(Clues to) Copying the Code: examining the evidence

Description of activity

(Clues to) Copying the Code provides students with the opportunity to view animations of DNA replication and transcription, as well as short video clips of several scientists involved in working out how DNA is copied and used. As students work through the *Copying the Code* module of the *DNAi* web site, they are asked to decide which "clues" provided evidence that was used to understand replication and/or translation.

Learning Outcomes

Students will:

1. listen to and evaluate information provided by scientists.
2. watch a series of animations and determine what information these provide about replication and translation
3. discern the difference between facts, opinions, and inferences.
4. realize that a hypothesis must be supported by data/evidence.
5. work together to formulate an answer.

Assumptions of Prior Knowledge

Students should know that DNA carries the genetic code.

Misconceptions

Students often think that scientists know the answer to a question before doing the experiment.

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 student sheets.

During class:

Step 1:

To initiate a discussion about the importance of data collection and how data support hypotheses, provide the class with the following scenario:

Several students claim that they have completed their homework; yet, they do not have it with them. Other than going home to get their work or having someone bring it in, how could these "homeworkless" students support their claim? Are they to be believed and given credit? You, as their teacher, want to be fair.

Have each student in your class prepare a list of six clues that would support the claim that the students in question have successfully completed their homework.

Next, have each student pair with another and compare lists. From their combined lists, students should next select any two clues they think are especially strong homework completion indicators. Together, they should write an explanation detailing why the two clues they selected are solid evidence of homework completion. They should be sure to include why the other clues are not as good.

Relate to the students that since the homework is not physically present, you, the teacher, are being asked to make inferences about what they have actually done.

Scientists must make inferences based upon "clues" or data. Through observations of naturally occurring events, data collected from their own experiments, and data provided by other researchers, scientists are able to develop explanations and create models.

Step 2:

Divide the class into groups composed of four students. Then subdivide each group into teams of two to work through www.dnai.org > **Code** > **Copying the Code**. Their task is to decide which of the "clues" provided in the table of *Possible clues to Copying the Code (DNA replication and transcription/translation)* provide factual support for the processes of replication, transcription, and translation occurring within a cell. If the clue does not directly indicate that one of these processes has occurred, or provide evidence to understand the process, the students should mark the "neither" column.

Once the table has been completed, the four students in each team should come back together and compare their findings. If everyone agrees, they can complete the next part of the activity. If they do not agree, the four should discuss the reasoning behind their selections. It might be advisable for them to go back and review the web site, and revise their choice of clues.

Further Explorations

Constructing a Scientific Poster

Provide students with information about scientific posters and the purpose of poster sessions at professional conferences. Have them select an experiment from this module and construct a scientific poster. The posters could then be used for formal class presentations of the selected experiments.

Narrating an Animation

Have teams of students develop their own narrations to go with the *Transcription* and *Translation* animations in www.dnai.org > **Code** > **Copying the Code** > **putting it together**. They could share their narrations with the rest of the class.

Glossary

Replication

Gene

Ribosome

Messenger RNA (mRNA)

Phage

Protein

Uracil

Code

Transcription

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.dnaftb.org

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

DVD

DNA Interactive DVD (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

Micklos, David A. , Freyer, Greg A., and Crotty, David A. (2003). *DNA Science: A First Course, (2nd Edition)*, Cold Spring Harbor Laboratory Press, New York.

Watson, James D., with Berry, Andrew (2003). *DNA: The Secret of Life*, Alfred A. Knopf, New York.

Activity pages include:

Student worksheets with questions and clue table.

Answer sheets.