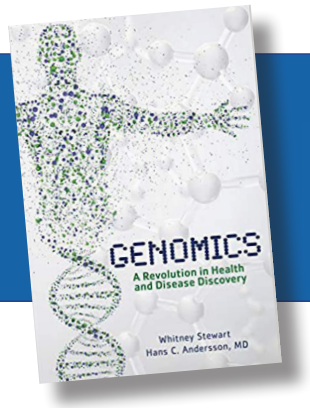


A Standards-Aligned Educator Guide for Grades 6 - 12

GENOMICS: A REVOLUTION IN HEALTH AND DISEASE DISCOVERY

Grade Level: Grades 6 - 12
Publisher: Twenty-First Century Books TM – An Imprint of Lerner Publishing Group
ISBN-13: 978-1541500563

About the book:

Genomics: A Revolution in Health and Disease Discovery delves into the history, science, and ethics behind recent breakthroughs in genetic research. Authors Whitney Stewart and Hans Andersson, MD, present fascinating case studies that show how real people have benefited from genetic research. Though the genome remains full of mysteries, researchers and doctors are working hard to uncover its secrets and find the best ways to treat patients and cure diseases. The discoveries to come will inform how we target disease treatment, how we understand our health, and how we define our very identities.

About the authors:

Whitney Stewart graduated from Brown University. She is an award-winning children's book author and a mindfulness instructor. As an adult, she was diagnosed with an inherited immune disorder, and this deepened her interest in medical genetics and inspired her advocacy for patients with disorders.

Hans C. Andersson, MD, is the director of the Hayward Genetics Center at the Tulane University Medical School, where he directs the Biochemical Genetics Lab.

Find more books by Whitney Stewart at whitneystewart.com.

Pre-Reading Discussion:

Consider the front cover of the book:

- Describe all that you know about DNA.
- Tell all that you know about genomics.
- Observe the graphic featuring a DNA helix beneath the silhouette of a human body. Note that the images ore formed by droplets of purple and green paint. What does this style of illustration suggest about the topic of genomics?
- The word *revolution* means innovation, radical change, and metamorphosis. Discuss how innovation, radical change, and metamorphosis might influence the field of medicine.
- Predict what this book is going to be about.

Post-Reading Discussion:

"Not knowing what's wrong with you is so frustrating. Sometimes doctors can't find answers on their tests, and they dismiss your medical case . . . My diagnosis took years . . . Finally, one immunologist was willing to look beyond the obvious and test me for immune deficiency. That was it" (14)!

- The word *abandoned* means rejected, deserted, and left behind. Make a connection between the feeling of abandonment and living with an undiagnosed disease.
- An *advocate* is a person who believes and supports another individual. Identify the impact of having someone accept the possibility that there may be some genetic reasons for one's illness and be willing to search for answers.
- The genome is an organism's complete set of DNA. It contains information that affects health. Discuss the possible consequences of just one pathogenic genetic mutation.

"What is PKU, you ask? I would say PKU is part of who I am. It means my liver cannot process protein. Instead, it breaks down into a toxin . . . So, I eat a low protein diet, and I love it. I get to go so much more, experience so much more, even though my food choices are far fewer. So, overall, I LOVE PKU" (48)!

- PKU (Phenylketonuria) is an inherited disorder that results in decreased metabolism of the amino acid phenylalanine. Examine the benefits of early diagnosis of this genetic abnormality.
- Consider the quote to the left. Rather than focusing on the restrictions PKU might have on an individual's life, this middle-schooler embraces the understanding of his genetic disorder. Explore the opportunities for empowerment an individual can experience through gaining full understanding of their genetic limitations.

"While experts in the NICU recognized in Frances when she was born and ordered multiple genetic tests, both the science and diagnosis didn't exist when Frances was born. . . Availability of geneticists and genetic developments will have significant positive impacts on real people's lives" (75).

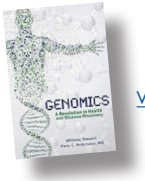
- Babies in the NICU are dangerously ill, many suffering from life-threatening illnesses. List the benefits of having the ability to anticipate the medical needs of a newborn with a genetic disorder before birth.
- Make a connection between symptoms of disease and their genetic causes. How do they affect each other?
- Do you feel that providing genomic sequencing information on medical records should be mandatory? Explain your answer.

"There are 7,000 genetic diseases for which we know the precise DNA misspelling. Couldn't this same strategy, the same set of principles, work for lots of those, maybe someday [even] all of them" (110)?

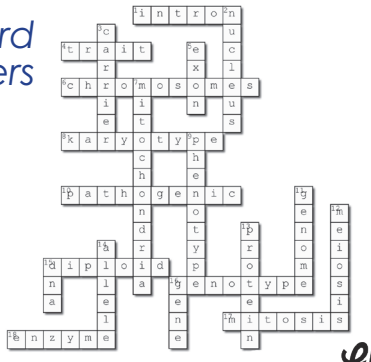
- A misspelling is an error, a mistake, something to be altered and corrected. In what ways is gene therapy founded on the abilities to correct errors and mistakes?
- Examine risks involved regarding the long-term effects of changing the human genome. Are the risks worthwhile? Explain your answer.
- Discuss the risks, benefits, and ethics of the practice of gene editing.

Writing Activity:

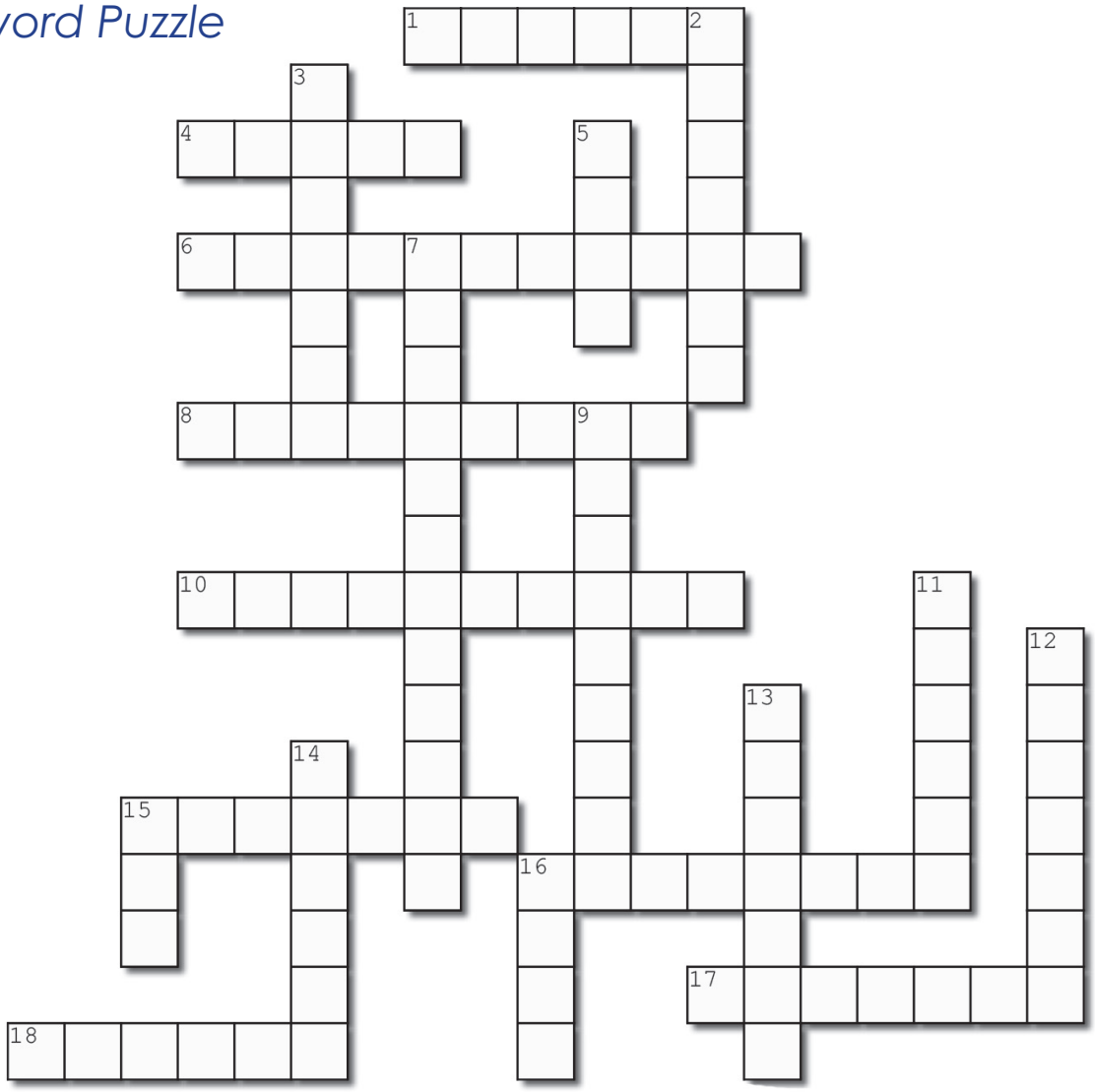
Analyze the title of the book, more specifically, the meaning of the word *revolution*. Write an informative essay explaining how and why the study of genomics is revolutionary. Cite examples from the text. Share your work with the class.



Crossword Puzzle Answers



Crossword Puzzle



Across

1. The part of DNA that does not contain instructions for making proteins
4. A specific characteristic of an organism
6. A threadlike structure of DNA and proteins
8. The number and visual appearance of chromosomes in the cell nuclei
10. Capable of causing disease
15. Containing two sets of chromosomes, one from each parent
16. An organism's complete set of genes
17. A type of cell division
18. A protein that triggers a chemical reaction in a living organism

Down

2. An organelle in most eukaryote cells that contains DNA
3. A person who possesses a disease-causing allele from one parent and a normal allele from the other
5. A part of DNA that contains instructions for making protein
7. Organelles of cells that convert energy from food to useful form
9. Often refers to the clinical features of a disease
11. An organism's complete set of DNA
12. When a single cell divides twice to produce four haploid cells
13. A string of amino acids linked by peptide bonds
14. A variant or alternative sequence of a gene
15. A self-replicating material that carries heritable genetic information
16. A basic physical and functional unit of heredity made of DNA

Guide created by
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COMMON CORE STATE STANDARDS ALIGNMENT:

Reading: R.1, R.2, R.3, R.4, R.7, R.10
Writing: W.1, W.4, W.7
Speaking & Listening: SL.1, SL.2, SL.4, SL.6

NEXT GENERATION SCIENCE STANDARDS ALIGNMENT:

From Molecules to Organisms:
Structures & Processes – MS-LS1-5