uBEATS Teacher's Guide:

Careers in Genetics

(Grades 11-12)

This teacher guide is a supplementary text to support the use of the uBEATS "Careers in Genetics" module for grades 11-12.

To help students develop the knowledge necessary for an incredible future in health care, we created UNMC Building Excellence in Academics Through STEM (uBEATS), an online health science resource for Nebraska students.

UNMC uBEATS modules are short (15 minutes or less), interactive online health science modules to supplement curriculum taught in grades 6 – 12. These do not replace curriculum but are a supplement for teachers and students incorporating evidence-based information and UNMC expert guided material. Each module is chunked into sections with formative and summative assessments with immediate feedback provided.

Tips on how to utilize uBEATS modules:

- Internet access is required to view uBEATS modules.
- For those who have access to one-to-one technology, modules can be used in or outside of the classroom as a topic introduction, extension, or review.
- For classrooms without individual student devices modules can be used in whole group instruction. Formative assessment questions can use the teacher's preferred call and response method and summative assessment questions can be displayed on the board and answered individually by students or printed and distributed to students after viewing the module.

Objectives

- List health science careers that involve the use of genetics.
- Determine courses that can prepare a person for a career in health sciences
- Explain how genetics are involved in solving real world problems.

ubeats@unmc.edu

Introduction

You love genetics. Such small, seemingly insignificant chains of proteins determine so much about a person. It's fascinating. So what's next? Maybe you love working in the lab and want to start as soon as possible. Maybe you want to incorporate your love of genetics with your love for people. Or maybe you want to focus on academics and research. An interest in genetics can take you down many paths. This module will teach you about three of them.

Prior Knowledge

A Message from the presidents of the National Academy of Sciences and National Academy of Engineering A Framework for K-12 Education

- We believe that the education of the children of this nation is a vital national concern. The understanding of, and interest in, science and engineering that its citizens bring to bear in their personal and civic decision making is critical to good decisions about the nation's future. The percentage of students who are motivated by their school and out-of-school experiences to pursue careers in these fields is currently too low for the nation's needs. Moreover, an ever-larger number of jobs require skills in these areas, along with those in language arts and mathematics.

Essential preparation for all careers in the modern workforce **NGSS**

- When we think science education, we tend to think preparation for careers in science, technology, engineering and mathematics, which are wellsprings of innovation in our economy. Why then is ensuring scientific and technological literacy for all students of equal concern? Over the past decades, demands have shifted in favor of skilled jobs requiring more education than the unskilled jobs they replaced. Moreover, many of the fastest growing occupations are those where science and mathematics play a central role.
- The National Association of State Directors of Career Technical Education Consortium, grouped all occupations into 16 career clusters. Fourteen of the 16 career clusters call for four years of science, with the remaining two clusters calling for three years. All 16 called for four years of mathematics. The inescapable message: to keep their options open and maximize their opportunities, all students should follow a rigorous program in both science and mathematics.

Scientific and technological literacy for an educated society **NGSS**

- Beyond the concern of employability looms the larger question of what it takes to thrive in today's society. Citizens now face problems from pandemics to energy shortages whose solutions require all the scientific and technological genius we can muster. Americans are being forced to increasingly make decisions—including on health care and retirement planning—where literacy in science and mathematics is a real advantage. Contrast these demands with the results of the 2003 National Assessment of Adult Literacy. Fewer than one in three *college graduates* can perform tasks such as interpreting a data table about blood pressure and physical activity.

Key Terms/Vocabulary

Health science, genetics, cytogenetic technologist, DNA, chromosome, gene, clinical phenotype, diagnostics, bioinformatics, forensics, genetic counselor, biochemistry, biotechnology, psychology, genetic researcher, population genetics, evolutionary divergence, speciation, cell cycle, nucleotide, primary investigator, medical genetics, molecular genetics, applied genetics, genetics professor, genetic engineer, pharmacogenetic scientist, pediatrician, oncologist, treatment protocol.

Science Standards

Nebraska's College and Career Ready Standards for Science 2017 Nebraska Science Standards

Engineering in Health Sciences: SC.HSP.17.1.A

- Obtain, evaluate, and communicate information related to health science careers. Examples include researcher, bio-medical engineer, medical professional, technician, manufacturer and distributor, administrator, and data storage and security professional.

Engineering in Health Sciences: SC.HSP. 17.1.C

- Evaluate a solution to a complex real-world human health problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts. Solutions could include the effects on the human body or solutions for environmental public health issues.

Extensions of the lesson

- To help students become more familiar with the Key Terms of this module, the teacher can use the vocabulary list for a classroom Word Wall or integrate the vocabulary into classroom word games during review sessions.
- To help the students see personal relevance, suggest that they have a **private** conversation with their parents to discuss anything they wish to share about a genetic abnormality in the family.
- The teacher may need to address student misconceptions by emphasizing these important concepts:
    - There are many different careers in the field of genetics, each requiring different skills and levels of education.
    - Genetic counselors do not cure a genetic condition, but they directly assist the patient in understanding what the lab technologists and genetic researchers are learning about it. Most importantly, the genetic counselor explains the options that a patient has for making decisions regarding the condition.

Enrichment

- For information about Healthcare Career Opportunities, see UNMC Health Career Book.
- Explore options for genetics careers listed by the American Society of Human Genetics: How do I become a Geneticist?
- To make connections in your community, contact local universities, hospitals, healthcare clinics, nurses, doctors, genetic counselors.