

Graduate STEM Fellows in K-12 Education (GK-12) Annual Conference

Group III Workshops / 9:30 a.m. – 10:45 a.m. / March 18, 2012

Building Effective GK-12 Relationships Among Teachers, Fellows, and Your PI Team **Room: Regency D (Ballroom Level)**

Presenters: Carol Stepien (PI), Thomas Bridgeman (co-PI), Amanda Haponksi (GK-12 Teaching Assistant), Verl Luse (Fellow), Nicole Lightle (Fellow), University of Toledo; David Bourland (Teacher), Bowsher High School; Tim Bollin (Teacher), Toledo Early College High School

In this session, our high school teachers, graduate fellows, and PI team discuss how we have evolved over the course of our GK-12 program to develop effective working relationships, teamwork, and camaraderie. When we began four years ago, we were rather awkward collaborators, yet now we have grown into high-functioning partners, and are having a lot of fun. Here we share and explore techniques that have worked for us, and invite you to share those from your programs.

Our program, Graduate Fellows in High School STEM Education: An Environmental Science Learning Community at the Land-Lake Ecosystem Interface, builds an environmental science learning community that links our teachers, graduate fellows, professors, environmental agencies, and the public. The goal is to develop environmental stewardship and expose high school students to STEM careers and technology. Graduate fellows work closely with teachers to engage the next generation in nature and science, mentoring ~420 high school students each year in urban/rural/suburban schools along the western Lake Erie watershed. Each fall, high school students led by fellow and teacher teams assess water quality, macroinvertebrates, and fish assemblages in their local schoolyard streams and then analyze, interpret, and present their data. Each spring, graduate fellows mentor high school science fair projects, which are showcased at our own science fair at the Lake Erie Center, as well as Ohio local and regional competitions; many low-income, minority students have won awards and university scholarships. Together we have built a true learning community through the Gk-12 program. When our formal program ends after another year, we are confident that our team relationships will continue long after, evolving into other education and research forums.

Building Long-Term Research Projects and Collaborations **Room: Congressional CD (Lobby Level near Bell Stand)**

Presenters: Nick Ballew (Fellow), Alycia Lackey (Fellow), Elizabeth Schultheis (Fellow), Tomomi Suwa (Fellow), Robin Tinghitella (Project Manager), Tom Getty (PI), Michigan State University; Marcia Angle (Teacher) Lawton Community Schools

We will share our experiences and successes in developing long-term research projects that foster long-lasting collaborations with K-12 communities. A central goal of our Kellogg Biological Station (KBS) GK-12 project is to bring Fellow expertise to K-12 classrooms in a way that engages teachers and students in scientific inquiry beyond the life of our grant. Together with our K-12 partners, we have created a network of schoolyard research sites in 13 districts where we test important and timely questions about bioenergy and basic ecology (e.g., diversity, productivity, succession, invasion). The research network is built upon well-developed relationships between KBS (<http://www.kbs.msu.edu/education/k-12-partnership>) and local school districts, which ensures that it is integrated into classrooms now and will be for years to come.

In establishing the BEST (BioEnergy SusTainability) research network (<http://kbsgk12project.kbs.msu.edu/best-research-network/>) we empowered teachers by involving them in the entire research process, including developing questions and hypotheses, designing protocols, and assessing and communicating results and conclusions. Together, we decided on the overarching question: Can we grow our fuel and our flowers and butterflies, too? Fellows use their research strengths to tailor this question to teacher and student needs, and teachers use their expertise in pedagogy and grade-level content to ensure topics and teaching strategies are relevant and realistic. By the end of our grant (and 5 years of data collection), teachers will have the experience and resources to continue to involve students in authentic research experiences.

Several districts are working to align their curriculum with the BEST research network at multiple grade levels. As students progress through the grade levels, inquiry becomes more open-ended. Elementary students might collect pre-prescribed data and draw simple conclusions; middle school students might pose questions, but conduct experiments designed largely by Fellows and teachers. In high school, students might develop their own questions and experiments that utilize the techniques they learned in previous years of research. Even within grade levels, we already note that as students gain experience with the scientific process and the research sites, they are becoming increasingly more independent. Both long-term research and long-lasting collaborations make our GK-12 project's efforts and impacts very likely to be sustainable for many years to come.

Networking in Ocean Science Education

Room: Bunker Hill (Ballroom Level)

Presenters: Adrienne Sponberg, Director of Public Relations (COSEE OCEAN & Association for the Sciences of Limnology and Oceanography, Director of Public Relations); Bob Chen (PI), University of Massachusetts Boston

While not explicitly one of the four main science disciplines (Biology, Chemistry, Physics, and Earth Science), ocean education offers interdisciplinary and engaging science education opportunities. This workshop aims to bridge ocean and environmental education efforts within the GK-12 Network with existing and developing ocean and environmental science education networks outside of the GK-12 Network. The goal is to learn from each other, share best practices, knowledge, and networks, and further ocean science research and education nationally, internationally, and locally. For example, the Centers of Ocean Science Education Excellence (COSEE) network has been operating over the last 10 years to define ocean literacy, engage ocean scientists in education and public outreach, and team ocean scientists with educators to increase the impacts of research as well as enrich STEM learning in formal and informal settings. Participants will share ideas, knowledge, goals, and resources to increase the connections between existing social and professional networks. This exchange is sponsored by COSEE Ocean Education Communities and social Networks (COSEE OCEAN and the Association for the Sciences of Limnology and Oceanography [ASLO]), and as such, potentially has a life longer than that of GK-12 or COSEE.

Increasing Diversity Awareness with GK-12 Graduate Students

Room: Lexington (Ballroom Level)

Presenters: Kimberly Wingo (Project Manager), Sarah Morgan (PI), Sherry Herron (co-PI), Maureen Smith (Fellow), University of Southern Mississippi

Reaching out to the diverse population of Mississippi is a key initiative of the GK-12 Connections in the Classroom Molecules to Muscles program. Several initiatives were implemented to educate graduate fellows on best practices for relating their research to high school science students. The presentation will highlight successful tools used to increase diversity awareness in GK-12 fellows. During the graduate fellow's summer workshop two sessions specifically targeted diversity education. One session, African American Views of Science, addressed specific fears and misconceptions that minority students encounter in science classrooms. Another session focused on educating graduate fellows on common personal problems many underrepresented minority students face on a day-to-day basis. Case studies were used during this session to further expand the graduate fellows' knowledge of specific issues they may encounter in high school classrooms. *A Framework for Understanding Poverty* by Ruby Payne was incorporated into the graduate fellows' bi-weekly meetings. Topics are selected for discussion which leads to fellows discussing successful and unsuccessful strategies for communicating science to underrepresented minorities. The benefit of these activities and other initiatives was to increase the fellows' knowledge of underrepresented minorities and their views of science.

Leveraging Resources to Prepare GK-12 Fellows

Room: Congressional B (Lobby Level near Bell Stand)

Presenters: Laura Conner (PI), Rich Boone (on assignment at NSF), University of Alaska; Marlene McDermott (Teacher), Watershed School

Every GK-12 program is faced with the tremendous challenge of quickly getting graduate students up to speed in pedagogical techniques, as well as developing a common language and frame of reference between teachers and graduate fellows. Why start from scratch? High-quality teaching tools have been developed and exported by institutions such as the Exploratorium, the famous San Francisco-based museum, and COSEE California, an NSF-funded project that developed a hands-on science pedagogy course now in use at over 20 universities. This workshop will use discussion and hands-on activities to explore ways that these tools have been adapted to effectively prepare GK-12 fellows for the classroom. Workshop participants will come away with adoptable strategies to prepare fellows in: 1) promoting inquiry-based instruction, 2) using student questions to guide classroom investigations, and 3) addressing misconceptions about science.

Marshmallow Launchers, Marine Animals, Cardboard Boat Races, OH MY! Preserving the Vision of the NSF GK-12 Program

Room: Capitol B (Lobby Level at top of escalators)

Presenters: Edgar Bautista (Fellow), Hanna Koch (Fellow), Nichole Lee (Fellow), Maria Ortega (Fellow), Tino Truong (Fellow), J. Patrick Vincent (Fellow), Jose Zamalloa (Fellow), Jane Dong (co-PI), Nancy Warter-Perez (PI), California State Los Angeles; John Cerezo (Teacher), Cynthia Godoy (Teacher)

GK-12 programs are coming to an end, but we can still continue our mission by adapting successful GK-12 activities. One such activity is a two-day science and engineering summer camp for middle school students. The goals of the summer camp are to 1) foster relationships between graduate students and teachers; 2) improve the communication skills of graduate students; and 3) engage middle school students in fun research-related STEM activities.

For the past three years, the IMPACT LA GK-12 Program has conducted a science and engineering summer camp as the culminating experience of the summer training workshops. During the camp, graduate fellows and teachers work together to lead activities and serve as tour guides. By serving as tour guides, teachers are exposed to a wide variety of science and engineering research and activities. In a post GK-12 funding era, the camp can help build relationships between teachers and graduate students that will form the foundation for graduate students volunteering in their classrooms as visiting scientists. While many graduate students would like to reach out to students, forming a relationship with a teacher is often one of the largest stumbling blocks. During the school year, each graduate student can bring their camp activities (and other activities) into the classroom of one or more of the teachers and also share his/her research with the students. Through this experience, the graduate students will improve their ability to communicate their research effectively to a broad audience.

Today, we will present the overall structure of the summer camp, discuss the schedule, provide detailed information on the activities, present evaluation data, and provide logistics including budget information. The workshop will also include at least one fun, hands-on activity to give a practical example of what can be done at reasonable cost. We will end by discussing strategies for adapting the summer camp to your university. Topics for discussion include methods for recruiting and training graduate students, ideas for identifying and engaging teachers, strategies for reaching out to middle school students, and ideas for building partnerships for funding. PIs, teachers, and graduate fellows are encouraged to attend to discover how to bring this fun, team-building, STEM outreach opportunity to their campus.

Utilizing the National Academy of Engineering *Engineering Grand Challenges* to Sustain STEM K-12 and University Partnerships through Regional, International and Informal Institution Collaborations

Room: Capitol A (Lobby Level at top of escalators)

Presenters: Jared Coyle (Fellow), Eleanor Small (Fellow), Drexel University

In this session we will discuss how our program has enhanced STEM K-12 education and graduate research through the incorporation of the NAE Grand Challenges. Participants will learn how this topical focus has been utilized to sustain the Drexel GK-12 program through current and by developing new partnerships with regional, international and informal institutions. Participants will explore ways in which to expand or enhance their own STEM GK-12 programs through discussion topics based on the following questions:

- 1) What are ideal collaborations between K-12 and Higher Education?
- 2) What are good ways to partner with teachers, classrooms, and schools outside of your region, whether national or international?
- 3) What kinds of new partnerships (informal institutions) can you envision for our schools and cities?

These discussions will include information on how to not only build and develop relationships, but also financially support them, whether via institutional or federal funds.