U.S. Energy Information Administration

Link: http://www.eia.doe.gov/

Description: Official energy statistics from the US government on energy production from different types of energy sources and energy use within different sectors of the economy.

Name: U.S. Geological Survey (USGS) Water Data

Link: http://waterdata.usgs.gov/ny/nwis/rt

Description: Stream flow records available for many rivers in streams throughout the US.

Name: U.S. National Agriculture Statistics

Link: http://www.nass.usda.gov/

Description: The USDA's National Agricultural Statistics Service (NASS) conducts hundreds of surveys every year and prepares reports covering virtually every aspect of U.S. agriculture. Production and supplies of food and fiber, prices paid and received by farmers, farm labor and wages, farm finances, chemical use, and changes in the demographics of U.S. producers are only a few examples.

Name: U.S. National Oceanic & Atmospheric Administration National Climatic Data Center

Link: http://www.ncdc.noaa.gov/oa/about/about.html

Description: The world's largest active archive of weather data. Our mission is to provide access and stewardship to the Nation's resource of global climate and weather related data and information, and assess and monitor climate variation and change.

Name: Web Soil Survey (WSS)

Link: http://websoilsurvey.nrcs.usda.gov/app/

Description: Provides national and local soils data and information from the USDA's Natural

Resources Conservation Service (NRCS). NRCS has soil maps and data available online for more than 95 percent of the nation's counties and anticipates having 100 percent in the near future.

Georgia Online Databases for Student Research

Name: Bird Atlas

Link:

Description: This database contains a comprehensive, statewide survey that reveals the current and historical distribution of local birds.

Name: The Georgia State Department of Environmental Conservation

Link:

Description: Data are available on include monitoring, permitting, inspections, wildlife and habitat. Information on environmental permit applications is available using the Permit Applications Search (DART)

Name: Air monitoring network

Link:

Description: Data on air pollutants from sites across Ga. If more data are required, you can contact the DEC through the website and request more information.

Name: GA Geographical Information System (GIS) Clearinghouse

Link:

Description: Free, downloadable GIS maps are available for GA

Name: School Power Naturally Performance Data NY

Link: http://www.powernaturally.org

Description: Contains daily and monthly data on power generated by solar panels located on the roofs of 50 schools across NYS.

Name: Audubon Society

Link: http://www.audubon.org

Description: Audubon members conduct annual waterfowl counts, Christmas bird counts, nighthawk migration and other bird counts which may be available upon request. The website contains a checklist for all birds found in local.

Name: Project Watershed

Link: http://projectwatershed.org/watershed_manage/

Description: A water quality database of the chemical, physical and biological properties of streams and lakes measured by volunteers and schools.

Name: SUNY-ESF Environmental Monitoring

Link: http://www.esf.edu/hss/em/index.html

Description: Stream water chemistry data available from the Adirondacks since 1995. Meteorological data are also available from sites in the Adirondacks and around Syracuse. In the future, air quality data from Syracuse will be included.

Other Tools

Name: ArcGIS Explorer

Link: http://www.esri.com/software/arcexplorer/explorer.html

Description: A free, downloadable application that can be used to create custom maps and perform spatial analysis.

Developing an Effective Search Strategy

Step 1: THINK about your search before you begin.

Ask yourself, what do I want to do?

1. Browse?

2. Locate a specific piece of information?

3. Retrieve everything I can on the subject?

Your answer will determine how you conduct your search and what tools you will use.

Step 2: CREATE your search statement.

Tips for creating a search statement:

1. Be specific.

2. Whenever possible, use nouns and objects as keywords.

3. The most important terms should be first in your keyword list.

4. Use at least three keywords in your query.

5. Combine keywords, whenever possible into phrases.

6. Avoid common words, e.g., the, an, and, water (unless they are part of a phrase).

7. Think about words you'd expect to find in the body of the page, and use them as keywords.

8. Write down your search statement and revise it before you type it into a search engine. Figure out what works for your topic.

Step 3: APPLY basic search strategies or Boolean Logic to your search statement

Searching with Boolean Logic

Boolean logic takes its name from British mathematician George Boole (1815-1864), who wrote about a system of logic designed to produce more accurate search results through the formation of precise queries. The operators of this logic are: **AND**, **OR**, and **NOT**, which are used to link words and phrases for more precise queries.

Boolean Logical Operators

• **AND** – Narrows your search by retrieving only documents that contain every one of the keywords you enter. Be careful; the more terms you enter, the narrower your search becomes.

• **OR** – expands your search by returning documents in which either or both keywords appear. Since the **OR** operator is usually used for keywords that are similar or synonymous, the more keywords you enter, the more documents you will retrieve.

The SUNY-ESF Research Guide for Students and Teachers 11

Developing an Effective Search Strategy

• **NOT** / **AND NOT** – limits your search by returning only your first keyword but not the second, even if the first word appears in that document, too. Note that **AND NOT** sometimes can be typed as **ANDNOT** (without space).

Nesting Operators:

• Using parentheses is an effective way to combine several search statements into one search statement. Parentheses separate keywords when you are using more than one operator and three or more keywords.

Other Search Strategies:

• (+) and (-): Use in front of words to force their inclusion (+) and/or exclusion (-) in searches. Do not use a space between the sign and the keyword. Example;

+lake –fish

• (" "): Use around phrases to ensure they are searched exactly as is, with the words side by side in the same order. Example; "Onondaga Lake Partnership"

• (*) wildcards: Use to look for variations in spelling and word form. Example;

library* returns library, libraries, librarian, etc. colo*r returns color (American spelling) and colour (British spelling)

• Type keywords and phrases in lower case to find both lower and upper case versions. Typing capital letters will usually return only an exact match.

• Remember you can combine phrases with keywords using the double quotes and the plus (+) and minus (-) signs. Example; +buffalo +animal -"Georgia"–chicken

9th Grade EIC - Fall 2013 Week 1 Schedule

How do human social systems and non-human natural systems impact each other?

EIC Week 1:

Dates	Task
9/10	➢ Take roll ➢ Have "Three Questions" on Board as a Warm Up. Students should write questions and attempt to answer them using what they think. ➢ Students will answer the Three Questions again (no erasing) using the presentations. ➢ Complete the What is EIC presentation. Students write down what EIC is according to the presentation. ➢ Complete the Scientific Method Presentation. Students write the steps of the scientific method and define them with the presentation. ➢ Complete the Ecosystems presentation. Students write the definition of an ecosystem AND the organization of an ecosystem from organism to biosphere. ➢ If time remains ask students to introduce themselves to class –we do not want to allow or encourage down time! ➢ For Thurs: Announce to students to dress appropriately for going outside and to bring their own cameras, phones with camera if possible for activity.
9/12	➢ Take roll ➢ Complete the Observation Review presentation. ➢ Have students form or place students in teams of 4 or 5 ➢ Give each team a manila folder. Have students write their names on the folder sheet. ➢ Student groups complete Scavenger hunt with sheet and plastic bag. Timed: 45 mins ➢ Students return to class to sketch and organize their hunt findings and complete WS. ➢ Students should submit their completed sheet inside the group manila folder. The folders should be kept by the teacher.

Week 1 Grades:

- **EIC/Sci Method/Ecosystem notes**

Week 1 Supplies:

Tues:

- EIC Roster
- Three Questions Warm up ppt
- EIC ppt
- Scientific Methods ppt
- Ecosystem ppt

Thurs:

- Observation review ppt
- Folders (supplied)
- Grocery Bags (supplied)
- Scavenger sheet per group (make copies)

9th Grade EIC - Fall 2013 Week 2 Schedule

How do human social systems and non-human natural systems impact each other?

EIC Week 2:

Dates	Task
9/24	➢ Take role ➢ Students should be sitting with their groups, pass out group folders. ➢ Review Organization of Environment from organism to biosphere verbally or from Ecosystem ppt presentation. ➢ Distribute "Identifying Organization Levels and Interactions of Ecosystems" WS to each group ➢ Read over the instructions together and ensure student understanding before going outside. Inform students that completion of sheet is a grade this week. ➢ Due to congestion when outside last EIC week, take your class to areas of the school grounds away from other classes. ➢ On returning inside, take role again
9/26	➢ Take role ➢ Students should be sitting with their groups, pass out group folders. ➢ Teachers present the class topic to students. ➢ Present Arabia mountain ecosystem ppt. Student take notes on presentation. ➢ From notes and prior knowledge, students will brainstorm in their groups the importance of their topic. Then, students should create a list of at least 5 identified items that they will research further and why they have been identified as important. Allow research using class computers or student devices if time allows. ➢ Brain storming, research list, notes should be submitted at the end of class

Week 2 Grades:

- **Identifying Organization Levels and Interactions of Ecosystems WS completion**

Week 2 Supplies:

Tues:

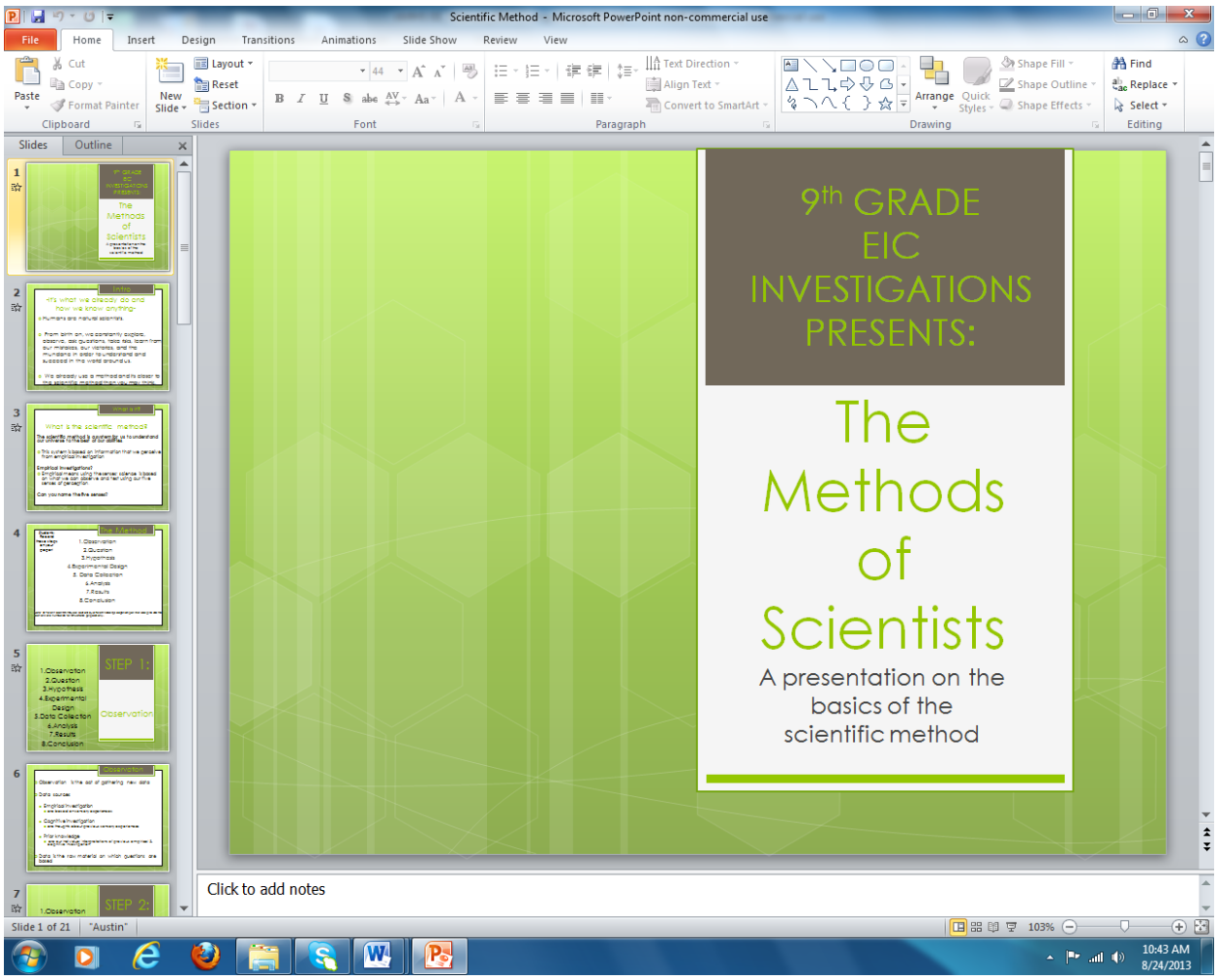
- Ecosystem ppt review of organism to ecosystem
- Identifying Organization Levels and Interactions of Ecosystems WS, one per group

Thurs:

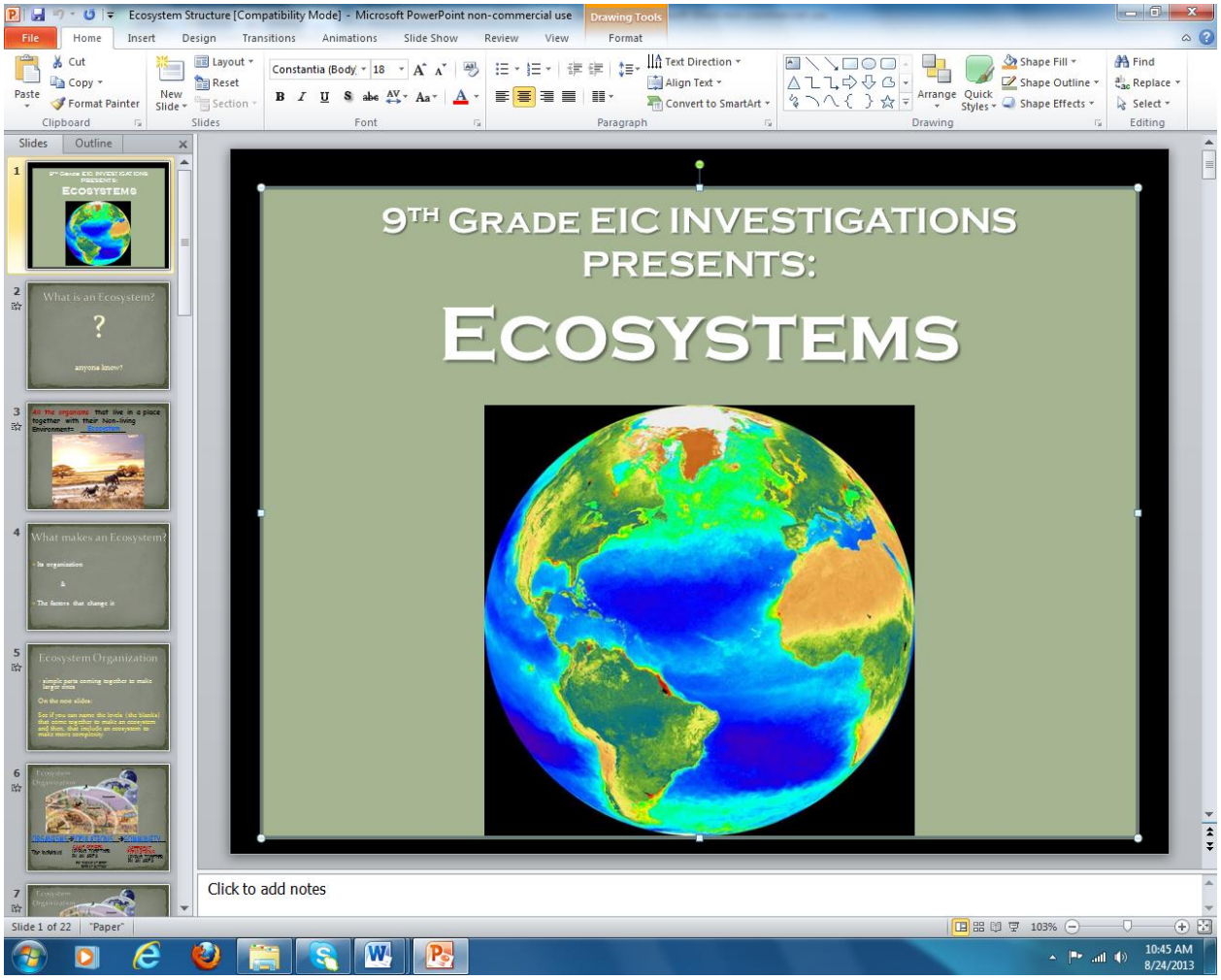
- Arabia mountain ecosystem ppt

Further weekly schedules TBA

The Methods of Scientists



EIC INVESTIGATIONS PRESENTS: Ecosystems



GROUP #:_____

Empirical Scavenger Hunt

Collect items in your school yard ecosystems in order to check of the scavenger hunt item. Do Not Disturb Your Ecosystem. Use your camera or use sketches to capture proof of finding items that you cannot or should not pick up. Enjoy the natural surroundings!

See: Visual sense

__Pick up All Litter (place in bag)

__Wild Flowers

__Fallen Log

__Pinecone

__Smooth rock

__Shiny rock

__Mud

__Reflections in water

__Fern

__Y-shaped twig

__Pine needles

__A nut

__Hole in a tree

__Green leaf unattached from tree

__Unusual shaped leaf

__Red Berries

__Vine

__Stalk of grass with seed head

__Clover leaf

__Moss

__Lichen

__Pine tree

__Seeds or seedpod

__Signs of erosion

__Dew

__Striped rock

__Signs of seasons changing

__Bracket mushroom (no stem)

__Clouds blowing by

__Small mammal

__Bird

__Spider

__Caterpillar

__Frog

__Butterfly

__Ladybug

__Lizard

__Spider web

__Nest

__Insect marks on a tree

__Tracks

__Chewed leaves

__Animal home

__Something rotting

__Seeds that stick to your clothes

_____TOTAL VISUAL

Hear: Auditory sense

__Crickets, other insects

__Water

__Rocks under your feet

__Leaves under your feet

__Bees

__Birds

__Wind

_____write-in something not listed

_____TOTAL ADITORY

Feel: Somatosensory sense

Describe item smelled next to items

__Something rough:

__Something smooth:

__Something slick:

__Something soft:

__Something wet:

__Something grainy:

__Something cold:

__Something pointy:

__Wind

__Water (where):

_____write-in something

_____TOTAL SOMATOSENSORY

Smell: Olfactory Sense

Describe smells next to items

__Grass:

__Mud:

__Pine trees:

__Flowers:

__Wet leaves:

__Moss:

__Water:

__Air:

_____write-in something:

_____TOTAL OLFACTORY

_____TOTAL EMPIRICAL FINDS

Taste: gustatory

Without surprise, we will not taste today. If you **did** have to survive in our ecosystem without food, speculate or infer what these food items could be and how they would taste in the space below. Give **FIVE** possibilities.

Group #_____

Identifying Organization Levels & Interactions of Ecosystems

1. Student groups should find their own separate piece of the overall ecosystem of Arabia Mountain to study by locating a mini ecosystem, an identified smaller area (an area outside) that will represent the whole.

2. Student groups will observe their area using all senses for at least five minutes before writing descriptions and listing observations. Why wait? You allow the area's life forms time to "forget" you are watching.

3. Complete the identifying parts of your mini ecosystem below.

Biosphere: Earth

Biome: Temperate Deciduous Forest

Ecosystem:

Description of small piece of the Arabia Mountain ecosystem, include size of area and identify the common name and quantities of BOTH biotic and abiotic forms.

Community:

Describe the community of your ecosystem; identify the common names and quantities of the prevalent life forms and give a detailed description of this community's role or importance to the overall ecosystem.

Population:

Choose one type of life form; identify the common name and give a detailed description of this population's role or importance to the overall community.

Organism:

Focus on one organism from your population, what is this one life form's role or importance to the overall population and describe how you know.

4. Choose 5 different identified biotic and abiotic forms from all that were made under ecosystem above. Write these factors first down the side, then along the bottom of the grid (the same 5 observations each way).

5. In the internal boxes of the grid, describe the interaction of the two factors or at least one way the item on the side interacts with the item along the bottom.

Observation 1:		1 + 2	1 + 3	1 + 4	1 + 5
Observation 2:	2 + 1		2 + 3	2 + 4	2+ 5
Observation 3:	3 + 1	3 + 2		3 + 4	3 + 5
Observation 4:	4 + 1	4 + 2	4+ 3		4 + 5
Observation 5:	5 + 1	5 + 2	5 + 3	5 + 4	
	Observation 1:	Observation 2:	Observation 3:	Observation 4:	Observation 5:

Grade 10

Theme: Pollution/Recycling/Air and Water Quality

Essential Question: In what ways will our "green" lifestyles reduce pollution and preserve our natural resources.

A. Students will be provided information on scientific method (See Ms. Erickson's power point).

B. Student will review use of media resources and research databases including MLA and APA style references for all reports. (Media center presentation). Student will also be given information on Cornell note taking.

C. Students will design and complete a project addressing aspects of pollution, recycling, air quality, water conservation and waste management. Students who are completing science fair projects must adhere to international science and engineering fair rules and requirements. Using the existing national and local data to study, analyze and describe impact of issues stated above on our quality of life.

D. The projects will be presented in the form of a research paper as well as an electronic presentation such as an electronic poster, power point presentation or other similar method for presentation in front of a large audience.

E. Each student will be required to complete (10) documented hours of **service learning each semester.**

Part 1

Once the students have been assigned to investigation areas, teachers will secure necessary baseline information related to their specific project. See below for examples.

Investigation Areas

What is Waste? Sample lesson plan

Related project ideas

Compost

Cafeteria collection

Create one composite pile onsite

Develop Literacy plan for students

General Waste –**Part of County Recycling Pilot/DeKalb Sanitation will provide resources**

Cafeteria collection

Develop Literacy for students

Compile date to present to Mr. Swanson

Paper Use and Recycling – **Part of County Recycling Pilot /DeKalb Sanitation will provide resources**

Collection throughout school

Develop literacy for students

Utilize EIC for collection days

Big blue bins / small bins in classrooms.

Plastic (can and bottle recycling) - **Part of County Recycling Pilot/DeKalb Sanitation will provided resources**

Develop Literacy

Coordinate collection

Purpose

Develop useful re purpose of trash

Develop website and put instructions on for re purposed items

Research setting up trash to treasure room.

Office Waste Audit

- Inventory front office, counseling office, gym etc.
- Make correction suggestions
- Compile data and present to Mr. Swanson / administration.

Miscellaneous waste audit

- Inventory community business
- Recommend solution

Air Quality: baseline information www.cleanaircampaign.org

- Develop literacy.
- Investigate commuters at school
- Emission testing – Why is this important?
- Why does Arabia have parking spaces for car pooling and low emission / fuel efficient cars? Investigate the school LEED certification etc… Purpose for these parking spaces
- Campaign to educate staff, parents and students on Arabia's Green mission. What is a Green Ribbon School?

Water Conservation: Sample lesson / Urban Rainwater Management by The Nature Conservancy. Other sources will be provided later.

- Develop Literacy
- 40 gallon challenge
- Rain barrel collection
- Rain garden design

Eco Friendly Cars and climate change: Alliance for Climate Change website and presenters

- Student will be provided educational presentation on climate change.
- Project related to Green cars etc..; and the connection to climate change
- Investigate Ford, GM and others

Suggested Areas of Study

- Investigate the effects of air pollutants on living organisms.
- Conduct investigations to determine the effects of chemical air pollutants on the community.
- Estimate the levels of ozone and other air particulates in the local community.
- Design and create an aquatic community.
- Introduce a pollutant into the aquatic community and compare the effects to a controlled community.
- Study natural and human sources of greenhouse gases.
- Simulate the effects of smog on plants.
- Demonstrate the need for environmental regulation.
- Explore different types of chemical and physical air pollutants in the Arabia Mountain Community and research the sources of these pollutants.
- Conduct experiments that determine the effects of different chemical air pollutants on living organisms.
- Explore the causes and effects of water pollution by testing the water in the ponds and streams in the Arabia Mountain community for different contaminants and compare their data to available local and national water pollution data.
- Explore how all greenhouse gas sources contribute to global climate change.
  (Through experimentation, they would discover how the greenhouse gas, carbon dioxide interacts with the atmosphere to contribute to rising global temperatures. They would then conduct experiment with a carbon dioxide chamber to see the effects under different climate conditions).
- Explore the need for laws to protect our environment and standard of living.
  (They would study the importance of the Clean Air and Clean Water Acts as well as the concept of the Tragedy of the Commons).
- Perform an LD50 (lethal dose 50%) experiment of a water pollutant on a population of brine shrimp and investigate the effects of nitrogen dioxide on plants.

Resources

SCIENCE PROJECTS: A MODULAR APPROACH Paperback – January 1, 1995

Michael H. Farmer

STEM Student Research Handbook - PB297X [Paperback]

Darci J. Harland

Useful Links

Environmental Protection Division (EPD) of the Georgia Department of Natural Resources
http://www.gaepd.org/

Clean Air Organization of Georgia
http://www.cleanaircampaign.org/

Science Buddies Science Fair Project Ideas, Answers, & Tools
http://www.sciencebuddies.org/

Oil Spill Law & Lawsuits
http://injury.findlaw.com/product-liability/oil-spill-law-lawsuits.html?DCMP=ADC-INJ_OilSpill-WaterPollution&HBX_PK=water+pollution

Every Drop of Water Counts in Metro Atlanta
http://www.mydropcounts.org/

How Organics Help Conserve & Protect Water
http://organic.about.com/od/organicindustrybasics/tp/How-Organics-Help-Conserve-And-Protect-Water.htm

Sample research topics on water pollution
http://index.about.com/index?am=broad&q=research+on+water+pollution&an=google_s&askid=39e3f312-1e0b-4557-997e-0e1b59f49cfa-0-ab_gsb&kv=sdb&gc=0&dqi=&qsrc=999&ad=semD&o=4649&l=sem

Water Quality Report
http://www.cityofdekalb.com/PW/Water/Reports/2009%20Water%20Quality%20Report.pdf

Research_Topics/Pages/Climate
http://www.rff.org/Research_Topics/Pages/Climate.aspx

Weather application using WeatherBug API tools
http://weather.weatherbug.com/desktop-weather/api.html

Specific Research Questions

Water Pollution

Water and air pollution has become one of the largest environmental problems throughout the world. Being greatly affected by this problem it has remained a prevalent topic in political and environmental debates for quite some time. Questions about the causes, results, statistics and solutions to water and air pollution and the problems it causes are presented below.

- What is an aspect of water and energy now and into the future that is easily explained through and A4 poster to Water Pollution
- What are the Results of using polluted water
- How does irrigation affect the pollution in lakes and rivers to Water Pollution
- How many sea animal die of pollution to Water Pollution
- What are the recommendation on water pollution?
- What are some names for a water filter?
- How does pollution affect the habitat?
- How do you clean river water?
- What can cause water pollution?
- Major water compartment?
- What are the advantages on water pollution?
- What are the influences of sewage in the quality of water?
- Is there a better alternative to water pollution?
- What is the definition of water pollution?
- Why people throw a garbage in the river?
- What are the measures taken to prevent water pollution?
- Can water tablets cause a miscarriage?
- How can you help prevent pesticide and fertilizer runoff from a 25K acre resort area?
- Pollution related information in marathi language?
- What are the negatives effects of agriculture?

- What is water pollution?

- How did the oil spill in the Gulf of Mexico happen?
- What are the precautions to control air and water pollution?
- How do people interact with their environment?
- What are human activities that destroy the earth?
- Hindi essay on water pollution?
- How is farming most likely produce water pollution?
- Hindi essay on water is life?
- How do people interact with the built environment?
- What life problems are caused by a dirty environment?
- What causes fingers to look wrinkled after soaked in water?
- Why must water that people use be clean?
- What happens when drinking water get mixed with sewage?
- What are the causes and effects of pollution?
- What causes most water pollution?
- Is ascariasis a waterborne disease?
- What are some slogans about pollution?
- Who is the patron saint of good health?
- What are two ways industries can reduce water pollution?
- What are the pros and cons of conserving water?
- When did water pollution start in California?
- Can you get some Slogans in Hindi language on water pollution?
- How does acid rain damage the environment?
- What secondary treatment or biological treatment of waste water mainly involves?
- How do you control water pollution in our locality?

- What are the four pollution?
- How does mining contribute to land water and air pollution?
- How did they solve the camelford water pollution problem?
- How industries are polluting the water resources?
- What caused the Exxon Valdez oil spill?
- What are the components of the environment?
- What is gross beta radioactivity limit in water by USPH standards?
- How does the water pollution harms the animals?
- How human activities destroy the earth?
- What is the pH for natural water?
- How does water pollution affect the ecosystem?
- How does water pollution effect the ecosystem?
- What are 4 sources of water pollution?
- Which website provide Hindi essays in water conservation?
- How Does Pollution Occur?
- How do human activities affect the environment?
- What are some of the effects of agricultural chemicals on farmland?
- What are the hazards of sewage treatment plants?
- Can pesticide cause pollution?
- What are the practical solutions to world pollution problem?
- What are some ways water pollution effects the earth?
- How much of the human caused air pollution is caused by cars?
- Why might a scientist studying water pollution work with percents less then one?
- How is soap a pollutant in water?
- How many percent of the earth's water is polluted?
- What is water purification?

- What is a waterborne pollutant?
- How does storm water become polluted?
- How is the water cycle affected by pollution?
- How did the Gulf of Mexico oil spill happen?
- What activity produces the most organic water pollution?
- How is water pollution affecting your earth today?
- What are the main effect of water pollution on aquatic plants and animals?
- What happens when people drink polluted water?
- What effects does water pollution have on marine animals?
- What are the sources of water supply?
- How do fertilizers pollute water bodies?
- Is water pollution bad in Australia?
- What are the remedies for water pollution in urban areas?
- How does water pollution affect animals that live in water?
- Why would ground water be more difficult than surface water to clean after contamination with chemicals or microorganisms?
- How to keep air clean?
- What happens if the wastewater dissolved oxygen increases above the standards specified?
- What diseases are caused by polluted water?
- How can adults and children reduce water pollution?
- Suggestions to improve water pollution?
- How much of earth's water is polluted?
- What are disadvantages of water pollution?
- What is the significance of pH in water treatment?
- How can you help pasig river clean?
- How to stop water pollution in oceans?

Grade 11

Theme: Universal Energy Dynamics (Global Warming and Energy)

Essential Question: How do forces of nature and human activities alter energy resources?

A. Note-taking

Students will review and use Note-taking strategies and skills using Cornell note-taking method. They will review and use Media Resources and research databases, including APA style reference for all reports.

B. Students will design, construct and complete a project intended to address any aspect of universal energy dynamics (global warming and energy) using the International Science and Engineering Fair (ISEF) rules and requirements.

C. Use existing energy data or audit from local and regional companies (Georgia Power, AT&T, Home Depot etc) to study, analyze and describe impact of universal energy dynamics on local and regional quality of life and economics.

D. Prepare a final investigation report suitable for regional science fair entry.

E. Prepare electronic poster suitable for regional science fair entry.

F. Service Learning

Each student would be required to complete (10) documented hours of service learning each semester.

Note: Because of the high technology need for research in this area, teachers and students are encouraged to pursue studies using existing energy data and audits rather than engaging in very elementary laboratory thermal energy studies.

CLIMATE CHANGE
AND PRESIDENT OBAMA'S ACTION PLAN

PRESIDENT OBAMA HAS ANNOUNCED A SERIES OF EXECUTIVE ACTIONS TO REDUCE CARBON POLLUTION, PREPARE THE U.S. FOR THE IMPACTS OF CLIMATE CHANGE, AND LEAD INTERNATIONAL EFFORTS TO ADDRESS GLOBAL CLIMATE CHANGE.

DUE TO CLIMATE CHANGE,

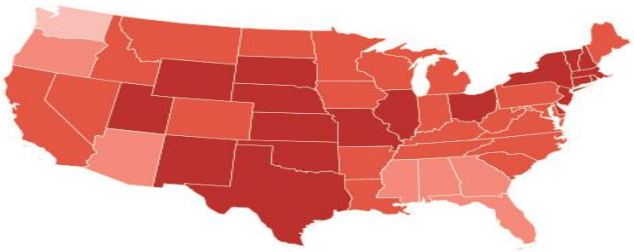
THE WEATHER IS GETTING MORE EXTREME

2012 WAS THE SECOND MOST EXTREME YEAR ON RECORD FOR THE NATION

SOURCE: NOAA, U.S. CLIMATE EXTREMES INDEX

RECORD HEAT ACROSS THE U.S.

STATE-BY-STATE TEMPERATURES IN 2012



ABOVE AVERAGE | 6TH-10TH WARMEST YEAR ON RECORD | 2ND-5TH WARMEST YEAR ON RECORD | WARMEST YEAR ON RECORD

SOURCE: NATIONAL CLIMATIC DATA CENTER/NESDIS/NOAA/V
Doesn't include Alaska, Hawaii or U.S. territories.

ALSO IN 2012:

AVG. TEMP

WARMEST YEAR ON RECORD FOR THE U.S.
Doesn't include Alaska, Hawaii, or U.S. territories.
SOURCE: NOAA

356 **RECORD HIGH TEMPERATURES TIED OR BROKEN**
IN THE UNITED STATES.
SOURCE: NOAA, STATE OF THE CLIMATE REPORT

APPROXIMATELY
ONE-THIRD OF THE U.S. POPULATION EXPERIENCED 100° TEMPERATURES
FOR TEN OR MORE DAYS.
SOURCE: NOAA

DROUGHTS, WILDFIRES, AND FLOODS ARE ALL MORE FREQUENT AND INTENSE

PRECIPITATION WAS 2.57 INCHES BELOW THE 20TH CENTURY AVERAGE.
SOURCE: NOAA

15TH DRIEST YEAR ON RECORD
SOURCE: NOAA

WILDFIRES BURNED MORE THAN 9.3 MILLION U.S. ACRES
SOURCE: NATIONAL INTERAGENCY COORDINATION CENTER

EXTREME WEATHER COMES AT A COST

CLIMATE AND WEATHER DISASTERS IN 2012 COST THE AMERICAN ECONOMY MORE THAN $100 BILLION

$30 BILLION
U.S. DROUGHT/HEATWAVE
ESTIMATED ACROSS THE U.S.

$1 BILLION
WESTERN WILDFIRES
ESTIMATED

$65 BILLION
SUPERSTORM SANDY
ESTIMATED

$2.3 BILLION
HURRICANE ISAAC
ESTIMATED

$11.1 BILLION
COMBINED SEVERE WEATHER
ESTIMATED FOR INCIDENTS ACROSS THE U.S.

THERE ARE ALSO PUBLIC HEALTH THREATS ASSOCIATED WITH EXTREME WEATHER

Children, the elderly, and the poor are most vulnerable to a range of climate-related health effects, including those related to heat stress, air pollution, extreme weather events, and diseases carried by food, water, and insects.

"WE CAN CHOOSE TO BELIEVE THAT SUPERSTORM SANDY, AND THE MOST SEVERE DROUGHT IN DECADES, AND THE WORST WILDFIRES SOME STATES HAVE EVER SEEN WERE ALL JUST A FREAK COINCIDENCE. OR WE CAN CHOOSE TO BELIEVE IN THE OVERWHELMING JUDGMENT OF SCIENCE — AND ACT BEFORE IT'S TOO LATE." - PRESIDENT OBAMA

Structure of EIC Project

1. Teacher chooses one energy focus

    a. Electricity
    b. Steam/Natural gas
    c. Water
    d. Petroleum

2. History of the Energy: Gapminder work
    a. Historical background for overall energy usage
    b. Affects of weather, temperature/solar data
    c. Focus on specific energy type
    d. Statistical analysis
    *TED Talk/Proposal (authentic assessment)

3. Energy Relating with Georgia/Home
    a. Georgia Power data for given energy source (energy usage)
    b. Residential vs Commercial (business)
    c. Personal utility bills from home (compare different homes)
    *Research paper (IJSER format)

4. Connection to AMHS: Building Audit & Compare with Similar Building Type in Dekalb
    a. HVAC, building controls & automation
    b. Electricity (lighting, computers)
    c. Water (plumbing)
    d. Transportation (fleet management, buses, cars)
    *Powerpoint presentation with Excel charts

5. Alternative energy (recommendations with data analysis, peer-reviewed research papers)
    a. Solar
        i. creation of flexible organic photonic and electronic materials and devices that serve the information technology, energy, and defense sectors
    b. Nuclear
        i. converting the heat generated from the nuclear reaction into electricity and contributing to the international criticality safety benchmark community
    c. Hydro-power
        i. water power turbine, rotor/generator and blade design optimization; ocean energy resource assessments; offshore wind farm feasibility studies that include coastal and marine spatial planning
    d. Wind
        i. wind power turbine, rotor/generator and blade design optimization; forecasting for wind energy power production and operational safety;
    e. Bio-energy/Biofuels
        i. developing technologies such as cellulosic ethanol from Georgia soft woods, biodiesel and ethanol from algae, rapid screening processes for liquid biofuels and defining new methods for generating energy from alternative biomass combustion processes

f. Hydrogen
    i. fuel cell technologies, including storage applications and applied use in aircraft and other vehicles
g. Electric vehicles
*Proposal to County Board/Administration (how to write a proposal)

6. Energy policy and economics
a. Clean Air Act & Carbon Pollution Standards
b. EPA Tailoring Rule and Greenhouse Gas Permitting
c. Carbon Tax, Cap & Trade or Cap & Dividend?
d. National and International Climate Policies
e. Carbon Capture and Sequestration
*Picture yourself as a member of the Environmental Protection Agency (EPA): write a proposal for policies that you feel need to be put in place to slow climate change

7. Students choose their own project that fits under the umbrella topic of energy

2. History of the Energy: Gapminder work

According to President Obama, the "overwhelming judgment of science"* tells a story of the cause for the climate change that we are experiencing today that simply cannot be ignored. Using the data found in Gapminder and the facts of history, find the trends and patterns to retell the story of climate change according to the cold hard facts.

At the website: http://www.gapminder.org/data/

Video tutorial here:

Keyword search "Energy".

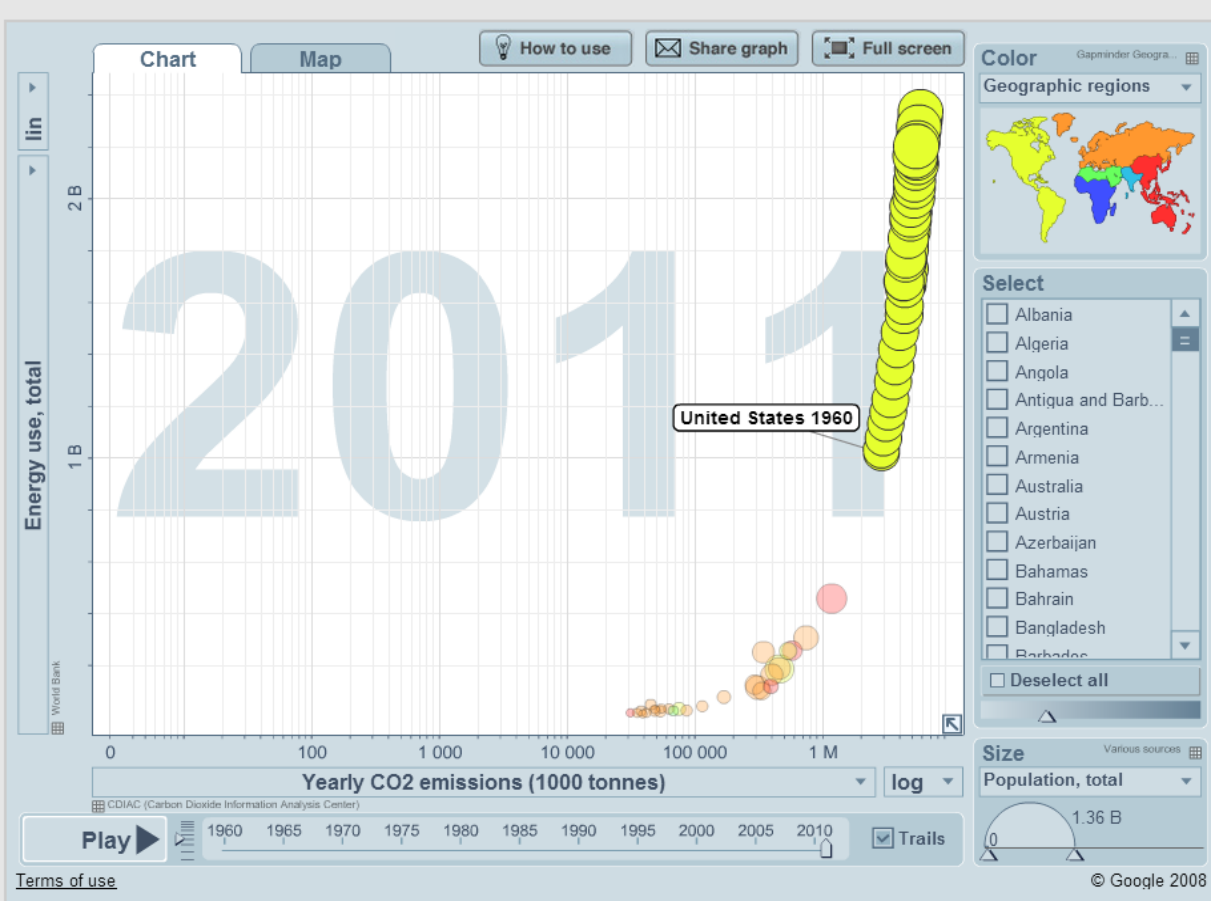
Clicking on the "Download" column provides the data in the form of an Excel spreadsheet.

The connection to US or World History should be emphasized in seeing how different countries progress through the last 50 years in comparing various indicators and how they relate to climate change. The data should be processed in Excel to focus on a specific country.

- http://www.whitehouse.gov/share/climate-action-plan
- http://www.usnews.com/news/articles/2012/08/21/3-energy-issues-no-ones-talking-about
- http://www.uschamber.com/issues/energy

Indicator name	Data provider	Category	Subcategory	Download	View	Visualize
Agricultural water withdrawal (% of total)	FAO aquastat database	Environment	Water			
Desalinated water produced (billion cu meters)	FAO aquastat database	Environment	Water			
Improved water source, overall access (%)	MDG indicators	Infrastructure	Water			
Improved water source, rural access (%)	MDG indicators	Infrastructure	Water			
Improved water source, urban access (%)	MDG indicators	Infrastructure	Water			
Industrial water withdrawal (% of total)	FAO aquastat database	Environment	Water			
Internal renewable water (cu meters per person)	FAO aquastat database	Environment	Water			
Municipal water withdrawal (% of total)	FAO aquastat database	Environment	Water			
Municipal water withdrawal (cu meters per person)	FAO aquastat database	Environment	Water			
Renewable water (cu meters per person)	FAO aquastat database	Environment	Water			
Total water withdrawal (billion cu meters)	FAO aquastat database	Environment	Water			
Water and sanitation aid given (% of aid)	OECD QWIDS	Economy	Aid given			
Water withdrawal (cu meters per person)	FAO aquastat database	Environment	Water			
Energy use, total	World Bank	Energy	Total			
Hydroelectric electricity production, per person	World Bank	Energy	Hydro			
Hydroelectric electricity production, total	World Bank	Energy	Hydro			
Natural gas production, per person	BP	Energy	Natural gas			
Natural gas production, total	BP	Energy	Natural gas			
Natural gas proved reserves, total	BP	Energy	Natural gas			
Natural gas proven reserves, per person	BP	Energy	Natural gas			
Nuclear electricity production, per person	Not Found.	Energy	Nuclear			
Nuclear electricity production, total	World Bank	Energy	Nuclear			
Oil consumption, per person	BP	Energy	Oil			
Oil consumption, total	BP	Energy	Oil			
Oil production, per person	BP	Energy	Oil			
Oil production, total	BP	Energy	Oil			
Oil proved reserves, total	BP	Energy	Oil			

“Visualize” will propagate a graph comparing two variables as a function of time.



In this case, looking at how CO2 emissions correspond with total energy use per year for different countries with the United States highlighted in yellow.

Many different graphs and trends can be investigated and each student should be required to compare at least 3 different types of energies with a given indicator like CO2 emissions while looking at events in history to explain sudden changes.

As a summative authentic assessment, the students should create a presentation of their findings perhaps in the form of a TED talk or a proposal to the President as to what they learned from the history of different countries to help fight against climate change. http://www.gapminder.org/videos/ted-us-state-department/

3. Energy Relating with Georgia/Home

How to read utility bills

http://www.toptenusa.org/Energy-Saving-Tips-News/How-to-Read-Your-Utility-Bill

Residential/Business: Green Energy

http://www.georgiapower.com/earthcents/green/home.cshtml

Georgia Energy Data: Energy Production

http://www.georgiaenergydata.org/

Solar Production:

http://www.georgiaenergydata.org/solarmap

Electricity Production:

http://www.georgiaenergydata.org/electricityproduction

Areas to Research During Building Audit:

- Roof Coverings & Insulation
- Exterior Windows
- Window Treatments (Energy usage is reduced 22% over standard building practices by using energy efficient mechanical systems, increased use of daylighting, and careful selection of window glazing.)
- Interior Lighting/Exterior Lighting
- Heating, Cooling & Air Conditioning (HVAC)
- Plumbing (Water use is reduced by over 40% (over current typical water use design) by using high efficiency fixtures to reduce potable water demand.)
- Building Controls & Automation

4. **Connection to AMHS: Building Audit & Compare with Similar Building Type in Dekalb**

How to create Excel spreadsheets

http://www.youtube.com/watch?v=8B8kFVNzlQ8

http://www.wikihow.com/Create-a-Graph-in-Excel

AMHS Building Audit

-Obtain building operational schedule, building characteristics, utility data, and operational information from building contact;

-Analyze building energy usage based on interval usage data (if available);

-Create a simplified energy model based on the building's details such as age, construction type, occupancy schedule, and heating, ventilating and air conditioning (HVAC) system type

-Create building benchmarks comparing the reviewed DeKalb County building with similar building types; and,

-Report on operational and retrofit savings opportunities, estimated savings potential, and next steps.

AMHS Utility Data/Building Schedules:

See Ms. Jackson/Mr. Moreland

Dekalb County School Comparison:

http://www.dekalb.k12.ga.us/www/documents/vision-2020/facility-report-(2011).pdf

http://www.co.dekalb.ga.us/energy_and_environmental/pdf/esplan.pdf

5. Alternative energy (recommendations with data analysis, peer-reviewed research papers)

- http://www.cleanenergy.org/learn/learn-about/
- http://www.herty.com/
- http://www.altenergy.com/
- **Nuclear:** http://www.southerncompany.com/what-doing/energy-innovation/nuclear-energy/home.cshtml
- **Solar:** http://www.suniva.com/
- http://www.georgiapower.com/about-energy/energy-sources/solar/home.cshtml
- **Hydro:** http://www.georgiapower.com/about-energy/energy-sources/hydro-power/
- **Biomass:** http://www.georgiapower.com/about-energy/energy-sources/biomass.cshtml
- http://www.georgiapower.com/about-energy/energy-sources/landfill-gas.cshtml
- **Wind:** http://www.georgiapower.com/about-energy/energy-sources/wind-energy.cshtml

6. Energy policy and economics

http://www.cleanenergy.org/learn/learn-about/learn-about-climate-policy/

Grade 12

12th grade EIC website from 2012-2013: https://sites.google.com/site/amhseic12/

Theme: Heritage and Preservation

Essential Question: How has the understanding of our heritage influenced us to preserve/utilize our natural resources today and in the future?

A. Information consumption/research strategies:
Students would be required to apply research processes and design. This would include the scientific method, literature search, abstract development, methodology and preparation of scientific report.

B. Culminating Activity: Each student would be required to write a scientific paper on a topic selected from a list provided by the teacher using research processes and design and MLA style reference. No actual laboratory work is required. Prepare electronic poster suitable for presentation in front of a large audience.

C. College Portfolio: Students will prepare a portfolio with elements that will assist them in achieving their post-high school plans. The portfolio will include: post-high school plans; brainstorming notes on possible careers; summaries of three possible career choices (include required education, average salary, current employment opportunities in that field); compare/contrast handout of three colleges/universities with written reflection on how the chosen colleges fit the students' academic and personal; college application checklist; scholarship information- find three scholarships that you qualify for, write a half-page summary of each one, and apply for a minimum of two; a college application essay; academic or professional resume; notes from conversation with parents regarding post-high school plans; reflection on the college portfolio process.

D. Social Investigation and Presentation: Students will formulate, research, analyze and complete a project intended to address an aspect of heritage or preservation as outlined below. Use existing archeological and historical data from local and regional communities to study, analyze and describe impact of changing demography, urbanization, social movements and other topics on local and regional quality of life and economy.

The Social Investigation will be presented in the form of a research paper as well as an electronic presentation such as an electronic poster, Power Point presentation, Prezi presentation or other similar method suitable for presentation in front of a large audience. (Students preparing a project for a science fair must use the International Science and Engineering Fair (ISEF) rules and requirements.)

E. Service Learning: Each student would be required to complete (10) documented hours of service learning each semester.

Senior EIC Semester 1

Part 1: Research Basics

Part 2: College Portfolios
We will focus for the first two weeks of EIC on the students' college portfolios
Deliverable: College Portfolio

Part 3: Social Investigation and Presentation
Students will develop a research project and presentation (PPT or Prezi) based on one of five focus areas related to preservation and heritage in Georgia or DeKalb County:

Environmental Legacy
A. Environmental Safety (pesticides, cleaning supplies)
B. School sustainability plan
C. Water Rights/Contamination

Environmental Justice
A. Disproportionate impact. How is pollution related to inequality?
B. Demography: impacting services, voting-rights laws, immigration
C. Food Deserts

Sustainability and Self-Sufficiency
A. Georgia natural resources: what is sustainable? Fisheries, forest, agriculture, kaolin.
B. School sustainability plan
C. Mapping environmental resources: sustainable resources and environmental hazards
D. Urban runoff
E. Waste Management

Urbanization
A. Beltline
B. Population Growth
C. Urban planning/sprawl
D. Land conservation

Historic Preservation
A**.** Oral Histories
B. Architectural Preservation
C. Food (history, preservation, heirloom foods)

Part 4: Service Learning
When students finish their social studies fair projects, they will plan a service-learning project related directly to their project. These projects must be submitted to the teacher for approval and must be true service-learning projects, not just volunteer work. Students must demonstrate both what they will be learning and whom they will be serving.

Deliverable: Service Learning Project Plan

OTHER RESOURCES

1. **Sample Lesson Plans**
2. **Media Center Resources**
3. **Note-Taking Guides**
4. **Arabia Heritage Project Video**
5. **Flat Rock Archives**