

## Green Chemistry Grant Recipient Project Summary

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Grand Valley State University  
Chemistry 180  
Pollution Prevention, Green Chemistry and Green Engineering

In September 2008, Grand Valley State University was awarded a grant by the Michigan Department of Environmental Quality for the development of a foundational course centrally focused on Green Chemistry and Pollution Prevention.

Chemistry 180, Pollution Prevention, Green Chemistry and Green Engineering, developed in part by Dalila Kovacs, Ph.D., is a course that was offered to incoming freshmen. This class presents the basic concepts of pollution prevention, green chemistry, and green engineering with the focus on green chemistry principles and their “green” application. Students were taught the 12 principles of green chemistry along with the principles of green engineering; they explored how they are used and developed as well as how they affect process changes in agriculture, natural resources, municipal service, health care, transportation, energy, and various manufacturing industries. Offered as a three credit hour course, the curriculum followed six important objectives, broken into units:

- Unit 1: This unit is designed as an introduction to pollution prevention, green chemistry, and green engineering. The classic pollution prevention principles will be introduced in parallel with the principles of green chemistry and green engineering using basic concepts of ecology and biology. Unit one will evaluate past concerns regarding pollution prevention, “dilution is the solution” and “waste reduction” and move towards the real solutions of “waste elimination” and “green design.” Chemistry, engineering, environmental studies, and sustainability will not only be taught as topics of study, but will also be presented as attractive career options.
- Unit 2: Humans - This unit presents humans as a source of pollution, but also as a resource for prevention. Industrial activity in relation to the impact it has on the environment will be studied in length as well as pollutants that have been created by human sources. The study of sustainability and improved manufacturing operations will also be studied during this time.
- Unit 3: Water - Supply and quality, sources of pollution, and the roles of pollution prevention, green chemistry and green engineering pertaining to our water. Not only will different types of contaminants be examined, but valuable alternatives will be suggested, such as municipal programs and different waste treatment technologies.
- Unit 4: Air - Topics covered are air pollution, different sources of air pollution, and contaminants, while also looking at how these topics can be addressed by pollution prevention and green alternatives, municipal programs waste treatment techniques, and green chemistry.
- Unit 5: Energy - This unit addresses energy and the environment, including different types of energy, both traditional and alternative or renewable and the environmental impacts of each.

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Unit 6: Agriculture - This unit covers agricultural pollution including: an overview of pollution sources from agriculture, like fertilizers, pesticides and runoff, soil and ground water contamination. New techniques will be examined pertaining to pollution prevention, such as different types of fertilization and pest control.

Chemistry 180 gives an overview of the foundation of pollution prevention, green chemistry, and green engineering. Students learn how improvements and modifications are being made in both research and manufacturing to maintain and even enhance environmental quality.

This grant provided Grand Valley State University with the opportunity to develop and offer a general education course with a focus on pollution prevention and green chemistry. The course helped to support the student sustainability certificate program, the environmental studies program, and the continued development of additional sustainability themes.

Grand Valley State University has showcased leadership through their sustainability initiatives and recognizes the serious demand for recent college graduates with a background in green chemistry as the awareness of environmental issues continues to develop.

The course has been run every year through 2012 since Grand Valley State University received the grant. The course is now called CHM 111: Introduction to Green Chemistry and has a maximum enrollment of 30 students.