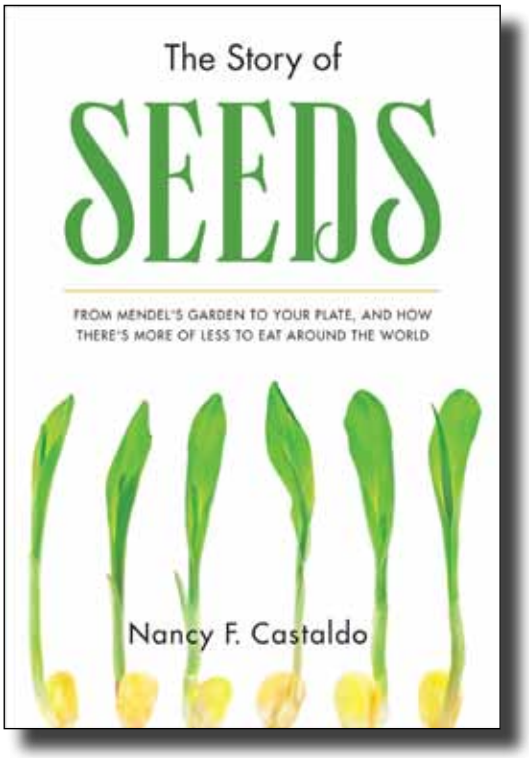
A Common Core State Standards and Next Generation Science Aligned Discussion & Project Guide for

The Story of Seeds

From Mendel's Garden to Your Plate, and How There's Less to Eat Around the World



Grades 5-9 ISBN: 9780544320239

By Nancy F. Castaldo

Published by Houghton Mifflin Harcourt

Something as small as a seed can have a world-wide impact. From Iraq to India to an impenetrable seed vault in a Norwegian mountainside, this book speaks to the current ways we think about our food , the more thoughtful and philosophical questions about regulating which crops farmers are allowed to grow, and what consumers are able to eat. Readers will discover just how important seeds are to the functioning of our global economy--and how much power we as a world-wide community have to keep seeds around, because once a seed disappears, it's gone forever.

Guide created by Debbie Gonzales

Guides by deb

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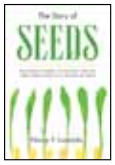

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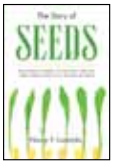
New York: Houghton Mifflin Harcourt, 2015.
ISBN: 9780544320239 www.nancycastaldo.com www.debbiegonzales.com

Agents of Social Change - An Overview

Objective: To examine the actions and impact of individuals and organizations who played significant roles in challenging and/or raising awareness of the critical need for seeds.

Materials:
- The Agents of Social Change template (p. 4)
- Pencil
- *The Story of Seeds: From Mendel's Garden to Your Plate, and How There's More of Less to Eat Around the World*

Procedure:
- Read *The Story of Seeds: From Mendel's Garden to Your Plate, and How There's More of Less to Eat Around the World* in its entirely.
- Using the Agents of Social Change template as a guide, discuss selected individuals' and organizations' roles in the historic development, enhancement and/or protection of seeds. Consider the following topics when doing so:
  - ~ Issue: Identify the purpose or need supporting the reasons for the action or discovery.
  - ~ Inspiration: Tell why that particular person or organization felt compelled to commit themselves to the cause.
  - ~ Obstacle: List the barriers these people had to overcome. Describe the risks they had to face in order to bring about change.
  - ~ Action: Explain what they did and how they did it.
  - ~ Impact: Tell how their actions affected the world we live in today.
  - ~ Summary: Interpret your perspective of the occurrence. Explain what the individuals' or organizations' actions mean to you.
- Discuss the following individuals and organizations listed below:
  - ~ Gregor Mendel
  - ~ Luther Burbank
  - ~ Nikolai Vavlov
  - ~ Adolph Hitler
  - ~ Dr. Sannaa Abdul Wahab El Sheikh
  - ~ Sibella Kraus
  - ~ Monsanto
  - ~ Dr. Vandana Shiva
  - ~ Dwipen Baruah and Kishore Tiwari
  - ~ Jere Gettle
  - ~ Bua Devi and Navdanya
  - ~ Dr. Gary Fowler
  - ~ Sheila Murray
  - ~ Ken Greene
  - ~ Dr. Elaine Solowey



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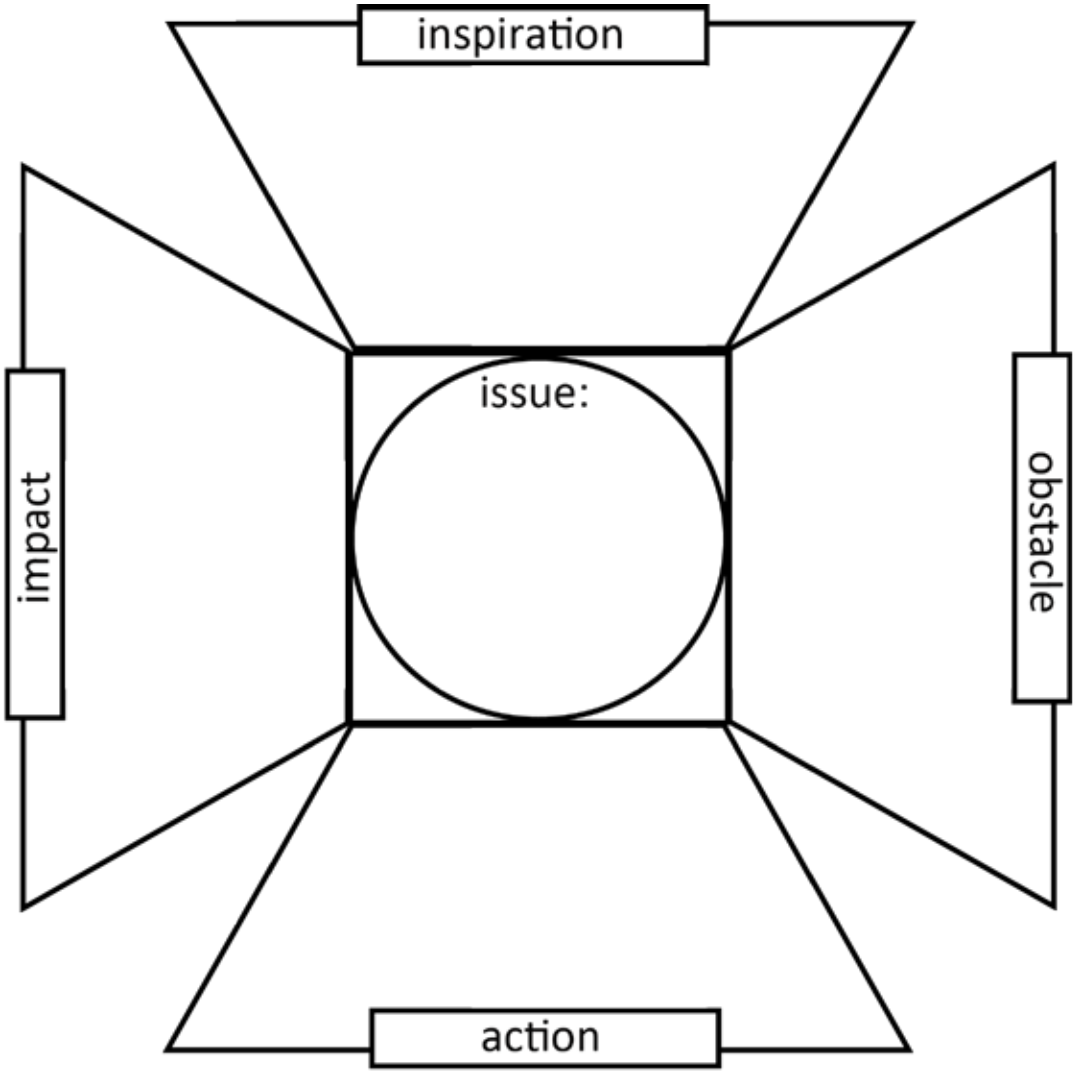
Agents of Social Change

Name of Individual or Organization:



Summary:

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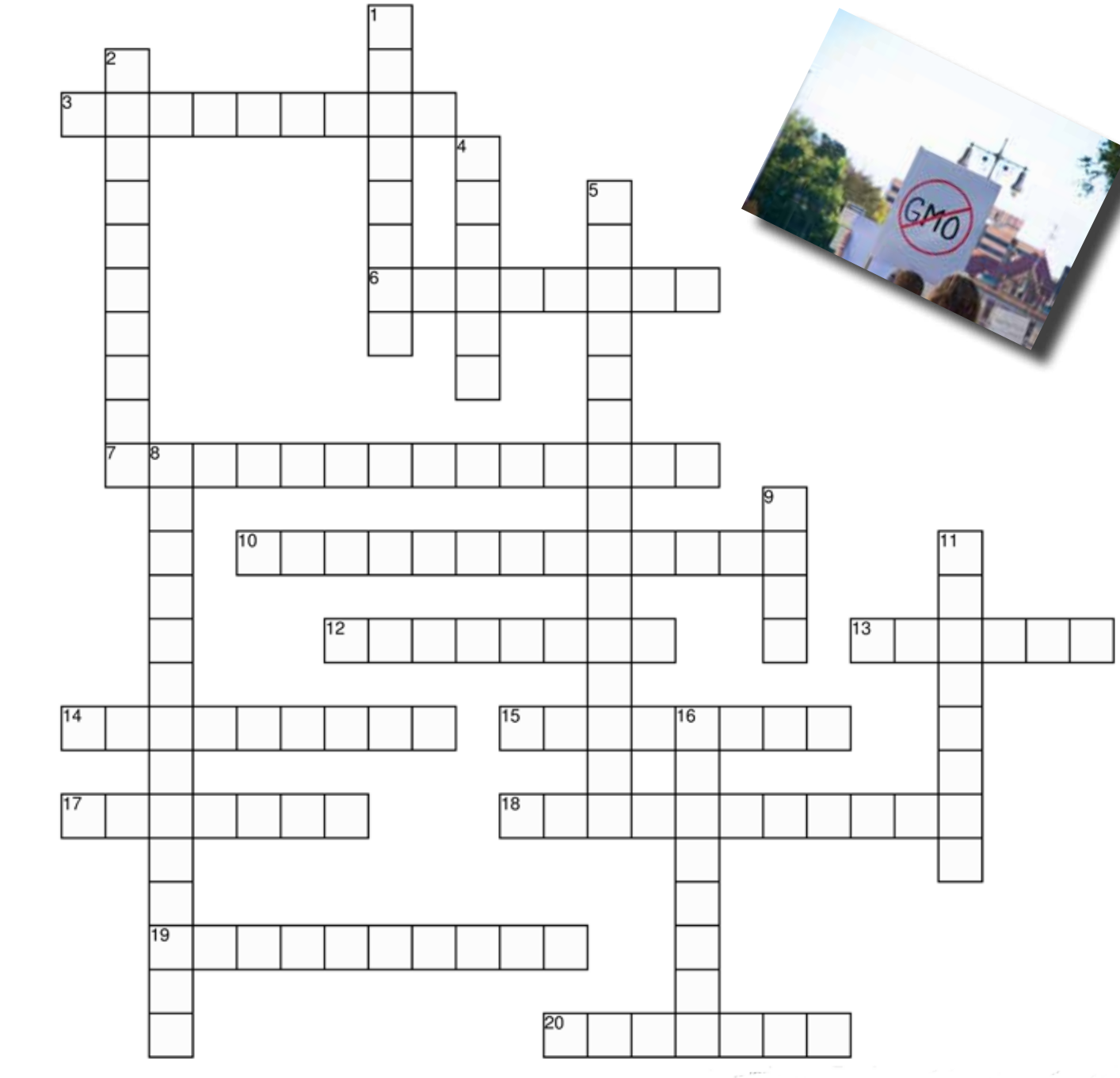
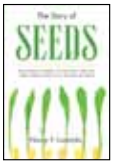
The Story of Seeds Crossword Puzzle





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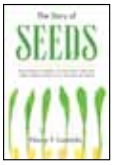
The Story of Seeds Crossword Puzzle Clues

Across

3. The number of samples of seed that grow every day (p. 92)
6. Region in the Midwest that is excellent for growing corn (p. 41)
7. GE or GM describe artificially created seed varieties formed by _____ altering genetic makeup (p. 32)
10. To transfer pollen from the anther to stigma in the same flower (p. 8)
12. Crops cultivated by humans (p. 30)
13. The scientific study of plants (p. 17)
14. The theft of wild or indigenous plants by corporations that then patent them for their own profit (p. 66)
15. Open-pollinated variety that has been around for 50 years or more (p. 46)
17. Multiple forms of genes on a chromosome (p. 10)
18. The cultivation of a single crop (p. 37)
19. An expert in soil governance and agriculture products (p. 18)
20. Grains such as wheat, rice, oats and corn (p. 82)

Down

1. A local variety of domesticated plant (or animal) species that has been developed over time by its environment (p. 74)
2. Substances that kill pests (p. 60)
4. First- or second-generation cross of inbred parent lines (p. 8)
5. Pollination that occurs by a natural mechanism such as an insect, bird, or wind (p. 47)
8. To transfer pollen from one flower to another variety (p. 96)
9. Houses a fertilized plant ovule (p. 4)
11. Virus, bacterium, or fungus that causes disease (p. 50)
16. Person who eats locally produced, sustainable food (p. 54)



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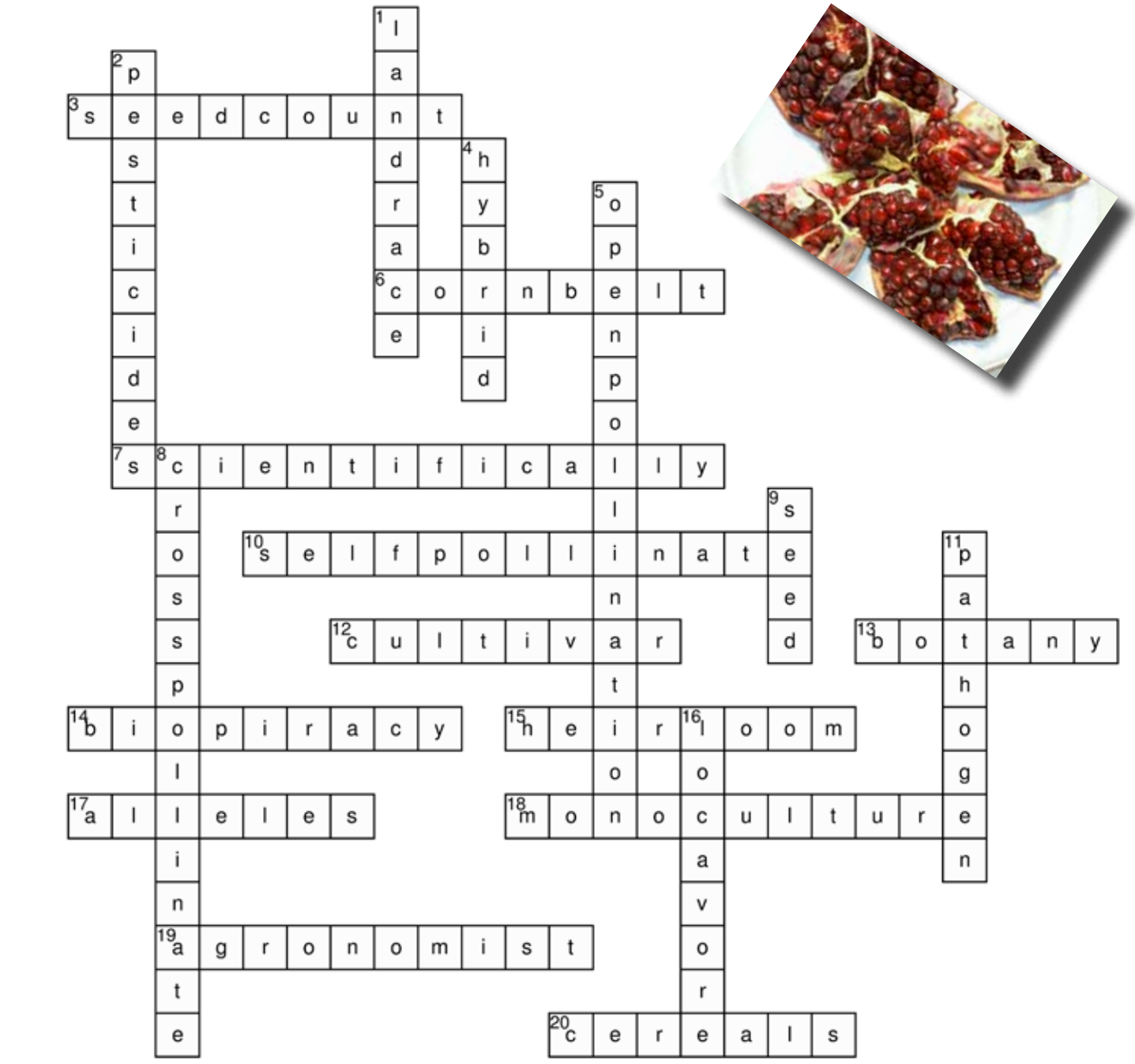
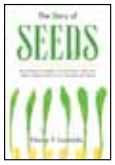
The Story of Seeds Crossword Puzzle Answers





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Vocabulary Foldables

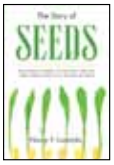
Objective: To identify and define key terms used in the text.

Materials:

- *The Story of Seeds: From Mendel's Garden to Your Plate, and How There's more of Less to Eat Around the World*
- Vocabulary Foldables (pp. 9-10)
- Scissors
- Pencil

Procedure:

- Print out Vocabulary Foldables.
- Use scissors to trim around the the border of templates.
- Fold template vertically along the dark center line.
- Use scissors to cut along the horizonal lines beneath the vocabulary words. Be certain to end cut line at the center fold.
- Write definition for terms beneath the tab.
- Once complete, use foldable to study vocabulary terms.



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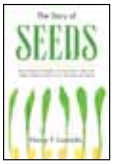
	Agronomist
	Alleles
	Biopiracy
	Blight
	Botany
	Cornbelt
	Cross-pollinate
	Cultivar
	GMO
	Heirloom



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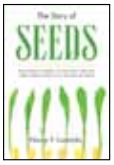
	Hybrid
	Landrace
	Locavore
	Monoculture
	Open pollination
	Pathogen
	Pesticides
	Seed
	Seedcount
	Self-pollinate



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The Story of Seeds Timeline

Objective: To explore historical issues such as the political raminfications, enviromental changes, and the importance of seed biodiversity in a concrete, hands-on manner.

Timeline and Tab Layout

Materials:

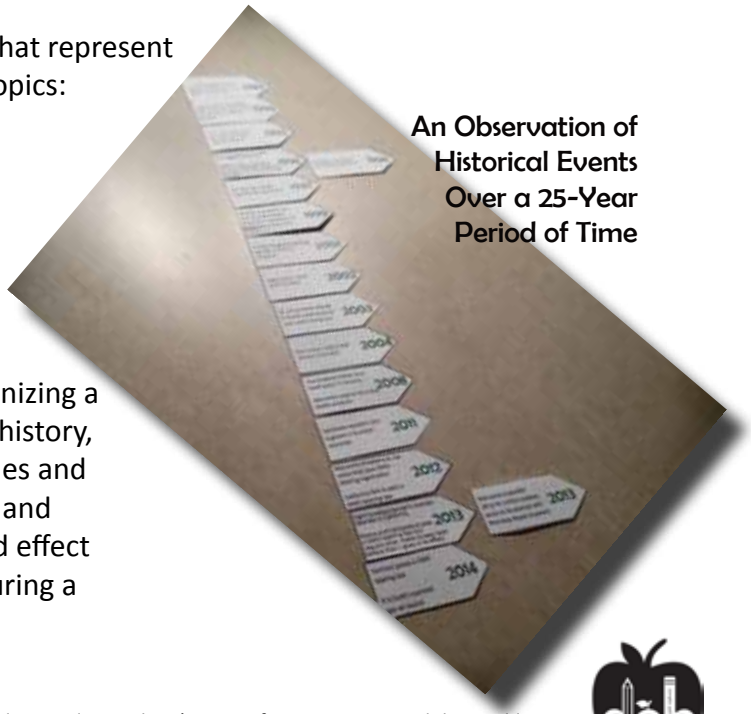
- Timeline strips (Guide, pp. 12 & 13)
- Timeline tabs (Guide, pp. 13-16)
- Tape
- Scissors
- *The Story of Seeds: From Mendel's Garden to Your Plate, and How There's More of Less to Eat Around the World*

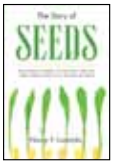
Procedure:

- Using scissors, trim around the borders of the Timeline and Timeline tabs.
- Using tape, construct timeline by securing strips together, taking care to align them in the correct numerical sequence.
- Lay Timeline on a flat surface.
- Match the dates printed on the timeline tabs close to the associating date along the Timeline as shown in the photo on the right.

Discussion/Research Topics:

- Observe the placement of Tabs alongside the Timeline. Note areas where a great many Tabs are clustered together. Explain the enviromental and social ramifications these periods in history.
- Identify individuals and/or moments in history that represent challenges, changes, or issues in the following topics:
  - ~ Biodiversity
  - ~ Climate Change
  - ~ Genetic variation
  - ~ Competition for the environment's limited resources
  - ~ Governmental influence
  - ~ Agents of social change
- Closely consider the sequence of events by organizing a selection of Tabs representing a specific time in history, as shown in the photo to the right. Analyze issues and identify individuals, organizations, publications, and environmental influences. Discuss the cause and effect connection of the issues and events occuring during a particular period of time.


An Observation of Historical Events Over a 25-Year Period of Time



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1800
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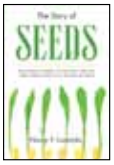

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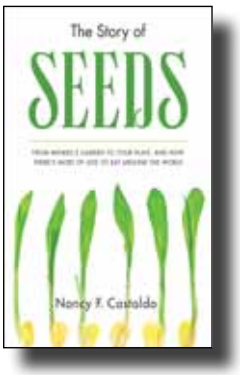
2005

2010

2015

2020

2025



Gregor Mendel is born. **1822**

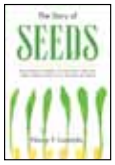
The Great Hunger begins in Ireland. **1845**

Mendel publishes the results of his pea experiments. **1865**

Darwin publishes *Variations of Animals and Plants Under Domestication.* **1868**

Luther Burbank attempts to create a new potato. **1873**

Luther Burbank begins work on developing spineless cacti. **1907**



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1916 Nikaloi Vavilov heads off on his first seed-gathering expedition.

1926 Vavilov publishes *Origin of Geography of Cultured Plants.*

Luther Burbank dies.

1931 The first patent is given to Henry Boseberg.

1934 Drought begins to set off the Dust Bowl environmental disaster.

1940 J. I. Rodale and his wife purchase a farm to raise food using the "organic" method as described by Sir Albert Howard.

Vavilov is arrested.

1941 Leningrad Seige begins.

Hitler advances on Vavilov Institute.

1942 The Russian scientist Alexander Shchukin dies of starvation inside the Vavilov Institute. Others follow.

Organic Farming and Gardening Magazine debuts.

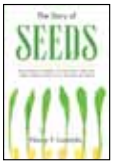
1944 The Leningrad Siege ends.

1950 U.S. Congress passes HR 323 authorizing investigation of chemical fertilizers and poison sprays.

1952 The famous actress Gloria Swanson warns against arsenic-sprayed produce.

1962 Rachel Carson's *A Silent Spring* is serialized, then published in book form.

1969 A corn blight hits America.



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The first Earth Day is held. **1970**

Sibella Kraus plans Tasting of the Summer Produce. **1983**

The actress Meryl Streep testifies in Washington D.C. against pesticide use. **1989**

Congress passes the Organic Foods Production Act, setting national organic labeling standards. **1990**

The USDA appoints the first National Organic Standards Board. **1992**

The Iraqi black box of seeds is smuggled out of Iraq.

William Weaver publishes *Heirloom Vegetable Gardening* and appears on *Good Morning America*. **1996**

Monsanto introduces herbicide-resistant corn. **1996**

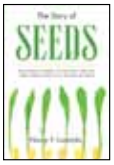
The Favr Savr tomato is genetically engineered. **1997**

Unilever and Nestle halt the use of genetically engineered ingredients in European product lines. **1999**

A national genetic labeling law fails in the U.S. Congress. **2001**

Afghanistan's seed vault is looted. **2002**

Dr. Sanaa Abdul Wahab El Sheikh saves precious Iraqi seeds during war. **2003**



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The Hudson Valley Seed Library is founded. **2004**

The Svalbard Global Seed Vault opens in Norway.

Monsanto deploys Roundup Ready products. **2008**

Herbicide-resistant corn is grown in fourteen countries. **2011**

Monsanto threatens to sue states that pass GMO labeling registration.

California fails to pass a GMO labeling law. **2012**

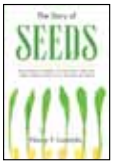
Eight hundred farmer's markets operate in California.

Maine and Connecticut pass a GMO labeling law but require other states to pass laws before their's goes in to effect. **2013**

Monsanto expected 39 to 41 million soybean acres to be planted with Roundup Ready Soybeans. **2013**

Vermont passes a GMO labeling law.

It is Earth's warmest year on record. **2014**



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What Now? - Analyzing the Author's Intent

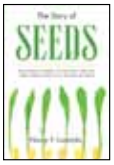
Objective: To explore the author's purpose in writing the book and to respond to her message.

Materials:
- *The Story of Seeds: From Mendel's Garden to Your Plate, and How There's More of Less to Eat Around the World*
- Agents of Social Change – An Overview templates (Guide, pp. 3-4)
- Story of Seeds Crossword Puzzle (Guide, pp. 5-7)
- Vocabulary Foldables (Guide, pp. 8-10)
- Story of Seeds Timeline (Guide, pp. 11-16)
- Writing materials

Procedure:
- Introduce author Nancy Castaldo to students. Access her website at www.nancycastaldo.com. Read about Nancy and her work. Get a sense of her values and interests.
- Review lessons and activities presented in this guide. Discuss topics of interest with students. Encourage students to personally connect with the issues, events, and individuals presented in the book and this Educational Guide. Discuss topics and/or issues that surprised them, shocked them, and inspired them.
- Review the 'Call to Action' section in *The Story of Seeds: From Mendel's Garden to Your Plate, and How There's More of Less to Eat Around the World* (pp. 110-114). Talk about the action items listed. Identify which action items sound appealing to them. Invite them to consider taking action in the way that Ms. Castaldo suggests.
- Explore the author's purpose for writing the book. Consider Ms. Castaldo's intent. Was her purpose to inform or to inspire? To entertain or to instruct? Have students support their opinions by citing examples in the text.
- Instruct students to write an explanatory essay on the topic of how *The Story of Seeds: From Mendel's Garden to Your Plate, and How There's More of Less to Eat Around the World* impacted their awareness of the need to defend seeds. Citing examples from the text, students are directed to identify issues of concern and ways that they will respond to Ms. Castaldo's 'Call to Action.'

Author Nancy Castaldo is very interested in the students' reaction to *The Story of Seeds: From Mendel's Garden to Your Plate, and How There's More of Less to Eat Around the World.* She desires to know about their 'Call to Action.' Nancy hopes she has inspired students to respond to the seed crisis much like the little hummingbird, by doing the best that they can.

Feel free to contact Nancy via her website. She'd love to hear from you and your students there.



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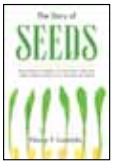
Common Core State Standards Alignment

English Language Arts Standards » Reading: Informational Text

		Agents of Social Change	Crossword Puzzle	Foldable	Timeline	What Now?
CCSS.ELA-Literacy.RI.5.1	Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text.	✓			✓	✓
CCSS.ELA-Literacy.RI.5.2	Determine two or more main ideas of a text and explain how they are supported by key details; summarize the text.	✓			✓	
CCSS.ELA-Literacy.RI.5.4	Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a *grade 5 topic or subject area* .		✓	✓		
CCSS.ELA-Literacy.RI.5.8	Explain how an author uses reasons and evidence to support particular points in a text, identifying which reasons and evidence support which point(s).	✓			✓	✓
CCSS.ELA-Literacy.RI.5.10	By the end of the year, read and comprehend informational texts, including history/social studies, science, and technical texts, at the high end of the grades 4-5 text complexity band independently and proficiently.	✓	✓	✓	✓	✓
CCSS.ELA-Literacy.RI.6.1	Cite textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.	✓			✓	✓
CCSS.ELA-Literacy.RI.6.2	Determine a central idea of a text and how it is conveyed through particular details; provide a summary of the text distinct from personal opinions or judgments.	✓			✓	✓
CCSS.ELA-Literacy.RI.6.4	Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings.		✓	✓		
CCSS.ELA-Literacy.RI.6.6	Determine an author's point of view or purpose in a text and explain how it is conveyed in the text.					✓
CCSS.ELA-Literacy.RI.6.10	By the end of the year, read and comprehend literary nonfiction in the grades 6-8 text complexity band proficiently, with scaffolding as needed at the high end of the range.	✓	✓	✓	✓	✓
CCSS.ELA-Literacy.RI.7.1	Cite several pieces of textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.	✓			✓	✓
CCSS.ELA-Literacy.RI.7.4	Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the impact of a specific word choice on meaning and tone.		✓	✓		
CCSS.ELA-Literacy.RI.7.6	Determine an author's point of view or purpose in a text and analyze how the author distinguishes his or her position from that of others.					✓
CCSS.ELA-Literacy.RI.7.10	By the end of the year, read and comprehend literary nonfiction in the grades 6-8 text complexity band proficiently, with scaffolding as needed at the high end of the range.	✓	✓	✓	✓	✓
CCSS.ELA-Literacy.RI.8.1	Cite the textual evidence that most strongly supports an analysis of what the text says explicitly as well as inferences drawn from the text.	✓			✓	✓
CCSS.ELA-Literacy.RI.8.2	Determine a central idea of a text and analyze its development over the course of the text, including its relationship to supporting ideas; provide an objective summary of the text.	✓			✓	✓
CCSS.ELA-Literacy.RI.8.10	By the end of the year, read and comprehend literary nonfiction at the high end of the grades 6-8 text complexity band independently and proficiently	✓	✓	✓	✓	✓
CCSS.ELA-Literacy.RI.9-10.1	Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.	✓			✓	✓
CCSS.ELA-Literacy.RI.9-10.10	By the end of grade 9, read and comprehend literacy nonfiction in the grades 9-10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	✓	✓	✓	✓	✓



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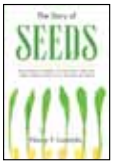
English Language Arts Standards » Writing

		Agents of Social Change	Crossword Puzzle	Foldable	Timeline	What Now?
CCSS.ELA-Literacy.W.5.2	Write informative/explanatory texts to examine a topic and convey ideas and information clearly.					✓
CCSS.ELA-Literacy.W.5.4	Produce clear and coherent writing in which the development and organization are appropriate to task, purpose, and audience					✓
CCSS.ELA-Literacy.W.5.8	Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources.	✓	✓	✓	✓	✓
CCSS.ELA-Literacy.W.5.9	Draw evidence from literary or informational texts to support analysis, reflection, and research.	✓	✓	✓	✓	✓
CCSS.ELA-Literacy.W.6.2	Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.					✓
CCSS.ELA-Literacy.W.6.4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.					✓
CCSS.ELA-Literacy.W.6.9	Draw evidence from literary or informational texts to support analysis, reflection, and research.	✓	✓	✓	✓	✓
CCSS.ELA-Literacy.W.7.2	Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content					✓
CCSS.ELA-Literacy.W.7.4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.					✓
CCSS.ELA-Literacy.W.7.9	Draw evidence from literary or informational texts to support analysis, reflection, and research.	✓	✓	✓	✓	✓
CCSS.ELA-Literacy.W.8.2	Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.					✓
CCSS.ELA-Literacy.W.8.4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.					✓
CCSS.ELA-Literacy.W.8.9	Draw evidence from literary or informational texts to support analysis, reflection, and research.	✓	✓	✓	✓	✓
CCSS.ELA-Literacy.W.9-10.2	Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.					✓
CCSS.ELA-Literacy.W.9-10.9	Draw evidence from literary or informational texts to support analysis, reflection, and research.	✓	✓	✓	✓	✓



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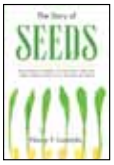
English Language Arts Standards » Speaking & Listening

		Agents of Social Change	Crossword Puzzle	Foldable	Timeline	What Now?
CCSS.ELA-Literacy.SL.5.1	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grade 5 topics and texts* , building on others' ideas and expressing their own clearly.	✓			✓	✓
CCSS.ELA-Literacy.SL.5.2	Summarize a written text read aloud or information presented in diverse media and formats, including visually, quantitatively, and orally.	✓			✓	✓
CCSS.ELA-Literacy.SL.6.1	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 6 topics, texts, and issues, building on others' ideas and expressing their own clearly.	✓			✓	✓
CCSS.ELA-Literacy.SL.6.2	Interpret information presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how it contributes to a topic, text, or issue under study.	✓			✓	✓
CCSS.ELA-Literacy.SL.7.1	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 7 topics, texts, and issues, building on others' ideas and expressing their own clearly.	✓			✓	✓
CCSS.ELA-Literacy.SL.7.2	Analyze the main ideas and supporting details presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how the ideas clarify a topic, text, or issue under study.	✓			✓	✓
CCSS.ELA-Literacy.SL.8.1	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others' ideas and expressing their own clearly.	✓			✓	✓
CCSS.ELA-Literacy.SL.8.2	Analyze the purpose of information presented in diverse media and formats (e.g., visually, quantitatively, orally) and evaluate the motives (e.g., social, commercial, political) behind its presentation.	✓			✓	✓
CCSS.ELA-Literacy.SL.9-10.1	Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9-10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.	✓			✓	✓

English Language Arts Standards » Science & Technical Subjects

CCSS.ELA-Literacy.RST.6-8.1	Cite specific textual evidence to support analysis of science and technical texts.	✓			✓	✓
CCSS.ELA-Literacy.RST.6-8.2	Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.					✓
CCSS.ELA-Literacy.RST.6-8.10	By the end of grade 8, read and comprehend science/technical texts in the grades 6-8 text complexity band independently and proficiently.	✓	✓	✓	✓	✓
CCSS.ELA-Literacy.RST.9-10.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.	✓			✓	✓
CCSS.ELA-Literacy.RST.9-10.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.					✓
CCSS.ELA-Literacy.RST.9-10.6	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.					✓



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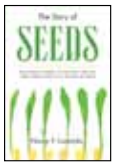
Next Generation Science Standards

			Agents of Social Change	Crossword Puzzle	Foldable	Timeline	What Now?
HS-LS4 Biological Evolution: Unity and Diversity							
	HS-LS4-5.	Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species	✓			✓	✓
Disciplinary Core Ideas							
	LS4.C: Adaptation	Evolution is a consequence of the interaction of four factors: (1) the potential for a species to increase in number, (2) the genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for an environment's limited supply of the resources that individuals need in order to survive and reproduce, and (4) the ensuing proliferation of those organisms that are better able to survive and reproduce in that environment.	✓			✓	✓
	LS4.C: Adaptation	Changes in the physical environment, whether naturally occurring or human induced, have thus contributed to the expansion of some species, the emergence of new distinct species as populations diverge under different conditions, and the decline–and sometimes the extinction–of some species.	✓			✓	✓
	LS4.D: Biodiversity and Humans	Humans depend on the living world for the resources and other benefits provided by biodiversity. But human activity is also having adverse impacts on biodiversity through overpopulation, overexploitation, habitat destruction, pollution, introduction of invasive species, and climate change. Thus sustaining biodiversity so that ecosystem functioning and productivity are maintained is essential to supporting and enhancing life on Earth. Sustaining biodiversity also aids humanity by preserving landscapes of recreational or inspirational value.	✓			✓	✓
	ETS1.B: Developing Possible Solutions	When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts.					✓



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