

Discovering the Genome: What is Genomics Module – For Teachers

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Module <i>(Estimated time to cover module sections)</i>	Where can I cover this in my Biology curriculum? Highlights?	Next Generation Science Standards HS-LS1 From Molecules to Organisms: Structures and Processes HS-LS4 Biological Evolution: Unity and Diversity	Other Resources <i>(Websites, related activities, etc.)</i>
What is Genomics? <i>Each video plus questions - 15 min each for the Intro video and 3 application videos</i>	<p>This module begins with a video introducing the genome and how it is studied by researchers. Three short videos highlight applications of genomics to food, biodiversity and health care.</p> <p>Intro video can be used in typical unit on DNA & Protein Synthesis; start of mitosis or meiosis when discussing chromosomes, homologous pairs, etc.</p>	<p>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.</p> <p>HS LS1.A: Structure and Function *Systems of specialized cells within organisms help them perform the essential functions of life. (HS-LS1-1) *All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells. (HS-LS1-1) (Note: This Disciplinary Core Idea is also addressed by HS-LS3-1.) *Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level. (HS-LS1-2)</p>	<p>Excellent video introducing genomics and its uses: http://www.ontariogenomics.ca/about/what-genomics</p> <p>Genetic Variation unit: http://learn.genetics.utah.edu/content/variation/</p> <p>Minds-on activities to introduce your students to basic biology background:</p> <p>Understanding the Functions of Proteins and DNA</p> <p>DNA or DNA Structure Function and Replication</p> <p>Transcription and Translation – From Gene to Protein – hands-on or analysis and discussion</p> <p>Mitosis – How Each New Cell Gets a Complete Set of Genes (including student understanding of DNA, genes, alleles and chromosomes)</p> <p>The Molecular Biology of Mutations and Muscular Dystrophy</p>

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<p>3 application videos plus jigsaw activity - 40 min</p> <p>Video: Food</p> <p>Video: Biodiversity</p> <p>Video: Health</p>	<p>Students could “jigsaw” these three videos- students will be assigned to watch one of three videos. They will then meet with other students who watched the same video to answer the questions. Finally, students will be put in mixed groups with the responsibility of teaching their classmates what they learned.</p> <p>*Food could be incorporated during Genetics unit; Plant Reproduction; whenever talking about natural selection/artificial selection; or in whichever unit you cover genetic engineering. GMO’s is a hot topic of discussion and lends itself well to incorporating ethical and societal issues.</p> <p>*Biodiversity and the concept of DNA Barcoding might be used in studying evolution and classification; at the very start of the year when introducing life and its diversity; or when talking about DNA/DNA Technology and identifying organisms by their DNA.</p> <p>*Health fits well with either DNA & Protein Synthesis or Genetics units, especially if you discuss genetic screening, which is a hot topic of discussion and lends itself well to incorporating ethical and societal issues. This is especially true with the resurgence of 23 & Me and the popularity of DNA testing related to personal genetics and ancestry related information.</p>	<p>HS LS1.A: Structure and Function Feedback mechanisms maintain a living system’s internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system. (HS-LS1-3)</p> <p>HS-LS4-1 Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.</p>	<p>Cracking Your Genetic Code http://www.pbs.org/wgbh/nova/body/crackin-g-your-genetic-code.html (also available by searching YouTube)</p> <p>Nova: Personal DNA Testing (12 min.) http://www.pbs.org/wgbh/nova/sciencenow/0302/01.htm (also available by searching YouTube)</p> <p>NOVA: Cracking The Code (8 min) http://www.pbs.org/wgbh/nova/body/crackin-g-the-code-of-life.html Select segment 11- Family Disease (also available by searching YouTube)</p>
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