



# RESEARCH GOES TO SCHOOL

Infusing rural high school science  
curricula with cutting edge  
research

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- Develop a model for delivering C3Bio research topics into high school STEM classrooms
- Use this model as a framework to establish a systemic approach for integrating research and education activities

## Goals of Our Integration



PD  
Workshop

- Teacher developed PBL units
- Grand Challenge Biofuels Research

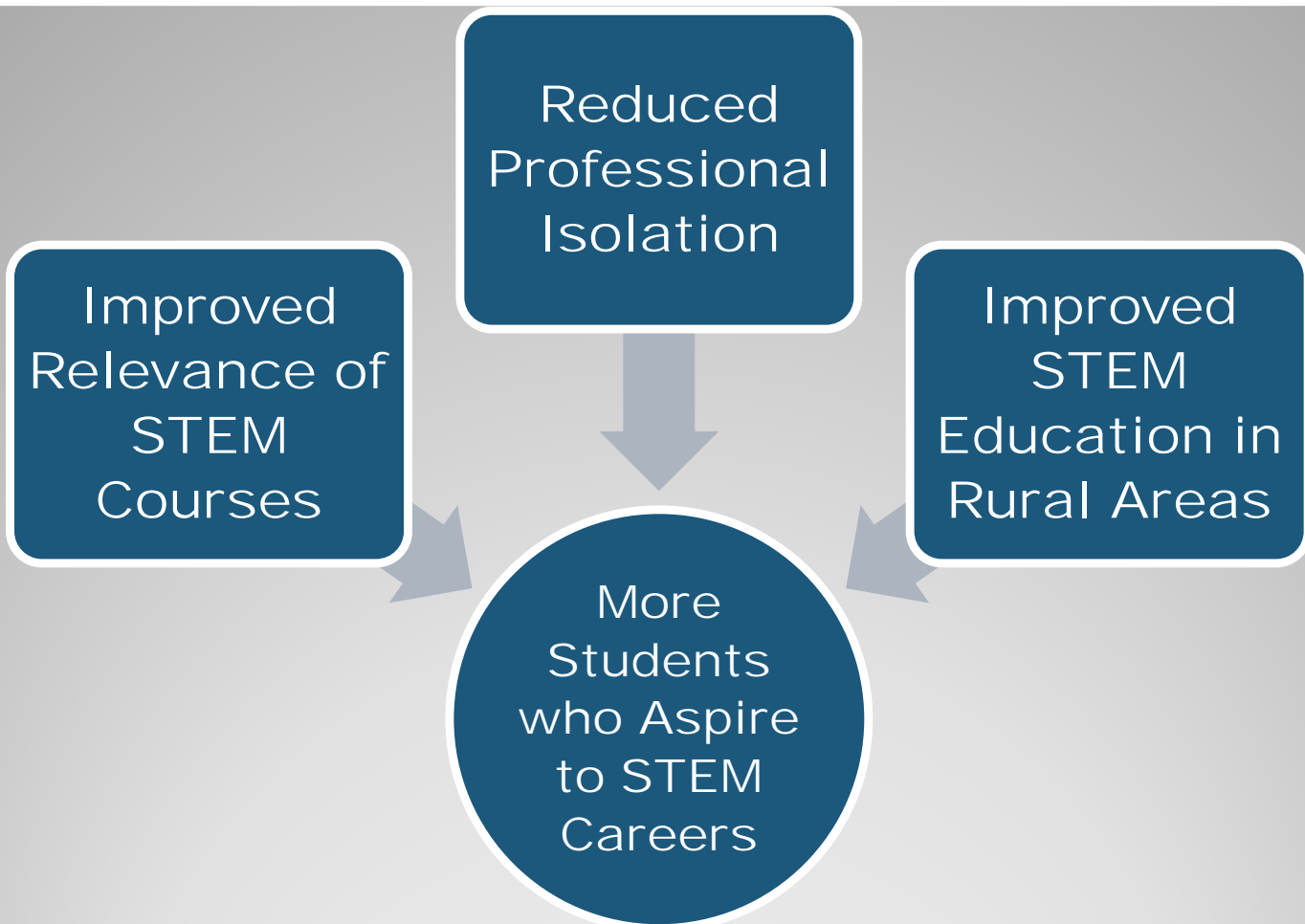
Support

- Webinars
- STEMEdhub

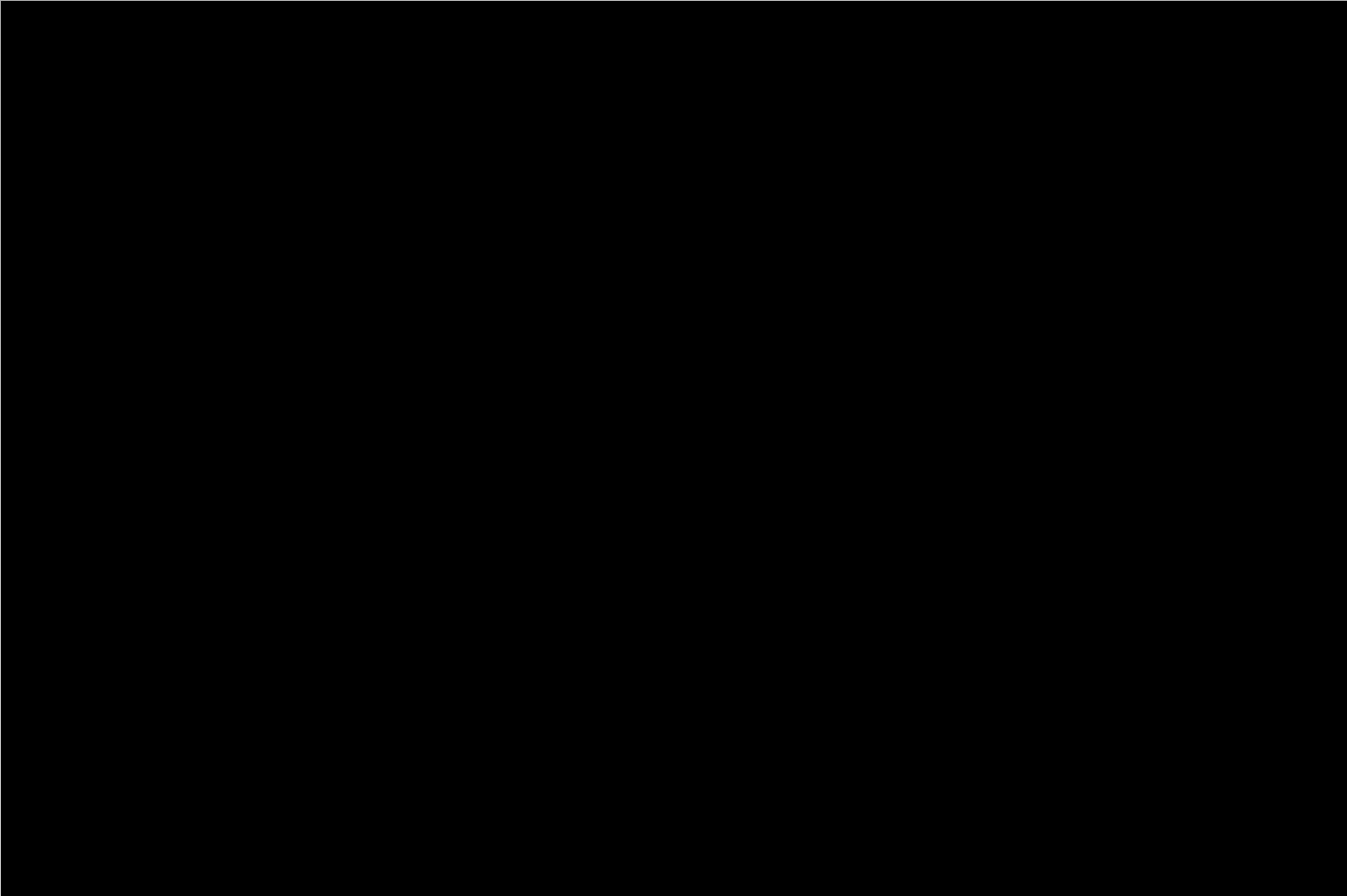
Sharing

- Regional Summits
- HASTI/NSTA

# Teacher Components



# Implications of Program



**C3 Bio Video**

 Search this site

#### Navigation

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## Introduction:

This problem based unit has students devise a way to use reclaimed and degraded land in their community to create a green energy source in the form of biofuel. The unit has a preliminary time line of 3 weeks, but may take a little more time.

The unit is designed for Advanced Placement Environmental Science, Horticulture Science and Earth Space Science. The standards/expectations are addressed in these three classes are listed on the corresponding pages. This unit also addresses 21st Century Skills.

The website is divided into three weeks of activities as well as the materials needed for the entire unit. The handouts needed for each week are also located at the bottom of each week's web page.

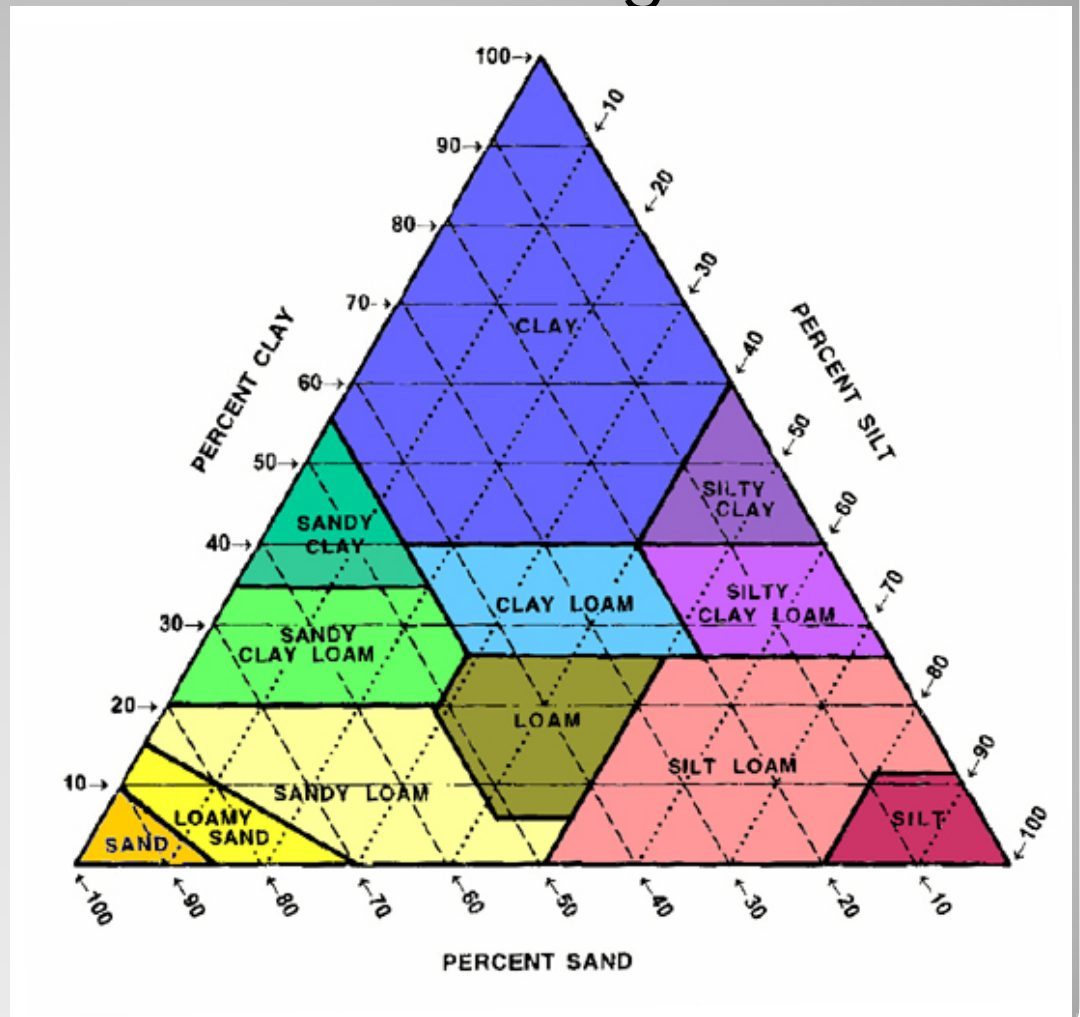
## Driving Question:

How can reclaimed or degraded land be utilized to produce biomass for a green energy source?

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# The Greenergy Project Website

- Soil Columns and the Soil Triangle



# Sample Activity 1

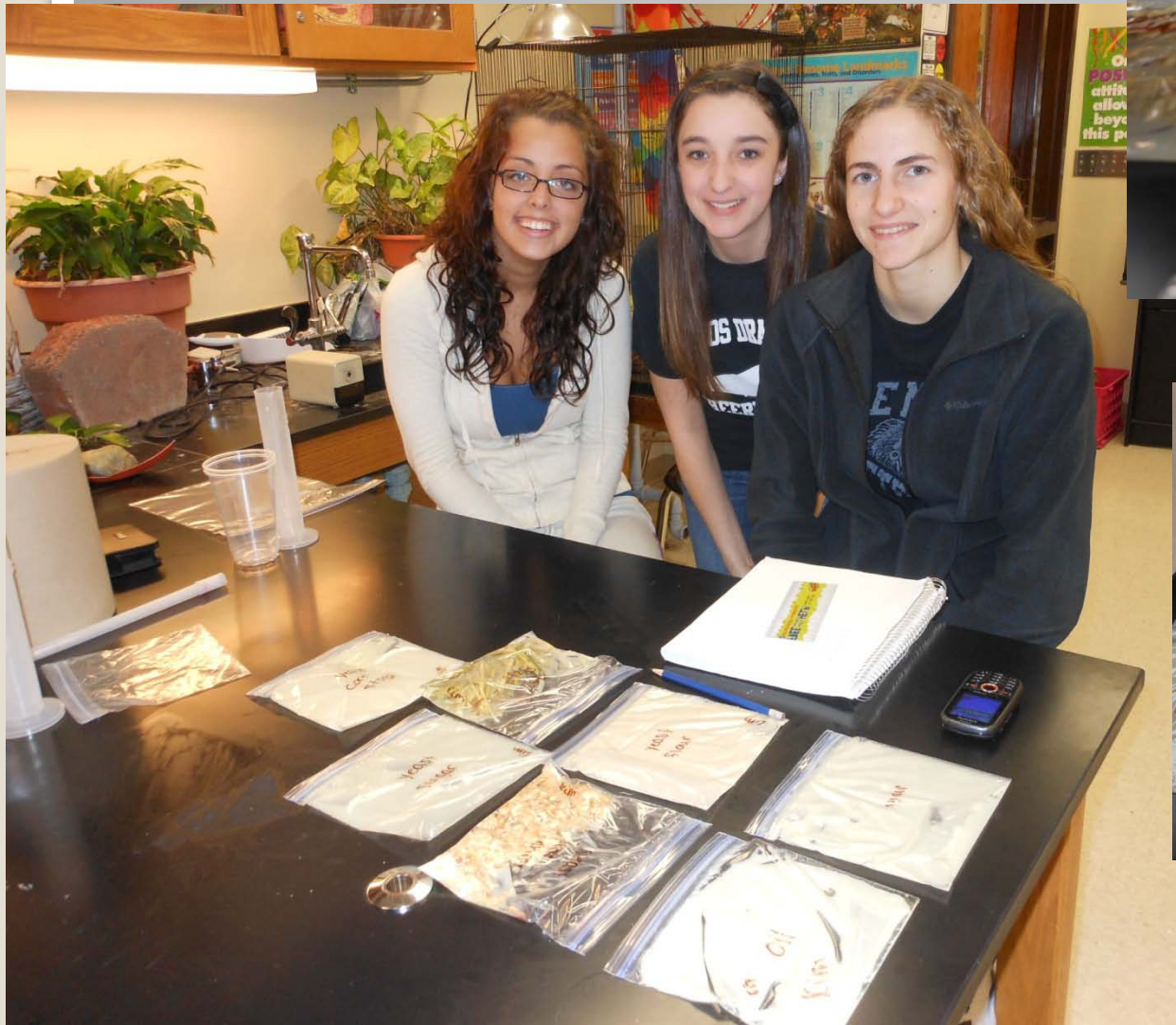
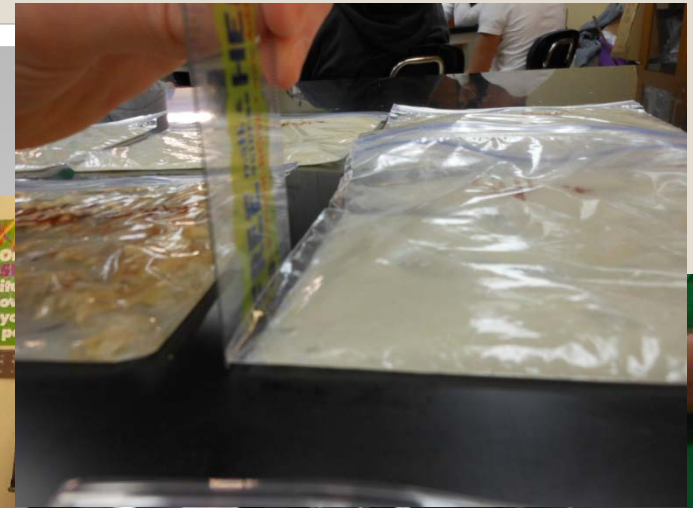
- Fermentation of Biomass Experiments



## Sample Activity 2



- Fermentation in a Bag



- 3 weeks
- Spent time before unit covering traditional non-renewable energy sources and renewable energy sources.
- I was careful not to spend too much time on biofuels though...
- Introduced unit with concept map of energy terms
  - Wanted to see what students knew and what misconceptions they had BEFORE we headed into PBL unit.

## Overall Summary of Kathy's PBL Unit



- Next we made our Mud Pies
- We watched the movie Dirt! – allowing time for our mud pies to dry out over the weekend



- Soil testing took place over 2.5 days
- Students prepared a group report to the class describing their soil in terms of texture, nutrient content, porosity, and germination results. (And in the future we will test organic content too)
- We transitioned from thinking about soil in degraded or reclaimed areas to thinking about biofuel crops.

- Students performed fermentation experiments and investigated methods of biofuel production.
- Students were given a scenario describing land in our own community that would be given to the biofuel company with the most convincing plan for developing that land to produce, distribute, and market their biofuel of choice.



- Students were given 2.5 days to research and put together a business plan.
- One day to present their plan
- One day to defend and debate with the other biofuel companies in the class.



### Crop Choices

**Corn**  
**Soy Beans**  
**Hemp**  
**Milletia Trees**  
**Rapeseed**  
**Grass**  
**Sunflowers**  
**Algae**



- Unit took 3.5 weeks
- Started with a pre-quiz to assess students previous knowledge on bio-fuels, soil and non- vs. renewable resources
- Topic was introduced by using the driving question and students filling out a KWL chart so we could discuss as a class what information we needed to answer the question

## **Overall Summary of Georgia's PBL Unit**

- Students made mud-pies and did soil testing with their mud-pies
  - Used jig-saw method so each person in the group became an expert on different soil tests
  - Results of tests were presented to the class
- Presentation about different types of degraded land was given and a discussion about what is degraded land was held
- Groups then each received a soil box and began testing on the soil

- Culminating activity included a research project where the students had to research biofuel methods and see how their soil could be used in the production of a biofuel
- Sample Presentation

Time to check soil  
columns  
and  
fermentation  
experiments!

**Questions and Answers**