



Funding by the NSF Graduate Teaching Fellows Program in K-12 Education (GK-12) DGE 0538555

UD GK-12 Website Development

Jeff Spraggins: www.udel.edu/GK-12



Delaware GK-12

A partnership between the University of Delaware and the New Castle County Vocational Technical School District

The University of Delaware partnership with the [New Castle County Vocational Technical School District](#), has received funding from the National Science Foundation to institute a [Graduate Teaching Fellows Program in K-12 Education \(GK-12\)](#) [website]. In each of the three years of this project, nine full-time UD graduate students in the sciences, who have completed all or most of their coursework, are selected to serve as fellows.

Goals

- Enhance Content
- Develop Written Communication Skills
- Compliance with UD Branding
- Upgrade Appearance
- Develop Web-based Communication Skills

Fellows are paired with high school science teachers. Project investigators (PIs) of this project, form a learning community that has the opportunity to examine and to reflect on current issues in education while specifically addressing critical needs in science education.

By participating in summer workshops and by working with the project leaders, the fellows are introduced to a number of innovative teaching strategies including problem-based learning (PBL). During the academic year, fellows engage in coteaching with their teacher partner. In this "teaching as learning" model, fellows learn about the complexities and nuances of teaching science in vocational technical high schools. Fellow/teacher pairs develop PBL activities, aligned with curricular needs, to allow their students to experience the benefits of guided-inquiry learning environments.

Fellows receive a twelve-month stipend of \$30,000 and are expected to spend twenty hours per week on the project. The time commitment includes ten days during the summer devoted to workshop and development activities and a minimum of ten hours per week during the academic year that fellows spend in their teacher partner's classroom. Fellows must be citizens, nationals, or permanent residents of the United States. Fellows are selected based upon a review of written applications and an interview process by the project leaders. It is essential that fellows have the support and cooperation of their research advisors to participate



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•Goals

• Enhance Content

Fellows are paired with high school science teachers. Fellows, along with the principal investigators (PIs) of this project, form a learning community that has the opportunity to examine and to reflect on current issues in education while specifically addressing critical needs in science education in vocational technical high schools.

• Student/Advisor Profiles

• Materials

By participating in summer workshops, fellows are introduced to a number of innovative teaching strategies including problem-based learning (PBL). During the academic year, fellows engage in coteaching with their teacher partner. In this "teaching in the shadows" model, fellows gain a better understanding of and appreciation for the complexities and nuances of teaching science in vocational technical high schools. Fellow/teacher pairs develop PBL activities, aligned with curricular needs, to allow their students to experience the benefits of guided inquiry learning environments.

• Develop Written Communication Skills

• Compliance with UD Branding

• Upgrade Appearance

Fellows receive a twelve-month stipend of \$30,000 and are expected to spend twenty hours per week on the project. The time commitment includes ten days during the summer months (July, August) and seven months (September through May) of ten hours per week during the academic year. The fellow spend their academic preparation fall month to fall, winter or permanent residents of the United States. Fellows are selected based upon a review of written applications and an interview process by the project leaders. It is essential that fellows have the support and cooperation of their research advisors to participate

• Develop Web-based Communication Skills



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- **Goals**
- **Enhance Content**
- **Student/Advisor Profiles**
- **Materials**
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Fellows are paired with high school science teachers. Working with the principal investigators (PIs) of this project, form a learning community that has the opportunity to examine and to reflect on current issues in education while specifically addressing critical needs in science education in vocational technical high schools.

By participating in summer workshops, fellows are introduced to a number of innovative teaching strategies including problem-based learning (PBL). During the academic year, fellows engage in coteaching with their teacher partner. In this "teaching of the teacher" approach, fellows gain a better understanding of and appreciation for the complexities and nuances of teaching science in vocational technical high schools. Fellow/teacher pairs develop PBL activities, aligned with curricular needs, to allow their students to experience the benefits of guided inquiry learning environments.

Fellows receive a twelve-month stipend of \$30,000 and are expected to spend twenty hours per week on the project. The time commitment includes ten days during the summer devoted to training and development activities and ten hours per week during the academic year. The fellows spend their academic year either on Fall, Spring, or permanent residents of the United States. Fellows are selected based upon a review of written applications and an interview process by the project leaders. It is essential that fellows have the support and cooperation of their research advisors to participate





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Fellows are paired with high school science teachers to develop and deliver lessons. The fellows and their research advisors (PIs) of this project, form a learning community that has the opportunity to examine and to reflect on current issues in education while specifically addressing critical needs in science education.

By participating in summer workshops and conferences organized by the project leaders, the fellows are introduced to a number of innovative teaching strategies including problem-based learning (PBL). During the academic year, fellows engage in coteaching with their teacher partner. In this "teaching as a way of learning" model, fellows are responsible for the complexities and nuances of teaching science in vocational technical high schools. Fellow/teacher pairs develop PBL activities, aligned with curricular needs, to allow their students to experience the benefits of guided-inquiry learning environments.

Fellows receive a twelve-month stipend of \$30,000 and are expected to spend twenty hours per week on the project. The time commitment includes ten days during the summer devoted to workshop and development activities and a minimum of ten hours per week during the academic year that fellows spend in their teacher partner's classroom. Fellows must be citizens, nationals, or permanent residents of the United States. Fellows are selected based upon a review of written applications and an interview process by the project leaders. It is essential that fellows have the support and cooperation of their research advisors to participate.



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Goals

Fellows are paired with high school science teachers from the New Castle County Vocational Technical School District. The project investigators (PIs) of this project form a learning community that has the opportunity to examine and to reflect on current issues in education while specifically addressing critical needs in science education in the New Castle County Vocational Technical School District.

By participating in summer workshops and during the academic year, the fellows are introduced to a number of innovative teaching strategies including problem-based learning (PBL). During the academic year, fellows engage in coteaching with their teacher partner. In this "teaching as a form of learning" model, the fellows are responsible for the complexities and nuances of teaching science in vocational technical high schools. Fellow/teacher pairs develop PBL activities, aligned with curricular needs, to allow their students to experience the benefits of guided-inquiry learning environments.

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Delaware GK-12

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[Fellows](#) [Teachers](#) [Advisors](#) [Leaders](#) [Press/Media](#)

2008 Press Coverage:

[University of Delaware](#):

6/11/2008, [UDaily](#): "[Symposium highlights NSF GK-12 UD fellows' work](#)" ([article pdf](#), photos: [1](#), [2](#))

2007 Press Coverage:

[University of Delaware](#):

5/24/2007, [UDaily](#): "[NSF GK-12 conference showcases UD fellows' work](#)" ([article pdf](#), photos: [1](#), [2](#), [3](#))

2/20/2007, [UDaily](#): "[NSF-funded program boosts teachers' skills](#)" ([article pdf](#), [photo](#))

NSF, March 2007: Delaware GK-12 receives honorable mention for Media Award ([photo](#))

2006 Press Coverage:

4/24/2006 Press Event at [Howard High School of Technology](#):

[PowerPoint presentation](#) (3.9 Mb) [Updated Oct 2006 to include all 2006 Teachers and Fellows]

[University of Delaware](#):

4/25/2006, [UDaily](#): "[UD, NCC vo-tech district announce NSF project](#)" ([article pdf](#), [cover pdf](#), [photo](#))

8/17/2006, [UDaily](#): "[NSF workshops target science education, teaching methods](#)" ([article pdf](#), [photo](#))

The News Journal/[delawareonline.com](#):

4/24/2006 print "[School to offer science for real world](#)" ([article pdf](#))

4/24/2006 [p.m. newscast](#) ([local copy](#)) [play 0:51 to 1:38]

[WDEL](#) 1150AM News Talk Radio:

4/24/2006 [newscast](#) ([local copy](#))

Conference Presentations:

October 2006, Annual Meeting of Geological Society of America, Philadelphia

poster "Delaware GK-12: Improvement of Science Education in Vocational Technical High Schools through Collaborative Learning and Co-Teaching" ([abstract](#), [poster](#))

March 2007, Seventh Annual NSF GK-12 Project Meeting, Washington, DC

poster "Delaware GK-12: Improvement of Science Education in Vocational Technical High Schools through Collaborative Learning and Co-Teaching" ([abstract](#), [poster.jpg](#), [poster.pdf](#) [71Mb!])

Delaware GK-12

[in the News...]

[\[Home\]](#) [\[News\]](#)

2008 Press Coverage:

[University of Delaware:](#)

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Fellows are paired with high school science teachers. The fellows and their research advisors (PIs) of this project, form a learning community that has the opportunity to examine and to reflect on current issues in education while specifically addressing critical needs in science education in Delaware. The fellows and their research advisors will develop and implement science education projects in Delaware.

By participating in summer workshops and in-service training provided by the project leaders, the fellows are introduced to a number of innovative teaching strategies including problem-based learning (PBL). During the academic year, fellows engage in coteaching with their teacher partner. In this "teaching team" approach, the fellows and their teacher partners address the complexities and nuances of teaching science in vocational technical high schools. Fellow/teacher pairs develop PBL activities, aligned with curricular needs, to allow their students to experience the benefits of guided-inquiry learning environments.

Fellows receive a twelve-month stipend of \$30,000 and are expected to spend twenty hours per week on the project. The time commitment includes ten days during the summer devoted to workshop and development activities and a minimum of ten hours per week during the academic year that fellows spend in their teacher partner's classroom. Fellows must be citizens, nationals, or permanent residents of the United States. Fellows are selected based upon a review of written applications and an interview process by the project leaders. It is essential that fellows have the support and cooperation of their research advisors to participate.





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Fellows are paired with high school science teachers from NCCoVoTech. These pairs, along with the principal investigators (PIs) of this project, form a learning community that has the opportunity to examine and to reflect on current issues in education while specifically addressing critical needs in science education in vocational technical high schools.

By participating in summer workshops and follow-up meetings facilitated by the project leaders, the fellows are introduced to a number of innovative teaching strategies including problem-based learning (PBL). During the academic year, fellows engage in coteaching with their teacher partner. In this "teaching at the elbow of another", fellows gain a better understanding of and appreciation for the complexities and nuances of teaching science in vocational technical high schools. Fellow/teacher pairs develop PBL activities, aligned with curricular needs, to allow their students to experience the benefits of guided-inquiry learning environments.

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Delaware

A partner

- 2006 Fellows
- 2007 Fellows
- 2008 Fellows
- Application

GK-12

*University of Delaware
County Vocational Technical School District*

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Fellows are paired with high school science teachers to form a learning community that has been addressing critical needs in science education.

By participating in summer workshops and following the project leaders, the fellows are introduced to a number of innovative teaching strategies including problem-based learning (PBL). During the academic year, fellows engage in coteaching with their teacher partner. In this "teaching at the elbow of another", fellows gain a better understanding of and appreciation for the complexities and nuances of teaching science in vocational technical high schools. Fellow/teacher pairs develop PBL activities, aligned with curricular needs, to allow their students to experience the benefits of guided-inquiry learning environments.

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- Adam Aguiar
- Christy Beal
- Mary Boggs
- Dana Boltuch
- Kristy Longsdorf
- Patricia Jones
- Jeffrey Spraggins
- Joshua Wickman

[County Vocational Technical School District](#), has received funding from the [Graduate Research Fellows Program in K-12 Education \(GK-12\)](#) [\[website\]](#). In each of the three years of this project, nine full time UD graduate students, who have completed all or most of their coursework, are selected to serve as fellows.

These pairs, along with the principal investigators (PIs) of this project, will examine and to reflect on current issues in education while specifically addressing critical needs in science education at vocational technical high schools.

Facilitated by the project leaders, the fellows are introduced to a number of innovative teaching strategies including problem-based learning (PBL). During the academic year, fellows engage in coteaching with their teacher partner. In this "teaching at the elbow of another", fellows gain a better understanding of and appreciation for the complexities and nuances of teaching science in vocational technical high schools. Fellow/teacher pairs develop PBL activities, aligned with curricular needs, to allow their students to experience the benefits of guided-inquiry learning environments.



Delaware GK-12

[2008-2009 Graduate Teaching Fellows]

[Home] [Fellows] [2008 Fellows] [2007 Fellows] [2006 Fellows] [UD Graduate Fellows Application]



[Adam Aguilar]
Biology / Sciences
aaguilar@udel.edu
5-min Presentations
Research: [PPT](#), [PDF](#)
Teaching: PPT, PDF



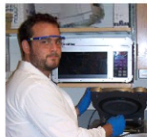
[Christy Beal]
Entomology and Wildlife Ecology
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Teaching: PPT, PDF



[Marilyn Boggs]
Biology / Sciences
mboggs@udel.edu
5-min Presentations
Research: [PPT](#), [PDF](#)
Teaching: PPT, PDF



Delaware GK-12

Profile: [Adam Aquino](#)[Home](#) | [Fellows](#) | [2008 Fellows](#) | [Adam Aquino](#)

Myself and My Research: I am 25 years old and from a little town on the coast of central New Jersey. Being a graduate student at the University of Delaware is a privilege in that I can visit my parents and three younger brothers at my leisure. Here at UD I'm currently pursuing my PhD in molecular biology where my area of study focuses on the implications of a specific protein in prostate cancer (PCa) progression. Techniques like cell culturing, invasion, migration, and growth-assays allow me to investigate the functions of this protein on a variety of PCa cell model systems. My hopes are that the research I complete here contributes and eventually leads to improved treatment strategies and diagnostic measures for people suffering from PCa. The passion I have for research and teaching that led me to pursue this track mold my future aspirations as well. I plan to use the skills I acquire here in obtaining a post doctoral degree. Ultimately, my goal is to find a position as a full professor at a small university, and possibly aiding in additional cancer research.

In The Classroom: At Saint George's Vocational High School I work with Mr. Mike Kittel in teaching sophomore biology. Here I implement methods and equipment from the laboratory at UD in exposing the students to how science is currently undertaken in today's field. Also, bringing my knowledge base on cancer and cell biologies rarely adds to lesson impact and classroom discussion for many topics. Relating such material to practical, real-life applications is a consistent goal of mine.

From this experience my love for teaching has grown even further, and I have gotten as much from the students as they've received from the classroom.

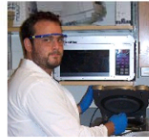
Developed Class MaterialResearch: [PPT](#) [PDF](#) Teaching: [PPT](#) [PDF](#)Lectures (PPT): [coming soon](#)Lectures (PDF): [coming soon](#)**Additional Information**Contact: aaquino@udel.edu

Delaware GK-12

Profile: [Adam Aquiar](#)



[Home](#) | [Fellows](#) | [2009 Fellows](#) | [Adam Aquiar](#)



Myself and My Research: I am 25 years old and from a little town on the coast of central New Jersey. Being a graduate student at the University of Delaware is a privilege in that I can visit my parents and three younger brothers at my leisure. Here at UD I'm currently pursuing my PhD in molecular biology where my area of study focuses on the implications of a specific protein in prostate cancer (PCa) progression. Techniques like cell culturing, invasion, migration, and growth assays allow me to investigate the functions of this protein on a variety of PCa cell model systems. My hopes are that the research I complete here contributes and eventually leads to improved treatment strategies and diagnostic measures for people suffering from PCa. The passion I have for research and teaching that led me to pursue this track mold my future aspirations as well. I plan to use the skills I acquire here in obtaining a post doctoral degree. Ultimately, my goal is to find a position as a full professor at a small university, and possibly aiding in additional cancer research.

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Delaware GK-12

Profile: [Christy Beall](#)



[Home](#) | [Fellows](#) | [2009 Fellows](#) | [Christy Beall](#)



Research: The purpose of my PhD project is to determine if birds prefer to forage for insects on native tree species as opposed to non-native trees. Several previous studies have focused on the fact that insect biomass is higher on native plants than on alien plants. Most birds, even those that eat seeds as adults, feed their young caterpillars. Caterpillars provide a high energy food source in a convenient carrying package that can be easily fed to baby birds. If native vegetation, and its associated insects, attracts a greater number of birds, much of the general public could be encouraged to actively participate in creating a suburban environment that is usable by a large variety of insect and bird species, as well as appealing to humans. The average homeowner does not want to encourage insects to live on their plants. However, encouraging backyard birds is a billion dollar business. According to a survey conducted by the U.S. Fish and Wildlife Service on Fishing, Hunting and Wildlife Recreation over 52 million Americans consider themselves, at least to some degree, to be bird watchers. I have been comparing bird foraging frequency and caterpillar biomass on native and non-native landscape trees in suburban and park areas in Southern New Jersey and Eastern Pennsylvania. Data collection began in the Spring of 2007. At each site bird counts are conducted by both myself and volunteers on ten different species of commonly planted landscape trees. Simultaneously, caterpillar biomass for each tree is determined by collecting frass (caterpillar droppings). Frass is weighed and the individual pellets counted for each 24-hour period during bird counts.

In the classroom: Since I started my graduate career, I have spent a significant part of every semester Taing or teaching introductory courses for Entomology. The GK-12 program offered me a fantastic opportunity to adapt my teaching to high school students, and to learn how to work with an age group that I had no previous experience with.

Working with Lisa Currie has been a blast. Ninth grade integrated science provides the students with a general overview of physics, chemistry and Earth science. In addition, Lisa has facilitated the addition of a little entomology and soil science into the regular curriculum.

This year, we tied soils and insects into conservation of matter and cycles in the hope of linking classroom labs to the world that the kids live in every day. I am a firm believer that science needs a bit of a WOW! factor to keep kids interested, but it also needs to be linked to everyday life to be truly comprehended. Fat cockroaches and sorting through dirt for worms and insect are a memorable link to real science in the classroom. Additionally, the students worked on a two week renewable energy project that related their everyday choices to global issues.

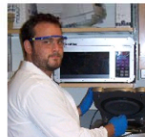
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Additional Information
 Contact: cbhall@udel.edu
[Center for Managed Ecosystems](#)



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Profile: Christy Beall

Home | Fellows | 2008 Fellows | Christy Beall



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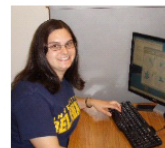
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Profile: Dana Boltuch

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Research: My research is doing gamma-ray astronomy with the VERITAS collaboration. VERITAS (the Very Energetic Radiation Imaging Telescope Array System) is an Imaging Atmospheric Cherenkov Telescope (IACT) located in southern Arizona. Gamma-rays, like all light, travel through space in a straight line. Some of the gamma-ray photons produced by an object in space will intersect Earth, allowing us to "see" the object they came from in gamma-ray light. Although gamma rays themselves cannot penetrate Earth's atmosphere, when a gamma ray hits the upper atmosphere, it decays into a shower of particles and visible photons that travel along the same path as the incoming gamma ray.

This visible light is what IACTs see, allowing us to observe gamma ray sources from the ground. Gamma rays are the most energetic form of radiation in the universe, far more energetic than visible light. Because they are so energetic, they can only be produced in extreme environments that are impossible to recreate on Earth. Gamma rays are seen from the far reaches of the universe in things like quasars and gamma-ray bursts, but they can also be produced by sources within the Milky Way. Some examples of galactic gamma ray sources are black holes, supernovae, and pulsars. These galactic sources of gamma rays are the focus of my work with the VERITAS collaboration.

In the classroom: I have long had an interest in education and teaching. As an undergraduate, I did research in Physics education and helped to develop a curriculum for a portable planetarium to teach high school students about radio astronomy. Now, as a graduate student, I have had further experiences in the classroom through my participation in the GK-12 program. During the 2008-2009 school year, I have worked with teacher Jessica Jackson, as well as teacher Timothy Brewer and fellow graduate student Joshua Wickman, to develop curricular materials to teach 11th grade Integrated Science students about multi-wavelength astronomy and energy. We have also investigated the effectiveness of alternative testing methods at revealing student understanding with students in an inclusion special education model.

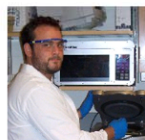
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 Lectures (PPT): *coming soon*
 Lectures (PDF): *coming soon*
Additional Information
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Delaware GK-12

Profile: Adam Aquino

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Myself and My Research: I am 25 years old and from a little town on the coast of central New Jersey. Being a graduate student at the University of Delaware is a privilege in that I can visit my parents and these younger brothers at my leisure. Here at UD I'm currently pursuing my PhD in molecular biology where my area of study focuses on the implications of a specific protein in prostate cancer (PCa) progression. Techniques like cell culturing, invasion, migration, and growth-assays allow me to investigate the functions of this protein on a variety of PCa cell model systems. My hopes are that the research I complete here contributes and eventually leads to improved treatment strategies and diagnostic measures for people suffering from PCa. The passion I have for research and teaching that led me to pursue this track mold my future aspirations as well. I plan to use the skills I acquire here in obtaining a post doctoral degree. Ultimately, my goal is to find a position as a full professor at a small university, and possibly aiding in additional cancer research.

In The Classroom: At Saint George's Vocational High School I work with Mr. Mike Kittel in teaching sophomore biology. Here I implement methods and equipment from the laboratory at UD in exposing the students to how science is currently undertaken in today's field. Also, bringing my knowledge base on cancer and cell biologies surely adds to lesson impact and classroom discussion for many topics. Relating such material to practical, real-life applications is a consistent goal of mine. From this experience my love for teaching has grown even further, and I have gotten as much from the students as they've received from the classroom.

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Delaware GK-12

Profile: Christy Beall

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Research: The purpose of my PhD project is to determine if birds prefer to forage for insects on native tree species as opposed to non-native trees. Several previous studies have focused on the fact that insect biomass is higher on native plants than on alien plants. Most birds, even those that eat seeds as adults, feed their young caterpillars. Caterpillars provide a high energy food source in a convenient carrying package that can be easily fed to baby birds. If native vegetation, and its associated insects, attracts a greater number of birds, much of the general public could be encouraged to actively participate in creating a suburban environment that is usable by a large variety of insect and bird species, as well as appealing to humans. The average homeowner does not want to encourage insects to live on their plants. However, encouraging backyard birds is a billion dollar business. According to a survey conducted by the U.S. Fish and Wildlife Service on Fishing, Hunting and Wildlife Recreation over 52 million Americans consider themselves, at least to some degree, to be bird watchers. I have been comparing bird foraging frequency and caterpillar biomass on native and non-native landscape trees in suburban and park areas in southern New Jersey and Eastern Pennsylvania. Data collection began in the Spring of 2007. At each site bird counts are conducted by both myself and volunteers on ten different species of commonly planted landscape trees. Simultaneously, caterpillar biomass for each tree is determined by collecting frass (caterpillar droppings). Frass is weighed and the individual pellets counted for each 24-hour period during bird counts.

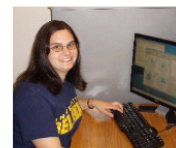
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Delaware GK-12

Profile: Dana Boltich

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Delaware GK-12

Profile: Mary Bezzo

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Research: My research focuses on understanding the mechanism of pain sensation in bone. How pain is transmitted when disease or injury occurs in bone, especially in patients with cancer that has metastasized to bone, is not well understood and thus the pain is not well treated. A better understanding of this mechanism will aid in targeting therapeutics to better treat patients with pain induced by bone cancer.

I hypothesize that the mechanism of pain sensation is through cell-to-cell communication between the most abundant cell type of bone cell and sensory neurons that innervate bone. In order to study this communication, I prepare surfaces that are patterned with two types of extracellular matrix proteins using a technique called micro-contact printing. This allows me to culture both cell types together to better study their interactions.

Further studies focus on manipulating bone cells on the patterned surfaces and monitoring for changes in intracellular calcium and membrane potential in the neuron, which would be indicative of direct activation of the neuron through bone cell activity. An understanding of this would be useful for development of better therapeutics to treat cancer induced bone pain.

In the classroom: Teaching science to students has been a vital part of my upbringing as a scientist. I began working with students when I was in college, particularly with undergraduates in biology, chemistry and organic chemistry. With this experience, I have learned that in order to really understand the sciences, one must appreciate it and understand it by being able to relate to it. I believe that if you are able to relate science to what you do in your everyday life, it drives you to appreciate, and desire to learn it.

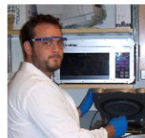
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 Lectures (PPT): [coming soon](#)
 Lectures (PDF): [coming soon](#)
Additional Information
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Delaware GK-12

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Profile: Adam Aquino

Myself and My Research: I am 25 years old and from a NJ Jersey. Being a graduate student at the University of Delaware and these younger brothers at my leisure. Here a molecular biology where my area of study focuses on the prostate cancer (PCA) progression. Techniques like cell growth assays allow me to investigate the functions of these systems. My hopes are that the research I complete her improved treatment strategies and diagnostic measures passion I have for research and teaching that led me aspirations as well. I plan to use the skills I acquire here. Ultimately, my goal is to find a position as a full professor aiding in additional cancer research.

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Delaware GK-12

Home | Fellows | 2007 Fellows | Kristy Longsdorf



Profile: Kristy Longsdorf

Research: My research is part of a collaboration between the Beebe (analytical chemistry) and Fox (organic chemistry) research groups at the University of Delaware. We are exploring the development of a novel method for attaching biological molecules, like proteins, on unnatural surfaces, such as glass and silicon. While many methods exist for attaching biomolecules, these methods do not directly control how the molecule is oriented relative to the surface. This can affect the biomolecule's function and interaction with other molecules if it is facing the wrong direction. My goal is to use an organic molecule as a tether to link biomolecules to the surface so that after they are attached to a surface they are facing the "right" way and can still do their job. This chemistry has many applications ranging from lab-on-a-chip research to biomedical industries.

As a surface scientist, the chemical changes made to the glass or silicon surfaces are monitored through surface-sensitive techniques, such as X-ray photoelectron spectroscopy (XPS) and time-of-flight secondary ion mass spectrometry (TOF-SIMS). XPS is useful for determining chemical state information that tells whether the carbon on the sample is from a carbon-carbon, carbon-oxygen or carbon-hydrogen bond. TOF-SIMS provides chemical composition information from masses of chemical fragments. Similar to putting pieces of a jigsaw puzzle together, we use the different mass fragments to see if they fit together to make the compounds we put on the surface.

In the classroom: The GK-12 program has provided a unique insight to teaching at the high school level that I would have otherwise never known. As a returning GK-12 fellow, I have had the opportunity to work with both Krista Webb and Terence Blanch within the NCCVT school District. For the 2007-08 school year at Delaware High School, Krista and I worked with 9th grade students in Physical Science and 11th grade students in Integrated Science. As a special education teacher, Krista was interested in creating more hands-on experiences for the various types of learners in her classroom. In the second semester we developed several activities to engage students for the astronomy portion of the Integrated Science course.

Currently, at St. George's High School Terence Blanch and I have 9th graders for Physical Science. Our goal this semester is to use the technology of digital media to enhance student performance and understanding of scientific inquiry and experimentation. In lectures we currently use digital video camera to display demonstrations on the projector screens for easier viewing. Digital cameras are also used to capture images during a lab experiment for later reference and class discussion. We plan to have students experiment with video lab reports giving them a chance to verbally explain their experiment and results versus the conventional written form.



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Profile: Christy Beall

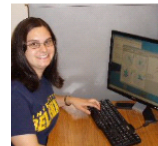
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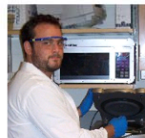


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Research: My research is part of a collaboration between (organic chemistry) research groups at the University of Delaware and the University of Maryland. My goal is to use an organic molecule as a tether that after they are attached to a surface they are facing this chemistry has many applications ranging from industries.

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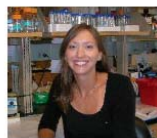
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Delaware GK-12

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Research: The extracellular matrix (ECM) is the major component of bone tissue and consists of proteins such as type I collagen and vitronectin. The adhesion of osteoblasts—the bone forming cells—to the extracellular bone matrix has been shown to be important to processes such as proliferation, differentiation, mineralization, and mechanotransduction. Consequently, my research concerns the signaling pathways that are activated in the osteoblast due to attachment to these matrix components. Previous research indicates that osteoblasts and osteoblast precursors respond to different ECM proteins in a unique manner. We believe that exposing osteoblast precursors to the appropriate ECM can drive these cells to increase their proliferative capacity. To that end, we are working on designing a three-dimensional scaffold that will maximize proliferative and anabolic responses of osteoblasts to the ECM.

In an aging population, the need for these kinds of artificial scaffolds to facilitate healing of osteoporotic and non-union fractures is great. Current therapies have many disadvantages including the risk of disease or death to the patient, as well as rejection of the implanted material. Understanding how osteoblasts respond to their extracellular environment and determining the conditions necessary for the proliferation of osteoblastic precursors in a three-dimensional scaffold will facilitate the development of novel and effective materials that will enhance bone formation and maintenance *in vivo*.

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In the classroom: In the GK-12 program, I have been working with Florence Malinowski in the Biotechnology vocational classroom at St. Georges. This year, we have worked to introduce a number of standard laboratory techniques to the students, while also providing them with a basic working knowledge of the chemical and biological principles needed to succeed in the biotechnology field. Throughout the year, I have helped to design laboratory activities and lessons, as well as set up a tissue culture facility in the classroom. Some activities we have done in the lab this year include solution preparation, extraction of plant DNA, chromatography, transformation of *E. coli*, and plant tissue culture. Despite the great deal of behind the scenes work I have done in the classroom, I have most enjoyed my time spent working with the students in both the laboratory and classroom setting. Although I hope to have enhanced their experience in the classroom, the students have helped me to gain new perspectives on my own research through their insightful questions and thoughts. My participation in the GK-12 program has truly been an invaluable experience that has improved my teaching skills and has given me an appreciation of the importance of linking scientific education with scientific research.

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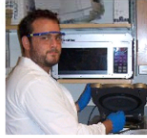
ERITAS collaboration: My research concerns the signaling pathways that are activated in the osteoblast due to attachment to these matrix components. Previous research indicates that osteoblasts and osteoblast precursors respond to different ECM proteins in a unique manner. We believe that exposing osteoblast precursors to the appropriate ECM can drive these cells to increase their proliferative capacity. To that end, we are working on designing a three-dimensional scaffold that will maximize proliferative and anabolic responses of osteoblasts to the ECM.

ray sources from the universe, far more than can be produced in any laboratory. Some examples of these sources are the focus of my

ated Science students
 ve testing methods at

Delaware GK-12

Home | Fellows | 2008 Fellows | Adam Aquino

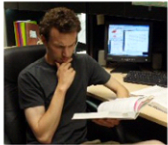


Myself and My Research: I am 25 years old and from a Jersey. Being a graduate student at the University of Delaware, I have two young brothers at my leisure. Here a molecular biology where my area of study focuses on the prostate cancer (PCa) progression. Techniques like cell growth assays allow me to investigate the functions of these systems. My hopes are that the research I complete here improved treatment strategies and diagnostic measures passion I have for research and teaching that led me aspirations as well. I plan to use the skills I acquire here ultimately, my goal is to find a position as a full professor aiding in additional cancer research.

In The Classroom: At Saint George's Vocational High School, I teach biology. I use a variety of methods at UD in expo currently bringing in biology to the classroom. Relating to the application of biology from this to the green even

Delaware GK-12

Home | Fellows | 2008 Fellows | Joshua Wickman



Research: My area of research lies in the intersection between two seemingly unrelated topics, particle physics and cosmology. Particle physics (or high energy physics) focuses on the smallest objects that make up the world around us – subatomic particles such as quarks and neutrons, and the interactions between them. Cosmology is the study of the largest – the universe – and how it developed over time into what we see today. The missing link that connects these two domains is the Big Bang. Early in the history of the universe, everything we see out in space (and everything we don't see, for that matter) was contained in a very small space. In other words, the density of particles/energy was incredibly high, meaning interactions between particles had a huge influence on the evolution of the universe.

Although the Big Bang explains why our universe is expanding, this theory is incomplete. There are a handful of major cosmological puzzles on which the Big Bang theory is silent. These can be accounted for by extending the theory, introducing a period very early in the development of the universe in which extremely rapid expansion took place. This idea is known as Cosmic Inflation.

My research so far has focused on improving the theoretical models of Cosmic Inflation. I compare results of mathematical calculations to data collected by satellite experiments such as the Wilkinson Microwave Anisotropy Probe (WMAP). This allows us to explore various ways in which inflation could have taken place, in an effort to better understand the universe in which we live.

In the classroom: Any scientist will tell you that scientific research is vital to the advancement of human knowledge. But research alone is not enough and is, in fact, utterly useless if the knowledge we gain is not effectively passed on to the next generation. Since science is done by building upon previous knowledge, it is especially critical to ensure that the most basic ideas are conveyed in an understandable and interesting way. If this is achieved, then the mystical notion that "science is something so difficult that it is out of most people's reach" is unraveled to reveal that scientific discovery and inquiry are an intrinsic part of our everyday lives.

This ideology has been central in my approach to teaching. Tim Brewer, Jessica Jackson, Dana Boltuch and I have worked together to break down the barriers in the minds of students that prevent them from connecting with scientific concepts. We have employed many different approaches, including a variety of hands-on activities, web-based research projects, interactive multimedia, and class discussions. We have formulated and administered both a Problem Based Learning (PBL) activity centered around designing a telescope, and an alternative exam format aimed at providing students with the means to respond in whatever way they feel will best convey their understanding (e.g. orally, or through drawing a picture).



Working with Phyllis Mayer last year, we developed a project on having students understand the cell cycle by relating it to what happens when the cycle loses regulation, mainly, cancer. Giving this model to the students provided them with an initiative to understand and learn the material. This year, my work with Lillie Kital has focused primarily on understanding how enzymes work in the body, and why people with enzyme deficiencies require supplements. One example of this was using a lab focused on Beano[®] and lactase to discuss what the enzymes do, having the students collect data in a system where the enzyme was either present or not, and then discussing how it is useful in the body. Aside from this, I am also working with Florence Malinowski in development of the Biotechnology Career Area at St. George's. My work there focuses on helping students with the essential techniques and understanding that they need for working in the biology lab setting.



Delaware GK-12

Home | Fellows | 2007 Fellows | 2008 Fellows | Kristy Longsdorf



Research: My research is part of a collaboration between organic chemistry research groups at the University of Delaware and a department of attaching biological systems to silicon. While many methods control how the molecule is a function and interaction with an organic molecule as a tell to a surface they are facing applications ranging from

the glass or silicon surfaces is 95% and time-of-flight secondary ion mass spectrometry (ToF-SIMS) provides chemical composition rather, we use the different materials.

Developed Class Material
 h2008: [PPT](#), [PDF](#)
 h2007: [PPT](#), [PDF](#)
 Lectures (PPT): [coming soon](#)
 Lectures (PDF): [coming soon](#)
Additional Information
kristy@udel.edu

We have developed several activities

for 9th graders for Physical Science and understanding of various demonstrations on the project experiment for later reference a chance to verbally explain

we would be using for

743

Delaware GK-12

Home | Fellows | 2008 Fellows | Christy Beall



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Delaware GK-12

Home | Fellows | 2008 Fellows | Patricia Jones



Research: The extracellular matrix (ECM) is the major component of bone tissue and consists of proteins such as type I collagen and vitronectin. The adhesion of osteoblasts—the bone forming cells—to the extracellular bone matrix has been shown to be important to processes such as proliferation, differentiation, mineralization, and mechanotransduction. Consequently, my research concerns the signaling pathways that are activated in the osteoblast due to attachment to these matrix components. Previous research indicates that osteoblasts and osteoblast precursors respond to different ECM proteins in a unique manner. We believe that exposing osteoblast precursors to the appropriate ECM can drive these cells to increase their proliferative capacity. To that end, we are working on designing a three-dimensional scaffold that will maximize proliferative and anabolic responses of osteoblasts to the ECM.

In an aging population, the need for these kinds of artificial scaffolds to facilitate healing of osteoporotic and non-union fractures is great. Current therapies have many disadvantages including the risk of disease or death to the patient, as well as rejection of the implanted material. Understanding how osteoblasts respond to their extracellular environment and determining the conditions necessary for the proliferation of osteoblastic precursors in a three-dimensional scaffold will facilitate the development of novel and effective materials that will enhance bone formation and maintenance *in vivo*.

In the classroom: In the GK-12 program, I have been working with Florence Malinowski in the Biotechnology vocational classroom at St. Georges. This year, we have worked to introduce a number of standard laboratory techniques to the students, while also providing them with a basic working knowledge of the chemical and biological principles needed to succeed in the biotechnology field. Throughout the year, I have helped to design laboratory activities and lessons, as well as set up a tissue culture facility in the classroom. Some activities we have done in the lab this year include solution preparation, extraction of plant DNA, chromatography, transformation of *E. coli*, and plant tissue culture. Despite the great deal of behind the scenes work I have done in the classroom, I have most enjoyed my time spent working with the students in both the laboratory and classroom setting. Although I hope to have enhanced their experience in the classroom, the students have helped me to gain new perspectives on my own research through their insightful questions and thoughts. My participation in the GK-12 program has truly been an invaluable experience that has improved my teaching skills and has given me an appreciation of the importance of linking science education with scientific research.

Developed Class Material
 Research: [PPT](#), [PDF](#) Teaching: PPT, PDF
 Lectures (PPT): [coming soon](#)
 Lectures (PDF): [coming soon](#)
Additional Information
 Contact: pjones@udel.edu



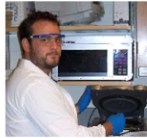
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 NCCVT NSF

ERITAS collaboration. vstem) is an Imaging Gamma-rays, like all photons produced by act they came from in a Earth's atmosphere, over of particles and na ray. Sources from the he universe, far more n only be produced in he of the universe in y. Some examples of ys are the focus of my

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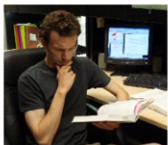
In The Classroom: At Saint George's Vocational High School teaching methods as UD in expo currently bringingm Biologies classroom Relating st applicator From this grovin even

Delaware GK-12

Home | Fellows | 2008 Fellows | Joshua Wickman



Delaware GK-12
 Phone: 302.838.1234
 Comments



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Delaware GK-12

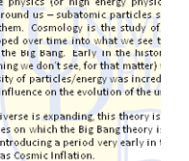
Home | Fellows | 2007 Fellows | Kristy Longsdorf



Research: My research is part of a collaboration between (organic chemistry) research groups at the University of Delaware and the University of Illinois. While many methods of controlling how the molecule is a function and interaction with

Delaware GK-12

Home | Fellows | 2008 Fellows | Jeffrey M. Spraggins



Research: My research focuses on the use of FT-ICR mass spectrometry for the analysis of environmentally significant samples. A Fourier Transform Ion Cyclotron Resonance Mass Spectrometer (FT-ICR Mass Spec) is an instrument that measures the masses of individual molecules that have been electrically charged to form ions. Although measuring the mass of something is not all that impressive, the ability of this instrument to measure individual ions with extreme accuracy and resolution merits such an intimidating name. In addition, the design of the instrument allows for it to be used as a gas phase beaker where reactions can be observed between ions and molecules in real time.

One example of how we use this powerful technique is our study of the environmentally important reactions between metal clusters and hydrogen sulfide. By monitoring these reactions within the mass spectrometer we have been able to understand more completely the reaction pathways and rates of reaction for cadmium clusters. Currently we are working on systems with iron and zinc metals. Reactions between metal clusters and hydrogen sulfide are important for understanding both the chemistry taking place near hydrothermal vents (geysers on our ocean floors) and the fate of metal pollutants in our natural waterways.

In the classroom: Although I enjoy research, teaching is my true passion. I have a couple fundamental beliefs that drive my teaching philosophy. I believe that (1) any student, if motivated, can learn and enjoy science and (2) there should be no separation between what is taught in the classroom and the research that we, as scientists, focus so much of our time and effort working on.

Working with Terry Blanch (St. George's 2008-2009) and Kevin Madigan (Delcastle 2007-2009) we have worked to develop a series of activities that aim to not only introduce our students to some of the cutting edge research done at the University of Delaware, but also aspire to motivate by highlighting the applicability of what they are learning during 9th Grade Physical Science. We have used what I have learned about hydrothermal vents though my graduate research to develop Problem Based Learning (PBL) activities that include web quests and a qualitative analysis lab (See [Underwater Volcanoes](#) & [Discovery of a New Ecosystem](#)).



Delaware GK-12

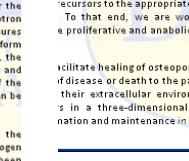
Home | Fellows | 2008 Fellows | Christy Beall



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Delaware GK-12

Home | Fellows | 2008 Fellows | Patricia Jones



Research: Bone is the major component of bone tissue and consists of collagen and mineral. The adhesion of osteoblasts—the bone forming cells—to the extracellular matrix has been shown to be important to processes such as bone formation, mineralization, and mechanotransduction. The signaling pathways that are activated in the bone matrix components. Previous research indicates that response to different ECM proteins in a unique manner. To that end, we are working on designing a three-dimensional scaffold that can drive these cells to proliferate and anabolic responses of osteoblasts to

facilitate healing of osteoporotic and non-union fractures of disease or death to the patient, as well as rejection of their extracellular environment and determining the role of a three-dimensional scaffold will facilitate the repair and maintenance of bone.

Teaching: PPT, PDF
 100m
 200m
[PPT](#)
[PDF](#)

Hydrothermal Vent Activity 1: [Underwater Volcanoes](#)
 Hydrothermal Vent Activity 2: [Discovery of a New Ecosystem](#)
 Hydrothermal Vent Activity 3: [Discovery of a New Ecosystem 2](#)
 Presentations
 2008 Linn East Conference on College and University Teaching
 University of Delaware, Newark, DE
 "Introducing Science Students to Cutting Edge Research through PBL Activities."
 Poster: [PDF](#)



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 NCCVT NSF

ERITAS collaboration. This system is an Imaging Gamma-rays, like all photons produced by a star, they come from the Earth's atmosphere, over of particles and gamma rays. Some examples of gamma rays are the focus of my research.

Students include solution preparation, extraction of plant DNA, and the great deal of behind the scenes work I have done in the laboratory and classroom setting. Students have helped me to gain new perspectives on participation in the GK-12 program has truly been an appreciation of the importance of linking science to teaching methods at

Delaware GK-12

Profile: Jeffrey M. Spraggins

[Home] [Fellows] [2008 Fellows] [2007 Fellows] [Jeffrey Spraggins]



Research: My research focuses on the use of FT-ICR mass spectrometry for the analysis of environmentally significant samples. A Fourier Transform Ion Cyclotron Resonance Mass Spectrometer (FT-ICR Mass Spec) is an instrument that measures the masses of individual molecules that have been electrically charged to form ions. Although measuring the mass of something is not all that impressive, the ability of this instrument to measure individual ions with extreme accuracy and resolution merits such an intimidating name. In addition, the design of the instrument allows for it to be used as a gas phase beaker where reactions can be observed between ions and molecules in real time.

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Working with [Terry Blanch](#) (St. Georges 2008-2009) and [Kevin Medina](#) (Delaware

Developed Class Material

Research: [PPT](#), [PDF](#) Teaching: [PPT](#), [PDF](#)

Lectures (PPT): [1](#) [2](#) [3](#) [4](#) [5](#) [6](#) [7](#) [8](#) [9](#) [10](#) [11](#)

Lectures (PDF): [1](#) [2](#) [3](#) [4](#) [5](#) [6](#) [7](#) [8](#) [9](#) [10](#) [11](#)

Hydrothermal Vent Activity 1: [Underwater Volcanoes](#)

Hydrothermal Vent Activity 2: [Discovery of a New Ecosystem](#)

Hydrothermal Vent Activity 3: [Discovery of a New Ecosystem 2](#)

Presentations

Delaware K-12

A partnership between the University of Delaware and the New Castle County Vocational Technical School District

[2006 Teachers](#)
[2007 Teachers](#)
[2008 Teachers](#)

The [University of Delaware](#), in partnership with the [New Castle County Vocational Technical School District](#), has received funding from the National Science Foundation to institute a [Graduate Teaching Fellows Program in K-12 Education \(GK-12\)](#) [\[website\]](#). In each of the three years of this project, nine full time UD graduate students in the sciences, who have completed all or most of their coursework, are selected to serve as fellows.

Fellows are paired with high school science teachers from NCCoVoTech. These pairs, along with the principal investigators (PIs) of this project, form a learning community that has the opportunity to examine and to reflect on current issues in education while specifically addressing critical needs in science education in vocational technical high schools.

By participating in summer workshops and follow-up meetings facilitated by the project leaders, the fellows are introduced to a number of innovative teaching strategies including problem-based learning (PBL). During the academic year, fellows engage in coteaching with their teacher partner. In this "teaching at the elbow of another", fellows gain a better understanding of and appreciation for the complexities and nuances of teaching science in vocational technical high schools. Fellow/teacher pairs develop PBL activities, aligned with curricular needs, to allow their students to experience the benefits of guided-inquiry learning environments.

Fellows receive a twelve-month stipend of \$30,000 and are expected to spend twenty hours per week on the project. The time commitment includes ten days during the summer devoted to workshop and development activities and a minimum of ten hours per week during the academic year that fellows spend in their teacher partner's classroom. Fellows must be citizens, nationals, or permanent residents of the United States. Fellows are selected based upon a review of written applications and an interview process by the project leaders. It is essential that fellows have the support and cooperation of their research advisors to participate.



Delaware GK-12

[2008-2009 Teachers]

[Home](#) | [Teachers](#) | [2008 Teachers](#) | [2007 Teachers](#) | [2006 Teachers](#)



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Tim Brewer
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Jessica Jackson
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Michael Kittel
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Amy Quillen
 Science Specialist
 NCC Vo-Tech School District
quillen@nccvt.k12.de.us

Delaware GK-12

[Graduate Student Advisors]

[\[Home\]](#) [\[Advisors\]](#)

2008-2009 Advisor Recommendation Form: [\[Word\]](#), [\[PDF\]](#)

2008 GK-12 Participants

<i>Advisors</i>	<i>Department</i>	<i>email</i>
Robert Sikes	Biological Sciences	RASIKES@udel.edu
Jamie Holder	Physics & Astronomy	jholder@physics.udel.edu
Randy Duncan	Biological Sciences	RLDUNCAN@udel.edu
Doug Tallamy	Entomology & Wildlife Ecology	DTALLAMY@udel.edu
Tom Beebe	Chemistry & Biochemistry	BEEBE@udel.edu
Doug Ridge	Chemistry & Biochemistry	DOUGR@udel.edu

Fellows

Adam Aguiar
 Dana Boltuch
 Patricia Jones
 Christy Beal
 Mary Boggs
 Kristy Longsdorf
 Jeffrey Spraggins



Delaware GK-12

A partnership between the University of Delaware and the New Castle County Vocational Technical School District

George Watson

Kathryn Scantlebury

Deborah Allen

Richard Donham

John Madsen

Amy Quillen

Jane Butler Kahle

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Delaware GK-12

[Delaware GK-12 Project Leaders]

[\[Home\]](#) [\[Leaders\]](#)



[\[George Watson\]](#)

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University of Delaware
ghw@udel.edu



[\[Kathryn Scantlebury\]](#)

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University of Delaware
kscantle@udel.edu



[\[Deborah Allen\]](#)

Dept. of Biological Sciences
University of Delaware
deallen@udel.edu



[\[Richard Donham\]](#)

Math and Science Resource Center
University of Delaware



[\[John Madsen\]](#)

Dept. of Geological Sciences
University of Delaware



[\[Amy Quillen\]](#)

Science Specialist
NCC Vo-Tech School District

Delaware GK-12

[Profile: George H. Watson]

[\[Home\]](#) | [\[Leaders\]](#) | [\[George Watson\]](#)



George H. Watson holds a Ph.D. in Physics and is the Unidel Professor of Physics at the University of Delaware; he is currently the Deputy Dean of the College of Arts and Sciences at UD. He serves as the principal investigator of the National Science Foundation GK-12 Project "Improvement of Science Education in Vocational Technical High Schools through Collaborative Learning and Coteaching".

George is director and founding member of the Institute for Transforming Undergraduate Education, created by UD to promote reform of undergraduate education through faculty development and course design. He has been a member of several organizing committees for international problem-based learning conferences, including PBL2002, hosted by the University of Delaware, PBL2006, PBL2008, and PBL2010. He has been supported by a NSF DUE grant for development of PBL curricula for introductory physics and by ALO/USAID funding for a project on science education reform in Peru through PBL.

George's physics research has been in experimental condensed matter physics and laser spectroscopy, funded by NSF in the areas of optically-disordered random media, photon localization, and photonic band structure measurements, particularly in colloidal crystals.

See [George Watson's Home Page](#) for more information.

Contact: ghw@udel.edu



Delaware GK-12

*A partnership between the University of Delaware
and the New Castle County Vocational Technical School District*

[2008 Fellows](#)
[2007 Fellows](#)
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The [University of Delaware](#), in partnership with the [New Castle County Vocational Technical School District](#), has received funding from the National Science Foundation to institute a [Graduate Teaching Fellows Program in K-12 Education \(GK-12\)](#) [[website](#)]. In each of the three years of this project, nine full time UD graduate students in the sciences, who have completed all or most of their coursework, are selected to serve as fellows.

Fellows are paired with high school science teachers from NCCoVoTech. These pairs, along with the principal investigators (PIs) of this project, form a learning community that has the opportunity to examine and to reflect on current issues in education while specifically addressing critical needs in science education in vocational technical high schools.

By participating in summer workshops and follow-up meetings facilitated by the project leaders, the fellows are introduced to a number of innovative teaching strategies including problem-based learning (PBL). During the academic year, fellows engage in coteaching with their teacher partner. In this "teaching at the elbow of another", fellows gain a better understanding of and appreciation for the complexities and nuances of teaching science in vocational technical high schools. Fellow/teacher pairs develop PBL activities, aligned with curricular needs, to allow their students to experience the benefits of guided-inquiry learning environments.

Fellows receive a twelve-month stipend of \$30,000 and are expected to spend twenty hours per week on the project. The time commitment includes ten days during the summer devoted to workshop and development activities and a minimum of ten hours per week during the academic year that fellows spend in their teacher partner's classroom. Fellows must be citizens, nationals, or permanent residents of the United States. Fellows are selected based upon a review of written applications and an interview process by the project leaders. It is essential that fellows have the support and cooperation of their research advisors to participate






Delaware GK-12

Developed Materials: 2007-2008 GK-12 Fellows

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<p>Teacher Pair: Brian Heeney Developed Materials Research Presentation: PPT, PDF</p> <p>Activities <i>Mutation and Cancer</i> Mutation and Cancer Presentation: PPT, PDF Bacteria-Tobacco Mutaiton Lab: DOC, PDF Bacteria-UV Mutaiton Lab: DOC, PDF</p> <p><i>Lorenzo's Oil</i> Lorenzo's Oil Presentation: PPT, PDF Lorenzo's Oil Guiding Questions: PPT, PDF Paperclip/Fatty Acid Modeling Activity: DOC, PDF</p>	<p>Subject: Biological Sciences Teaching Presentation: PPT, PDF</p> <p><i>Natural Selection at Work</i> Bacterial Resistance Presentation: PPT, PDF Serratia Ampicillin Resistance Lab: DOC, PDF TB Simulation Activity: DOC, PDF</p> <p><i>Owl Pellet for Integrated Sciences</i> Owl Pellet Presentation: PPT, PDF Barn Owl Worksheet: DOC, PDF</p>	 <p>Erin Foster Biological Sciences ecc@udel.edu</p>
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The Big Picture

- New GK-12 Website
 - Enhanced Web-presence for UD GK-12
 - Educational Resource
 - Written Communication Skills
 - Web-based Communication Skills