The University of Texas at Austin
Environmental Science Institute

The Fate of Food

Lesson Plan for Grades: 9th grade
Length of Lesson: 50 minutes

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Subject area/course:

- Biology

Materials:

- Posterboard
- Markers
- Laptop or Printed Articles

TEKS/SEs:

§112.34. Biology (One Credit), Adopted 2017

(3) Scientific processes. The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom. The student is expected to:

- (A) analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, so as to encourage critical thinking by the student;
- (B) communicate and apply scientific information extracted from various sources such as current events, published journal articles, and marketing materials;
- (D) evaluate the impact of scientific research on society and the environment;

(12) Science concepts. The student knows that interdependence and interactions occur within an environmental system. The student is expected to:

- (E) describe how environmental change can impact ecosystem stability.

Lesson objective(s):

- The students will understand the consequences of climate change on agriculture.
- The students will use their critical thinking skills to think of solutions to the current and future agricultural crisis.
- Students will connect the relationship between climate and agriculture.

Differentiation strategies to meet diverse learner needs:

- The teacher should ask students whether they prefer to read or watch videos to learn about concepts; then have students learn in their preferred learning style. However, the teacher may assign students certain methods to improve their skills. For example, if a student prefers reading, teachers may have them watch a video and take notes to improve their listening skills.
- ELL students and students with learning disabilities should have multiple forms of instruction including visual and written instruction sheets as well as a verbal instruction and demonstration.
- This lesson can also easily be adapted and modified as an online only (zoom) lesson.

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ENGAGEMENT (5 minutes)

- The teacher will start the lesson by asking the students the following check in question.
    - Which of the following is your favorite fruit?
        - Strawberries
        - Apples
        - Oranges
        - Peaches
        - Mangos
- The teacher will then go through each option and ask the students to raise their hand if that fruit is their favorite in order to figure out which fruit is the most popular in the class.
- Once the teacher knows which fruit their class prefers the teacher will give the students about 2 minutes to discuss with the person nearest to them what they know about the chosen fruit and the conditions it's grown in.
- Questions to ask as the students are discussing if they are having difficulties:
    - Where is (chosen fruit) normally grown?
    - What do you know about the climate of this location?
    - When do we typically harvest (chosen fruit)?
    - Any interesting facts you may know about it?
- After the students have discussed the teacher will reconvene the class and ask the students what they know about the fruit and its growing conditions
- As the students are listing off information the teacher will be recording this information on the board.

Transition: "As we've briefly discussed, many plants evolved in very specific conditions and as a result can only grow under certain conditions including many of the crops that we rely on for food. Today we're going to learn more about the different crops and the environments the need to grow and how climate change is affecting them.

Alternative Engagement

- The teacher will play the following video about the effects of climate change on agriculture.
- https://www.youtube.com/watch?v=G0K9sD0vGus
- After the video, the students will be given about 2 minutes to discuss with someone near them what they thought about the video, the students should try to come up with something they learned and a question they still have.
- The teacher will then reconvene the students and call on a couple pairs a discuss what they learned and what questions they still had.

Transition: "We now know that climate change isn't just something we have to worry about in regard to our air quality, our oceans, or biodiversity it's also becoming something we can taste and today we're going to look at a few crops in more detail and see how they're responding to climate change"

EXPLORATION (15 minutes)

- For this activity, the students will be working in groups to create a posterboard presenting the information they learned about how climate change is affecting their assigned crop.
- The teacher will break the students into groups of 4. Each student in the group will be assigned one of the following roles to ensure accountability.
    - Leader: Responsible for keeping everyone on task and managing group
    - Secretary: Group writer/main person writing on the posterboard (but the other students should be helping)

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  - Reporter: Spokesperson for the group
  - Timekeeper: keeps track of the time and assists another group member when needed
- Once the groups are formed and roles have been established the teacher will either assign each group a crop or have the student choose which crop, they want to work on from a list. (Note: each group should ideally study a different crop however if necessary multiple groups can work on the same crop or the teacher can add additional crops.)
- In order to complete this activity each group will be given an article related to their crop. The teacher can either print out the articles for the students to read in class or the students can use laptops to read the articles online (the articles are listed below).
- Potential Crops:
  - Coffee
    - https://time.com/5318245/coffee-industry-climate-change/
  - Corn
    - https://www.scientificamerican.com/article/rising-temperatures-could-cut-corn-production/
  - Peaches
    - https://thecounter.org/global-warming-climate-change-usda-georgia-peaches-liberty-joy-crimson-joy-rich-joy/
  - Apples
    - https://eos.org/articles/as-climate-changes-so-does-the-apple-as-rising-temperatures-push-growers-higher-into-himalayas
  - Grapes
    - https://www.nytimes.com/interactive/2019/10/14/dining/drinks/climate-change-wine.html
- The students will now be given 12 minutes to work with their group members to answer the questions below and create a posterboard demonstrating what they learned.
- The students should start by reading the article individually or as a group.
- Once they've read the article, they should take the time to answer each of the following questions and design a posterboard that displays the information in a clear and concise way.
- How the students present the information is up to them it just needs to be easy to understand.
- The following guidelines should be written on the board, so the students know what needs to be included on the posterboard.
  - Assigned Crop
  - Any special growing conditions your crop needs in order to thrive?
  - How is climate change affecting your crop?
  - Who's the most impacted by a decline in your crop's yield?
  - Any important statistics mentioned (for example: how much the crop yield is predicted to decline by 2050).
  - Potential solutions: those listed and ones you come up with?
  - At least one additional interesting fact.
- As the students are working the teacher should be walking around monitoring the conversation, making sure the students are on tasks, taking note of any interesting conversation points to potentially bring up later and answering any questions.

Transition: "I heard a lot of wonderful conversations and it looks like everyone is done so let's go ahead and talk about our crops"

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EXPLANATION (10 minutes)

- Once all of the groups have completed the activity the teacher will call on each group to stand up and display their posterboard to the class. The reporter will then be given 1-2 minutes to present their posterboard to the rest of the class.
- Once the reporter has finished talking the teacher will open the floor for questions and encourage the students to ask questions and engage in an open conversation about the crops and how climate change is impacting them.

Alternative Explanation:

- The teacher will now have the students perform a gallery walk, each group will display their posterboard at their tables and one student will be assigned to explain the posterboard to the other students. (Recommended that different members explain the posterboard throughout the 10-minute time period by having the students rotate who's at the board at what time).
- As the students are walking around, they are expected to ask the group questions about their poster and crops.

During the explanation, the teacher will be walking around monitoring the conversations and asking additional open-ended questions to encourage student participation.

After the initial explanation, the teacher (if time allows) should reconvene the class and ask additional questions starting a class discussion.

- Potential questions
  - Overall, how does climate change appear to be affecting agriculture?
  - Are some crops better off due to climate change, why?
  - What are some potential consequences of people not doing anything about climate change in regard to agriculture?
  - Can you think of any additional solutions that can be implemented on a mass agricultural scale that will help mitigate climate change?

Transition: "Everyone did such an amazing job explaining how climate is effecting their different crops and I know many groups offered solutions for their respective crop. Now we're going to watch a video about how we can use agriculture itself to help reverse the effects of climate change so instead of focusing on just one crop we will see how changing our practices can help us and the environment."

ELABORATION (15-20 minutes)

- The teacher will now play the following video about regenerative agriculture.
  https://www.youtube.com/watch?v=HuRpEA1sFow
  Note: The video is about 11 minutes long. If you're short on time only play part of the video, the 5-minute mark is a reasonable place to stop.
- As the students are watching the video the teacher should encourage them to take notes, write down anything interesting that they hear and any additional questions they may have.
- After the video is over the teacher will have the students go back to their groups and discuss the video they just watched. The students will be given about 3-4 minutes to discuss.
- Questions the students should discuss/think about in their groups about the video:
  - How does regenerative agriculture help reverse climate change?
  - What are some of the benefits of regenerative agriculture?
  - Why isn't regenerative agriculture more "mainstream"?

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- Is a practice like regenerative agriculture actually enough solve the climate change problem?
- Once the 3-4 minutes are up the teacher will reconvene the class and begin a group discussion about the questions listed as well as any additional questions the students may have from the video.

EVALUATION (throughout entire lesson)

- The teacher will predominantly be using formative assessment to evaluate the students during this lesson.
- The teacher will be paying close attention during the exploration section of the lesson, making note of student participation, conversation topics, and the overall quality of their posterboard.
- During the explanation section the teacher will be evaluating the students on how well they were able to explain the article they read and present that information in a concise and easy to understand manner.

SOURCES AND RESOURCES

- Amanda Little's *Hot Science at Home #1.6,* **"The Fate of Food",** https://www.esi.utexas.edu/talk/fate-of-food/
- Planet Forward, "Climate, Agriculture and the Challenges Ahead": https://www.youtube.com/watch?v=G0K9sD0vGus
- Time, 2018, "Your Morning Cup of Coffee is in Danger. Can the Industry Adapt in Time?": https://time.com/5318245/coffee-industry-climate-change/
- Eos, 2019, "Temperatures Push Growers Higher Into Himalayas": https://eos.org/articles/as-climate-changes-so-does-the-apple-as-rising-temperatures-push-growers-higher-into-himalayas
- Scientific American, 2018, "Rising Temperatures Could Cut Corn Production": https://www.scientificamerican.com/article/rising-temperatures-could-cut-corn-production/
- The Counter, 2020, "Shorter, warmer winters are killing Georgia peaches. Three new varieties could help fix that": https://thecounter.org/global-warming-climate-change-usda-georgia-peaches-liberty-joy-crimson-joy-rich-joy/
- New York Times, 2019, "Climate change will inevitably transform the way the world produces goods": https://www.nytimes.com/interactive/2019/10/14/dining/drinks/climate-change-wine.html
- NowThis Earth, 2021, "Can Regenerative Agriculture Reserve Climate Change?": https://www.youtube.com/watch?v=HuRpEA1sFow