Submission Form for ELO Samples

ELO Title: Personal Genetics

School: Winnacunnet High School

Essential Question:
How is personal genetics data obtained and what can it tell me about my health and heritage?

Area(s) of Study: Science/Biology

Amount of credit earned: 2 Credits (Equivalent to one trimester course)

Description:
The student undertaking the "Personal Genetics" project based ELO will be exploring their own sequenced genome with the help of 23andMe, a direct to consumer genetic sequencing service. The genomic data from 23andMe will be used to explore personal genealogy and personal health genetics. The student will complete a teacher monitored laboratory segment in which the student will perform protocols for DNA extraction and purification, Polymerase Chain Reaction, Restriction Digestion, Gel Electrophoresis, and Preparation for Sequencing.

Competencies:

Short description	Full text of competency
Content Specific Competencies	
Sequencing	Student will demonstrate the process involved in sequencing partial and whole genomes
Genealogy	Student will explain how personal genomic data is used to determine genealogy
Disease	Student will explain how personal genomic data is used to determine the likelihood of disease
Ethics	Student will explain the ethics behind the use of personal genetics data by government or industry
Science Department Competencies	
Scientific Literacy	A scientifically literate student is able to apply their knowledge of scientific concepts and processes to the evaluation and presentation of issues that arise and to the decisions that they make in their daily life, about the natural world and changes made to it through human activity.

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Facility with Knowledge	The ability to critique and apply facts, information, and skills acquired as defined by the discipline and grade level expectations.
Scholarship	The demonstration of responsible behavior, preparedness, and perseverance in the pursuit of scientific knowledge and understanding.
WHS School Wide Learning Expectations	
Communication	Student uses various media to interpret, question, and express knowledge, information, ideas, feelings, and reasoning to create mutual understanding.
Creativity	Student uses original and flexible thinking to communicate ideas or construct a unique product or solution.
Collaboration	Student works in diverse groups to achieve a common goal.
Self-Direction	Student initiates and manages personal learning, and demonstrates a "growth" mindset, through self-awareness, self-motivation, self-control, self-advocacy and adaptability as a reflective learner in order to develop personal goals
ELO Department Competencies	
Research	A student participating in an ELO analyzes and demonstrates an understanding of his/her learning experience through reflection.
Reflection	The student applies the ongoing research of the ELO experience to the evaluation and presentation of issues that arise, and the decisions made as their experience progresses.
Product	The ELO student demonstrates his/her gained knowledge and applies an understanding of what they learned by developing a tangible product that relates to his/her interests, skills, and abilities.
Presentation	The student clearly communicates the entire ELO experience, including both the process and the learning, in a manner that is appropriate to the experience and the audience.

Student Activities (up to 10):

1. Student will meet with mentor teacher for initial instruction.
2. Student will complete four lab protocols over six one-hour meetings with the mentor teacher in order to learn DNA extraction and purification, polymerase chain reaction, restriction digestion, gel electrophoresis, and preparation for sequencing. Teacher used materials from Jackson
3. Student will conduct research on genetic sequencing, disease, genealogy and ethics.
4. Interviews of related professionals. Student used lessons from the Personal Genetics Education Project.
5. Autogenomography project planning with mentor teacher using 23 and Me, a direct to consumer genetic sequencing service.

6. Independent work mining personal genome data and incorporating it into presentation.
7. Draft of project submitted for self-assessment and teacher feedback

School Partners:

- Winnacunnet High School Science Teacher
- Winnacunnet High School ELO Coordinator

Community Partners:

- 23 and Me, a direct to consumer genetic testing company

ELO Partner responsibilities in this ELO:

The mentor teacher is the primary partner on the ELO. The teacher met with the student regularly to fully understand their personal autogenomography and how it relates to their personal ancestry. The mentor teacher also plays a critical role in teaching the student how DNA is extracted and how the data is used to map genomes and how it correlates to ancestry and health.

23 and Me provided guidance and support in interpreting the student's autogenomography. This support is something the company will provide to educators who are using it as part of their classroom curriculum or in a project experience like ours.

Assessment:

Reflection

Student was responsible for meeting regularly with the teacher and completing a final reflection paper.

Research

Student was responsible for conducting their own research on personal genetics and genomics and cite that research in an annotated resources list.

Product

The culminating product will be an oral explanation of the process of genomics and how the data is used to determine one's genealogy and the existence of specific alleles that correlate with one's health.

Presentation

The final presentation will incorporate the entire learning experience including:

- Summary of research conducted
- Answers to the essential questions
- What surprised them most from this experience

Connection to student's measurable postsecondary goals (for students with IEPs):

N/A

Comments and suggestions for other schools implementing a similar ELO:

This was an interesting ELO that required the student to commit to hours in lab learning how to extract and map DNA. This was essential for the student to fully understand the results of their personal autogenomography. Even though the plan was to also connect to other professionals in the field, we underestimated how much time the lab hours would take and so the student ran out of time. Admittedly it would have been a richer experience had we been able to connect the student with other professionals that process DNA in in similar ways (like a medical professional and forensic lab technician).

Willing to be contacted by another school interested in developing something similar to this?

Yes! Contact me through email at dcouture@warriors.winnacunnet.org.

Supporting material included. List and briefly describe:

- Teacher instruction and lab protocol materials from Teaching the Genome Generation from The Jackson Laboratory
- 23 and Me Autogenomography information
- Student Presentation on Prezi

Photos or student work submitted:

Yes, permission is granted to use these on the BeyondClassroom website. (*DC*)