

On the Farm Project Based Learning- Unit of Study Outline

Beef Education Resource

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The following is a proposed 10-day unit of study that outlines standards, objectives, supplies, key vocabulary, resources and high level content outline.

Unit: Beef – Past, Present, and Future

Time: 10 days

Objectives:

1. Student will come up with solutions for where to place a new farming operation with green power options.
2. Students will make/simulate barn, lagoon, digester, animals, and animal-welfare plans.
3. Students will try to find ideal heredity for animals based on needs of the farm and farm futures.
4. Students will interview and research with farmers and green energy personnel.
5. Showcase night on farm to fork, farm to STEM in partnership with a trade school or elementary school.
6. Students will write a book using publication software/tools with a story about their imaginary farm with a target audience of elementary students.
7. Students will have options to 3D print, build models, or make posters.

Supplies:

- Laptops/Desktops
- Tablet/Smartphone
- Poster Boards
- Recycled Materials for Projects
- Pencils/Pen
- Plickers Cards (Class Set of 25): These digital check-for-understanding cards are available from Amazon and www.plickers.com.
- Scissors
- Glue
- Colored Pencils
- Quiver Sheets
- Pre-Printed Reading Materials
- Tri-fold Boards
- Office 365
- Post-it Notes
- Individual White Boards for each Student
- Dry-Erase Markers
- MudWatt Device: STEM Kit available from Amazon and other vendors. This kit allows students to build their own living fuel cell that feeds on soil.

Key Vocabulary: See the attached Vocabulary List. An entire glossary of terms is searchable at <http://www.beefusa.org/glossaryofterms.aspx>. See below for specific vocabulary for this project.

Online Resources:

www.tagxedo.com

<https://www.plickers.com/>

www.newsela.com

www.youtube.com

www.rewordify.com

<http://www.beefusa.org/y.aspx>

<https://www.kamihq.com/>

<http://www.iabeef.org/resources/education-resources>

<https://bites.nrel.gov/>

<https://www.epa.gov/agstar/agstar-national-mapping-tool>

<https://www.socrative.com/>

<https://worditout.com/word-cloud/create>

<https://www.edmodo.com/>

[http://www.depts.ttu.edu/meatscience/history_of the meat industry.pdf](http://www.depts.ttu.edu/meatscience/history_of_the_meat_industry.pdf)

www.quivervision.com

<https://eyes.nasa.gov/eyes-on-the-earth.html>

App Resources for iPad:

- Quiver (Augmented Reality)
- Earth Now
- QR Reader
- Google Cardboard (Virtual Reality)
- Viewmaster: Earth, Travel, Underwater (Virtual Reality)

NGSS Standards:

- HS-LS2-1. Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.
- HS-LS2-3. Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.
- HS-LS2-5. Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.
- HS-LS2-8. Evaluate the evidence for the role of group behavior on individual and species' chances to survive and

- reproduce.
- HS-PS3-2. Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a
- combination of energy associated with the motions of particles (objects) and energy associated with the relative
- positions of particles (objects).
- HS-PS3-3. Design, build, and refine a device that works within given constraints to convert one form of energy into
- another form of energy.
- HS-ESS3-1. Construct an explanation based on evidence for how the availability of natural resources, occurrence of
- natural hazards, and changes in climate have influenced human activity.
- HS-ESS3-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.*
- HS-ESS3-5. Analyze geoscience data and the results from global climate models to make an evidence-based forecast
- of the current rate of global or regional climate change and associated future impacts to Earth systems.
- Change and rates of change can be quantified and modeled over very short or very long periods of time. Some system
- changes are irreversible. (HS-ESS3-3, HS-ESS3-5) Feedback (negative or positive) can stabilize or destabilize a system. (HS-ESS3-4)

Essential Questions:

- What impacts do humans have on the environment?
- What is your individual role in these impacts?
- What are world governments doing to assess these impacts?
- How are these impacts going to affect the future?

Enduring Understanding – Students will understand that:

- Biomes are connected and impacts are felt globally.
- How adaptations for climates work and how they might work against species in a changing environment.
- Energy in ecosystems is very fluid.

Skills – Students will be able to:

- Analyze data with respect to emission and populations.
- Express creativity with projects.
- Use digital tools to create products and complete assignments.
- Describe how water is analyzed and the impacts of solids and toxins.

- Use augmented and virtual reality elements.

Performance Tasks:

- Poster on beef will showcase students' understanding of how the farm they selected fits into larger picture and relates to prior topics on pollution, energy, and biology.
- Students will be able to describe and compare farm types.
- The brochure and infomercial will show synthesis of ideas and interpretation of concepts into a different style of assessment and focus on a creative outlet.
- Students will simulate populations and pollution impacts on biomes to show data analysis skills.
- Students will show impacts of humans on populations and what particular items have the largest impact.
- Students will label maps and integrate art and technology to show how making something interactive makes it a valuable and engaging learning tool.

Day One – Launch Day – Where are We Now?

- Project Overview and Expectations.
- Warm Up – Brainstorming on what students know about beef and beef farm operations.
- Index Cards Activity – On the front of the card, ask students to write down how they think beef gets to their plate? On the back of the card, as students to answer the following questions: What is a day on a beef farm like? For the farmer? For the animal?
- Sharing Activity – Ask students to share their thoughts about beef farms and community perspectives. Use a poster board to capture, highlight, take a photo, or save on board for later.
- Word Cloud Activity – Using www.Tagxedo.com and/or <https://worditout.com/word-cloud/create>, help students become familiar with key vocabulary. Use the attached vocabulary sheet for reference. Save this digitally, as students will use this during showcase night.
- Hand out the beef education word search. Save these, as students will use them during showcase night.

Day Two –Where are We Now?

- Jigsaw Activity – Four groups create a PowerPoint, Sway, or infographic.
 - Group One – History of Beef
 - Group Two – Modern Beef Farms
 - Group Three - Beef Consumption/Trends
 - Group 4 - Beef Heredity: Beef Types from Around the World.
- Reading Assignment – You may wish to identify reading assignments using a Newsela teacher account, or assign reading from the following direct sources:
 - “Where's the beef? Texas' cattle rangers go high-tech to cut off rustlers” By Dallas Morning News, adapted by Newsela staff 03.28.16
 - “Grass-fed cattle take slower path to market, filling small consumer niche” By Orlando Sentinel, adapted by Newsela staff 11.13.15

- “Seven percent of Americans think chocolate milk comes from brown cows”
By Washington Post, adapted by Newsela staff 6.23.17
- “For many farmers, use of unmanned flying vehicles is taking off” By Associated Press,
adapted by Newsela staff 07.24.15
- Non-Newsela Suggested Articles:
 - Smith, Gayle. (2016, September). Drones, smart ear tags & cameras: The case for using technology in ranching. *Beef Magazine*. Retrieved from <http://www.beefmagazine.com/pasture-range/drones-smart-ear-tags-cameras-case-using-technology-ranching>
 - Mazur, Michal. (2016, July). Six ways drones are revolutionizing agriculture. *MIT Technology Review*. Retrieved from <https://www.technologyreview.com/s/601935/six-ways-drones-are-revolutionizing-agriculture/>
- Notes:
 - If you wish, you can import any of these article into the website Rewordify at www.rewordify.com and create quizzes, text lists, and Lexile adjustments.
 - If you wish, you can digitally annotate articles using the website Kami at <https://web.kamihq.com/web/viewer.html>.
 - If you wish, use Plickers Formative Assessments to check for understanding.

Day Three – Where are We Now?

- Gallery Walk of Jigsaw Activity
- Brief Oral Presentation of Findings
- Have students write and reflect on what surprised them. Ask them what they think can be improved and what they think is affecting beef trends (e.g., eating of beef, ranch/farming of beef, etc.).
- Homework/Extension Activity – Have students research two articles to share with the class. One of the articles should be on beef farming technologies and the other article should be about raising healthy animals on beef farms.
- Suggested Video Supplement – HistoryTV; Modern Marvels. (Producer). (2015). *Cattle ranches: Where money is like milk*. (44:22) Retrieved from <https://www.youtube.com/watch?v=e9yRT0kccEg>

Day Four – Beef: Where are We Going?

- Before the session, contact local farm agencies to see if robotics are being used locally. If possible, see if a farmer using robotics can come speak to the class.
- Read and share researched articles on beef farm technology.
- Discuss articles and future applications.

- Suggested Video Supplements:
 - Datacube. (Producer). (2015). *Drones in farming or agriculture: Futuristic ideas and uses*. Retrieved from https://www.youtube.com/watch?v=i7GLo-2F7_o
 - National Geographic. (Producer). (2015). *Drones and the future of farming*. Retrieved from <https://www.youtube.com/watch?v=v3YcZtlVrls>
 - Bloomberg. (Producer). (2015). *How robots are saving the dairy farm*. Retrieved from <https://www.youtube.com/watch?v=-Xl4siKp-nU>

Day Five – Beef: Where are We Going?

- Before the session, contact a local veterinarian or university and ask if someone is available to speak to the class about animal welfare and genetics.
- Read and share articles on beef farming best practices and raising healthy animals.
 - Suggested Articles/Videos:
 - Sustainability at the Feedyard (January 24, 2017) <https://factsaboutbeef.com/2017/01/24/sustainability-at-the-feedyard/>
 - A Vet's Perspective on Antibiotics and the Veterinary Feed directive (January 13, 2017) <https://factsaboutbeef.com/2017/01/13/a-vets-perspective-on-antibiotics-and-the-veterinary-feed-directive/>
 - Would Removing Beef from the Diet Actually Reduce Greenhouse Gas Emissions? (April 21, 2016) <https://factsaboutbeef.com/2016/04/21/would-removing-beef-from-the-diet-actually-reduce-greenhouse-gas-emissions/>
- Discuss articles and future applications.
- Suggested Video Supplement
 - AHDB Beef & Lamb. (Producer). (2015). *Webinar: Growing and finishing cattle this winter*. Retrieved from <https://www.youtube.com/watch?v=FcvBB72xGrU>
 - Clemson University. (Producer). (2008). *Forage and cattle genetics*. Retrieved from <https://www.youtube.com/watch?v=SLdYrrOv-XY>
- Optional Learning Extension: Have students research the use of genetics in helping create healthier cattle.
 - Students will research the top three commercially bred cattle breeds in the US and find out what traits are favorable.
 - Students will research what breeds will perform better in the local climate.
 - Students will create a poster on one cattle breed of their choosing with information about where the breed originated, what its best known for, and how genetics helped make this breed stronger.
- If you wish, use Plickers Formative Assessments to check for understanding.

Day Six – Green Energy

- Warm Up – Have students create a map of different breeds of cattle around the world. Have students focus on breeds in the US versus those in Europe and Asia. Create a map key. Save these, as students will use them during showcase night.

- Jigsaw – Have students split into two groups. Have each group research their topic and create a tri-fold brochure with key information. After becoming experts on their topic, have them pair with a member of the opposite group to share learning.
 - Group A – What does an anaerobic digester do on a cattle farm?
 - Group B – What is proper wastewater/lagoon management on a cattle farm?

Optional Learning Extensions:

- Using Google Cardboard or Viewmaster, see if students can find local farms based on information collected from websites, visitors, and Google Street View.
- Show the class similar technology by getting a class anaerobic digester mockup or Mudwatt device. Products are available at the following:
 - <https://www.magicalmicrobes.com/collections/kits/products/mudwatt-clean-energy-from-mud>
 - <http://www.build-a-biogas-plant.com/school-bio-gas-kits/>

Day Seven – Green Energy

- Before the session, preview the BITES website at <https://bites.nrel.gov/>. Students will need an account set up in order to use this resource. This site shows trends and possible trends that can be adjusted by the student.
- Student Discussion – Could anaerobic digester technology help with the reduction of greenhouse gases and provide cleaner energy?
- Have students break up into groups of three or four for final projects.
- Go over expectations and outcomes of the final project. These expectations will vary depending on your specific setting, resources available and supporting objectives. Suggested final project concepts are listed below:
 - Farm Mockup (digital, or model), posters, brochures, research, coloring sheets, and mini book for elementary students (or younger audience) The book topics- Digesters, Life on a beef farm, technology on a beef farm.

Days Eight Through Ten – Putting it All Together

- Students will come up with solutions for where to place a new farming operation with green power options.
- Students will exhibit their work at a showcase night on farm to fork, farm to STEM in partnership with a trade school or elementary school.
- Students may express their learning in a variety of ways. The following ideas have been provided as suggested applications:
 - Students will make/simulate a barn, lagoon, digester, animals, and animal-welfare plans.

- Students will try to find ideal heredity for animals based on needs of the farm and farm futures.
- Students will interview and research with farmers and green energy personnel.
- Students will write a book using publication software/tools with a story about their imaginary farm with a target audience of elementary students.
- Students will have options to 3D print, build models, or make posters.

Final Preparations for Showcase

- Create a project timeline, as ordering professionally printed books may take time.
- Make sure you involve local media and any trade groups that might be able to help.
- Invite as many speakers as you can. Use Skype to facilitate speakers.
- Add lessons to your Google classroom, Microsoft classroom, Edmodo, etc.
- Invite a keynote speaker.

Night of the Showcase

- Have students create posters and mini commercials using iMovie to help with promotion.
- Make sure any and all release forms for photos and quoted material are on file.
- Create stations with all student work from this unit, have students man stations, and take questions.
- Keynote speaker speaks.
- Have students create reflection videos. These videos should be two to three minutes long about what the students have learned. Play these videos on a loop.

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The Beef Checkoff Program funded development of this educator resource. The Beef Checkoff Program, MyBeefCheckoff.com, was established as part of the 1985 farm bill. The checkoff assesses \$1 per head on the sale of live domestic and imported cattle in addition to a comparable assessment on imported beef and beef products. In states with qualified beef councils, states may retain up to 50 cents of the dollar and forward the other 50 cents per head to the Cattlemen's Beef Promotion and Research Board, which administers the national checkoff program, subject to USDA approval.