



# YALE NATIONAL INITIATIVE

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Curriculum Units by Fellows of the National Initiative  
2021 Volume V: Human Centered Design of Biotechnology

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## Introduction

by Anjelica Gonzalez, Associate Professor of Biomedical Engineering

The Yale National Initiative seminar entitled “Human Centered Design of Biotechnology” was filled with science, technology, engineering and math (STEM) educators from across the country. With varying backgrounds, classroom sizes and levels, each Fellow within the seminar was fully engaged in readings and discussions that ranged from biotechnology design processes and economics to vaccinology and anthropology. From the wide scope of academic topics, these teachers were able to build curriculum units that will encourage creativity, drive and resilience in students that will master geometry, biology and data literacy among other topics.

In “Human-Centered Design of Biotechnology: Where will we Be without Bees?” Valerie Schwarz has created a unit that will incorporate ecology and botany with skills of design and coding. For grades 3-8, Valerie has designed a curriculum that gives students the opportunity to see how their scientific knowledge has wide-reaching application to the world they see and the food they eat. As important, bringing their world into the classroom, Taissa Lau’s unit, entitled, “Vertical Farming: The Future of Urban Agriculture” provides the opportunity for students to understand urban food deserts and design agricultural solutions to food scarcity in the form of vertical farming.

Mike Doody has created a curriculum unit entitled “Human Population Over Time – Analyzing the Demographic Transition Model” that is designed for students to develop a deep understanding of the Demographic Transition Model, including its causes and effects, limitations as a model, and some potential solutions to the environmental challenges it poses. Similarly, in her curriculum unit “Math by Design; Creating Innovators in a Post-Pandemic Classroom” Christianna Loza created a student-centered classroom approach to developing data literacy to enable students to tell the story of public health historical transitions. Leslie Solomon also created an integrated unit that emphasizes the value of data literacy. In her unit entitled “Data and Graphical Analysis in Life Science” Leslie describes activities in which students will learn to analyze and interpret graphs, with the goal of communicating the overall ideas and conclusions generated from data analysis.

While Mike, Christianna and Leslie focused their units on data literacy to understand historical elements of human health and longevity, others, like Michelle Melby and Irene Jones, are challenging students to create their own technologies for public health solutions. In her unit entitled “The Curb Cut Effect: A Local and Global Citizen Bioengineering Challenge” Michelle Melby describes how designing for the most vulnerable of our local and global populations enables the most widely used and applicable solutions to medically related problems. “More Than Frybread: The Road to Healthy Eating and Physical Fitness” is a unit, created by Irene Jones, that utilizes the Design Thinking method to introduce concepts of noncommunicable diseases and their association with nutrition. This work is targeted to 4<sup>th</sup> grade American Indian and Alaska Native students who will engage

the Navajo Food Pyramid to develop both healthy and culturally appropriate food choices for themselves and their families.

Finally, as teachers, we know that creativity, resilience and persistence are keys to advancement in any endeavor. Two Fellows, Charlette Walker and Jesse Baker have incorporated the concepts of creativity and failure into their units as a means of encouraging self-directed and self-exploratory interest in Math and Engineering. Jesse Baker developed a curriculum unit that emphasized the need for arts in creating affordable, accessible and appropriate biotechnology in the unit entitled “STEAM and Human Centered Design of Biotechnology.” By acknowledging that the process of learning involves trying, making mistakes, learning from those mistakes, and trying again, Charlette Walker embraces failure as part her unit entitled “Harnessing the Power of Failure as a Catalyst for Innovation.” Specifically, Charlette has designed a unit that utilizes Design Thinking to help middle school aged students harness the power of making mistakes to find novel solutions to challenging problems.

During our multiple week Intensive Session together, the National Initiative Fellows of the Human Centered Design of Biotechnology seminar worked together to create a series of novel and impactful curriculum units that will be well received by their own students and those across the country. The experience of leading this seminar was not only an utter joy, but also an extraordinary opportunity for me to learn from some of the best and most dedicated STEM educators in the country.

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