

Unit Flow Chart

CTE Biotechnology Pathway / Alternative Proteins

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	Identifying GMOs	LAB: Detecting GE Crops	DNA to Alternative Proteins	Golden Rice Case Study	Bioethics Debate	Industries with GE Technology	Project Rollout	Community Outreach	Sustainability and Manufacturing	Ad Campaign—Commercialization	
Launch an educational campaign around the production of a novel GE product.	Learn about GMOs and their advertising through product examples.	Discover if a food product has been made with genetically engineered crops using PCR and lateral flow tests.	Explore the technology and protein products behind GE, and develop an ad around a selected GE product.	Learn about Golden Rice and its development.	Argue for or against Golden Rice as a solution for vitamin A deficiency.	Investigate GE industries in the community.	Create a novel GE product to positively impact the community.	Develop interview questions to understand and bolster community perspectives on their GE product.	Develop a potential plan for novel GE product development based on sustainability and stakeholder opinions.	Use collected data to finalize novel product advertisements and websites.	
44 TOTAL DAYS	4 DAYS	5 DAYS	4 DAYS	4 DAYS	4 DAYS	5 DAYS	4 DAYS	4 DAYS	4 DAYS	6 DAYS	
INSTRUCTIONAL ACTIVITIES											
	GMO Card Sort	Bt PCR	Exploring Genetic Engineering (GE)	Summarize the Case study	Building Stakeholder Knowledge and Empathy	Industry Profile Exploration	GE Product Discovery	Develop Interview Communication	GE Webquest	Summarizing Community Data	
	Students sort cards into “real” and “not real” GMOs, and discuss the ethics behind the real products.	Students extract and amplify DNA from a food product to test for the Bt gene.	Students review the central dogma of genetic engineering and summarize genetic engineering methods.	Students summarize a video on food fortification and article on Golden Rice.	Students learn about multiple stakeholders, connect to the varied perspectives, and read interviews from individuals.	Students learn about multiple GE industries and what they are doing to enhance GE products.	Students brainstorm GE product idea, community struggles, and GE industries, then rank each.	Students develop a plan for communicating their product information, and develop interview questions for stakeholders.	Students research a production pipeline and GE regulations along with potential risks.	Students analyze interview and survey data and create graphs to tell a story.	
	How can we recognize GMOs?	Lateral Flow	Marketing Experts for a GE Product Ad	Career Perspectives on Golden Rice	Debate preparation	Career and Industry Spotlight	Product Proposal	Interview Stakeholders	Manufacturing Research Guide	Logos and advertisements	
	Students compare nutrition labels, then complete a PCR lab to gather evidence of genetic modification.	Students perform a lateral flow strip test on food product extract to test for delta endotoxin proteins.	Students learn tips for effective advertising and then develop a PSA for their GE product.	Students use data and readings to analyze Golden Rice from the perspective of a sociologist, plant and food scientist, food science technician, and an economist.	Triads develop a stance on Golden Rice for their assigned stakeholder and find supporting evidence.	Students investigate four GE products from a given industry (crops, food retail, nutrition, medical) and research careers associated with the industry.	Groups brainstorm three novel GE products to solve a local community struggle and receive teacher feedback.	Students develop questions and conduct interviews with community stakeholders via phone or email.	Students determine community stakeholders at multiple phases of the lab-to-table pipeline.	Students design logos, ad campaigns, and data displays for final project.	
	GMO CER			Golden Rice Production Flow Chart	Socratic Seminar	Brainstorm Community challenges	Website Development	Final Project Outline (Develop)	Final Project Outline (Manufacture)	Share and review PSAs & final informational websites	
	Students argue for or against GMOs based on lab data, readings, and research.			Students develop a product life cycle flow of Golden Rice.	Students take on the role of stakeholders and debate the use of Golden Rice.	Students connect community challenges to specific industries to brainstorm potential GE products for their community.	Students act as Community liaison, Industry expert, Genetic engineer, and Concept designer to build their GE product website.	Group members add information on community, existing GE technology, gene and protein product, and safety of parallel products.	Groups add information on sustainability, regulation, production, and product prototype to their websites.	Groups review each others’ products and provide feedback to improve their projects.	