

Genomic Statistics and Research

Module 1: Introduction to Genomic Statistics and Research

Module 1 Learning Objectives

Course Outcome: Discuss the principles of molecular genetics.

LO 1) Define DNA and RNA.

LO 2) Explain the process of meiosis.

LO 3) Explain variations in DNA sequences.

LO 4) Describe methods for sequencing DNA.

LO 5) Explain how Mendel's laws apply to phenotypes.

LO 6) Describe various inheritance patterns for diseases.

Total Module Timing Target: 18

Learning Phase	Submodule Title	Timing ESTIMATE	Description Proposed Topic(s)	Textbook/ Creation	Plan to Use the Following	LO Active Coverage
Passive (Encoding)	Introduction	n/a - The SME will write an introduction during the Module writing phase.				
Passive (Encoding)	Readings	6.25 hours	The textbook materials cover genetic information, variation, sequencing, Mendel's laws, phenotypes, inheritance patterns, and population genetics.	Textbook	Chapter 1: Molecular Genetics, pp. 1-17 Chapter 2: Formal Genetics, pp. 21-42 (38 total pages – technical rate)	LO 1) Define DNA and RNA. LO 2) Explain the process of meiosis. LO 3) Explain variations in DNA sequences. LO 4) Describe methods for sequencing DNA. LO 5) Explain how

						<p>Mendel's laws apply to phenotypes.</p> <p>LO 6) Describe various inheritance patterns for diseases.</p>
	Media (SRM creation)	.25 hour	This activity covers definitions of key molecular genetics terms.	Creation/ Textbook	<p>Card Flip Interaction: Flash Cards</p> <p>Students will test their understanding of key terms with a Card Flip Flash Card activity based on key terms and definitions in Chapters 1 and 2.</p>	LO 1) Define DNA and RNA.
Active (Storage and Retrieval)	Discussion	4.5 hours	The discussion will cover Mendelian principles and phenotypes.	Creation/ Textbook	<p>This discussion will be based on Chapter 2, Problem 2.2.2:</p> <p>Consider the following descriptions of diseases or general phenotypes. Which phenomena might be the cause?</p> <ol style="list-style-type: none"> 1. In polydactyly, some affected individuals show additional fingers, some additional toes, and some both. 2. In familial hypercholesterolemia, the number of a certain kind of receptors depends on a specific genotype. Individuals who are heterozygous typically have about half the number that individuals carrying two normal alleles have. Individuals homozygous for the disease-causing allele usually have no receptors at all. 3. Albinism follows an autosomal recessive inheritance pattern. However, if two albino individuals have a child, this child may not be affected. <p>Discussion stem: Students will apply the basic</p>	LO 5) Explain how Mendel's laws apply to phenotypes.

					<p>principles of inheritance genetics to discuss how traits are passed down. Students will respond to three of their classmates' posts with an evaluation of their classmates' posts.</p> <p>This discussion board is open ended because it requires students to present and defend the possible causes. It will encourage robust discussion because students will comment on each other's analyses.</p>	
	Assignment 1	3 hours	This activity covers principles of molecular genetics and Mendel's laws.	Textbook	<p>Students will complete 5 short-answer questions:</p> <p>Chapter 1, all sections of Problem 1.1 and Problem 1.3: Students will define basic molecular genetics concepts and terms that will be needed for the rest of the course.</p> <p>Chapter 2:</p> <p>Problem 2.1.5: Students will answer a question about patterns of inheritance.</p> <p>Problem 2.2.1: Students will define basic terminology related to Mendel's laws.</p> <p>Problem 2.2.3: Students will demonstrate mastery of the material by calculating disease risk.</p>	<p>LO 1) Define DNA and RNA.</p> <p>LO 2) Explain the process of meiosis.</p> <p>LO 3) Explain variations in DNA sequences.</p> <p>LO 4) Describe methods for sequencing DNA.</p> <p>LO 6) Describe various inheritance patterns for diseases.</p>

	Assignment 2	3.75 hours	This assignment covers the understanding of inheritance patterns in diseases.	Creation	<p>This is an assignment written by the SME:</p> <p>Students will choose an inherited disease to examine. As part of their research, they will review this information on inheritance patterns: https://www.ncbi.nlm.nih.gov/books/NBK115561/ They will then apply their knowledge to prepare a PowerPoint presentation (15-20 slides) describing the inheritance pattern for a specific disease.</p>	LO 6) Describe various inheritance patterns for diseases.
	Knowledge Check	n/a - Knowledge Checks will be written at the Module Level.				