Middle-level CTE Learning Experience Title: Composting School Food Waste Educator: Steve Perry Length of Lesson: 7 day(40 minute periods) Grade Level: 7	CTE Area: Agriculture CTE Theme: Sustainability CTE Content: Stewardship of the Land Date Created: 3/27/2020

PLANNING	
Curriculum Goal	Students will conduct action research in the school cafeteria to determine the amount of food waste generated by students during lunch periods. Students will research methods for reducing food waste and for utilizing food waste through composting. Students can investigate the use of the compost in a school garden to grow vegetables to serves in the cafeteria.
Essential Question(s)	What knowledge and skills are necessary to evaluate the long-term effects of personal practices on the environment and to demonstrate introductory understanding of how to use and conserve resources to meet human needs while minimizing harm to the environment? What knowledge and skills are necessary to demonstrate introductory understanding of agricultural impacts on natural resource systems?
National Standards	Common Career Technical Core Standards https://www.careertech.org/career-ready-practices Career Ready Practices 1. Act as a responsible and contributing citizen and employee 2. Apply appropriate and academic and technical skills 3. Attend to personal health and financial well-being 5. Consider environmental, social, and economic impacts of decisions 6. Demonstrate creativity and innovation 8. Utilize critical thinking to make sense of problems and persevere in solving them 9. Model integrity, ethical leadership, and effective management 11. Use technology to enhance productivity 12. Work productively in teams while using cultural global competence National Agricultural Education Standards https://www.ffa.org/thecouncil/afnr CS.04. Demonstrate stewardship of natural resources in AFNR activities. CS.06. Analyze the interaction among AFNR systems in the production, processing and management of food, fiber and fuel and the sustainable use of natural resources. ESS.03. Develop proposed solutions to environmental issues, problems and applications using scientific principles of meteorology, soil science, hydrology, microbiology, chemistry and ecology. CS.05. Describe career opportunities and means to achieve those opportunities in each of the Agriculture, Food, and Natural Resources career pathways NRS.01. Plan and conduct natural resource management activities that apply logical, reasoned, and scientifically-based solutions to natural resource issues and goals

	NRS.02. Analyze the interrelationships between natural resources and humans NRS.03. Develop plans to ensure sustainable production and processing of natural resources NRS.04. Demonstrate responsible management procedures and techniques to protect, maintain, enhance, and improve natural resources
NYS Standards	New York State Career Development and Occupational Studies (CDOS) Standards Intermediate Level http://www.p12.nysed.gov/cte/ Standard 1: Career Development Students will be knowledgeable about the world of work, explore career options, and relate personal skills, aptitudes, and abilities to future career decisions. Standard 2: Integrated Learning Students will demonstrate how academic knowledge and skills are applied in the workplace and other settings. Standard 3a: Universal Foundation Skills Students will demonstrate mastery of the foundation skills and competencies essential for success in the workplace.
Learning Objectives	Sustainability 1. Resources Students will a) Define "sustainability" as it applies to resource use b) Explain how sustainability can be a factor in decision making c) Define and give example of renewable and non-renewable resources d) Explain factors to consider when evaluating environmental implications of decisions e) Investigate practices that promote stewardship of environmental resources f) Research the personal, environmental and financial costs and benefits of sustainability-conscious decisions to individuals, families, schools, workplaces and communities. g) Practice making decisions that show consideration for sustainability of resources in a variety of classroom applications. Stewardship of the Land 1. Soil Students will a) Examine the physical and chemical properties of soil b) List and describe the various agricultural uses for land c) Apply knowledge of soil and conservation to management decisions d) Explain agricultural practices designed to protect land and soil quality

Vocabulary	Academic Sustainability, Renewable, Nonrenewable Environment, Natural Resource	Content Compost, Organic Matter, Sand, Silt, Clay
Materials and Resources	Agriscience notebooks (Day 1, 2, 5 Chart Paper, Markers (Day 1) PBS Learning Media Recycling and Composting (Day 1) https://ny.pbslearningmedia.org/resource/ess05.sci.ess.earthsys.lp_recycle/recycling-and-composting/ What is Composting? (Day 2) https://study.com/academy/lesson/what-is-composting-definition-and-examples.html Cornell waste Management Institute (Day 2) http://cwmi.css.cornell.edu/composting.htm 55 gallon garbage cans (Day 3, 4, 5, 6, 7) Quart jars, lids, soil (Day 4) Soil Texture Analysis (Day 4) https://www.soils4kids.org/ Amazing World Under Our Feet (Day 4) https://extension.unl.edu/statewide/fillmore/Soils%20Intro%20Lesson.pdf Soil Health (Day 5) http://soilhealth.cals.cornell.edu/ Computers, printer (Day 6, 7) A guide to starting a compost system in your school (Day 6, 7) http://greenmountainfarmtoschool.org/programs/farm-to-school/ Small Compost Systems (Day 6, 7) https://www.walmart.com/search/?query=composter https://www.wayfair.com/keyword.php?keyword=composter&class_id= https://www.gardeners.com/search?q=compost+bins&simplesearch=submit https://www.rainchainsinanutshell.com/search?type=product&q=composters	

INSTRUCTION	What will the teacher do?	What will the students do?	How much time for each activity?
Preparation	Teacher will meet with necessary school personnel, i.e.: cafeteria manager, custodian etc., in order to arrange for 55 gal garbage can containers to be set aside for food waste and for other than food waste in the student cafeteria.		Prior to Day 1 instruction.
Pre-assessment	Day 1 Teacher displays various items to	Day 1 Students take out their Agriscience notebooks.	Day 1: 40 mins 10 mins

	the class. i.e.: leaves, grass clippings, coffee grinds, meat, fish, plastic, etc. (teacher selects items to use) Teacher asks, "As I hold up each item, can you tell me if it should go in a compost pile or not?"	Students consider each item, write the item in their notebook. Next to each item indicate "yes compost" or "no compost".	
Do-now/Hook	Teacher hangs up two large sheets of paper. Next to each sheet, places a magic marker. One sheet is labeled "Compost". The other is labeled "Do not compost". Teacher asks for volunteers to fill in any items they can think of for each of the sheets. Teacher leads a review discussion on each of the items listed: - What makes items compostable? - What makes items non compostable?	Students place their answers on each of the sheets provided. Students participate in the teacher-led discussion on why something is good for the compost pile and why something is not.	10 mins 10 mins
Procedure for Instruction/ Learning Activities	Teacher delivers direct instruction lesson on: Natural resources - Renewable – those that can be renewed or replaced in a relatively short time by natural ecological cycles. - Nonrenewable – those that cannot be replaced at all or take a very long time to replace. Resource: PBS Learning Media Recycling and Composting	Students takes notes in their Agriscience notebooks on the information presented during the teacher's direct instructions.	10 mins

	https://ny.pbslearningmedia.org/resource/ess05.sci.ess.earthsys.lp_recycle/recycling-and-composting/ Day 2 Teacher introduces the class to the Composting School Food Waste Project. Teacher explains the class will be conducting research into how much food waste is produced each day in their schools' student cafeteria. Teacher further explains that students will investigate not only how much food is wasted but how the waste could be better utilized. Teacher leads a summary discussion: - What do we mean by the term compost? - Utilizing students input, the teacher develops a formal definition to include "a form of waste disposal where organic (define) waste decomposes naturally under oxygen-rich conditions…Once these waste items are placed in a pile, the composting process can start. The organic materials are broken down naturally by earthworms, bacteria and other organisms that live in soil." Resource: Study.com What is Composting	Day 2 Students take out their Agriscience notebooks. Students write down the components of the class research project as explained by the teacher. Students offer their input as to what a definition of compost should include.	Day 2: 40 mins 10 mins 30 mins.

	https://study.com/academy/lesson/what-is-composting-definition-and-examples.html Teacher continues direct instruction with these questions - How can compost help improve the quality of the soil? Teacher leads a summary discussion: - Puts nutrients back in the soil - Increases organic content. Resource: Cornell Waste Management Institute http://cwmi.css.cornell.edu/composting.htm	Students offer their responses to the question. Students takes notes in their Agriscience notebooks on the main ideas presented during the teacher's direct instruction lesson.	
	Day 3 Teacher takes class to student cafeteria to see food waste/other waste containers. Teacher asks the class - How can we best figure out how much student food waste is produced each week in this cafeteria? Possible Solutions - Total number of food waste containers for the day and multiple by 5 (days a week) - Total number of food waste containers for each day for a	Day 3 Students accompany their teacher to the student cafeteria with a pen / pencil and Agriscience notebook in hand. Students offer mathematical solutions for the question and vote on method to be utilized.	Day 3: 40 mins 40 mins

	week. - Total of food waste containers for a day for select number of days. Compute the average and multiply by 5 days. Teacher supervises class as they offer instruction to students eating in the cafeteria as to how to discard their waste. Food waste research begins. Teacher selects students to receive data each day from school personnel. Computations done according to method selected by class. Day 4 Teacher asks student to report on the weight of student food waste. Teacher divides the class into groups of 4. Each group is to receive a quart size jar with lid, paper bag of soil, quart of water and black sharpie pen. Teacher explains to the class that today we will take a look at what soil is made of. Teacher asks the class - Can someone remind us how compost helps to improve soil?	Students remain for the period to observe food waste disposal and offer instruction to other students as to what is placed in each of the containers. Student(s) receive data (weight of food waste) and shares with the class. Day 4 Student reports weight in pounds of student cafeteria food waste from the prior day and records the information on a chart. Students collect each of the necessary components for their group.	Day 4: 40 mins 20 mins

	Responses should include - Organic matter - Nutrients - Composition Teacher explains that starting today, we will take a look at the components of soil as well as its properties. Teacher provides the following explanations and procedures for today's exercise. - Today we will begin to take a look at what exactly soil is made up of. 1. Fill your quart jar half full with soil. 2. Utilizing the water provided, wet the soil just until it looks like mud. Be careful not to add too much water. 3. Mark the level of soil on the jar with the sharpie pen. 4. Add water to the top of the jar, put on the lid, and shake until the soil and water are mixed. 5. Put the jar back on your table and someone tell us when 40 seconds has passed. 6. Now mark the level of the soil in the jar. *Teacher explains that this is the sand portion in the soil.* 7. Teacher explains that the jars will need to stay until tomorrow in order to settle out. Then we will be able to finish the exercise and see the other components in the soil.	Students offer responses to the question posed by the teacher. Students follow teacher's direction in order to accomplish todays exercise. Students fill the jar half full with soil. Students adds water to mud consistency. Students mark the jar at soil level. Students fill jar to top with water and put on the lid. Students shake the jar until soil mixed with water. Students put jar on table. Student times 40 seconds for the class. Students mark the level on the jar.	

	Resource: Soil Texture Analysis https://www.soils4kids.org/ Teacher leads students into a discussion: What is soil? - 50% solids (sand,silts,clay) - 25% air - 25% water Teacher mentions that today we are beginning to look at the solids in our little jar exercise. Teacher asks How do each of these components help the plant? - Support - Oxygen - Water - Nutrients Teacher asks How do you imagine soil is formed? In other words, where did it come from? - Slow weathering process that takes place above and below the Earth's surface. - Physical breakdown and chemical decomposition of rock. - Wind and rain blow against mountains. Boulders become loosened and freezing rain cracks smaller boulders. Below ground during decomposition rock becomes soil.	Students take out their Agriscience notebooks and take notes on the main ideas presented during the discussion. Students offers responses to the question. Students offer responses to the question. Students continue to take notes in their Agriscience notebook. Students offer responses to the question. Students continue to take notes in their Agriscience notebooks.	20 mins

	Teacher reminds class that tomorrow when we come in, we should be able to see just what solids are found in the soil in our jars. Resource: Amazing World Under Our Feet https://extension.unl.edu/statewide/fillmore/Soils%20Intro%20Lesson.pdf Day 5 Teacher requests student report on total food waste from the day before. Teacher requests student groups from day before to return to their jars and report on visual observations. Teacher instructs students to use their sharpie pens to mark each of the levels present. Teacher requests students to draw what they see in their Agriscience notebooks. Teacher asks the following - How many layers do you observe? Teacher leads a summary discussion: CLAY SILT SAND	Day 5 Student records pounds of food waste on wall chart. Students return to their jars and observe contents. Students use their sharpie pens to mark each of the different layers in the jar. Students take out their Agriscience notebooks and draw their observations. Students respond to what they observe.	Day 5: 40 mins 10 mins 30 mins

	- Soil made up of minerals, decaying leaves and living organisms. - Texture – the presence of sand, silt or clay particles in the soil. Resource: Soil Health http://soilhealth.cals.cornell.edu/ Teacher asks: Why is healthy soil so important? - Basic element of life - Provides plants with essential minerals and nutrients. - Provides air for gaseous exchange between roots and the atmosphere. - Protects plants from erosion. - Holds water (moisture) Teacher asks: How can our research project illustrate ways to help improve the quality of soil? COMPOSTING Teacher leads a summary discussion: How does composting improve soil? Why is healthy soil essential for our health? Can you think of the term used for keeping soil healthy for long periods of time? Teacher introduces a definition for the term.	Students offer responses. Students continue to take notes in their Agriscience notebooks. Students respond to the question. Students participate in the teacher led summary discussion.	

	Sustainable Soils - Using practices that build healthy soil, reduce erosion and reduce the need for fertilizer, pesticides and herbicides. Day 6-7 Teacher requests students to report on total food waste from day before. Teacher asks students to return to their soil activity groups. Teacher provides each group with a laptop computer. Resource: A guide to starting a compost system in your school. http://greenmountainfarmtoschool.org/programs/farm-to-school/ Teacher provides links for various compost systems to be utilized for students to review various small compost systems and select a **System** to be used at the school site. (Budget provided by teacher.) https://www.walmart.com/search/?query=composter https://www.wayfair.com/keyword.php?keyword=composter&class_id=	Day 6-7 Student records pounds of food waste on wall chart. Teacher assembles students in their groups. Students utilize laptops to begin to review the various sites for selection of a compost systems.	Day 6-7: 80 mins 80 mins.

	https://www.gardeners.com/search?q=compost+bins&simplesearch=submit https://www.rainchainsinanutshell.com/search?type=product&q=composters Teacher provides the following outline for students to follow: - Compost system selected - Cost - Reasons for selection over other systems reviewed. Teacher explains that each group will be called upon to deliver their choice to the class and explain why they chose that system over the others reviewed. Each members of the group will be required to participate in the presentation. Teacher leads the group vote on systems presented in order for the class to select the method (system) of choice. Teacher leads the group on walk of school campus in order to review possible sites for the composting system selected. Teacher makes arrangements for a future date for placement of the compost system and utilization of student food wastes to be brought	Students select the system the group decides upon. Student groups present their compost choices to their classmates. Student vote on the systems presented. Students walk school campus to select compost system site. On future dates, students maintain compost system and transfer of student food wastes to the compost bin continues on an on-going basis.	

	by students to the compost bin. Sites are selected for utilization of compost for school soil improvement.	Students utilize compost to improve school soils.	
Differentiation	Students will be grouped by their abilities and interests. Teacher will provide scaffolded support where needed. Students who have physical disabilities will be accommodated for. Students who are meeting all of the expectations will be challenged to go above and beyond.		
Closure	Students will select a site for placements of a compost bin. Students will decide on use of food waste for compost bin. Students will decide on school compost site(s) for compost to be added to soil. Next steps can be planting of a vegetable garden.		
ASSESSMENT			
College, Career, and Life Readiness Skills	Based on Middle-level Life/Career Rubrics available at https://nyctecenter.org/middle-level-life-career-rubric-database/rubrics?start=0		

Performance Measure	Exemplary	Proficient	Developing	Beginning
Uses System Thinking	Recognizes and manipulates parts of a system to come together to accomplish tasks.	Recognizes how the parts of a system work together to accomplish tasks.	Identifies the parts of a system but cannot explain how they work together.	Is able to identify only some system parts and loses sight of how they work together.
Allocates Resources to Meet Needs	Consistently plans in advance how much stock can and should be used to complete a project promptly (e.g., portioning meals, making a budget, having correct quantity and type of materials onsite).	Correctly figures how much stock can and should be used to complete a project promptly (e.g., portioning meals, making a budget, having correct quantity and type of materials onsite).	Often guesses how much stock should be used to complete a project (e.g., portioning meals, making a budget, having correct quantity and type of materials onsite).	Does not understand how much stock can and should be used to complete a project (e.g., portioning meals, making a budget, having correct quantity and type of materials onsite).

Contributes to Well-being of Community	Is a strong advocate for the community and always acts in a manner that benefits the community.	Understands responsibility of the individual to the community and acts in a manner that benefits the community.	Usually considers the well-being of the community even if occasionally acts in self-interest.	Favors self-interest over the well-being of the community.
Demonstrates Understanding of the System and Environment Influencing the Organization	Consistently acknowledges the economic, political, and social relationships that impact multiple levels of an organization and uses this knowledge in interactions within the group (e.g., local, national, international).	Acknowledges the economic, political, and social relationships that impact multiple levels of an organization (e.g., local, national, international).	Acknowledges some social relationships that impact multiple levels of an organization.	Does not acknowledge social relationships that impact multiple levels of an organization.
Sees Consequences of Actions	Consistently considers the implications and consequences of actions.	Considers the implications and consequences of actions.	Occasionally acts in ways that fail to anticipate consequences.	Acts impulsively and fails to consider consequences of actions.