Norman Borlaug- Hunger Fighter

Grades 9-12
English Language Arts, Social Studies

Objectives
Through classroom experiences, students will learn about the research of Nobel Prize-winning plant breeder Norman Borlaug, do research, and write an essay to enter in the World Food Prize Global Youth Institute about Norman Borlaug’s influence in beginning the Green Revolution, and apply concepts to current local and world events.

Vocabulary
- **crop failure**—reduction in crop yield to a level that there is no marketable surplus or the nutritional needs of the community cannot be met
- **developing nation**—a nation with a low level of material well-being
- **dwarf**—an animal or plant much below normal size
- **gene**—a part of DNA or RNA that is usually located on a chromosome and that contains chemical information needed to make a particular protein controlling or influencing an inherited bodily trait or activity or that influences or controls the activity of another gene or genes
- **plant breeder**—someone who propagates plants sexually under controlled conditions
- **resistant**—capable of withstanding the force or effect of a disease
- **stalk**—a plant stem especially of a plant that is not woody

Background
Norman Borlaug was a **plant breeder**. He used high-yield agriculture techniques to help people get more food from their land. For 50 years he worked in **developing nations** like Mexico, India, and Pakistan. Before he began his work, mass starvation had been predicted in many parts of the world. Since then, food production has expanded faster than human population in all parts of the world except sub-Saharan Africa. Borlaug received the Nobel Peace Prize in 1970, mostly for his work reversing food shortages in India and Pakistan during the 1960s.

Norman Borlaug was born in Cresco, Iowa, in 1914. When he was a young man, the Dust Bowl hit the Midwestern US. Some people blamed modern farming methods, but Borlaug believed just the opposite was true. He noticed that the effects of the Dust Bowl were not as bad in Iowa and other places where high-yield agriculture techniques were being tried. He decided that his life’s work would be to help people grow more food in places where **crop failures** were regular facts of life.

Borlaug helped found the International Maize and Wheat improvement Center (CIMMYT) in Mexico. There he helped develop high-yielding semi- **dwarf** wheat varieties. Today this wheat feeds a large portion of the world’s population.
Borlaug’s leading research achievement was the development of dwarf spring wheat. He found many benefits to growing plants with shorter **stalks**. Nature favors **genes** for tall stalks because in nature, plants must compete for sunlight. Borlaug found that plants with stalks that were short and of equal length would receive equal amounts of sunlight when they did not have to compete with taller-stalked plants. In addition, dwarf wheat used more energy growing valuable grain rather than using its energy to grow tall stalks with no food value. Stout, short stalks also support wheat kernels better. Tall-stalked wheat may bend over at maturity, making it more difficult to harvest.

Borlaug also developed cereal grains that were day neutral (insensitive to the number of hours of light in a day) and could, therefore, be grown in many climates. He particularly favored growing wheat in countries where starvation was a concern because wheat grows in nearly all environments and is **resistant** to insects.

**Additional Reading**

**Websites**
https://allianceforscience.cornell.edu/blog/2020/04/norman-borlaug-legacy-documentary/
https://www.purdue.edu/discoverypark/food/programs/borlaug-fellows/norman-borlaug.php
Norman Borlaug- Hunger Fighter
Activity 1  Grades 9-12 Teacher Resources and Standards

Activity 1: Freedom from Famine, (Social Studies)  2  50 minute class periods
Students will watch a documentary about Norman Borlaug and complete a worksheet and notes.

Oklahoma Academic Standards
Activity 1: Freedom from Famine (Social Studies)

WG.5.1  Examine the origin and diffusion of agriculture including the Agricultural Revolutions and the Green Revolution.

WG.5.2  Describe and summarize the characteristics of modern commercial agriculture including major production regions, variations within major zones, and effects of markets.

Materials:

- Activity 1 Worksheet 1 “Video Worksheet”
- Activity 1 Worksheet 2 “Cornell Notes”

Procedures

2. Have students complete the “Video Worksheet” or “Cornell Notes.”
Directions: Complete these questions while watching the “Freedom from Famine: The Norman Borlaug” documentary found at:

Part I (0:00-12:00)

1. “We’re going to teach you to be rebels. Not with guns and daggers, but with __________________________ and __________________________.”

2. What caused concerns over food shortages after WWII?

3. What major historical event happened during Dr. Borlaug’s time in high school?

4. Name two sports Dr. Borlaug played.

5. Where did Dr. Borlaug go to college and what was his major?

6. How did Professor Statemen collect rust spores?

7. What major historical event happened after Dr. Borlaug took his job at DuPont?
8. What was the soil quality in Mexico when Dr. Borlaug arrived?

9. Describe the importance of wheat to the world’s diet.

10. What disease is the biggest threat to wheat crops?

11. What traits was Dr. Borlaug searching for in his wheat crossbreeding?

Part III (22:00-31:00)

12. Why did Dr. Borlaug choose the Yaqui Valley to set up his second wheat breeding station?

13. What were the challenges to this new station?

14. What was the impact of the new dwarf wheat plant?

15. What are the “two sides to this complex human problem”?
Part IV (31:00-56:00)

16. What world events impeded Dr. Borlaug's work from reaching needy populations?

17. What are two implications of the Green Revolution?

18. What is the impact of Quality Protein Maize?

Directions: Write a paragraph to explain your opinion to answer 19-21.

19. What impact does Dr. Borlaug's work have on your life?

20. Why is it important for countries to become self-sufficient in their food production?

21. How does the Green Revolution continue today?
1. “We’re going to teach you to be rebels. Not with guns and daggers, but with science and technology.”

2. What caused concerns over food shortages after WWII? Population growth

3. What major historical event happened during Dr. Borlaug’s time in high school? Stock market crash, Great Depression

4. Name two sports Dr. Borlaug played. Wrestling, Football, Baseball

5. Where did Dr. Borlaug go to college and what was his major? University of Minnesota, Forestry

6. How did Professor Statemen collect rust spores? Flypaper on airplanes

7. What major historical event happened after Dr. Borlaug took his job at DuPont? Pearl Harbor, US joined WWII

8. What was the soil quality in Mexico when Dr. Borlaug arrived? Poor, continuously cultivated without replenishing nutrients

9. Describe the importance of wheat to the world’s diet. Has many nutrients, 2nd most produced crop, staple in many diets

10. What disease is the biggest threat to wheat crops? Rust

11. What traits was Dr. Borlaug searching for in his wheat crossbreeding? Resistance to rust, high yield

12. Why did Dr. Borlaug choose the Yaqui Valley to set up his second wheat breeding station? Climate, another growing season, ample acres, irrigated land

13. What were the challenges to this new station? Roads, distance, rivers w/o bridges

14. What was the impact of the new dwarf wheat plant? Higher yields, feeding hungry over the world, Mexico self-sufficient in wheat production

15. What are the “two sides to this complex human problem”? Food production and population growth

16. What world events impeded Dr. Borlaug’s work from reaching needy populations? Vietnam War, Indian/Pakistan War

17. What are two implications of the Green Revolution? Conservation of natural resources, producing more food with same acreage

18. What is the impact of Quality Protein Maize? Prevent malnutrition, complete food source

19, 20, 21: Answers may vary.
## Norman Borlaug- Hunger Fighter

**Activity 1 Worksheet 2: Cornell Notes**

<table>
<thead>
<tr>
<th>Main Ideas</th>
<th>Your Notes</th>
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<tbody>
<tr>
<td><strong>Dr. Borlaug’s Early Life and Education</strong></td>
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<tr>
<td>- How did his experiences set him up for his future work?</td>
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<td>- What obstacles did he have to overcome to reach his goals?</td>
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<tr>
<td><strong>Dr. Borlaug’s Work in Mexico</strong></td>
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<tr>
<td>- What were the conditions in Mexico when Dr. Borlaug arrived?</td>
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<td>- What science was Dr. Borlaug using to help the people of Mexico?</td>
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<td>- What was the global impact of Dr. Borlaug’s work?</td>
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<tr>
<td><strong>Green Revolution</strong></td>
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<tr>
<td>- What aspects of Dr. Borlaug’s work continue today?</td>
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<tr>
<td>- What are the ongoing challenges to feeding the world?</td>
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<td>- What are some of the potential solutions to world hunger?</td>
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<tr>
<td><strong>Summary</strong></td>
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<tr>
<td>- Give a synopsis of the video to someone who has never heard of Dr. Norman Borlaug.</td>
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For more lessons and resources, please visit [www.agclassroom.org/ok](http://www.agclassroom.org/ok)
Activity 2: World Food Prize Essay, (ELA/SS)  3-5  50-minute class periods

Students will research and write an informative essay.

Oklahoma Academic Standards
Activity 2: World Food Prize Essay (ELA/SS)

9.6.W.1  Students will write research papers and/or texts independently over extended periods of time (e.g. time for research, reflection, and revision) and for shorter timeframes (e.g. a single sitting or a day or two).
10.6.W.1
11.6.W.1
12.6.W.1

9.3.W.2  Students will compose essays and reports to objectively introduce and develop topics, incorporating evidence (e.g. specific facts, examples, details, data) and maintaining an organized structure and a formal style.
10.3.W.2
11.3.W.2
12.3.W.2

WG.5.1  Examine the origin and diffusion of agriculture including the Agricultural Revolutions and the Green Revolution.

WG.5.4  Describe the impact of agricultural practices including irrigation, conservation, desertification, deforestation, organic farming, pesticides and herbicides, and genetic modification on the environment and the quality of life.

Materials:

- Computer/laptop
- “High School Research Graphic Organizer”
- “World Food Prize Essay Grading Rubric”

Procedures

1. Students will choose one of the World Food Prize Global Youth Institute topics (plants, water scarcity, renewable energy, animal health, climate volatility, sustainable agriculture, animal agriculture, spoilage and waste, water and sanitation, dietary disease, malnutrition, infectious diseases, populations, conflicts, human rights, education, policy and governance, international trade, foreign aid, and infrastructure) to research and write an informative essay.

2. Have students use the “High School Research Graphic Organizer”.

3. More resources and information about submission to the Youth Institute can be found here https://www.worldfoodprize.org/index.cfm?nodeID=87704&audienceID=1

4. See “World Food Prize Essay Grading Rubric”.
## Norman Borlaug - Hunger Fighter
### Activity 2 Worksheet 1: HS Research Graphic Organizer

Name: ___________________________________ Date: ____________________

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<tr>
<td>ATTENTION GRABBER</td>
<td>SUPPORTING STATEMENT 1</td>
<td>SUPPORTING STATEMENT 2</td>
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<td>THESIS STATEMENT</td>
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<td>REVIEW OF SUPPORTING STATEMENTS</td>
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<td>MEMORABLE ENDING</td>
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For more lessons and resources, please visit [www.agclassroom.org/ok](http://www.agclassroom.org/ok)
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<td>-Organization</td>
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<td>-Some original thought</td>
<td>-Thesis mostly</td>
<td>is lacking</td>
<td>-Missing or incorrect</td>
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<td>-No attempt at</td>
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<td>and Needs stronger</td>
<td>-Not memorable</td>
<td>conclusion</td>
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**Comments:**

**Overall Grade:**
Activity 3: World Hunger Debate, (ELA, SS)  2-4  50-minute class periods
Students will research a topic and propose a solution to world hunger.

Oklahoma Academic Standards
Activity 3: World Hunger Debate (ELA/SS)

9.1.R.3     Students will engage in collaborative discussions about appropriate topics and texts, expressing their own ideas clearly while building on the ideas of others in pairs, diverse groups, and whole class settings.
10.1.R.3
11.1.R.3
12.1.R.3

9.1.W.1     Students will give formal and informal presentations in a group or individually, providing textual and visual evidence to support a main idea..
10.1.W.1
11.1.W.1
12.1.W.1

WG.5.4     Describe the impact of agricultural practices including irrigation, conservation, desertification, deforestation, organic farming, pesticides and herbicides, and genetic modification on the environment and the quality of life.

Materials:

- Computer/laptop
- “High School Research Graphic Organizer”
- “World Hunger Debate Rubric”

Procedures:
1. Group students into groups of 2-4.
2. Assign solutions to world hunger (birth control, GMO food production, plant based diets, food donations, access to education, immigration, etc.).
3. Have students use the “High School Research Graphic Organizer” to research and create a presentation to propose their solution to world hunger.
4. Supervise student debate and discussion over solutions.
5. See this link for tips on using debates in the classroom
   https://blogs.shu.ac.uk/shutel/2014/09/02/debate-an-approach-to-teaching-and-learning/
6. See “World Hunger Debate Rubric”
<table>
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<td>-Didn’t restate thesis</td>
<td>-No attempt at conclusion</td>
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<td>ideas</td>
<td>-Left reader with memorable idea</td>
<td>-Needs stronger conclusion</td>
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<td>-Left reader with memorable idea</td>
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**Comments:**

**Overall Grade:**