Discovering the Genome – PA Keystone Eligible Content – For Teachers

Module	Pennsylvania Keystone Eligible Content
What is Genomics? **Intro video**	BIO.B.1.2.2 Explain the functional relationships between DNA, genes, alleles, and chromosomes and their roles in inheritance.
3 application videos	BIO.B.2.4.1 Explain how genetic engineering has impacted the fields of medicine, forensics, and agriculture (i.e. selective breeding, gene splicing, cloning, genetically modified organisms, gene therapy)
Tour of the Genome **Genome Overview**	BIO.B.1.2.1 Describe how the process of DNA replication results in the transmission and/or conservation of genetic information. BIO.B.2.2.1 Describe how the processes of transcription and translation are similar in all organisms.
Chromosome Close-up	BIO.B.1.2.2 Explain the functional relationships between DNA, genes, alleles, and chromosomes and their roles in inheritance.
Packaging DNA	BIO.B.1.2.2 Explain the functional relationships between DNA, genes, alleles, and chromosomes and their roles in inheritance.
Chromosome Arrangement	BIO.B.1.2.2 Explain the functional relationships between DNA, genes, alleles, and chromosomes and their roles in inheritance.
Genome Structure and Disease	BIO.B.2.1.2 Describe processes that can alter composition or number of chromosomes (i.e. crossing over, nondisjunction, duplication, translocation, deletion, insertion, and inversion). BIO.B.3.2.1 Interpret evidence supporting the theory of evolution (i.e. fossil, anatomical, physiological, embryological, biochemical, and universal genetic code).
DNA Sequencing	BIO.B.1.2.1 Describe how the process of DNA replication results in the transmission and/or conservation of genetic information.

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RNA Sequencing	BIO.B.1.2.1 Describe how the process of DNA replication results in the transmission and/or conservation of genetic information. BIO.B.1.2.2 Explain the functional relationships between DNA, genes, alleles, and chromosomes and their roles in inheritance. BIO.B.2.2.1 Describe how the processes of transcription and translation are similar in all organisms. BIO.B.2.4.1 Explain how genetic engineering has impacted the fields of medicine, forensics, and agriculture (i.e. selective breeding, gene splicing, cloning, genetically modified organisms, gene therapy) BIO.B.3.2.1 Interpret evidence supporting the theory of evolution (i.e. fossil, anatomical, physiological, embryological, biochemical, and universal genetic code). BIO.B.2.3.1 Describe how genetic mutations alter the DNA sequence and may or may not affect phenotype (e.g., silent, nonsense, frame- shift). BIO.B.3.1.3 Explain how genetic mutations may result in genotypic and phenotypic variations within a population.

Why look at RNA instead of DNA?	BIO.B.1.2.2 Explain the functional relationships between DNA, genes, alleles, and chromosomes and their roles in inheritance. BIO.B.1.2.1 Describe how the process of DNA replication results in the transmission and/or conservation of genetic information
Activity: RNA-seq data on the GTEx portal	BIO.B.1.2.2 Explain the functional relationships between DNA, genes, alleles, and chromosomes and their roles in inheritance. BIO.B.1.2.1 Describe how the process of DNA replication results in the transmission and/or conservation of genetic information
What Makes a Nerve Cell Different Than a Skin Cell	BIO.B.1.2.1 Describe how the process of DNA replication results in the transmission and/or conservation of genetic information. BIO.B.1.2.2 Explain the functional relationships between DNA, genes, alleles, and chromosomes and their roles in inheritance. BIO.B.2.2.1 Describe how the processes of transcription and translation are similar in all organisms. BIO.B.2.4.1 Explain how genetic engineering has impacted the fields of medicine, forensics, and agriculture (i.e. selective breeding, gene splicing, cloning, genetically modified organisms, gene therapy)
Sickle Cell Disease	BIO.B.1.2.1 Describe how the process of DNA replication results in the transmission and/or conservation of genetic information. BIO.B.1.2.2 Explain the functional relationships between DNA, genes, alleles, and chromosomes and their roles in inheritance. BIO.B.2.2.1 Describe how the processes of transcription and translation are similar in all organisms. BIO.B.3.2.1 Interpret evidence supporting the theory of evolution (i.e. fossil, anatomical, physiological, embryological, biochemical, and universal genetic code).

	BIO.B.2.3.1 Describe how genetic mutations alter the DNA sequence and may or may not affect phenotype (e.g., silent, nonsense, frame- shift). **BIO.B.3.1.3** Explain how genetic mutations may result in genotypic and phenotypic variations within a population.
Genome Size	BIO.B.1.2.2 Explain the functional relationships between DNA, genes, alleles, and chromosomes and their roles in inheritance. BIO.B.3.2.1 Interpret evidence supporting the theory of evolution (i.e. fossil, anatomical, physiological, embryological, biochemical, and universal genetic code).
Huntington's Disease	BIO.B.1.2.2 Explain the functional relationships between DNA, genes, alleles, and chromosomes and their roles in inheritance. **BIO.B.2.1.2** Describe processes that can alter composition or number of chromosomes (i.e., crossing-over, nondisjunction, duplication, translocation, deletion, insertion, and inversion). **BIO.B.2.3.1** Describe how genetic mutations alter the DNA sequence and may or may not affect phenotype (e.g., silent, nonsense, frame- shift). **BIO.B.3.1.3** Explain how genetic mutations may result in genotypic and phenotypic variations within a population.
Cystic Fibrosis	BIO.B.1.2.2 Explain the functional relationships between DNA, genes, alleles, and chromosomes and their roles in inheritance. BIO.B.2.2.1 Describe how the processes of transcription and translation are similar in all organisms. BIO.B.2.4.1 Explain how genetic engineering has impacted the fields of medicine, forensics, and agriculture (i.e. selective breeding, gene splicing, cloning, genetically modified organisms, gene therapy) **BIO.B.2.1.2** Describe processes that can alter composition or number of chromosomes (i.e., crossing-over, nondisjunction, duplication, translocation, deletion, insertion, and inversion).

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Breast Cancer ***BRCA1**	BIO.B.1.2.2 Explain the functional relationships between DNA, genes, alleles, and chromosomes and their roles in inheritance. BIO.B.1.2.1 Describe how the process of DNA replication results in the transmission and/or conservation of genetic information BIO.B.3.2.1 Interpret evidence supporting the theory of evolution (i.e. fossil, anatomical, physiological, embryological, biochemical, and universal genetic code).
Bioinformatics: What? Why? Who?	BIO.B.1.2.2 Explain the functional relationships between DNA, genes, alleles, and chromosomes and their roles in inheritance. BIO.B.2.4.1 Explain how genetic engineering has impacted the fields of medicine, forensics, and agriculture (i.e. selective breeding, gene splicing, cloning, genetically modified organisms, gene therapy) **BIO.B.2.3.1** Describe how genetic mutations alter the DNA sequence and may or may not affect phenotype (e.g., silent, nonsense, frame- shift).
RNA Sequencing - Up Close With The Data	BIO.B.1.2.2 Explain the functional relationships between DNA, genes, alleles, and chromosomes and their roles in inheritance. BIO.B.2.2.1 Describe how the processes of transcription and translation are similar in all organisms. BIO.B.2.4.1 Explain how genetic engineering has impacted the fields of medicine, forensics, and agriculture (i.e. selective breeding, gene splicing, cloning, genetically modified organisms, gene therapy) BIO.B.3.2.1 Interpret evidence supporting the theory of evolution (i.e. fossil, anatomical, physiological, embryological, biochemical, and universal genetic code).

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Browsing Genomes	BIO.B.1.2.2 Explain the functional relationships between DNA, genes, alleles, and chromosomes and their roles in inheritance. BIO.B.2.2.1 Describe how the processes of transcription and translation are similar in all organisms. BIO.B.2.4.1 Explain how genetic engineering has impacted the fields of medicine, forensics, and agriculture (i.e. selective breeding, gene splicing, cloning, genetically modified organisms, gene therapy) BIO.B.3.2.1 Interpret evidence supporting the theory of evolution (i.e. fossil, anatomical, physiological, embryological, biochemical, and universal genetic code). **BIO.B.2.1.2** Describe processes that can alter composition or number of chromosomes (i.e., crossing-over, nondisjunction, duplication, translocation, deletion, insertion, and inversion). **BIO.B.2.3.1** Describe how genetic mutations alter the DNA sequence and may or may not affect phenotype (e.g., silent, nonsense, frame- shift). **BIO.B.3.1.3** Explain how genetic mutations may result in genotypic and phenotypic variations within a population.