

SCSU CRISP CCSA Teacher Module 2016

Title of Module: Bio Bistro

Subject or Unit of Study: Biotechnology, Synthetic Biology

GRADE LEVEL: 5-12+

LENGTH OF DEMO/LESSON: _____

STUDENT OBJECTIVES:

Students will learn the following concepts:

- 1) Synthetic biologists solve problems by applying engineering principles to living materials.
- 2) We all have a role in shaping the development and use of new technologies.
- 3) Synthetic biology may provide solutions to problems in areas such as food security, healthcare, energy, and the environment.

NEXT GENERATION SCIENCE STANDARDS

<p>NGSS Performance Tasks</p>	<p>MS-LS1-2: From Molecules to Organisms: Structures and Processes</p> <ul style="list-style-type: none"> • Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function. • Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms. <p>HS-LS1-2. From Molecules to Organisms: Structures and Processes</p> <ul style="list-style-type: none"> • Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. • 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>NGSS Disciplinary Core Ideas (DCI)</p>	<p>MS - LS1.A: Structure and Function</p> <ul style="list-style-type: none"> • Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell. <p>HS - LS1.A: Structure and Function</p> <ul style="list-style-type: none"> • 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.
<p>NGSS Cross-Cutting Concepts (CCC)</p>	<p>CCC 6 - Structure and Function</p> <ul style="list-style-type: none"> • Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and connections of components to reveal its function and/or solve a problem. <p>Interdependence of Science, Engineering, and Technology</p> <ul style="list-style-type: none"> • Engineering advances have led to important discoveries in virtually every field of science, and scientific discoveries have led to the development of entire industries and engineered systems.
<p>NGSS Science and Engineering Practices (SEP)</p>	<p>SEP 2 - Developing and Using Models</p> <ul style="list-style-type: none"> • Develop and use a model to describe phenomena. <p>SEP 5 - Constructing explanations (for science) and designing solutions (for engineering)</p> <ul style="list-style-type: none"> • Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.

COMMON CORE STANDARDS

CC-ELA/Literacy Standards	<p>SL.8.5</p> <ul style="list-style-type: none">Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-LS1-2) <p>SL.11-12.5</p> <ul style="list-style-type: none">Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. (HS-LS1-2)
CC-Math	<p>6.EE.C.9</p> <ul style="list-style-type: none">Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. (MS-LS1-2)

MATERIALS:

- Activity and facilitator guides
- Activity sign and holder
- Playing cards (shaped like foods)
- Red, orange, and green plates
- Red, orange, and green plate labels
- Place card holders (3)
- Reference sheets: Traditional Agricultural Breeding, Genetic Engineering, and Synthetic Biology

SAFETY:

LEARNING ACTIVITY OR PROCEDURE:

Please see the Building with Biology facilitators guide for activity instructions

ASSESSMENT:

Provide an assessment to measure student progress of objectives.

STEM CAREERS:

Agricultural and/or Food Scientist
Bioengineer
Geneticist
Quality Control/Quality Assurance Technician
Research Scientist
Synthetic Biologist

TEACHER NOTES:

Things to discuss:

- Why would you be comfortable eating some of these foods? What made you feel cautious about others?
- What kinds of problems are researchers trying to solve with these engineered foods? What do you like or dislike about their solutions? Can you think of different solutions?