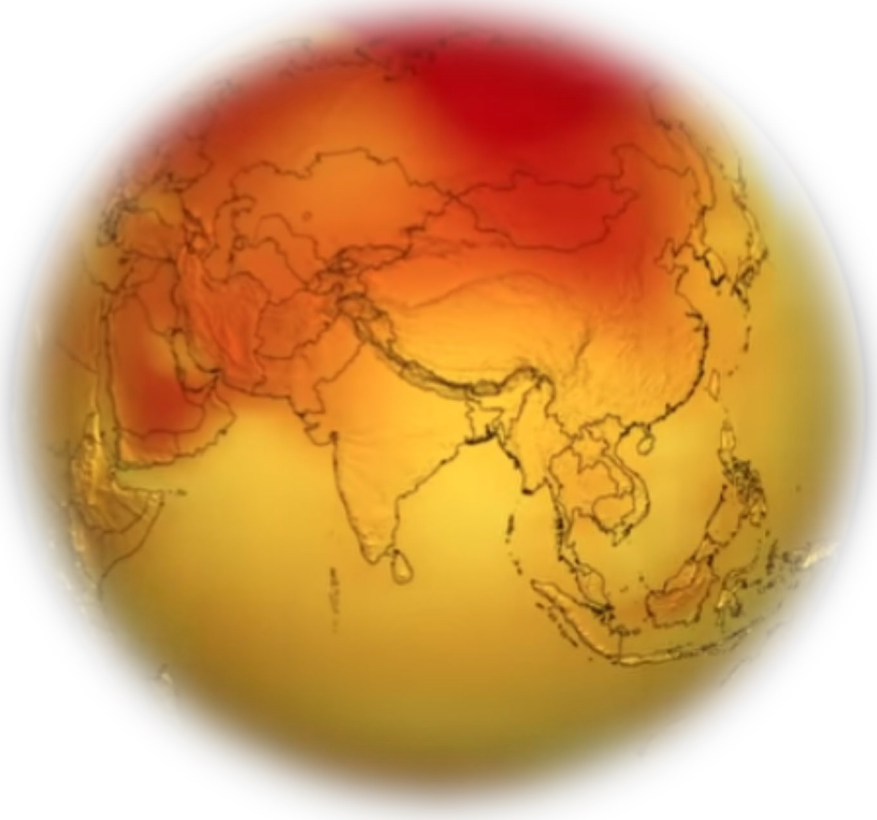
TEXAS STATE
LBJ INSTITUTE FOR
STEM EDUCATION AND RESEARCH

STEM Research
White Paper Series

April 2019
Volume: 3
Number: 4

Climate Change, Water Resources and Renewable Energy: Engaging K-16 Students on Solutions for Global Challenges



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"The abundant and free NASA resources and planning tools have elevated my teaching and my students learning experiences."

- Anonymous Educator

Although the literature in active learning is relatively new dating back to the early 1990s, it can be traced back to the early writings of John Dewey in the early 20th century (Wurdinger and Carlson 2010). Active learning is stepping out of the traditional lecture approach to teaching to provide opportunities for student to "talk and listen, read, write, and reflect as they approach course content" (Meyers and Jones 1993). Furthermore, active learning experiences can be enhanced by the intentional inclusion of relevant projects for participating learners. When students can relate to the problem at hand, learning is enhanced by students' opportunity to tap into their own funds of knowledge and cultural wealth for a meaningful and authentic learning experience.

Themes such as drinking water, climate change, and clean energy can be explore through various active learning strategies that can help students make important connections between content ideas. Although, NASA generates a lot of excitement about space exploration, and rightly so, NASA remote sensing and satellites technology are generating a vast amount of data on Earth systems. There are many NASA educational resources align to NGSS standards that focuses on our planet and provide opportunities for all students to engage with real-world data. Below some of these resources are highlighted which can be integrated in any K-16 classroom to bring relevancy to content.

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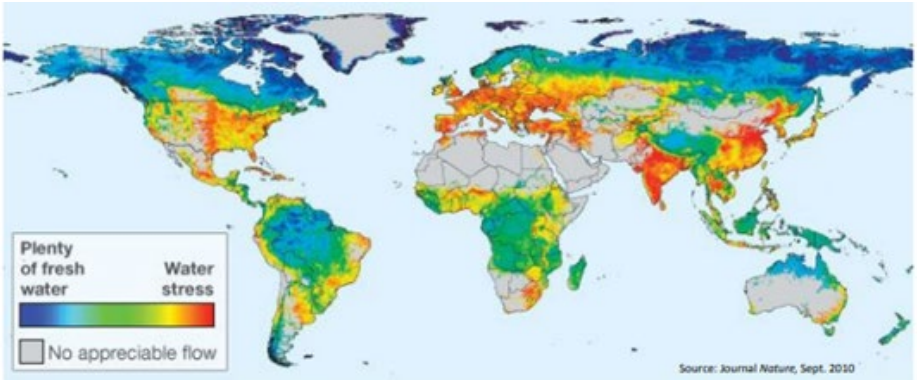
"Teaching reflection and collaboration is critical to the future of our students. Give them time to share and struggle with the problem. It validates and enhances learning."

- Anonymous Educator

SAFE DRINKING WATER RESOURCES WITH LESSON PLANS

Precipitation Education
https://pmm.nasa.gov/education/

Precipitation Education is a digital library with a search and advanced search tool. The web page offers videos, images, interactive technology, science literacy articles, lesson plans and links to additional web sites. The site includes lesson plans on the water cycle, weather, climate, technology and societal applications. The search allows the viewer to look for lessons in grade bands (K-5. 6-8 and 9-12). When you search "water resources", 87 resources are returned including a Freshwater Availability Speakers Toolkit to California Drought Visualization and Science for a Hungry World: Growing Water Problems.



Source: Journal Nature, Sept. 2010

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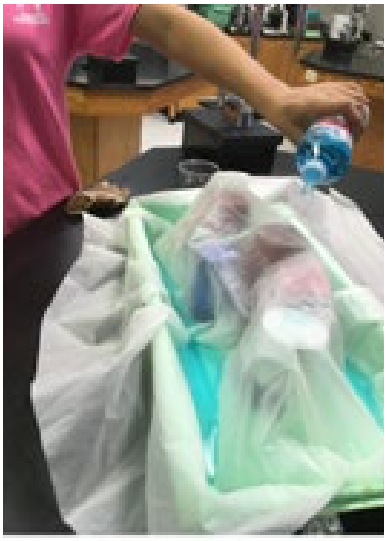
Students engaging in a project-based learning activity on watersheds.



Mission Geography

http://people.tamu.edu/~cairns/missgeog/index.html

Mission Geography is a global awareness project addressing the critical need to bring real world problem solving to STEM education and literacy. Three modules, Mission Geography K-4, Mission Geography 5-8, and Mission Geography 9-12, contain curriculum support materials focused on the development of key problem-solving skills including remote sensing and map/image interpretation. The modules use NASA data and images to engage students in active, hands-on inquiry, modeling the scientific method and developing students' understandings of environment-society relations and earth science.

My NASA Data

https://mynasadata.larc.nasa.gov/

NASA offers authentic data sets with lesson plans to educators using a phenomena-based approached to develop student's skills in inquiry and problem solving.The search tool allows educators to quickly access relevant content. The search can be conducted by NGSS standard and, CORE Ideas and Strategies, or by topic. The program focuses on global awareness through connections to the Global Learning and Observations to Benefit the Environment (GLOBE) citizen science field study programs. The Hydrosphere resources focus on featured water related phenomena with STEM lesson plans.

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School districts are already implementing Project-Based Learning and STEM students authentic relevant learning experiences.

CLIMATE CHANGE RESOURCES WITH LESSON PLANS

NASA Global Climate Change: Vital Signs of the Planet

https://climate.nasa.gov/r esources/education/

The NASA Global Climate Change web site provides educators with facts, articles, solutions, explorations and additional resources. Nine educator websites are featured with searchable STEM Lesson plans. Critical global questions are provided to help students pose culturally relevant questions for problem solving STEM lessons. Researchable topics on mitigation and innovation are provided. Resources for real-world authentic data sets that are current, unusual and interesting are provided to explore both singular occurrences and significant trends. The websites are searchable by content, standards and grade levels.

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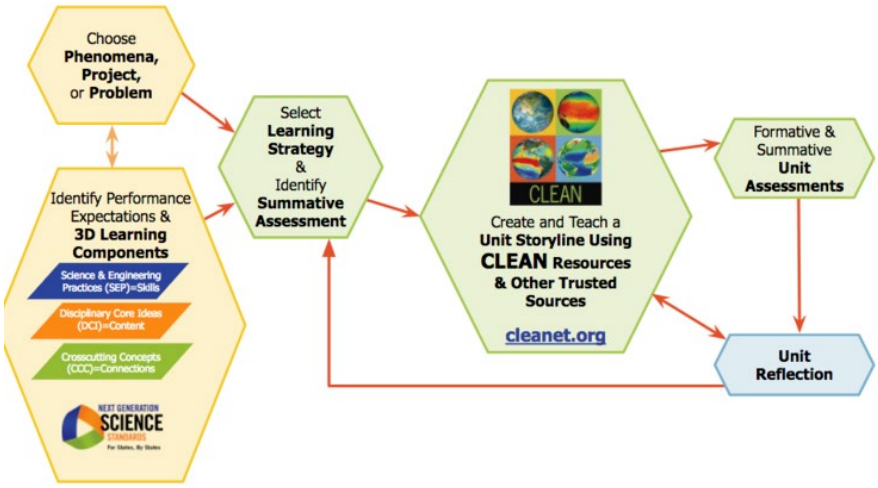
"Start them young! Give students authentic research sources."

- Anonymous Educator

The CLEAN Collection of Resources provides authentic and accurate education resources. The focus of the program is allowing educators to search for lesson plan ideas with the confidence of knowing the materials are reliable and scientifically credible. Teachers search the CLEAN resources by keywords, grade level, resource type and NGSS standards. Teaching guides are provided for instructional support for educators from Kindergarten through College level and Grad School. NGSS templates are provided to create unique custom lesson plans. Examples of classroom ready units are included on the web site. There are 275 problem-based lesson plans including "A Climate Change Musical, "Where do you put a wind farm?" and "Making sense of Data- Tree growth and Climate". Webinars about teaching with CLEAN and NGSS are available.

CLEAN: CLIMATE LITERACY AND ENERGY AWARENESS NETWORK

https://cleanet.org/clean/educational_resources/index.html



Source: cleanet.org

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For more information about NASA STEM EPDC, please visit txstate-epdc.net.

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