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Sustainable Agriculture Lesson for Middle School Classrooms

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Sustainable Agriculture Lesson for Middle School Classrooms

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Abstract: In this lesson, students will learn about sustainability, where farmers/agriculturists can meet the needs of food, fiber, and fuel for the growing population. Students learn about growing population, its growth rate, major food source, sustainability barrel, potential ripple effects of positive impacts as well as the food waste and its effects.

Lesson Description:

Grade Level: Grade 7-8

Estimated Time for Completing Activity: 2-50 minute period

Learning Outcomes:

- Students will be able to understand the core question, “How will we sustainably feed nine billion people by the year 2050?” and begin to think about the challenges and opportunities presented by this question.
 - Students will be able to describe the expected population growth between now and the year 2050.
 - Students will be able to identify agricultural products that must be provided by agriculture in order to accommodate a growing population.
 - Students will be able to explain what sustainable agriculture is using the sustainability barrel.
 - Students will be able to discover how the ripple effect can relate to sustainable agriculture and have a positive impact in our society.
 - Students will be able to understand the role food waste plays in our world.
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South Dakota Standards of Learning:

- MSA 2.1: Give examples of how the agriculture industry provides basic human needs (food, clothing, shelter).
 - MSA 3.1: Appraise fundamentals of the agriculture industry and its impact on the world.
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Oceti Sakowin Essential Understandings and Standards:

<https://indianeducation.sd.gov/documents/OcetiSakowinEUS.pdf>

ESSENTIAL UNDERSTANDING 1: The original land base and natural resources of the Oceti Sakowin were under communal stewardship prior to immigrant settlement. The Oceti Sakowin tribes have a distinct and unique interrelationship with the environment that contributes to South Dakota.

- Indicator #1: Analyze the land base and natural resources of the nine reservations in South Dakota
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Standard: Students are able to identify the physical geographical changes to explain the causes that impacted the land base and boundaries.

- Indicator #3: Evaluate the strategies in which the tribal governments and other leaders are taking action to improve the lands and natural gifts.

Standard: Students are able to identify and explain how a tribal government manages the ecosystem and its natural gifts.

Prerequisite: A general understanding of the atmospheric processes needed to form clouds.

Materials:

- Sustainability PowerPoint
 - Sustainability Flashcards
 - Laptops
 - Internet access
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Vocabulary:

- Sustainability
 - Agriculture
 - Sustainable Agriculture
 - Social impact
 - Economic impact
 - Environmental impact
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Lesson Links:

- <https://www.symbaloo.com/home/mix/13ePQMqNC>
 - <http://journey2050.wpengine.com/play-the-game/>
 - <https://edu.google.com/expeditions/#about>
-

Background:

It is estimated that by 2050, Earth will be crowded with 2 billion more people. They're all going to need water, homes, jobs and medicines. But most importantly, how are they all going to be fed? This growing population will eat the equivalent of all the food grown in the last 500 years put together. That's over 60 percent more than we grow today or 1 billion tons more cereal and 50 percent more freshwater every year. This additional food has to be grown on less land and in a way that protects the environment and animals, while also ensuring there's enough food for generations to come. This is called sustainability, and it can only be achieved by improving its three interconnected elements: economy, society and the environment.

The economic component of sustainability is about earning money—creating jobs and incomes to support the national and local community. The social element encompasses things like food, education, medical care and infrastructure, including the roads used to transport food from the farm to your plate. And finally, there are environmental needs to consider. Soil quality needs to be maintained, habitats need protection, water must be conserved, and we need to protect our atmosphere by keeping greenhouse gas emissions to a minimum.

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Imagine a barrel with parts made equally from the three elements of sustainability. You can only fill this barrel to the level of its lowest piece. If the environment is the lowest piece of the barrel, it limits sustainability. This element must be improved to make the world's sustainability better.

World leaders in the United Nations have committed to 17 Global Goals in order to achieve extraordinary things such as: end extreme poverty, fight inequality and injustice, and fix climate change. Sustainable agriculture is key to meeting these goals and creating a stronger 2050 for our people and our planet.

The planting of a single seed creates a ripple effect that helps the farmer's family, their community, their country and ultimately, the world. The more farmers grow and sell, the more they have to spend on seeds, machinery and fertilizer to produce even more food and fiber. Income that's spent locally is invested in the community, providing education, medical care and infrastructure and protecting the environment. If farmers around the world start a ripple, it could improve global economies and help billions rise from poverty. Different farmers raise different crops and animals according to their local soil, climate, technology and markets. But they all have one thing in common. They love agriculture.

On our journey to the year 2050, we're going to be spending time with three different farm families who are growing food sustainably. First, you'll meet the Madges. They're a three-generation farming family from Central Alberta, Canada. Then we'll fly across the Atlantic to meet the Oloos. They own a small farm in Kenya, East Africa. Finally, we'll visit the Singhs, who live in India where multiple generations farm together. These families and agricultural experts will be giving you advice on what we call best management practices, which will allow us to grow more with less, protect the environment, build stronger communities and feed the growing population of our planet.

Procedure:

- Present Sustainability PowerPoint (see the supplementary PowerPoint Slides and worksheet), and ask students to go over sustainability Flashcards (<https://quizlet.com/240062584/topic-8-sustainability-flash-cards>)
 - Follow-up discussion about the powerpoint slides and flashcards
- Watch Some Food for Thought Youtube Video (<https://youtu.be/0DNbOzupS3k>)
 - Follow up group discussion regarding student's thoughts of the video.
- Show the "World Population Youtube Video (<https://youtu.be/Qmla9NLFvU>):
 - Follow up group discussion regarding student's thoughts of video.
- Show the 7 Billion: How Did We get So Big So Fast? Youtube Video (<https://youtu.be/VcSX4ytEfcE>)
 - Group discussion regarding student's thoughts of video.

Play Level 1 of Journey 2050 (<http://www.journey2050.com/agricultural-resources/>)

Journey 2050 Follow-Up Discussion:

- After growing your first crop, did you invest some of your money to purchase additional land? Why or why not?
- Discuss different farming practices (tilling vs. no-till, organic vs. heavy pesticide use) and discuss their impacts on environment and economy.

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- What was your limiting factor in your limiting factor in your sustainability barrel? What did this mean?
- What were some of the ripple effects of your farming choices?

Optional Activity: Set up a simulation to physically show the negative impacts of un-sustainable farming practices. For example, set up a small garden in a tub that has loose (tilled) soil. Pour a bucket of water to represent a downpour (climate change is expecting us to get more rain in larger doses rather than more frequent lighter rains). Watch how the soil just washes away. Then create a tub that has more compact (untilled) soil and plants covering the surface. Pour a bucket of water into the tub and watch how the soil does not wash away quite as easily as the tilled soil. You could do a similar set up for cover crops and wind erosion.

Extensions: Complete Google Expeditions Farming in Tazenia Journey 2050 Game Levels 2-6

Assessment:

- Group discussions during procedure (see the questions listed).
 - Students can be quizzed using Kahoot (large classrooms) or through index cards
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Accompanying resources:

- Sustainability PowerPoint Slides, by Jennifer McLaughlin
- Sustainable Relationship Worksheet, by Jennifer McLaughlin

Reference:

- Step-by-Step Guide. (2018). *Nutrien*. Retrieved from http://journey2050.rnp.io/teachers/online/activities_and_resources#step-by-step-guide.
- <https://www.journey2050.com/food-waste/>
- <https://youtu.be/G-YX4iNO2N8>
- <https://www.youtube.com/user/TheDailyConversation>

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