

Graduate STEM Fellows in K-12 Education (GK-12) Annual Conference Group II Workshops / 11:15 a.m. – 12:30 p.m. / March 17, 2012

A Tale of Two Cultures: Integrating Knowledge through Sustained Cooperation between Fellows and Teachers *Room: Congressional CD (Lobby Level, near Bell Stand)*

Presenters: Megan Pogemiller (Fellow), Eric Lynch (Fellow), Elizabeth Harris (Fellow), Meg Carr (Fellow), East Tennessee State University; Lynzie Haywood (Teacher) and Yecenia Cigarroa (Teacher), North Side Elementary School

The GK-12 program at East Tennessee State University has been a great success due to the continuous two-year relationship among fellows, teachers, and students at one school, North Side Elementary. It has enabled fellows and teachers to learn from each other in meaningful and impactful ways. Fellows remain in the same classrooms for the entire school year and in some cases for the duration of their contract. Exposure to the same students has helped fellows to become familiar with their different learning styles and how to appropriately address them. Fellows have been encouraged to work with teachers in art, physical education, language arts, technology lab, and music. This relationship has allowed both fellows and teachers to creatively incorporate the sciences and mathematics in areas of education that typically do not address STEM issues. Teachers have also benefited greatly from a sustained relationship with their fellows. They are exposed to higher levels of science and mathematics through a series of five graduate level STEM courses as well as through the lessons brought in and presented by fellows. This greater understanding of the sciences and math allows teachers to bring more into their classrooms than textbook content, thus providing their students with a better education. A long term relationship with a fellow provides the teachers with advanced lessons in more than a single subject that can be used in the future. We will describe our efforts and what has been learned from this type of partnership between scientists and K-12 education.

Authentic Research Modules Integrate Fellows Research into Science Classrooms *Room: Regency D, Ballroom Level*

Presenters: Victor S. Strozak (Co-PI), Stephanie Nygard (Fellow), Stephen Harris (Fellow), Zachary Aidala (Fellow), Graduate Center CUNY; Marissa Bellino (Teacher), Jennifer Dahlstrom (Teacher), Danielle Dubno-Hammer (Teacher), Kelly Feeney (Teacher)

Authentic Research Modules in Science (ARMs) integrate fellows' research into classrooms in New York City high schools. ARMs research projects include field based activities and use technology as a teaching and learning tool. The research projects we have developed involve students in investigations of the New York City urban environment under a wide variety of scientific disciplines such as evolutionary biology, molecular biology, and neuroscience. By investigating their own backyard and developing research projects on some aspect of their local environment, high school students become engaged in the research process, acquire scientific and critical thinking skills, gain content knowledge, and improve overall science literacy. The ARMs strategy can be adopted by other GK12 projects and our existing curriculum materials can be adapted for a variety of environments. The workshop will show excerpts from ARMs that are currently posted on the project website, www.cunygk12.net. Presenters will demonstrate hands-on activities from several ARMs and sample curriculum materials will be provided. There will be ample time for discussion with the presenters, and participants will learn how to adopt, adapt, and implement authentic research modules in their own science courses and classrooms.

Creating Appealing and Interesting GK-12 Deliverables in Easily Consumable Forms: Digital Media to the Rescue *Room: Capitol A (Lobby Level, top of escalators)*

Presenters: Anant Kukreti (PI), Mike Borowczak (Coordinator), Andrea Burrows (Coordinator Alumnus), Brian Ervin (Fellow), University of Cincinnati

The NSF GK12 program is rooted in graduate Fellow teaching development through the delivery of sustainable STEM content to K12 classrooms. The assumption of sustainability is typically knowledge transfer--a clear and achievable goal--assuming K12 teachers, find and assimilate Fellow created content for their own needs. Currently, content across many GK12 sites exists in text-heavy/index repositories - daunting, time consuming, and unfortunately - unappealing for most teachers. Using videos to present overviews of content as well as core content could inspire K-20 teachers. We propose a 3-part session in Lesson to Video synthesis, highlighting existing examples, the use of a novel technology (youdemo.info) in assessing video qualities, and finally an opportunity for participants to create storyboards for future videos using techniques, skills and ideas gained during the first two segments.

Culturally Situated Design Tools in the Classroom

Room: Concord, Ballroom Level

Presenter: Dan Lyles (Fellow), Rensselaer Polytechnic Institute

This session will describe how our research is improving mathematics education through the use of cultural simulations. STEM education is an important focus in improving the quality of education in many countries, improving educational outcomes for underserved populations. Utilizing cultural simulations found in cultures that these students might identify with can increase interest and therefore result in their achieving positive learning outcomes. With this, we aim to show how math and science practices are embedded in the daily life of culture and not external to it. We will present software, Culturally Situated Design Tools (CSDTs), that has been developed by the research group headed by Dr. Ron Eglash and Dr. Mukkai Krishnamoorthy at Rensselaer. Participants should bring laptops to the session as the demonstration of the CSDTs will be highly interactive and offer lots of opportunities in participatory design.

In addition to presenting the tools, we will discuss our experiences in using them with students, in particular those at Hackett Middle School in Albany, NY. Hackett is an urban, high needs school that has been identified through standardized testing as “failing.” We have learned much from working with this student population, and these experiences have truly informed the direction of our research. We have had the opportunity to challenge some of our own assumptions about best practices for teaching science and math concepts to young minds. We would like to integrate these observations into a workshop that focuses not merely on teaching the logic and constraints of the software, but also on helpful information for communicating scientific knowledge to middle school age students.

Putting Science into Motion: Illustrating Science Concepts Using Animations

Room: Yellowstone/Everglades (Third Floor, take elevators on Lobby Level near Bell Stand)

Presenters: Richard A. Tankersley, PI, John G. Windsor, co-PI, Philip M. Gravinese, Fellow, Stephanie Kronstadt (Fellow), Peter Cohen (Fellow) Florida Institute of Technology; Michelle Ferro (Partner Teacher), Brevard Public Schools

One of the greatest benefits for both students and teachers is the ability to monitor learning and get instant feedback on the understanding and mastery of concepts. Animations are an effective learning tool that helps students organize content, and can accommodate multiple learning styles. We will share strategies on how to incorporate easy and effective animation tools into the classroom. We challenged elementary school students to generate power point animations to illustrate complex scientific progressions, especially those that involve sequences of integrated steps, and/or dynamic interactions between various processes.

Graduate students and educators incorporated biological, chemical, and physical science standards into the curriculum using power point animations as a learning tool. The partner teacher introduced the topic. Misconceptions were identified by utilizing formative assessment probes for each concept. Power point animation tools were then used to help students understand the steps involved for each concept. Elementary students were given preliminary exercises designed to introduce them to the features of Power Point’s animation tools. Students were then instructed to create an animation storyboard complete with “characters,” and director notes outlining the actions taken by each actor in their animation. Once the storyboard was complete, students created an animation that effectively illustrated the sequence of events that take place in concepts such as the lunar cycle, mitosis/meiosis, and the rock cycle.

The workshop will explain the process, and partner teachers and graduate students will describe how to overcome pitfalls and successes encountered during implementation. We will provide guidance on effective ways to assist students in creating a storyboard for their animation. We will discuss the effectiveness of using student-designed animations to teach scientific concepts while improving technology literacy. The use of power point animations as a teaching tool can be easily adapted for concepts that incorporate sequences, time-lines, and dynamic processes within the STEM subjects (i.e, plate tectonics and mass spectrometry).

Three Presentations in One Workshop:

Real-Time Evaluation: What Works, What Doesn’t, and How do you Know?

Room: Bunker Hill, Ballroom Level

Presenter: Laura Regassa (PI), Janee Cardell (Project Manager), Jenny Dickson (Fellow), Adam Fleming (Fellow), Georgia Southern University; Laura Ike, (Teacher), Effingham School District; Anne Newell (Teacher), Bulloch School District

We will examine an integrated evaluation structure that allows for routine formative feedback, and then demonstrate how the formative evaluation data highlighted what did or did not work within the GK-12 program, thereby leading to program and/or evaluation modifications. The Molecular Biology Initiative (MBI) partners MS-level fellows with teachers at high schools in rural southeast Georgia.

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The fellow-teacher teams work together throughout the year to generate hands-on, research-infused classroom activities that address Georgia Performance Standards in biology, chemistry, and physical science. MBI is in its third year and each year supports 7 first-year fellows that are engaged only in professional development activities and 7 second-year fellows that are also partnered with in-service teachers. Partner schools are located 30-90 minutes from the university and fall within several school districts. Given the numbers, locations and types of stakeholders, MBI worked to institute an efficient data collection system to provide timely information for data-based decision-making. We will present aspects of the communication/evaluation structure, including difficulties that were encountered along the way and program or evaluation modifications introduced. All online forms used for data collection are available at www.georgiasouthern.edu/mbi.

How Do We Know What They Learned?

Room: Bunker Hill, Ballroom Level

Presenter: Kevin Zak (Project Manager), Julia Williams (Evaluator), University of Minnesota Duluth

The goal of this presentation is to spur thinking regarding the efficacy of employed measures in current GK12 projects. Often in the field, we continue to utilize evaluative measures that seemed important at the time of planning, but that may not yield information that empowers projects to intervene as needed. In addition, use of valid data to determine effectiveness is absolutely contingent upon the value of the measurement tool utilized. Participants in this session will explore how we determined assessment measures to align with project goals and outcomes for graduate fellows, K-12 teachers, and K-12 students using a program-participant oriented evaluation model.

Development of a Student Attitude Survey for GK-12 Programs

Room: Bunker Hill, Ballroom Level

Presenters: Julie Westerlund (PI), Texas State University; Susan Hillman (co-PI), University of New England

This presentation centers on a national GK-12 collaboration between Texas State University in San Marcos, Texas with Julie Westerlund and the University of New England in Maine with Susan Hillman. We will discuss a 40 item survey for assessing elementary and secondary student attitudes in a pre-post design towards science in GK-12 programs. The development of the instrument (initial items, field testing for content validity, etc.) will be described. The survey contains four major categories: attitude towards science, value of science to society, perception of scientists, and desire to become a scientist. Each item within each section reached over 85% inter-rater agreement on the content validity. Workshop participants will be given the instrument with instructions for scoring.

Targeting Research Through Virtual Learning

Room: Lexington, Ballroom Level

Presenters: Rebecca Bennett (Fellow), Ohio University; Keith McGuire (Teacher), Gallia Academy

One of the goals of the BookS NSF- GK12 project is to provide an opportunity for students to engage in real-world, virtual and hands-on research by providing a multi-faceted learning environment which reaches out to a broad range of student interests while promoting differentiated learning. The goal of our workshop is to help other projects develop hands-on, real world classroom research opportunities supported by virtual simulations where limited resources may exist, while meeting National Science Standards.

In the BookS project, every fall and spring a group of 20 students are chosen from each classroom participating in the grant. They attend a field trip upon Ohio University's Boat of Knowledge where they use technology typically reserved for university labs (DataSonde, GPS, probes) and hands-on (Test strips, Kremmer Bottle, Turbidity Tube) testing methods to test and record water quality parameters at designated stations in the Ohio River and its tributaries. Students then return to the classroom as instructors for the students who did not go on the field trip. They guide their classmates through a field trip within a Virtual Boat of Knowledge. The students navigate the virtual boat to designated test sites and perform and record virtual water quality testing results. At the end of the research activity, every student has a complete water quality worksheet like those completed on the actual field trip.

Now that everyone in the classroom knows what the water quality values are and how they were obtained, the graduate Fellow helps students compute the Water Quality Index sheet (a quantitative river health index used by ORSANCO) to determine the water quality rating at their testing site. This unit of lessons can be adapted and used in many different ways for any school in the GK-12 program. While not every GK-12 participant has a boat at their disposal, any classroom can play the Virtual Boat simulation on Ohio University's website. The Water Quality Index can be adapted for small streams or a water quality rating used for ponds or lakes near participating schools. Many hands-on laboratory scenarios can be derived from the virtual boat. We will describe other investigations and activities developed by fellows and teachers. Participants will create a hands-on lab based on the virtual boat that is unique to their classroom that will support research activities in science classrooms.

The Power of the Pair: Taking an Innovative Approach to Optimizing Mentorship through Creating Strong GK-12 Partners

Room: Congressional B (Lobby Level, near Bell Stand)

Presenters: Mariah Judd (Project Manager, Kathleen Marrs (PI), Indiana University-Purdue University Indianapolis

The success of any partnership starts with the individuals in said partnership. The IUPUI GK-12 Urban Educators program places extreme value on the subject of team pairings by taking a creative, innovative and unconventional approach to pairing each team. Once a strong team has been formed, they can begin to strive toward achieving the maximum potential for their team. As part of this journey, strong relationships are formed and a variety of mentoring opportunities take place which can only successfully happen after those relationships are formed. Mentoring from teacher to fellow, fellow to teacher, fellow to student, program administration to fellow/teacher, curriculum specialist to fellow/teacher, and even fellow to fellow. It is the mentorship that facilitates the growth throughout the GK-12 experience, fosters outstanding team work and increases communication skills for all involved.

We will hold an interactive workshop that demonstrates the methods that we use to pair our teachers and fellows which include personality tests, team building activities, role playing, and two speed dating rounds to really allow the participants get to know each other. A presentation will also be included which will highlight the other methods used to make the most optimal pairings including fellow lab tours and realities of graduate school/realities of K-12 presentations. Testimonials from current IUPUI GK-12 participants will also be included which will focus on their mentoring relationships and the value they have gleaned from the partnership. Finally, materials and resources will be provided to all workshop attendees that will allow for any project that pairs teachers and fellows to easily and effectively implement our strategies and activities which will help those projects meet their full potential.

The University Arkansas GK-12 KIDS Summer Workshop: A Dynamic Experience

Room: Congressional A (Lobby Level, near Bell Stand)

Presenters: Paul Calleja (co-PI), Ronna Turner (co-PI), Morgan Ware (Project Manager), University of Arkansas

Over the past 10 years, the University of Arkansas (UA) GK-12 KIDS program has implemented a one-month summer workshop that has evolved into a fluid learning experience for both fellow and teacher. Its design focus has always been to (1) improve the fellows and teachers understanding of the inquiry process and its application in a middle school math and science setting, (2) enhance the communication between the fellow and the teacher, (3) enhance the way the fellow communicates to persons outside the science community (middle school students), and (4) develop sustainable working relationships between the fellow and the teacher. The summer workshop itself is divided into several parts that build upon each other and end with one culminating experience. Those parts include:

1. Providing the fellow and teacher with the tools to develop and implement inquiry-based science and math lessons that are grounded in the Arkansas state frameworks.
2. Assisting the teacher and fellow in learning how to work together using a two-day team-building workshop.
3. Assisting the fellow and teacher in developing an inquiry-based lesson that is implemented during the KIDS science camp (final week of summer workshop).

This session will provide attendees with an overview of the UA summer workshop. Attendees will be asked to participate in several mock experiences to demonstrate the process that UA fellows and middle school teachers matriculate through as they complete the summer workshop. The mock experiences will include a sample of (1) how fellows learn about the inquiry process, (2) the activities used to develop working relationships between the fellows and the teachers, and (3) the process used to develop inquiry-based activities used in the KIDS science camp. In addition, attendees will also learn how the UA summer workshop has impacted the middle school classroom environment.