



Finding the Structure: pieces of the puzzle

Description of activity

Finding the Structure provides students with the opportunity to view short video clips of the several scientists involved in the discovery of the structure of DNA. Students are asked to decide if the information on pieces of the DNA puzzle is accurate and correctly correlated with the scientist named.

Learning Outcomes

Students will:

1. listen to and collect information related by scientists in video interviews.
2. understand that scientists work together to solve problems.
3. appreciate the contribution each scientist made to our understanding of DNA.
4. work together to evaluate data in order to solve their version of the DNA puzzle.

Assumptions of Prior Knowledge

Science experiences in the middle school should have provided students with some knowledge of heredity, the transmission of traits, and DNA.

Misconceptions

Students often think that different cells have different kinds of DNA. This is how they explain variations in structure and function from one type of cell, tissue, and organ to another. Holding this belief would make understanding the significance of Chargaff's ratio difficult.

Implementing the Lesson

Become familiar with the *DNA Interactive* (DNAi) web site (www.dnai.org) and how to navigate through it. Provide students with information about navigating the site, and how to play animations and video clips.

Before class:

Photocopy the two sets of puzzle pieces. Cut out the pieces and place a set of both correct and incorrect pieces in an envelope. Enough sets should be made so that students can work in teams of two. Hint: Use cardstock or laminate the copies so that the puzzle pieces can be used with multiple classes.

During class:

Discuss with students what they know about how genetic information is transmitted from one generation to the next. Ask them why scientists would be interested in knowing more about this topic and why they as students are interested.

Provide each team of students with copies of the activity *Finding the Structure* and envelopes of puzzle pieces.

Next, have students follow their worksheets to access the DNAi site.

After class:

Address possible misconceptions (one is listed at left). An appropriate misconception question could be:

"Students often think that different cells have different DNA. Explain why this statement is incorrect."



Further Explorations

Writing

Tell students that they are reporters for the *New York Times* Science section. They have been assigned to write a series of one-page articles informing readers about why DNA has been heralded as the most important molecule ever discovered. The first piece should explain the basic structure of the DNA molecule. These articles should be written for the general public.

Model Building

Create DNA models from common household materials. Each model must be at least 20 nucleotides long and form two turns of the helix. Remember that there are 10 bases per turn. Include a key to show how the phosphates, sugars and nitrogen bases are represented. Remember to include the correct number of hydrogen bonds between the bases.

Mapping

Have students make concept maps about the structure of DNA using the following terms:

Deoxyribose sugar	Phosphate groups	Thymine
Adenine	Cytosine	Guanine
Nucleotides	Double helix	Nitrogen bases

They should add other words that are necessary to make their map accurate. Be sure that they include the proper linking words between the concepts and think up an appropriate title for their maps.

Glossary

DNA (deoxyribonucleic acid)

Helix

Adenine, Guanine, Cytosine, and Thymine (A, G, C, & T)

Nucleotide

Phosphate group

Ionized

Resources

Web

Access Excellence @The National Health Museum (1994-2003). *ae@nhm: the Site for Health & Bioscience Teachers and Learners*, www.accessexcellence.com

Cold Spring Harbor Laboratory (2002). *DNA From the Beginning: an animated primer on the basics of DNA, genes, and heredity*, www.dnafb.org

Woodrow Wilson National Fellowship Foundation (2002). *Leadership Program for Teachers: Teacher Resources > Core Websites*, www.woodrow.org/teachers/Teacher_Resources/CORE/core.html

Video/DVD

Race for the Double Helix. Available from Carolina Biological Supply Company, www.carolina.com

DNA Interactive (2003). NTSC version produced by Cold Spring Harbor Laboratory and Red Green & Blue Company; funded by Howard Hughes Medical Institute. Available at www.dnai.org

Books

Watson, James D. (1968). *The Double Helix*, W. W. Norton & Company, New York.



Articles

Watson, J. D., and Crick, F.H.C. (1953).
"Molecular Structure of Nucleic Acids: A
Structure of Deoxyribose Nucleic Acid,"
Nature 171, 737-738.

Klug, A. (1968). "Rosalind Franklin and the
Discovery of the Structure of DNA," *Nature*
219, 809.

Pauling, L., and Corey, R. B. (1953). "A Proposed
Structure for the Nucleic Acids," *Proc. Nat.
Acad. Sci.* 39, 84-97.

Activity pages include:

Student worksheets.

Answer sheets with listings of scientists and
both correct and incorrect correlations from
the puzzle pieces.

A puzzle template with correct correlations and
DNA background image.

A puzzle template with incorrect correlations
and an incorrect DNA background image (with
blank pieces for additional incorrect clues).