

Project Description

The University of Delaware (UD) in partnership with the New Castle County Vocational Technical School District (NCCoVoTech) in Delaware with funding from the National Science Foundation has initiated a GK-12 Program. In each of year this program, nine full time UD graduate students in the sciences, who have completed all or most of their coursework, will be selected to serve as fellows. Participation in the GK-12 program benefits the graduate fellows in many ways. In addition to gaining general insight into current issues of science education, the fellows enhance their experience as scientific researchers by directly improving their ability to effectively communicate complex quantitative and technical knowledge to an audience with multiple and diverse learning needs.

In the first year of this project, fellows have been paired with high school science teachers from NCCoVoTech. These pairs, along with the principal investigators (PIs) of this program have formed a learning community that is taking this opportunity to examine and to reflect on current issues in science education while specifically addressing critical needs in teaching science in vocational technical high schools.

By participating in summer workshops and follow-up meetings facilitated by the PIs, the fellows have been introduced to a number of innovative teaching strategies including problem-based learning (PBL). Fellow/teacher pairs have begun to develop and teach PBL activities that are in agreement with State of Delaware science standards and that support student learning through inquiry. Fellows also have the opportunity to engage in coteaching with their teacher partner. In this "teaching at the elbow of another", fellows will gain a better understanding of and appreciation for the complexities and nuances of teaching science in vocational technical high schools.

While not taught as a stand-alone course in NCCoVoTech high schools, earth science topics are integrated into the science curriculum at nearly all levels from the freshman through the senior year. Three of the current group of nine fellows are engaged in Ph.D.-level research within the disciplines of astronomy and hydrology. They will bring this expertise into their collaboration with their practicing teachers with the goal of improving the understanding of earth science topics by high school students within a vocational technical school setting.

<http://www.udel.edu/GK-12/>

Fast Facts about NCCoVoTech District

Number of Schools:	3
Student Enrollment:	3,386 (49% female, 51% minority)
% of Special Education Students:	14.8%
Student to Computer Ratio:	2.7 : 1
Average Daily Attendance:	95.3% (State = 92.6%)
Graduation Rate:	96.1% (State = 83%)
Overall satisfaction rating (parent and student):	4.30 out of 5
% of parents who would recommend district:	93%
Employer satisfaction with students:	4.25 (out of 5)

Career Areas at Howard High School

<ul style="list-style-type: none"> Academy of Finance Carpentry Computer Network Administration Cosmetology Culinary Arts Dental Assistant Electrical Trades TSS Nurse Technicians Public Service

DELAWARE GK-12: IMPROVEMENT OF SCIENCE EDUCATION IN VOCATIONAL TECHNICAL HIGH SCHOOLS THROUGH COLLABORATIVE LEARNING AND COTEACHING

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Funding Agency - National Science Foundation, Division of Graduate Education Graduate Teaching Fellows in K-12 Education (GK-12)

2006-07 Graduate Fellows

GK-12 Fellow

Anissa Brown
Biological Sciences

- Research on the cellular and molecular processes of cartilage formation
- Attributes much of her educational success to mentors and tutors and through involvement in the GK-12 program she will enable students to also have this opportunity

GK-12 Fellow

Bryan Danysh
Biological Sciences

- Research on the role of basement membranes on the development and function of the eye lens
- Prior to returning to Graduate School, he was an Assistant Vice President in the IT Department at MBNA, developed teaching "bug" answering questions at the Technology "Help Desk"

GK-12 Fellow

Genevieve Griffiths
Biological Sciences

- Research at the cellular level on mechanisms aiding mammalian reproduction
- Hopes to transfer her joy of discovery through scientific research to her students
- Teaching in the family - her mother has been a 4th grade teacher

GK-12 Fellow

Thomas Madura
Physics & Astronomy

- Research on the evolution of the η -Carinae stellar system
- As a graduate of Polytech High School in Kent County, he has an appreciation for what it takes in high school science courses to motivate and interest vocational students

GK-12 Fellow

Marguerite McDonald
Chemistry & Biochemistry

- Research in biochemistry at the molecular level on the effect of certain enzymes on RNA
- Love of chemistry fostered by teachers and mentors sharing a passion for science
- Her goal is to combine her enthusiasm for science with her research experiences to inspire young citizens of Delaware

GK-12 Fellow

Fayth Miles
Biological Sciences

- Research on the growth of cancer cells
- NSF - Integrative Graduate Education, Research and Training (IGERT) Scholar
- Wants to work with high school teachers to increase interest and performance of minority students in the sciences

GK-12 Fellow

Rose O'Connor
Biological Sciences

- Research at the genetic level on the development of bone density related to Rett Syndrome
- Has been a mentor with the Big Brothers/Big Sisters program
- Participation in the GK-12 program will help to promote science and math in high schools which is "essential to the advancement of our society"

GK-12 Fellow

John Shaw
Physics & Astronomy

- Research on the life cycles of brown dwarf stars
- Prior to returning to graduate school, worked as a systems manager for Sunoco at the Marcus Hook Refinery
- One of his joys of teaching is the moment when a student "gets it"

GK-12 Fellow

Katherine Skalak
Geology

- Research on the transport of mercury in rivers
- Geology Department's Outstanding Teaching Assistant in 2004
- Teaching in the family - her husband Nick is currently teaching in the Delaware Schools

2006-07 Science Teachers

GK-12 Teacher

Ingrid Anderson
Howard High School Of Technology

- Biological Sciences
- Partnering with GK-12 Fellow Rose O'Connor

GK-12 Teacher

Carol Buswell
Howard High School Of Technology

- Integrated Sciences and Physical Sciences
- Partnering with GK-12 Fellow Katie Skalak

GK-12 Teacher

Ronney Bythwood
Howard High School Of Technology

- Physics and Physical Sciences
- Partnering with GK-12 Fellow Tom Madura

GK-12 Teacher

Brian Gross
Delcastle Technical High School

- Biological Sciences
- Partnering with GK-12 Fellows Brian Danysh and Genevieve Griffiths

GK-12 Teacher

Brian Heeney
Delcastle Technical High School

- Biological Sciences
- Partnering with GK-12 Fellows Brian Danysh and Genevieve Griffiths

GK-12 Teacher

Sharon Horrocks
Howard High School of Technology

- Special Education
- Partnering with GK-12 Fellow Fayth Miles

GK-12 Teacher

Michael Kittel
Howard High School of Technology

- Biological Sciences
- Partnering with GK-12 Fellow Anissa Brown

GK-12 Teacher

Ralph May
Howard High School of Technology

- Chemistry
- Partnering with GK-12 Fellows Marguerite McDonald and John Shaw

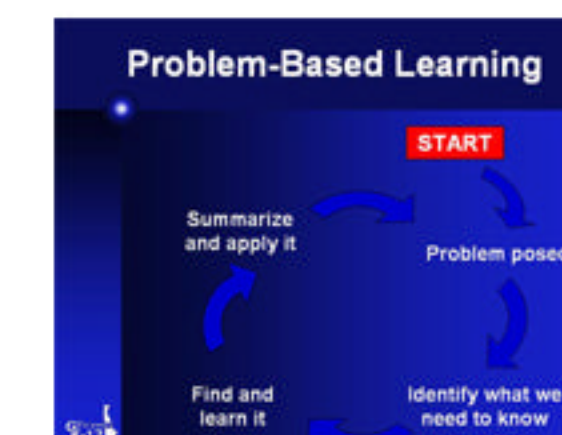


Delaware GK-12 Activities

- In summer workshops, teaching teams will be introduced to a number of innovative teaching strategies, including problem-based learning (PBL).
- During the academic year, Fellows will engage in coteaching with their teacher partners.
- Fellows will gain a better understanding and appreciation of the complexities and nuances of teaching science in high school.
- Teaching teams will have the opportunity to develop PBL activities, aligned with curricular needs, for students to experience the benefits of guided-inquiry learning environments.

What is Coteaching?

- Teaching at the elbow of the other, with multiple teachers
- Focus on learning of ALL students
- Supportive environment for analyzing and critiquing practice
- Opportunity to learn aspects of teaching that are not easily verbalized
- Link between theory and practice



We Will Use PBL to:

- Motivate learning by connecting science course content to real world situations
- Assess content understanding to inform future instruction
- Foster development of reasoning, communication, information retrieval, and team-building skills

Delaware GK-12 Benefits

Expected outcomes include:

- Improved communication, teaching, and team building skills for the Fellows;
- Professional development opportunities for science teachers;
- Enriched learning for the high school students; and
- Strengthened partnership between University of Delaware and the New Castle County VoTech School District.

Project Evaluation

The planned evaluation includes external and internal activities. The Evaluation and Assessment Center for Mathematics and Science Education (E & A Center) in Ohio will serve as the external evaluator for the proposed project. The Center brings together the strengths of three evaluation groups: the Evaluation Services Center (Dr. Deborah Zorn, Director) at the University of Cincinnati, the Applied Research Center (Dr. Robert Seufert, Director) at Miami University—Middletown, and the Evaluation and Assessment Center (Dr. Jane Butler Kahle, Principal Investigator) at Miami University-Oxford. The Center is the repository of valid and reliable instruments to assess progress in the various science disciplines. It is noted for its effective dissemination of research findings through both scholarly and popular venues.

Based on the goals of the project, the evaluation will be guided by the following questions:

- Do the project activities deepen and extend science content knowledge for fellows, teachers, and high school students?
- Do the project activities deepen and extend pedagogical knowledge for fellows and teachers?
- Do the project activities create learning communities?
- What elements of the program become institutionalized as a program partnering STEM graduate students and teachers to address critical issues in high school science education?

Multiple sources of quantitative and qualitative data will be gathered from fellows, faculty research advisors, cooperating teachers, and high school students. In addition, artifacts, including PBL and Lesson Study units, will be collected and used to address the evaluation questions. The external evaluation will also review reports conducted as part of internal evaluation activities.