Engaging Context Data Integration Report
By James Wieder

Genetic Disorder Research Project
U.S. National Institutes of Health
https://ghr.nlm.nih.gov

The purpose of this project is for our eighth grade students to extend their classroom studies beyond how normal genes operate, into research on what happens when gene expression goes awry. In class, students begin their studies on anatomy and physiology by exploring the differences between plant and animal cells. They then move on to human cells, organelles, and their functions. The history and outcome of the Human Genome Project, begins with Gregor Mendel and his pea plants.

What happens when something goes wrong during meiosis? How does the genetic mutation express itself; in the cell, proteins, enzymes? What does it mean to the members of the family if another member has breast cancer? Why do certain genetic disorders seem to run in families, races, or ethnic groups? Are there treatments? What is the life-long prognosis? Why have screening programs started among Ashkenazi Jews of Europeann descent for Tay Sachs or other groups for other illnesses? What if anything can be done with this information? Can stem cell research help?

To this end, I have created a research project to help the students understand what happens when genes go bad. I direct the students to seek out trusted government websites. In particular I encourage them to visit http://www.ghr.nlm.nih.gov . This site has all of the information they need to complete the research project. It is constantly updated and checked for accuracy, allowing my students to get the most relevant and up to date information possible. In the late 1990's when I started this project, my students only had dry, dusty encyclopedias to look through. Little by little the information got easier as the books started to target the younger generation. Then came the internet revolution.

The data available in the above website allows the students to focus their search in many ways. They may look for overviews of hundreds of disorders as their primary search begins. When they narrow down their choice they can systematically search and answer all of the questions that the project calls for. They may wish to search for more information on the exact gene and its location on the chromosome. Updates are continuous as to the incidence of genetic disorders in general and specific populations. The website also has trusted links to other databases on medicines, treatments, help on understanding genes, genetics, chromosomes, and all written for any audience. For those students that may need some remediation, the site even has a section called, "Help Me Understand Genetics" https://ghr.nlm.nih.gov/primer

One aspect of genetic disorders that students explore are possible treatments. In my opinion, our students are living in the best age possible. With the advent of single board micro-controllers such as the Raspberry Pi, Arduino boards, and 3D printing, students can

explore as never before how technology can aid those that need help; from 3D printing of prosthetics or learning how to manipulate objects by the simple twitch of the mouth using a microcontroller for paraplegics. I encourage my students to use the information they glean to join national contests, such as NSTA's Exploravision and create technology for the disabled. One group received honorable mention by looking to invent a sneaker sensor that alerts the sighted via a bluetooth signal into a pair of glasses to avoid bumping into things; no more cane tapping.

I have seen website data integration change the way my students do research, and the way I teach. From the olden days of copying endless encyclopedia articles and pages from books, to having the information downloadable from one or two websites, data sources such as the one above or www.cdc.gov , www.nih.gov ,or www.medlineplus.gov help expand the minds of the students. They have clear and trusted sites to do research that are constantly updated to ensure accurate information. I have the ability to give more meaningful and expansive assignments without over burdening the students at the same time. We live in an age where teachers don't have to force students to memorize massive amounts of information, because they have all of the World's knowledge literally at their fingertips. Our job now is to help them make sense of the knowledge they can obtain and teach them how to use it properly.