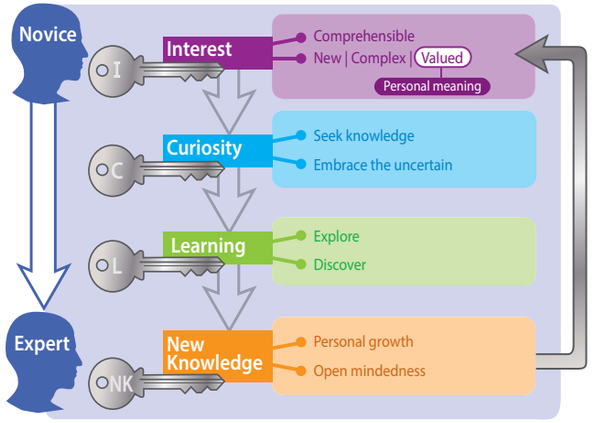
Molecular Sciences Made Personal

An Investigation into Integrating Molecular Genetics and Biochemical Mechanisms into the Undergraduate Chemistry Curriculum



The cycle of how Interest leads to New Knowledge and back again.

Research Project Overview

Our goal is to develop a new sequence of General and Organic Chemistry courses targeted towards pre-professional students. Traditional chemistry courses teach chemistry concepts like kinetics and thermodynamics without the context of other disciplines. The new course sequence is designed to spark student interest by connecting personal genetic information with fundamental chemistry concepts. This Interest leads to Curiosity, which leads leads to Learning and New Knowledge, which finally cycles back to new Interest. We began in Spring 2016 with a General Chemistry course of 300 students.

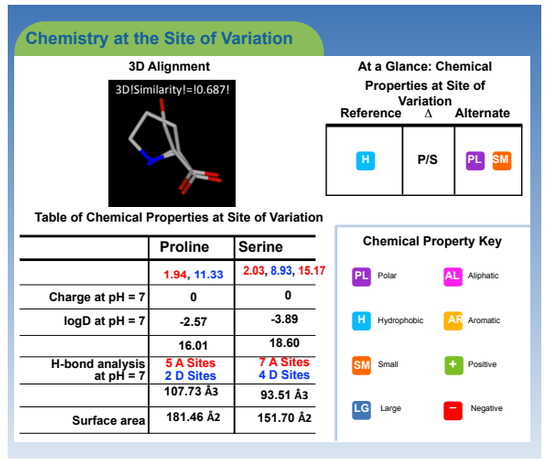
By making chemistry personal, we can help students not only learn more, but be more curious.

Group Project

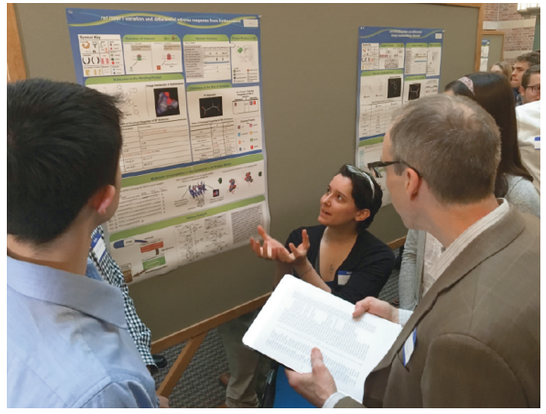
In General Chemistry, we implemented a capstone group project to provide students a structured journey through the process of discovery. Student groups were assigned a variant known to have pharmacological significance. Curiosity about this SNP motivated exploration and learning about the biochemical consequences of this SNP. Learning how the SNP impacts drug response generated knowledge, while naturally connecting to chemical concepts like kinetics and thermodynamics. New knowledge, in turn, broadened what was comprehensible to the students, closing the loop back to interest.

Poster Content

Each student group was assigned a pharmacologically active missense mutation paired with a therapeutically active compound. After determining the phenotypic effects of the mutation, students were given publicly available 23andMe data and asked to determine the person's genotype. Genetic data was visualized in GenomeBrowe, a freely available genome browser from Golden Helix. Students were also required to investigate how the missense mutation affected the chemical properties of the protein at the site of variation, how the 3D structure of the protein changed, and how the biological pathway involved was affected. Finally, students presented their poster with their group members at a public poster session.



An example section of the student poster project detailing changes at the site of variation from the reference allele to the variant allele.



A booklet of the posters is available upon request via the contact information below.

Help Us Improve!

While this research project is targeted towards pre-professional students, we hope that our work will also benefit students who intend to pursue graduate degrees in life sciences, chemistry and engineering.

We ask for your earnest feedback on the student-group poster project in particular. Please send your comments and suggestions to Jeffrey Moore at jsmoore@illinois.edu. Some questions are listed below as prompts, but please send any feedback you feel is appropriate!

- Do you believe topics discussed in the poster are important for students in your discipline? What topics should be added/removed?
- Are the tools students were asked to use valuable?
- Would this project help prepare someone for a job in your organization?

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