SCSU CRISP CCSA Teacher Module 2016

Title of Module: Tech Tokens

Subject or Unit of Study: Biotechnology, Synthetic Biology

GRADE LEVEL: _____ **LENGTH OF DEMO/LESSON**: _____

STUDENT OBJECTIVES
Students will learn the following concepts:
1) Technologies and society are interconnected.
2) People's values determine which technologies are developed and used.
3) Synthetic biology benefits from many voices.

NEXT GENERATION SCIENCE STANDARDS

NGSS Performance Tasks	**MS-ETS1-1 Engineering Design** • Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions. **HS-ETS1-1 Engineering Design** • Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
NGSS Disciplinary Core Ideas (DSI)	**MS - ETS1.A: Defining and Delimiting Engineering Problems** • The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that are likely to limit possible solutions. **HS - ETS1.A: Defining and Delimiting Engineering Problems** • Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them. • Humanity faces major global challenges today, such as the need for supplies of clean water and food or for energy sources that minimize pollution, which can be addressed through engineering. These global challenges also may have manifestations in local communities.
NGSS Cross-Cutting Concepts (CCC)	**Interdependence of Science, Engineering, and Technology** • All human activity draws on natural resources and has both short and long-term consequences, positive as well as negative, for the health of people and the natural environment. (MS) • The uses of technologies and limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. (MS) • New technologies can have deep impacts on society and the environment, including some that were not anticipated. Analysis of costs and benefits is a critical aspect of decisions about technology. (HS)

NGSS Science and Engineering Practices (SEP)	**SEP 1 - Asking Questions and Defining Problems** • Define a design problem that can be solved through the development of an object, tool, process or system and includes multiple criteria and constraints, including scientific knowledge that may limit possible solutions.(MS) • Analyze complex real-world problems by specifying criteria and constraints for successful solutions.(HS)

COMMON CORE STANDARDS

CC-ELA/Literacy Standards	**RST.6-8.1** • Cite specific textual evidence to support analysis of science and technical texts. (MS-ETS1-1) **WHST.6-8.8** • Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. (MS-ETS1-1) **RST.11-12.7** • Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. (HS-ETS1-1) **RST.11-12.8** • Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. (HS-ETS1-1) **RST.11-12.9** • Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. (HS-ETS1-1)
CC-Math	**MP.2** • Reason abstractly and quantitatively. (MS-ETS1-1) (HS-ETS1-1) **MP.4** • Model with mathematics. (HS-ETS1-1) **7.EE.3** • Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. (MS-ETS1-1)

MATERIALS

- Activity and facilitator guides
- Activity sign and holder
- Technology and character cards
- 50 tokens (5 sets of 10, in different colors)
- Reference sheet: Synthetic Biology

SAFETY

List all safety precautions needed for this lesson/demonstration

LEARNER BACKGROUND
Describe the students' prior knowledge or skill related to the learning objective(s) and the content of this lesson, using data from pre-assessment as appropriate.

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:
Bioengineer
Bioinformatics Specialist
Biomedical Engineer
Customer Sales Representative
Environmental Scientist
Environment Technician
Investment Banker
Manufacturing Technician
Market Research Analyst
Medical Technologist
Quality Control/Quality Assurance Technician
Research Scientist

ADDITIONAL RESOURCES:
Apply any links or additional information for students or teacher including videos, websites, etc.

TEACHER NOTES:

Things to talk about:

- Does everyone in your group value the same technologies? Why or why not?
- How might some of these new technologies change the way we live? Would the changes benefit everyone equally, all around the world?