

Unit Flow Chart

CTE Biotechnology Pathway

YEARS		YEAR 1				YEAR 2				
		Crowdsourcing Innovations in Biotechnology	Taking Action in Your Community: Health Equity	Nucleic Acids and Proteins: Disease Treatment Innovations	Behind the Scenes of Scientific Breakthroughs	Solution Seeking Microbes	Alternative Proteins	Plants to Pharmaceuticals	Community Science	
LESSON PLANS										
Problem Overview	Cellular Aging	Genetic Sequencing	The Human Genome Project	Can an Organism Have No Parents?	Bioengineering of Organisms	Bioengineering of Plants	Therapeutic Cloning and Embryonic Stem Cells	LAB: Longevity Markers—How are you so old?	Senolytics: Our War Against Aging!	Ethical Considerations and Longevity
<i>Explore the idea of increasing the human lifespan, and then examine scientific breakthroughs and careers that advance human health goals.</i>	<i>Explore the cellular hallmarks of aging and the role that DNA plays in the process through research, sharing information, and modeling.</i>	<i>Examine how technology is used to sequence a human genome and the health disparities and ethical questions created by this technology.</i>	<i>Students learn about the genome and proteome and how modifying the DNA sequence can affect protein function.</i>	<i>Explore how the creation of synthetic DNA in the laboratory could be used to alter traits, treat disease, and create ethical dilemmas.</i>	<i>Review genetic modification techniques and consider how GMO's can be used for the benefit of human health.</i>	<i>Examine the process of creating genetically modified plants and how these GMOs could be utilized to improve human health and lifespan.</i>	<i>Explain the various types of stem cells and the technology used in reproductive and therapeutic cloning.</i>	<i>Detect unique genome features of humans who live the longest.</i>	<i>Build models that show the causes of cell senescence and how senolytic drugs can be used to benefit human health on a cellular level.</i>	<i>Analyze common drug delivery mechanisms and emerging techniques by reviewing technologies.</i>
52 DAYS	5 DAYS	5 DAYS	5 DAYS	5 DAYS	5 DAYS	5 DAYS	5 DAYS	5 DAYS	5 DAYS	7 DAYS
INSTRUCTIONAL ACTIVITIES	Hallmarks of Cellular Aging Jigsaw <i>Students research one aspect of cellular aging and share information with each other in a jigsaw-style activity.</i> Autophagy Webquest <i>Student visit various websites to read articles on the role of autophagy in the cellular aging process.</i> Cellular Aging Conference Presentation <i>Student groups create a digital poster and model that is presented at a mock biomedical research conference.</i>	Cancer PSA <i>Students create a public service announcement that gives information about disparities in cancer rates for various cultural and ethnic groups.</i> Ownership of DNA Interview <i>Students write interview questions pertaining to the topic of genome ownership and record their interview with another student.</i>	Gene Control Interactive <i>Students learn about epigenetic tags and manipulate them to influence gene expression in a virtual activity.</i> Create a Mini Biotech Unit <i>Students work in teams to create a mini teaching unit that would help middle school-aged students learn about the human genome and how proteins are created and influenced by the environment.</i>	DNA Synthesis Investigation <i>Students view a video and take notes on the process involved in creating synthetic DNA.</i> Synthetic Organism Poster <i>Students work in small groups to design a fictional synthetic organism and create a poster that gives information about the purpose of and ethical questions surrounding their artificial organisms.</i>	DNA Editing Guide <i>Students research the regulations surrounding DNA modification and create a digital guide.</i> Increasing Life Expectancy Poster <i>Students create a poster that shares information about possible ways the human life expectancy could be increased through the use of biotechnology.</i>	GMO Plant Trading Cards <i>Students design GMO plants containing genes that produce important human antibodies, which could help treat disease and other human health issues.</i> Golden Rice Debate <i>Students demonstrate an understanding of the complexities of the debate, and use facts and supporting details from the text to write a reflective journal entry.</i>	History of Cloning Timeline <i>Students feature significant events in the history of cloning as they review an informational article.</i> Cloning Facts Presentation <i>Students use the National Institute of Health website to create an informative presentation.</i> Biotechnology Professions Recruitment Poster <i>Students create a poster about a career involved in the 3D printing of tissues and organs.</i>	DNA Analysis <i>Student lab groups model the steps in a Genome-Wide Association Study by extracting DNA from their own cheek cells, running a gel electrophoresis on their DNA, and using a genetic database to analyze mock genotype data for the study to identify links between genetic SNP's and longevity.</i>	Causes of Senescence Model <i>Students work in teams to create a 3D model demonstrating one of the main causes of cell senescence.</i> Senolytics Infographic <i>Students complete research and create an infographic introducing the audience to a mechanism and benefits of a senolytic drug.</i>	Case Study Video <i>Students produce and record a news report on a famous bioethics case, including visuals and researched facts and figures.</i> Interactive Job Board (PBL) <i>Students work in groups to create an interactive job board that seeks to add members to a team of scientists that have made a scientific breakthrough in the area of aging and longevity.</i>