TEACHING THE GENOME GENERATION

Teacher Professional Development and the Integration of Human Genetics into High Schools

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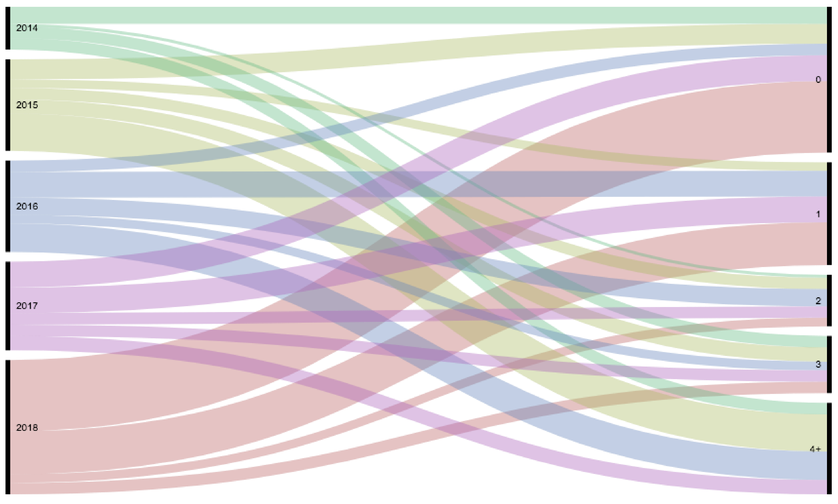
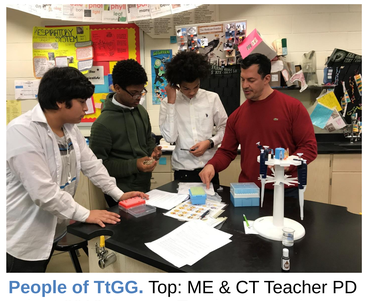
Teaching the Genome Generation (TtGG) is a multifaceted teacher professional development program focused on human genetics, ethics and bioinformatics. The primary goal of TtGG is to increase genomic and genetic literacy by training and reinvigorating high school teachers. TtGG uses summer professional development courses to train teachers and during the academic year supplies portable laboratory kits, as well as support to participating schools. Participating teachers from New England and northern California implement the curriculum at a high rate in a variety of biology classrooms. Evaluation data collected over several years indicate that TtGG has increased teachers' abilities to integrate complex concepts of genomics and bioethics into their high school classes.

Professional Development → Practice



Teacher implementation of TtGG. The program has trained 165 teachers; 65% of them have implemented the program one or more times.

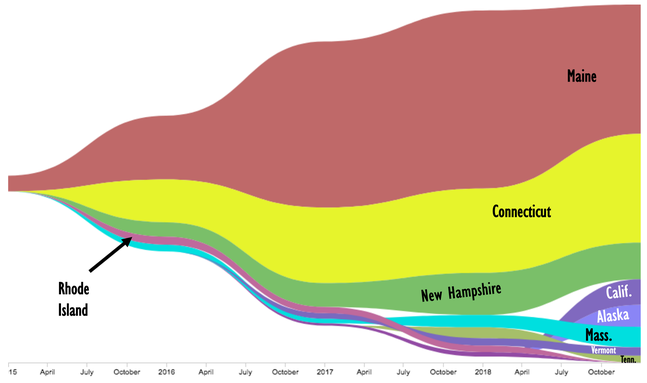


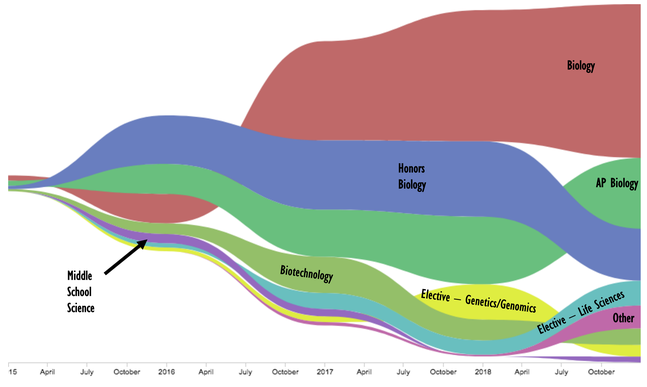
People of TtGG. Top: ME & CT Teacher PD cohort 2018; bottom: Teacher beginning classroom implementation of TtGG.

Molecular genetics lessons include Micropipetting, DNA Extraction, PCR, Restriction Enzyme Digestion, Gel Electrophoresis and Sequencing Prep. Teachers perform experiments as they will be done in their own classroom during the academic year so that they gain confidence with the techniques and the equipment used.

Bioethics training within *TtGG* is provided in partnership with the Personal Genetics Education project (pgEd) of the Harvard Medical School Department of Genetics. Bioethics lessons increase participants' confidence in making health care decisions and enhance interest in scientific and biomedical fields.

Bioinformatics remains a challenge for High School teachers. This year TtGG adapted our bioinformatics training approach. Our new lessons simplify entry into bioinformatics and use two case studies, *The Curious Case of James Lupski* and *Scientific Breakthroughs,* to guide teachers and students into biological database resources.





Student participation in TtGG by US state and course. Data represents academic years 2015-2019 n=9,804 students.

OUTCOME Teacher feedback:

"TtGG has had a very positive impact at my school. It helped me to develop two courses: Human Heredity and Biological Problems in Contemporary Society….In addition, many students have completed genetics related research projects in our Science and Technology Seminar and Project courses. Those were possible because of the techniques and methods students learned from the TtGG labs and protocols."

OUTCOME Evaluation:

Self-efficacy items show increased teacher confidence when tested before the PD, and at the time of the implementation, sometimes months later. For example, respondents from the 2017 PD cohort (n=27) are 17% more confident on tasks related to use of bioinformatics tools at the time of implementation than before the PD.

OUTCOME Publications:

LaRue, K.M., Howell, G., Wray, C., Wojiski, S. 2019. The Curious Case of Dr. James Lupski, Bioinformatics Lesson/Case Study. *National Center for Case Study Teaching in Science*.

LaRue, K.M., McKernan, M.P., Bass, K.M. and Wray, C.G., 2018. Teaching the Genome Generation: Bringing Modern Human Genetics into the Classroom Through Teacher Professional Development. *Journal of STEM Outreach*. V 1: 2 April 2018.

Wray, C. 2019. Teaching the Genome Generation, *Scientia UK*. https://www.scientia.global/dr-charles-wray-teaching-the-genome-generation/

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