THE POWER OF INNOVATION IN AGRICULTURE, FOOD & NATURAL RESOURCES

Anna Herman

The U School

Abstract

The Power of Innovation will introduce students to the history of technology and innovation in agriculture, food and natural resources and then look to the future of innovation, and the process by which problems are identified, and solutions attempted through an iterative process. Through the lens of innovation students will be exposed, and deepen their experiences and knowledge of, many very practical aspects of farming and food production. Students will complete hands-on labs, and complete independent research on problems solved over time with technology, and explore problems still left to solve and some of the innovators and their processes who are working on these problems. Students will also consider the unintended consequences of many of the innovations in farming and food production for the environment that humans are untangling as we deal with the climate changing consequences of many of these innovations.

Key Words
innovation, iteration, urban agriculture, agriculture history, farming, food production, agriculture technology, food technology, farming technology

Unit Content

Introduction

I teach a unique Career and Technical Education (CTE) program in Urban Agriculture, Food and Natural Resources (AFNR) at the U School. The U School was founded to offer a competency-based model that requires young people to demonstrate their learning through tangible performance tasks and to offer opportunities for independent and self-directed learning. With this process, the goal is to empower young people through challenging and scaffolded learning experiences, and for students to be supported to create portfolio based assessments. CTE programs generally aim to provide students with opportunities to learn and practice specific skills and tasks, which can be thought of as competencies, and is generally not broken up into curriculum units, but rather into skill exposure, practice and application opportunities.   I am always seeking ways to combine the CTE list of competencies into comprehensive units that allow students to contextualize their learning, and connect the competencies, skills and tasks to practical real-world learning, citizen science, community partnerships and service learning experiences.

This program I teach is the only CTE program offered at the U School, and is designed as a one-year intensive opportunity for high school seniors to learn, gain certifications, practice skills and gain exposure to green collar career pathways.   So, while our AFNR program is the only CTE program at The U School, the idea of competency based skills organized into classroom learning is a good fit.   This unit attempts to use the U School unit and lesson plan design tools to marry required CTE competencies, Sustainability Competencies and Habit of Success Competencies together in a form that offers students meaningful engagement in material that connects to real world issues in incremental ways. My hope is students will enngage with useful content, and also through the active participation in scaffolded experiences will gain confidence in their abilities to evaluate and address real problems.

Our AFNR program curriculum is evolving and still new, and covers a wide range of topics such as sustainable food and agriculture production & processing and distribution, environmental monitoring, and climate change.   I plan to use this new unit to introduce students to the history of technology and innovation in agriculture, food and natural resources. Then to look to the future of innovation, and the process by which problems are identified, and solutions attempted through an iterative process.   This unit can help me cover a wide range of seemingly disparate required competencies from introducing specific emerging technologies to wrestling with the big idea of environmental impacts, while also exposing students will little experience or knowledge about agriculture to the basic practices of sowing, weeding, harvesting, processing and distributing food which is at the heart of our food and agriculture economy, and our AFNR class. I view this unit at one which can both introduce students to key vocabulary and fundamental facts that are needed as prior knowledge for many of the remaining course units - but also as a gateway into the exciting and somewhat alarming aspects of futuristic innovations (eating bugs; meat from laboratories, robots taking over the most tedious and hard parts of our job if not the whole world etc.) which will spark interest in some students, who might not see themselves as urban farmers or foresters, but might see themselves as food innovators and environmental strategists.

Through the lens of innovation students will be exposed, and deepen their experiences and knowledge of, many very practical aspects of farming and food production. Students will complete hands-on labs, and complete independent research on problems solved over time with technology, and explore problems still left to solve and some of the innovators and their processes who are working on these problems. Students will also consider the unintended consequences of many of the innovations in farming and food production for the environment that humans are untangling as we deal with the climate changing consequences of many of these innovations. The ideas considered in environmental impact reviews will end up as a through line throughout the course as enviornmental impact is the fundamental issue when considering sustainability in all areas of agriculture, food and natural resources.

Students will be introduced to design thinking, and a big picture view of the value of iteration in the service of solving a food, agriculture or natural resources "problem." Having students understand that big ideas grow into final form through a series of steps will serve them in all aspects of their learning. The idea of creating a draft, reviewing and then revising is an essential transferable skill-and one I want to emphasize early and often. Another key facet for any unit I offer in a CTE program is explicit exposure and links to career pathways and job prospects.

Technological innovations in food and agriculture may have started when someone took a stick, stuck a hole in the ground, and planted a seed. Then, they likely sharpened the stick. From oxen drawn plows of yesteryear to the "smart" combines using IoT (internet of things) to sort, weigh, measure and even process crops with sensors, robotic technology and wireless connectivity - technology born of innovation has inserted itself into our food and food growing systems and our ability to monitor, measure and impact the environment.

In this TIP Seminar I have had the chance to explore how soft robots and technology in general can be integrated into the many overlapping and interrelated fields of study within the Agriculture, Food and Natural Resources. We have learned about labs that are working to engineer biodegradable building materials, to use agricultural waste to fabricate biomaterials, and to create robots with pliable parts that can pick fruit and help automate food handling.

We were invited (virutally and in person) into engineering laboratories to witness how teams consider a problem, review materials, create protypes, plan and measure, review and refine. This window into the inner workings of our instructor and guest lecturer's thought processes, team building and laboratory set up inspired me to help my students understand the step-by-step iterative process that underlies most innovations.   This dedication and vision to take an idea, raise funding, assemble a team, try an idea, collaborate with colleagues who are sometimes competitors for funding and opportunities, is something that I had neglected to appreciate, and I am sure is something that my students have little insight into. Making this iterative aspect of work of innovation explicit became an important goal for me in planning this unit.

Each guest lecturer was generous with their time and their ideas, and clearly desired to share their passion, ideas and vision to us fellows.   I was entranced by the Dumolabs work using biologic materials to engineer structures. It seemed like a short stretch to imagine valuable uses for agricultural waste and byproducts in creating a sustainable future where even buildings biodegrade. I was surprised to learn that there is a lab at U Penn collaborating on agriculture technology innovations, whose participants seems interested and available to collaborate with the urban agriculture community my students and I are a growing part of. Our instructor Cynthia Sung's Lab's work inspired by origami and the power and posssibilitea of folding to create compliant materials, and her ability to explain complicated engineering concepts inspired me to attempt to both share and expect understanding of more technological details and underlying principles than I would have thought possible.   It was humbling to attempt to assemble and troubleshoot a simple arduino microcontroller, and this experience - while frustrating - was an important reminder of how our students often experience challenges.

As a culmination to our TIP fellowship, Sung invited us to attend ICRA, the International Conference on Robotics and Automation. This international conference happened to be in Philadelphia on the date scheduled for the last day of our seminar. I was able to directly meet innovators and see first hand some of the technology that is being marketed to agriculture, supply chain and food service uses - as well as innovations to support sustainable natural resources such as robots that clean and sort plastic in waterways, and provide the latest environmental monitoring. I was able to take photographs to use in presentations for this unit, gather resources and contacts to share with my students.

I already have had some experience using technology for environmental monitoring, and (with help from other teachers) have built simple systems to monitor some indoor agriculture systems in my classroom.   It could be useful for us to have the ability to remotely monitor and control indoor agriculture systems, and apply technology in a useful way to the growing spaces and food labs at in our urban agriculture classroom. I have also used mycelia (the network of fungal threads which mushrooms are the fruiting body) to digest agricultural byproducts and create bio-building materials. These existing and emerging technologies are both practical and potentially inspirational, and so I want them to have a firm grounding in our curriculum, and in our classroom infrastructure and funding priorites.

Teaching Strategies

There are always students who would be drawn into the world of sustainability, food systems and agriculture with technology, computers, robotics and sensors while others who might be interested in aspects of that are less technological, but are nonetheless innovative - such as building with biological materials like mycelia, and using microbes to digest and transform plastic waste.

The course is organized around our AFNR program schedule, in which the same 20-22 students are rostered together with me for 3-5 hours each day. This means we are often working simultaneously on more than one unit and finding interconnections between material. This unit will span 2-3 weeks and overlap with the tail end of AFNR unit called *The Power of Connections Ecology & Communites*. This unit leaves students ready to consider the role of food and the impact of agriculture on the history of civilization, and the impact of humans on the world.

This new unit will include a combination of self-paced hands-on labs, group field trips, direct instruction, independent research, and optional time spent in a pop-up classroom ag innovation maker-space over the rest of the quarter (4-6 additional weeks). This unit will overlap on the other side with a unit called *The Power of Best Practices - procedures to ensure health, food safety & sanitation; storage; IPM*. There are many aspects of innovation that were designed specifically to address these *best practice* issues, and students may align a portfolio project to address one of the issues we uncover in this next unit using the theme of innovation and iteration.

Classroom Activities

The Power of Innovation unit will start with a hands-on lab which will be set up as multiple stations around the classroom at which small groups of students will be tasked to do the work by hand, or with very simple hand tools, that has in many cases been made easier with mechanical innovations. Students will thresh, winnow & grind grain; comb cotton & spin thread with a drop spindle; churn cream into butter with a hand crank.. This lab will help students experience directly some of the key practices that were made easier by tools, machinery and inventors. Students will then watch videos of hand milking, and learn about the robotic milking machine that many consider better for cows - but at what cost? Students will review research that has attempted to evaluate the energy and cost efficiences. In another lab day, students will plan and set up an efficient system to plant seeds, water seedlings, and care for these plants indoors for several weeks. We will introduce a simple sensor to assist with watering. They will then contrast their experience to the video and information about a product called the FarmBot which does the same thing for $2500. Students will see demonstration of locally sourced oyster mushroom myclia and hemp by-products used to craft bio-bricks and/or bio-based packaging material (styrofoam substitute), and compare the embedded energy and structural uses for each . Students will explore how drones are now used in agriculture, and make some assessments of how what is learned from a fly over is an improvement from “walking the fields.” Training to certify to use our classroom drone camera will be a highlight of this unit for several students.

Students will watch several interactive slide presentations - using a tool called NearPod - an innovative add-on to google slides where a teacher can include videos, virtual reality tours, quizzes, polls and collaborative boards. This tool allows a student who is absent from a day with key direct instruction occurring to keep up or catch up with their peers. These direct instruction presentations and discussions will focus on AFNR innovations that exist, are in the pipeline or on the drawing board such as soft-robotic crop pickers; micro-controllers to monitor and automate crop growing and animal care; sensors to monitor water and air quality; bio-building with mycelia & various proteins; nano-drones for target pesticide application, and computerized soil sensors. Students will then select one of these agriculture innovations and research the problem it is solving, what is this innovation replacing? where it is being studied/used/tested/piloted? Who is working on this? They will complete a guided notes document to demonstrate.

There are four key goals of this unit. First: to consider why and how agriculture technology has impacted humans relationship with the world. Second for a student to be able to explain how improvments to systems such as food growing, processing & distribution happen through iterative processes, teamwork, collaboration and invention. Third, sudents will be able to explain how environmental impacts are considered, assessed and evaluated. Lastly, students will have explored jobs and opportunities that these innovative technologies offer.

The unit will culminate with hands on project to illustrate the iterative process. Students will be asked to design and craft a pot- then to use, review, and revise their design based on criteria they help create. This simple iterative task is conceived to allow all students to succeed- while demonstrating the step by step nature of design. And they will have a pot to grow plants for an upcoming lab. Students may also opt to join a team that identifies and attempts to solve a problem or support the functioning of an indoor and outdoor agriculture or food production activity using some of the tools we have learned about. A subset of students will participate in this pop up maker space project which has a budget to purchase supplies for projects that complete a short proposal review process.

Below is a detailed guide, which attempts to marry the CTE competencies and the U School unit design process. I have also included a lesson plan, and several review tools that guide students to complete their required portfolio requirements. The unit guide includes links to many of the resources that a student would use for learning and how they demonstrate what they need to show to earn their competency credit. This unit offers something for teachers in other subjects besides Agriculture CTE. Subsets of this unit would make stand alone lessons in an world history (History of Agriculture & The Impact on Civilization), environmental or general science or math class (Environmental Impact Reviews can be quantified and evaluated in detail). Any teacher who wishes to offer their students a chance to connect agriculture, food and natural resources to their daily lives while considering environmental impact and unintended consequences of even the most brilliant innovations can find something here.

The School

The Power of Innovation

AFNR CTE One Year

Overview

Essential Question: Why does innovation in agriculture, food & natural resources not always lead to a more sustainable & just future? How does iteration connect to innovation?

This unit will review key innovations in agriculture, food & natural resources; explore the step-by-step process by which innovations occur (iteration); and evaluate the usefulness of new technologies through the lens of environmental impact.

Culminating Performance Task(s)

AFNR Innovation Portfolio to include:
Reflections on Lab Tasks
AFNR Innovation/Iteration Review & Report Back
Ag Innovation Career Exploration Guided Notes
Completion and Exhitbition of "maker" assignment

CTE Competencies: AFNR CIP 1.999 covered in this unit

- 1601 Discuss trends in food production, world population and supply and demand for food products.
- 1602 Identify emerging technologies and their impacts on food products and processing.
- 906 Describe computerized and electronic animal management technologies.
- 907 Explain emerging mechanical technologies in the plant industry: Understand how Drones and Mapping Technology assist decision making in agriculture
- 901 Discuss the value of irrigation, integrating solar, indoor etc
- 902 Understand the Technologies related to Controlled Indoor Agriculture Practices
- 502 Analyze current agricultural environmental challenges.

Competencies: Educators for Sustainability/The Cloud Institute

INVENTING AND AFFECTING THE FUTURE

- The vital role of vision, imagination and intention in creating the desired future. Students will design, implement and assess actions in the service of their individual and collective visions.
- Reconciling Tradition and Change Students will:
  - .Develop an understanding of cultural influences on the ability of people to live well in their places over time. Pay particular attention to what should be preserved and what must change in order to thrive over time.
  - Transfer knowledge from lessons learned about changes in their own communities to changes in local communities throughout the world and draw conclusions about similaritiesanddifferences.
  - Consider the benefits of cultural homogeneity and of cultural diversity to the sustainability of a community in a place over time.

Competencies: Habits of Success (HOS)

Competencies: Habits of Success (HOS)
• HOS 3.2 Seek support and resources • HOS 4.2 Communicate Effectively • HOS 4.3 Adaptabiltiy & Flexibility

Student Activities	Activity Type	Time to Complete	Learning & Assessment Tools	SWBAT/ CTE Competency
EXPLORE				
1. **Doing things by Hand** - a taste of why innovations are so useful. • Churn cream into butter. • Pull seeds out of cotton bolls (ginning), and Turn Fiber into thread (spinning); • Thresh & Winnowing Wheat Document process with photos and notes.	LAB	80-120 minutes	Add to AFNR vocabulary list Guided Lab Review Doc	required
2. **In the Field with Tools & Machines** Cost/Benefit: - $$, time, energy, environmental impact? Over Two Field Trips to AFNR Partner Urban Farm with Solar & Multiple Irrigation Systems. Students tour & learn about systems. Observe/ participate in weeding/mowing and raking/leaf blowing exercises using a variety of hand, electric & gas powered tools. Students will be invited to evaluate their experiences on: time, ease, comfort, noise, smell. Review to include simple air quality monitor data, decibel app and surveying staff & each other..	LAB & Circular Economy Video (turn into EdPuzzle) To include: Tools of the Trade: Landscaping Stand Alone Lesson	80-120 minutes	Guided Lab Review Doc Guided Enviornmental Impact Statement	Required 901 Discuss the value of irrigation, integrating solar, indoor etc 502 Analyze current agricultural environmental challenges 706 Analyze the ways in which human needs and environmental considerations interrelate.
3. Agriculture History is The History of Civilization & Full of Innovation. Life on Earth Chapter 4: Humans History of Ag EDPUZZLE	Explore- Direct Instruction Nearpod.	60-80 minutes	Report Back on What You Learned -Google Form (if absent) Other students	Required if absent 1601 Discuss trends in

Students will be introduced to a number basic agricultural practices AND innovations. Agriculture inventions timeline A Brief History of Agriculture and Food Production: The Rise of "Industrial Agriculture" 5 Farming Technologies That Changed the World I HowStuffWorks			will complete Nearpod Activitie during class	food production, world population and supply and demand for food products.
4. Class selects one historic innovation and as a group goes through steps to consider closely the issue/problem and the iterations of solution over time	Facilitated Group Collaboration	45 minutes	If absent from class complete innovation iteration worksheet	Required if absent
5. Students presented with a number of AFNR innovations in the pipeline such as soft-robotic crop pickers, micro-controllers to monitor and automate crop growing and animal care; sensors to monitor water and air quality; bio-building with mycelia & various proteins; nano-drones for target pesticide application, and computerized soil sensors, indoor grow towers with timers/sensors etc.	Direct Instruction - Nearpod Activities/ Formative Assessment	40 minutes	Completed nearpod	Required 1602 Identify emerging technologies and their impacts on food products and processing. 902 Understand the Technologies related to Controlled Indoor Agriculture Practices
6. Review Innovation Case Studies in Specific Ag Innovation/Iterations: **The Plow/Plough** Over Time **Milking a Cow** - hand to robot system to autonomous robot (Lely) **Out in the Field** - Refractometers/Drones/Autonomous **Mycelia Products**- biobricks, biodegradable packaging	Teacher Led-Direct Instruction - Nearpod	60 minutes	Group Slide Deck	Required 906 Describe computerized and electronic animal management technologies 907 Explain emerging mechanical technologies in the plant industry: Understand how Drones and Mapping

				Technology assist decision making in agriculture
7. Choose one Innovation - Complete a case study analysis.		60-120 minutes	Guided Case Study Guided Enviornmental Impact Questions	Case study required
8. Students complete a simple innovation *maker* assignment to make two iterations of a CLAY POT. Research, design, make, review, revise, iterate, review... .Document process.			Clay Pot Iteration Instructions	
9. Career Exploration -list names of ten jobs/careers in the agriculture innovation/ag technology field. Choose one to dig into and describe.	Independent research-complete guided notes doc		Career Re...	required
Deliver				
Students will complete two iterations of innovation *maker* assignment. CLAY POT make, review, revise, iterate, review... .Document process.	Independent & small group project		CLAY POT MAKE ASSIGNMENT	Required to exhibit & document
Unit Portfolio To Include: required assignments completed. Photos/Sketches & Any Optional Extension Activities see below.			KEEP TRACK & TURN IN VIA LIFT	

OPTIONAL EXTENSION ACTIVITIES Choose One 1. Students fabricate a replacement part for our irrigation system using the 3D printer. Think through 2 iterations - plan, do, review, revise. 2. Students research DIY web-sites provided by teacher, and use supplies provided to assemble and use a food or agricultural sensor and/or controller. Think through 2 iterations - plan, do, review, revise. 3. Students will coordinate drone training with teacher and get drone handler certification. Think through 2 iterations - plan, do, review, revise. 4. Students will fabricate a planter or other object using a bio-material: biobricks with mycellium. Think through 2 iterations - plan, do, review, revise. 5. Students will plan and work through some problem using some innovation/tech solution(s) for AFNR or one of our urban agriculture partners.Think through at least 2 iterations - plan, do, review, revise.				

Your Name:

The Power of Innovation - Iteration Case Study Report Back
Choose one of the innovations from lesson #6 and complete this Case Study Review **The Plow/Plough** Over Time **Milking a Cow** - hand to robot system to autonomous robot (Lely) **Out in the Field** - Refractometers/Drones/Autonomous **Mycelia Products-** biobricks, biodegradable packaging You may not be able to answer all the questions for the innovation you are evaluating. Do your best. Ask Questions.
What innovation did you choose to report on? (answer below)

▪ What is/are the issue/problem this product or process is solving? In other words, Why is/was innovation needed?	
▪ Who is/was the decision-maker or team that was grappling with some question or problem that needs to be solved?	
▪ A description of the problem's context? What is current solution, why does this need to be solved?	
▪ What key facts were considered? Price, environmental impact, value, ease of use etc.	

■ What alternatives are available to the decision-maker?	
■ What can you learn about the design/iteration process?	
■ What did the decision maker come up with – and why? Is this a useful technology?	
■ What, if any, are the (potential) downsides to this technology?	

Your Name:

Unit Name: The Power of Innovation
Lab Assignment: Make Two Iterations of a Clay Pot
Use this form to guide your work. Complete each section, then do it again.
The goal is for to create a pot that is useful for growing a plant in, that is also "environmetally friendly". When you are done you will be expected to display your pot alongside a sign that explains why this pot is useful, and how it is environmentally friendly. What it is made from, how big it is, what shape it is, what you mean by environmentally friendly - and all the other factors -are for you to decide. **Do Think. Don't overthink. Try to Make a Nice Pot.** Use this chart to guide your efforts.

DESIGN	
■ **Pre-Design Questions** ○ What do you need to know before you start? ○ What sort of plant will you grow ○ How much space does it need? ○ Where can you find this info? (when in doubt, ask Herman) ○ What do you mean by "environmentally friendly?	
■ **Research Questions**: ○ Are there common materials are generally used for pots? ○ Are there common shapes and sizes? ○ What materials do you have access to? ○ What materials do you want to try? Why? ○ How will you know if these materials are environmentally	

"friendly" (what was your definition from above)	
■ How will You **Evaluate Your Design** (it helps to know before you make something how you will decide if it is good) There are some key facts you considered when evaluating a product earlier: Price, environmental impact, value, ease of use etc. ○ Is there any advantage you can see (besides that this is assigned to you) to MAKING a pot, rather than buying a pot? ○ Which of those factors matter to you? Why? ○ How will YOU decide whether your pot is "good"? ○ What matters more to you - that the pot is environmentally "friendly", that it is beautiful? That is is functional? That it combines some of these elements? ○ How will you determine that this pot is a "good one" - what criteria will you judge it on? ○ How will you test your pot?	
■ **SKETCH A DESIGN (or just make something)** ○ Sketch you idea, and make a list of materials you need.	

○ What do you know about the environmental impact of the materials? ○ Add this sketch to your binder or upload a photo to your digital portfolio. ○ Add notes about the environmental "friendliness" of this product	
MAKE & TEST:	
■ **So - make the pot** - and test it. Say a little about that in this box… ..	
REVIEW:	
■ So - What do you Think ? ○ Evaluate the pot based on the criteria that you thought mattered? ○ Does it work? ○ How is it "environmentally friendly? ○ What improvments would make it betterr?	
RE-DESIGN STAGE:	
■ Make another pot based on your ideas	
REVIEW AGAIN::	
■ So - What do you Think ? ○ Is it what you expected? ○ Why? ○ Why Not?	

○ How can you make it better?	
SELF EVALUATION::	
■ So - What do you Think ? ○ Is it what you expected? ○ Why? ○ Why Not? ○ Is there a Way To Make It Better	
TURN IN/EXHIBIT::	
■ Plan to display your pot with signage. ■ Signage should include: ○ Why this pot is useful ○ Why this pot is environemntally friendly ○ Any other information that you want to share	

Resources Appendix

For Students & Teachers:

Background Information about Food, Agriculture/History
https://www.nature.com/articles/s43016-020-0074-1
Can we Feed a Growing Population - Best Practices Activity

Agriculture Innovation Resources:

Homemade Agricultural Inventions | Agriculture Technology - CropForLife
75 technological innovations for our future farming toolbox
American Farm Machinery and Technology Changes from 1776–1990
The evolution of agricultural technology - Innovation News Network
Impact of Technology on Agriculture | National Geographic Society

Impact of Food/Ag on the Enviornment:
Opinion | Indoor Farming Is a 'No-Brainer.' Except for the Carbon Footprint. - The New York Times
Impact of Sustainable Agriculture and Farming Practices
Carbon Footprint of Food | Green Eatz

Suppliers of Kits & Components of Ag Tech:
Seeed Studio:
Arduino OPLÀ IoT Starter Kit - KIT-17694 - SparkFun Electronics

Innovative Engineering Laboratories in the Philadelphia Area (and beyone).
Visit as a virtual field trip:
Sung Robotics Lab
DumoLab Research | Weitzman School
IoT4 Ag - Lab at U Penn
Okada Design

Innovative Engineering Technologies: more info
https://aese.psu.edu/teachag/curriculum/modules/biomaterials/what-is-a-biomaterial

Agriculture Technologies:
https://www.instructables.com/howto/agriculture/
https://learn.browndoggadgets.com/Guide/Plant+Watering+System/326?lang=en
https://farm.bot/
https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/milking-robot

https://www.fb.org/land/ag-innovation-challenge
Do milking robots pay?
Food Technology Disruptions - 1st Edition

Dairy Robotic Milking Systems – What are the Economics? – DAIReXNET
Agriculture Technology -

Food Innovation/Technology Career Exploration

AgExplorer - FFA tool to explore a range of agriculture careers

Horticulture Careers - Seed Your Future - on-line tool to explore horticulture careers, including some in innovative technologies

Resources for Teachers:
Links to the The Power of Innovation teaching/learning documents shared above:

The Power of Innovation in Agriculture Unit Plan - complete unit plan with links to multiple resources

Lesson Plan: Power of Innovation/Milking

Assignment Guide The Power of Innovation: Iterate a Clay Pot (Student Facing)

Guided Notes/Assignment Guide

Educators for Sustainability Standards - Cloud Institutue…
https://static1.squarespace.com/static/5825f79f59cc6805946db437/t/5e3da244adb7535cee58f0e0/1581097541395/CloudInstitute_EfS_Standards_Performance_Indicators_aligned-to-cultural-competency-ver2.0+%283%29.pdf