



Contemporary Approaches to Genetics

Driving Question:
How can DNA barcoding help identify species and solve public health problems?

Context: Students learn important ideas and concepts related to genetics such as DNA structure, transcription, translation, protein synthesis, mechanisms associated with heredity, and inheritance. They employ various scientific practices, such as research design (e.g., asking testable questions and designing investigations), data analysis, and formulating scientific arguments using evidence as they participate in a DNA project.

Project: Students complete background research on a species identification problem of their choice, design a DNA barcoding investigation, collect DNA sequence data, and write a scientific abstract for their study.

Approach: Students explore genetics using their own questions about disease, inheritance, and other topics of interest. Student-generated questions and related experiences serve as vehicles that integrate the content associated with the unit. Students conduct a series of hands-on labs, online simulations, and scientific games. In addition, students are able to pose their own research questions in their DNA barcoding project.

Expert Involvement: Classrooms that choose to use experts will invite them to respond to student-generated questions about genetics. This begins a dialogue between experts and students that lasts throughout the unit. Experts review students' DNA barcoding research design plans and provide feedback. Students revise their research design plans based on this expert feedback. As a culminating experience, experts provide feedback on students' scientific abstracts and discuss them with students in person or through video chat.

Primary Standards: Next Generation Science Standards- Performance Expectations

HS-LS1-1. Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.

HS-LS1-2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.

HS-LS1-4. Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.

HS-LS3-1. Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.

HS-LS3-2. Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.

HS-LS3-3. Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.

CC Writing Standards for Literacy in History/Social Studies, Science, and Technical Subjects

WHST 9-10.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

WHST 9-10.7 Conduct short, as well as more sustained, research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.