VERNON MALONE
COLLEGE AND CAREER ACADEMY

PROJECT TITLE: "BioREACT!" - Engineering a Bioreactor for Protein Medicine

COURSE: NC Math 3 Honors

INSTRUCTOR: Ms. Grismer & Ms. Surratt

DRIVING QUESTION

How can we use math to design an efficient bioreactor that produces protein-based medicine effectively?

PROJECT SUMMARY

Students apply math concepts like volume, flow rate, and retention time to design a bioreactor that efficiently produces protein-based medicine.

REAL-WORLD CONTEXT

Local companies use this process all the time. Examples: Biogen, KBI. Medicines for diseases that students have heard of are created this way. For example, Multiple Sclerosis and Diabetes. Students will need to research bioreactors, the vocab around it, and learn the general knowledge of how the process works to create medicines from cells.

PRODUCTS & AUDIENCE

Students created a poster presentation with bioreactor design and final calculations and conclusions.

STUDENT REFLECTIONS

- "We had staff come who were curious, as well as some people who worked in the industry. The people who worked in the industry were able to provide feedback, as well as ask questions, to help us understand what we were talking about better."
- "I found getting feedback very useful when I was working on an equation and someone noticed a possible misstep, which ended saving us lots of time."
- "I really enjoyed how open the presentation environment felt, while still giving us opportunities to show off our work and teach others what we know."
- "I learned more about the actual process of math, instead of just regurgitating equations."
- "I'm in the Biopharma program, so learning about bio reactors helped me take the first steps I need to go into the field."

NC PORTRAIT OF A GRADUATE SKILLS GAINED

COLLABORATION | COMMUNICATION | CRITICAL THINKING

ADAPTABILITY | LEARNER'S MINDSET | PERSONAL RESPONSIBILITY

TEACHER REFLECTION

"This project went incredibly well, as students were engaged in learning how math connects to the real-world application of biomanufacturing. They were especially intrigued when they realized that the same processes used in their bioreactor designs are similar to how real protein-based medicines, such as insulin, are produced. Many students made meaningful connections between the math behind flow rate, volume, and efficiency and how these factors impact medicine production. Overall, it was rewarding to see them apply mathematical concepts to something so relevant and impactful."