NIH SciEd24

Project Name: Teaching the Genome Generation

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If SEPA project, URL for project on https://nihsepa.org/
https://nihsepa.org/project/teaching-the-genome-generation-cultivating-high-school-genomics-through-teacher-education/

Brief Program Description (50 – 60 words)

Teaching the Genome Generation (TtGG) provides pre-service and current high school teachers with the content knowledge, teaching strategies, and resources needed to enhance student learning in genetics and genomics, with an emphasis on math skills and data literacy. Our approach weaves together three learning strands—molecular genetics, bioinformatics, and bioethics—within the context of Next Generation Science Standards (NGSS).

Program and Participant Characteristics

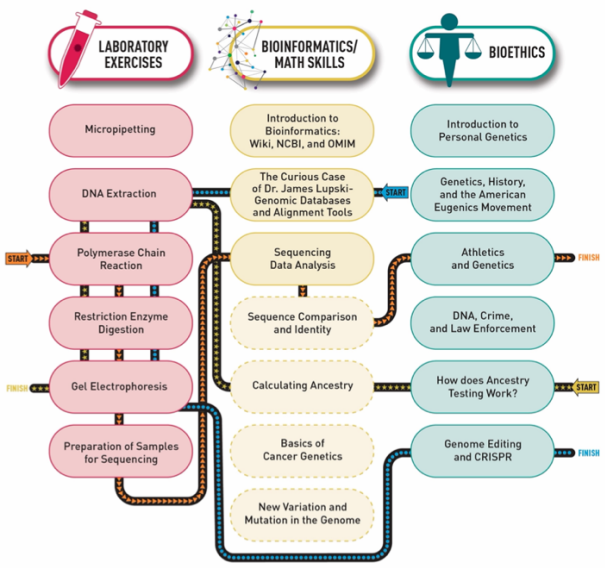
Program type (Please check all that apply):
_X_ Curriculum. __ Out-of-school program
__ Exhibit _X_ Interactive multimedia
_X_ Teacher PD
__ Research experiences for students or teachers
__ Other (describe):

Setting(s): _X__ Formal ___Informal

Types of participants
__ Students _X_ Teachers __ Scientists
__ Families __ Public
__ Other (describe):

Grade level(s) of participants
__ PreK __ Elementary (K-5) __ Middle (6-8)
_X_ High (9-12) __ Adult

Characteristics of the populations you serve relative to DEIA:



Program Activities

- MULTI-FORMAT TEACHER PROFESSIONAL DEVELOPMENT experiences invite educators to engage with TtGG in a format that suits their needs. An in-person annual week-long short course trains New England-based educators. A hybrid part virtual, part in-person course allows flexibility to educators. Online courses offer asynchronous, self-paced learning experiences.
- STUDENT PARTICIPATION in TtGG from academic years 2015-2023, n = 22,152 total number of students impacted, and 279 teachers trained. 45% of participating schools are designated Title I eligible for federal assistance.
- VIRTUAL SIMULATIONS: To further broaden our audience, we have developed a suite of laboratory simulations and interactives based off of the TtGG lab curriculum, hosted on LabXchange and available to teachers and students around the world.
- CURRICULUM DEVELOPMENT: Our four newest learning modules—Sequence Comparison & Identity, Cancer Genetics, Ancestry Testing, and Variation in the Genome—emphasize quantitative skills and data literacy

Evaluation

Constructs measured

_X_ Content knowledge _X_ Skills

__ Nature of science _X_ Career awareness

_X_ Attitudes (e.g., interest, identity, belonging)

_X_ Quality or fidelity of implementation

__ Other (describe):

Methods

_X_ Tests/surveys _X_ Interviews/focus groups

__ Observations __ Artifacts (e.g., student work)

__ Other (describe):

Design characteristics

__ Comparison or control group

_X_ Pre/post surveys or assessments

__ Longitudinal tracking of participants

__ Other (describe):

Project Lessons Learned

- Student reading level and reading comprehension continue to be a challenge in accessibility of our curriculum to broader audiences of students.
- Teachers are eager and willing to bring bioethics content into their classrooms, particularly around topics related to social determinants of health, race, and ancestry, but are fearful of harming students and "saying the wrong thing." Discussion facilitation guides are warranted to assist teachers in navigating potentially challenging conversations.

Key Accomplishments and/or Findings

- Evaluation with Rockman *et al.* examined impact of TtGG materials on students' genetics & genomics: a) content knowledge; b) confidence engaging in labs & concepts; c) interest in academic & career opportunities. 13 teachers (4 first-time TtGG implementers, 9 TtGG veterans) and 878 students participated in this 2022 classroom study.
- Key Findings from the 2022 classroom indicate the use of our curriculum leads to increased knowledge of, and confidence in, biotechnology laboratory procedures and increased student interest in genetics and genomics concepts.
- The TtGG team was granted a sub-award through the University of Utah to create curriculum based on the *All of Us* Research Program. Three computer science (CS) teachers participated in a focus group, providing ideas and feedback on our initial lesson plans. Focus group outcomes are guiding the development of pilot health data analysis lessons, which teachers indicated they would be interested in utilizing in Data Science, Statistics, and AP CS courses. We will also develop a research training framework that high school students could follow to investigate health disparities using the *All of Us* Registered Tier data and the Researcher Workbench, which could be incorporated into high school research or capstone courses.
- With the support of a supplement grant to TtGG, we successfully established a TtGG "Hub" in Memphis, Tennessee, with collaboration of a mentor teacher, Dr. Chikezie Madu. The JAX team coordinated the ordering and shipment of laboratory equipment (four complete kits) and reagents to run the entire suite of TtGG molecular genetics protocols. In June of 2023, three TtGG team members traveled to Memphis to run a three-day professional workshop for 18 current biology teachers.
- TtGG was awarded a supplement to design curriculum around health disparities and race. TtGG staff surveyed the TtGG network teachers and followed up with focus groups to examine how much their current biology curricula incorporate quantitative skills, data analysis, and content on bioethics, health disparities, social determinants of health, and race and ancestry. We are currently analyzing the data we collected and will use the results to guide the design of new content that centers on the analysis of data related to social determinants of health and genomics acquired from databases such as the *SEER*Explorer* (NCI) and *All of Us*.

Questions, Advice Wanted, or Topics of Discussion for the SciEd Community (optional)