Instruction of content related to chemical and biological polymers: the impact of integrating research

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Goal:

Students will be introduced to content about natural and synthetic polymers. After learning about constructing polymers from simple building blocks, students will apply this knowledge to gain an understanding of biological polymers (polysaccharides, nucleic acids, and proteins). This goal will be enhanced by regular contact with Professor Frederick.

State of Connecticut Content Standards and Expected Performances addressed in this project: Grades 9-10 Curriculum-Embedded Performance Task (Strand II: Chemical Structures and Properties): Synthetic Polymers Laboratory Investigation

Targeted Content Standard

9.6 - Chemical technologies present both risks and benefits to the health and well-being of humans, plants and animals.

Targeted Scientific Inquiry, Literacy and Numeracy Standards

D INQ. 1 Identify questions that can be answered through scientific investigation.

D INQ. 3 Formulate a testable hypothesis and demonstrate logical connections between the scientific concepts guiding the hypothesis and the design of the experiment.

D INQ. 4 Design and conduct appropriate types of scientific investigations to answer different questions.

D INQ. 5 Identify independent and dependent variables, including those that are kept constant and those used as controls.

D INQ. 6 Use appropriate tools and techniques to make observations and gather data.

D INQ. 7 Assess the reliability of the data that was generated in the investigation.

D INQ. 9 Articulate conclusions and explanations based on research data, and assess results based on the design of an investigation.

Action Plan:

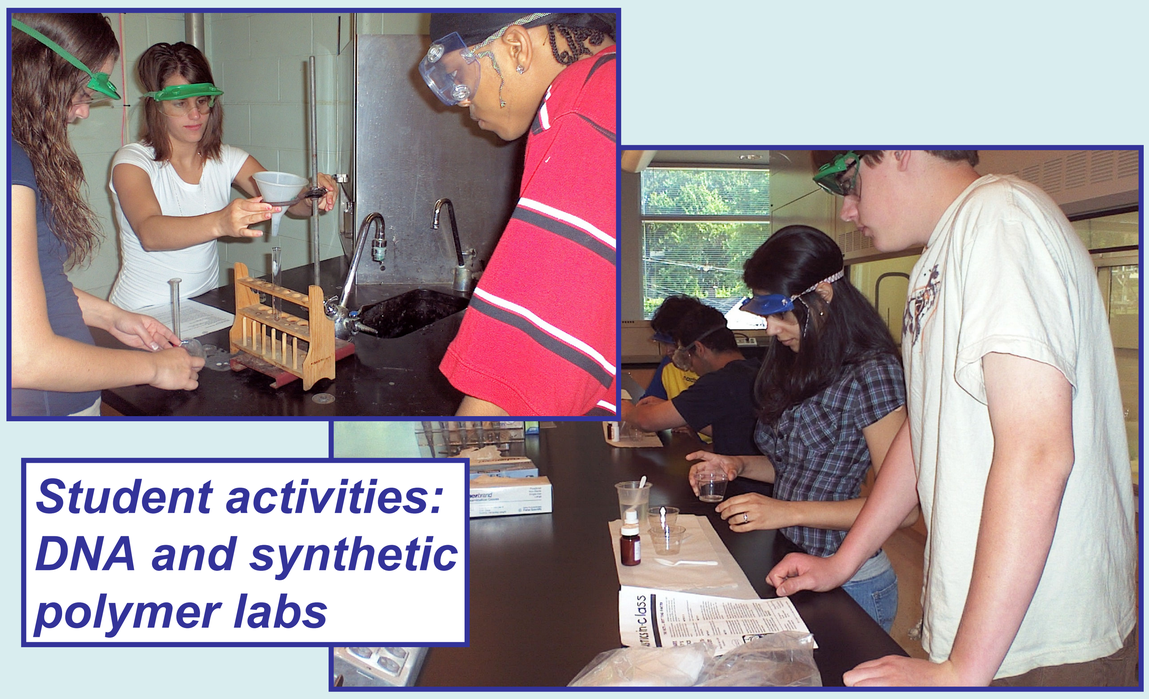
A group of students will work on the State of Connecticut embedded performance task of the SYNTHETIC POLYMERS laboratory exercise while interfacing with Dr. Jennifer Frederick's research program at WCSU.

Overview:

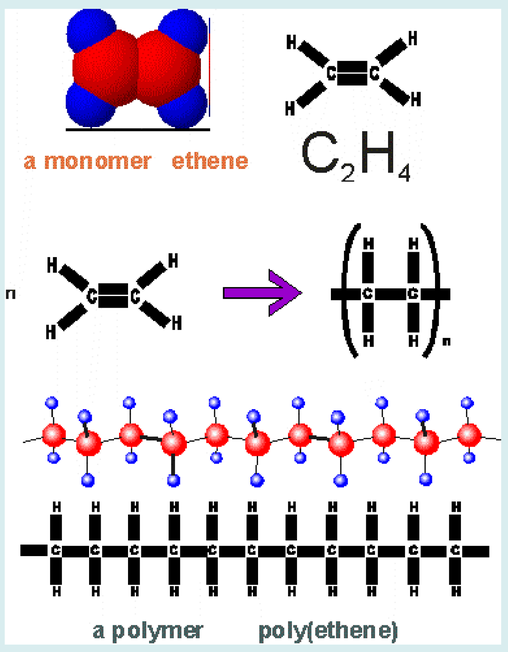
Students were involved with Dr. Frederick's research program in several ways.

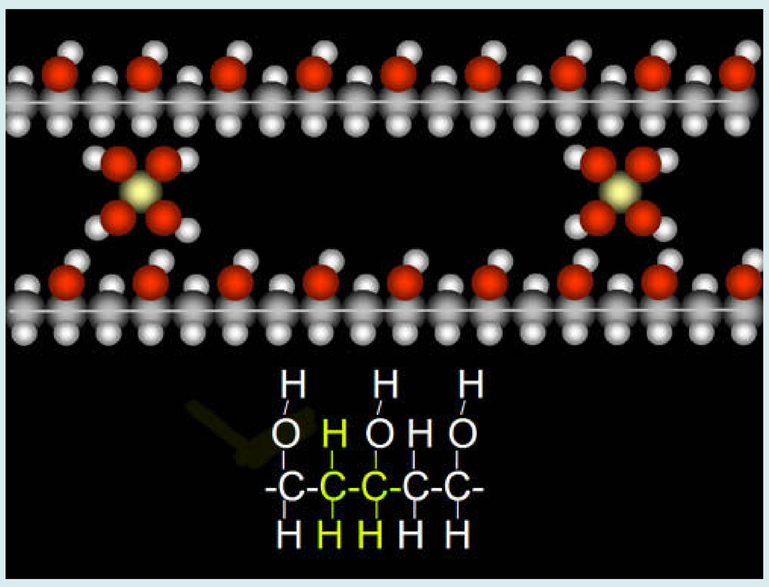
- Classroom visits by Dr. Frederick – discussions about research, opportunities in science;
- Field trip to the WCSU Chemistry facilities – raised awareness of college science and research, hands-on activities with polymer chemistry.

Field trip to WCSU



Student activities: DNA and synthetic polymer labs





Molecular structure of "slime"

Outcomes:

*Preliminary data derived from pre- and post-field trip surveys, qualitative assessment based on teacher observations.

1. Student awareness of scientific career opportunities increased.
2. They discovered that polymers are significantly present in everyday life, in obvious (plastics and textiles) and not-so-obvious ways (DNA, starch, cellulose).
3. Exposure to university research in Dr. Frederick's lab helped students grasp the importance of gaining basic understanding of polymer chemistry.
4. More assessment will be needed over time to see if the experience carries any long-term effects (greater percentage of students pursuing science degrees and careers, for example).

Acknowledgements:

Dr. Theodora Pinou, Dr. Jennifer Frederick, and Dina Livesay for guidance and support during this unique opportunity to expand my teaching abilities to motivate inquiry-based learning. I would also like to thank colleague Susan DeMattio for helpful discussion and project coordination. WISTR was funded through a TPQ grant from the State of Connecticut Department of Education. Finally, I would like to thank my students for their help in getting this project completed.