



Agriculture in the Classroom

Eisenhower High School, Goddard USD #265

Ms. Denise Scribner

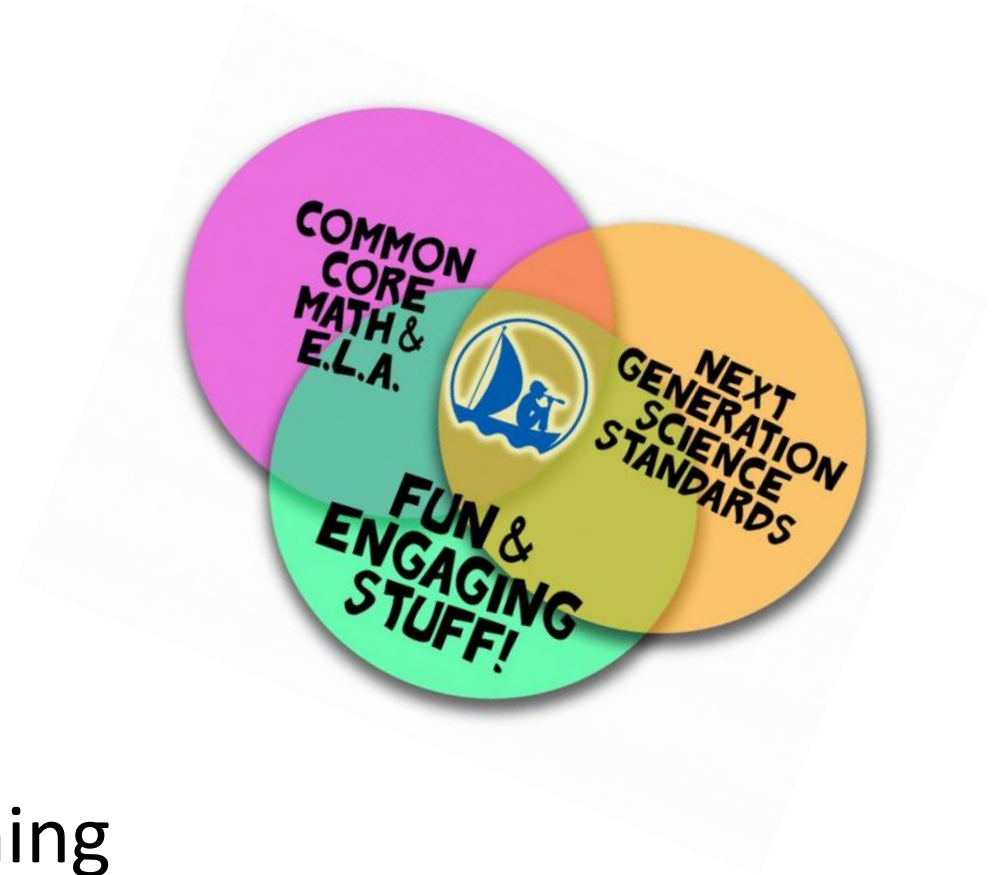
Why teach using Agriculture?



- Kansas is an important agricultural state, ranking 7th among the states for total agricultural production.
- Approximately 88% of the state's land is under agricultural production
- Agriculture classes are the application of math, science, language arts, and social sciences. In other words, students practice all of those "core" subjects when studying agriculture!
- The integration of agriculture in elementary, junior high and high school curricula brings learning to life with "real-world" applications.
- Educators have suggested that the integration of agriculture into the general curriculum would help students learn based upon the arguments of experiential learning.

Common Core Connections

- Anchor Standards
- Reading
- Writing
- Language
- Practice Standards
- Mathematics
- Speaking and Listening



Content Areas



- Science
- Social Studies - Economics
- Social Studies - Geography
- Social Studies - History
- Health/Nutrition
- Career & Technical Education

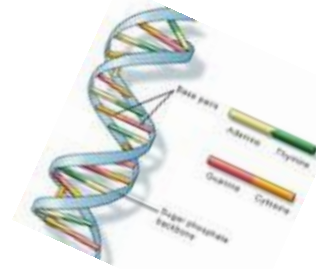
Why I Teach Agriculture?



“My students represent the future leaders of society, the people we will depend on to support, regulate, and advocate for agriculture.

That is why I expose them to trending issues like sustainable farming, natural resources and energy alternatives in my science classes so they may make sustainable life choices in the future.”

Integrating Agricultural Concepts into science classes reaches more students





<http://www.agclassroom.org/agroworld/index.htm>

The National Agricultural Literacy Curriculum Matrix is an online, searchable, and standards-based curriculum map for K-12 teachers. The Matrix contextualizes national education standards in science, social studies, and nutrition education with relevant instructional resources linked to Common Core Standards.

<http://www.agclassroom.org/teacher/matrix/>

Genetics using Agriculture!

Eyes of Nye - GMO foods

https://www.youtube.com/watch?v=8z_CqyB1dQo

How GMOs are created

<https://www.youtube.com/watch?v=2G-yUuiqlZ0>

Life of a Seed – Jake, A GMO Seed (farming and plant breeding)

<https://www.youtube.com/watch?v=L9tlirsBNg4>

Transgenic Manipulation

<http://www.pbs.org/wgbh/harvest/engineer/transgen.html>



http://www.myamericanfarm.org/classroom/games/?gid=power_up

MORE FREE STUFF!

On-line interactive games for pre-K, K-2 and grades 3-5 using agriculture in Kansas as the hook



Geography



Math



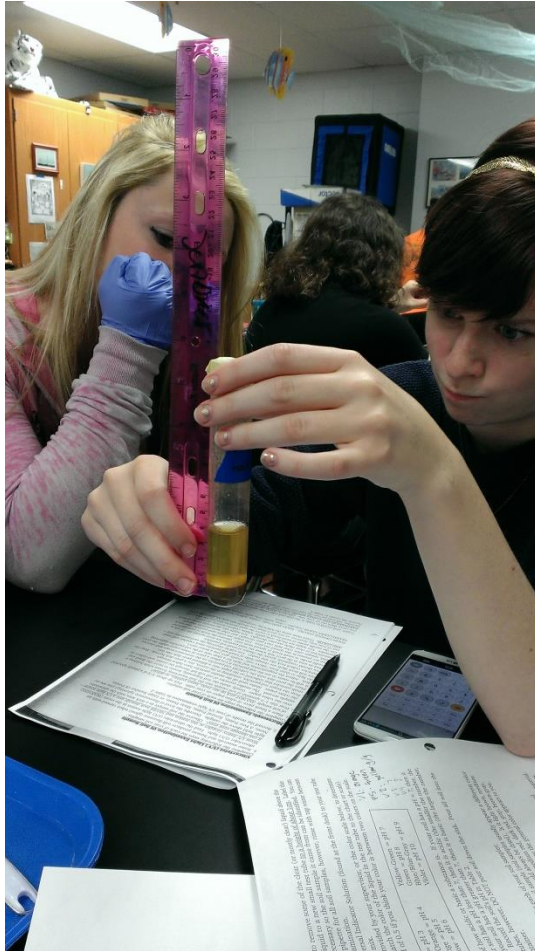
Science



Science & Engineering



CTE Forensic Crime Science Class

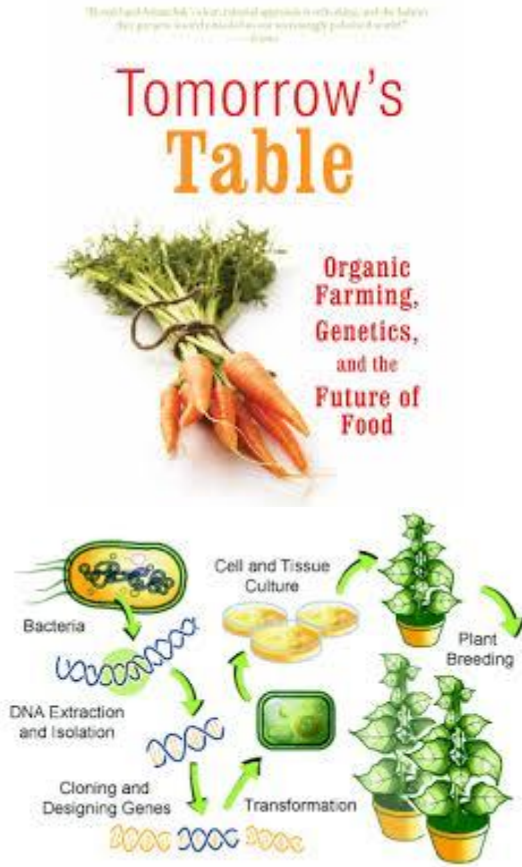


Forensic Characteristics of Soil



Teaching Biology with an Agricultural Twist

Genetics—GMOs--DNA

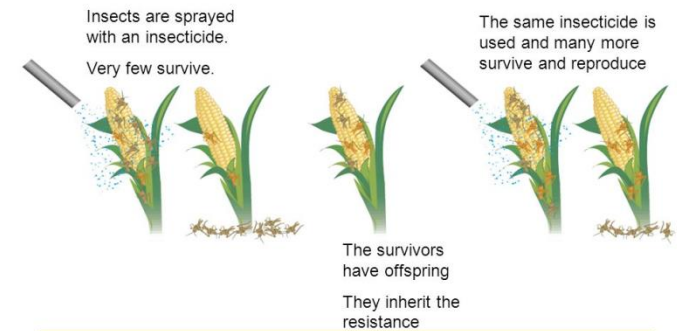


Bio Blitz



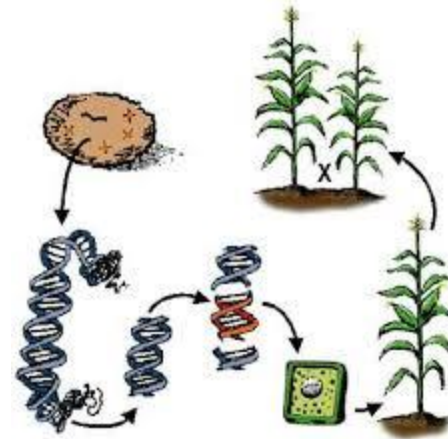
Evolution of Resistance

Evolution of Resistance



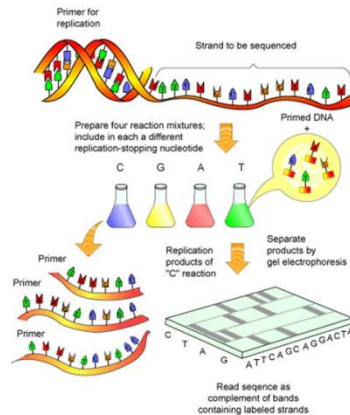
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DNA Extraction from Corn



Manipulating DNA

- **Genetic Engineering** is the process of reading and changing DNA sequences in an organism.
- Reading the Genetic Code
 - DNA extraction
 - **Cutting and Labeling DNA**
 - Separating DNA
 - Reading the DNA sequence
 - Making Copies (PCR – polymerase chain reaction)



GMO Speed Dating

GMOs?



Bt corn

- Insert a bacteria (*Bacillus thuringiensis*) gene that makes a toxin into corn.
- Greater yield
- No use of pesticides



Top 10 Genetically Modified Foods





cross curricular--Add visual and written documentation to a biology project.

Kindergarten students are expected to learn and understand what things plants need to survive (K-LS1-1).

- Have students grow a plant in the window of the classroom. Track the growth (or death) of the plant by taking time-lapse photos with a classroom document camera or Smartphone, or use a time-lapse photo app like [Lapse It](#).
- Then, replay the visual record of the plant for the class.
- Students could then draw or describe the effects that the water, sun, or lack of nutrition had on the plant.

Soil Science

Below ground, the soil bears witness to the incredible diversity and chaos of life within even the smallest patch of ground.

Just a teaspoonful of Kansas soil contains tens of thousands of microbial species to be studied





www.soils4teachers.org/

- <https://www.soils.org/iys/monthly-videos>



<http://www.soils4kids.org/>

DIG DEEPER



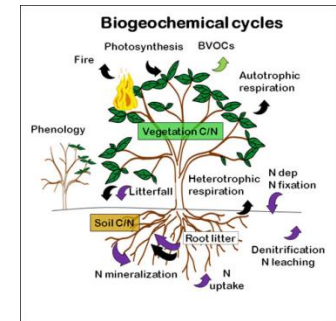
<https://www.plantingscience.org/index.php/>



Ecology and Agriculture— a natural educational partnership

Green Revolution

Biogeochemical cycles and connecting these cycles to farming practices



Aldo Leopold's Land Use and Land Use Ethic

Organic food production

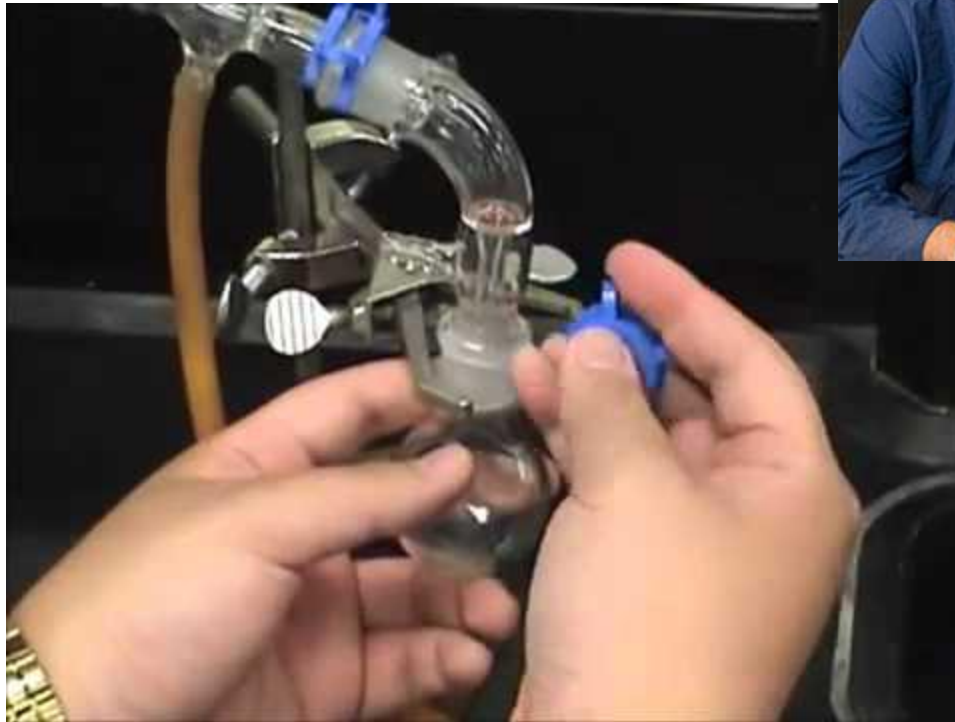


Sustainable Agriculture to feed a growing population



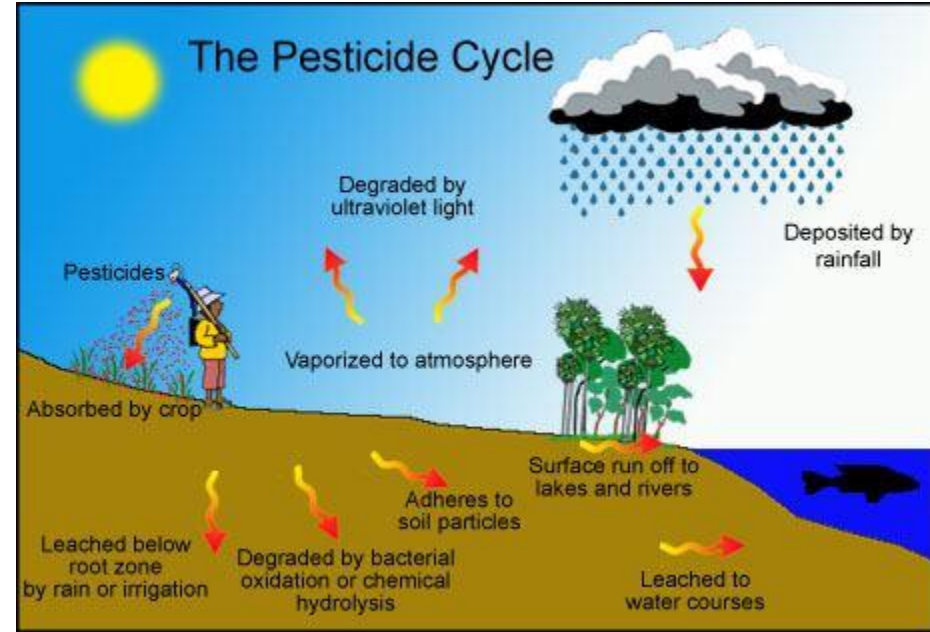
No-tillage, terrace, conservation tillage, contour farming to promote soil and water conservation

Distilling Fermenting Corn into Ethanol Bio Fuel





Water Resource Management



Green Revolution , Irrigation Scheduling,
Drought Resistant Crops, water harvesting
systems and more...



Students as part of the carbon cycle conducting patch burning of native prairie grasses at on-campus OWLS space



Composting



Entomology

- Evolution of Resistance
- Ecosystems
- Pest Control Application
- Natural Resource Management



Restoring the Land to Native Grasses



Outdoor Wildlife Learning Site Phase I & II





Building and mapping “Legacy for Learning” native plant gardens



Pollinators



Certified Monarch Butterfly Way Station

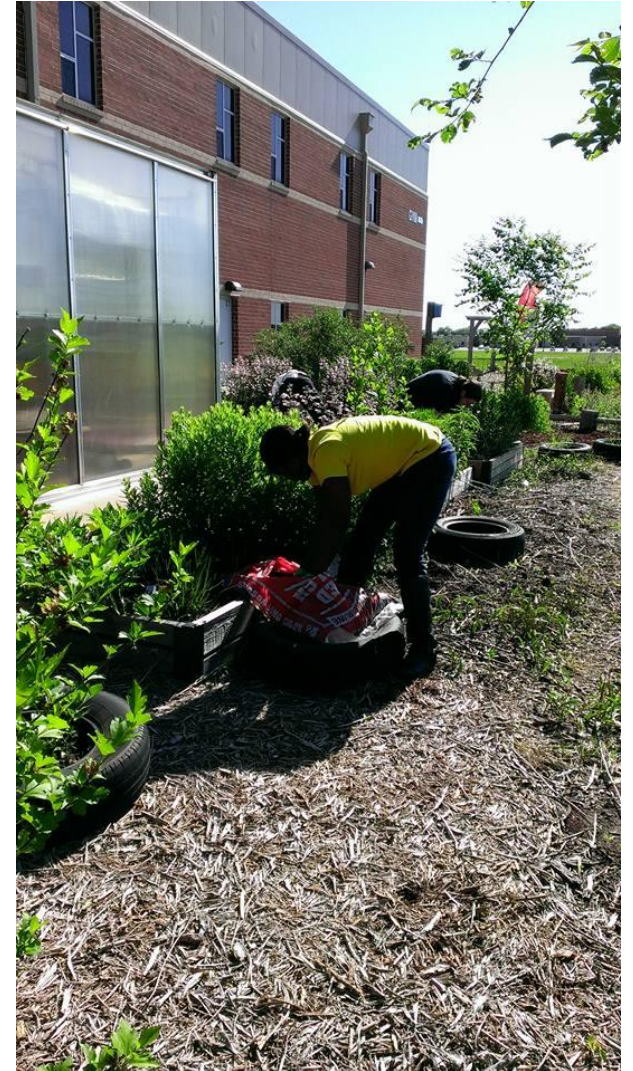
CO2 Monitoring and learning about photosynthesis



Sorting seeds



Green Thumb Brigade



Working in Green House




Building outdoor classroom from repurposed wood



Eco-Meet KS Flora & Fauna



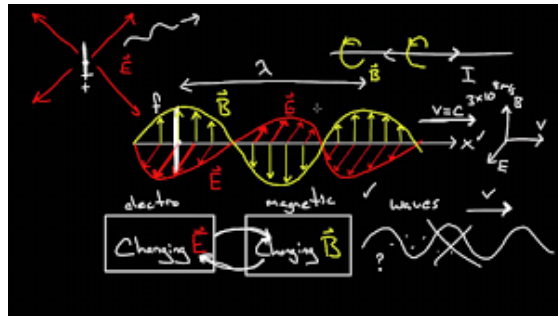
Change the “GAME” of One Topic Science classes

- By generating excitement through integrating “real-world” applications to the science concepts you are teaching.
- By relating  other elements literature, current events, and history.
- By getting out of your comfort zone and looking for ways to get the concepts across using other sciences.



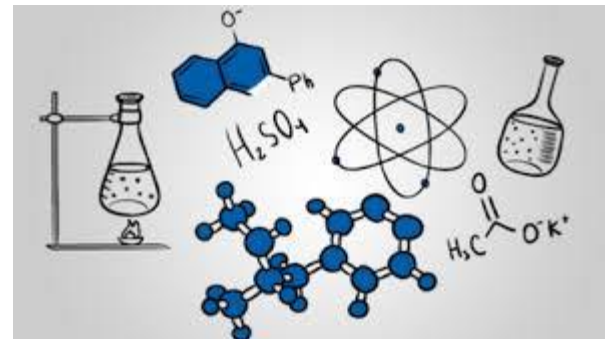
- Earth Dynamics—tectonic plate movement and impact on species development
- Heat and energy transfer—heat islands and greenhouse effect
- Atmosphere—air quality & pollution; ozone impacts

Physics



- Laws of Thermodynamics relating to the greenhouse effect
- predicting dissolved oxygen (DO) both upstream and downstream using Henry's law.
- Energy and heat transfers
- Energy conservation and conversion
- Atmospheric Spectroscopy (particulate matter)

Chemistry



- “Green” Chemistry
<http://www.beyondbenign.org/k12education/highschool.html#rxnslab>
- Acid rain and its effects (pH, balancing equations, inorganic reactions)
- Air Pollution--Which elements or compounds form pollutants? How is air pollution formed? How does the law of conservation of matter govern reactions, which result in air pollution? How can air pollution be mitigated or reduced?

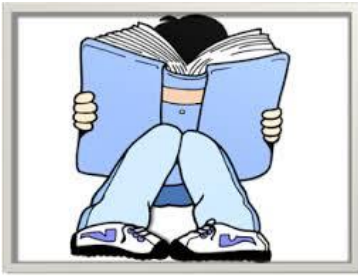
Water Quality and Chemistry

- Conductivity, salinity and total dissolved solids
- Dissolved oxygen
- Nutrients: Phosphorus and Nitrogen as Nitrate and Ammonia
- pH



Biology--<https://www.biologycorner.com/lesson-plans/ecology/>

- [Estimating Population Size](#) | [Online Simulation](#) – mark and recapture technique
[Owl Pellets](#) – dissect owl pellets, reconstruct skeletons
[Predator Prey Graph](#) – graph data on deer and wolf populations (growth curves)
[Lesson of the Kaibab](#) – another deer graphing exercise
- [Random Sampling](#) – estimate a population of “sunflowers”
[Random Sampling with Dandelions](#) – estimate the number of weeds on your school grounds using string and counting the number of plants within a plotted area
[Interpreting Ecological Data](#) – graphs and data tables
- [Population Biology \(Virtual Lab\)](#) – growth of paramecium
[Demography Lab](#) – collect cemetery data, construct survivorship curve
[Predator Prey Simulation](#) – collect data, growth curves, analyze how reproductive rates of predator and prey affect growth curves
[Predator Prey Simulation with Notecards](#) – use notecards to demonstrate how predator and prey numbers change over time
- [Examine an Ecosystem](#) – observation of jar/pond water
[Examine Succession](#) – graphic shows how species are replaced as a pond dries up.
- [Build an Ecosystem](#) – use bags, water BTB, oxygen data
[Food Web Label](#)– image; label producers, consumers, carnivores..etc
[Food Web Label II](#) – another image to identify producers, consumers..etc
- [Biomes Concept Map](#) – research biomes, create graphic organizer from scratch
[Biomes Concept Map Fill In](#) – concept map is already created, students fill in words
[Biome Project](#) – research biomes, create a presentation, travel brochure or similar artifact to showcase your biome
[Biomes \(Ecosystem\) Venn Diagram](#) – compare two biomes and complete diagram
[Biomes at MOBot](#)– web lesson, research site, fill out table and answer questions
[Biome Map](#)– color N. America’s biomes
- [Isopod Behavior Lab](#) – AP Lab 11, modified



Meet Reading Standards while integrating ecology

To meet some of the Ecological Standards (for example 4-ESS3-1), the trick isn't the cross-curricular process as much as it is finding appropriate resources for students to read.

- Using data from the EPA about air quality or emissions raises the text complexity and gives students exposure to great content-rich vocabulary (RI.4.4).
- It's also great exposure to both author's purpose and to primary sources.
- In the world of climate change literature, vetting the sources is a critical component of getting accurate information, and it aligns nicely with the Common Core Standards in reading (RI.4.8).

Elementary School FREE Resources

Kids Connection Magazines: 3rd- 5th

A Pollinator Party: Partners in Agriculture Bees, birds, bats, oh my! Learn about the importance of pollinators in agriculture.

http://ksagclassroom.org/pollinator_final

Awesome Aqua: What to Know About H₂O
Learn about water use & the importance of water conservation in agriculture.

<http://ksagclassroom.org/finalwaterissue.pdf>

Energy models and technology

Students can use many different apps or tech tools to create models of photosynthesis or the food cycle (5-PS3-1).

- When it's time for a more independent or summative assessment, something like a Pic Collage would be an easy way for students to demonstrate understanding.



Touch on history while covering earth science

The Earth itself is an important topic in second and fourth grades – specifically volcanoes, erosion, shells, fossils, and earthquakes (ESS1).

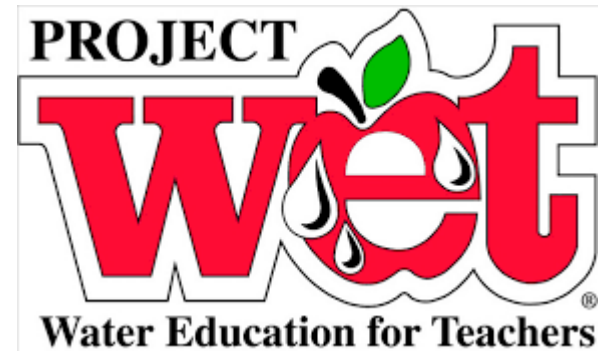
Geology KIDS Discover

<http://www.kidsdiscover.com/apps/>

is a great app that highlights these principles through an interactive tour of the rock cycle. This interactive reading app will teach students how fossils form, and also includes fun features such as a virtual field trip to Stonehenge.

S P I C E
I T U P !

<https://www.youtube.com/watch?v=-ujiCeXK4zI>



Professional Development

<http://seed2stem.org/>



Questions? Contact me at:



dscribner@goddardusd.com

<http://ehs.goddardusd.com/scribner>