Outreach Activities for Lehigh Valley Partnership for Teaching Fellows (2003-2007)

Graduate teaching fellows were part of outreach teams. Each team consisted of a faculty team leader, a graduate teaching fellow, one or two undergraduate teaching fellows, and two STEM teachers. This section summarizes activities of each of the eight teams, per year.

Chemistry Team at Freedom High School, Bethlehem, PA:
Dr. Keith Schray – Professor, Faculty Team Leader
Kelly Cafflin – Graduate Teaching Fellow (Years 1-3)
Tracy Vrablik – Undergraduate Teaching Fellow (Years 1-2)
Adrienne Blount – Undergraduate Teaching Fellow (Year 2)
Kristin Baltrusaitis – Undergraduate Teaching Fellow (Year 2)
Jessica Simons – Undergraduate Teaching Fellow (Year 3)
Linda Frederick – STEM Teacher (Years 1-3)
Stephen Teeno – STEM Teacher (Years 1-2)
Rebecca Mace – STEM Teacher (Years 2-3)
Hector Rivera – STEM Teacher (Years 2-3)

In the first year of the project, it was determined that the graduate fellow, Kelley Cafflin, would go to Mr. Teeno’s honors chemistry class and Ms. Frederick’s ninth grade chemistry and physics class. The undergraduate fellow, Tracy Vrablik, focused on the chemistry and physics class. Then it was determined that we should focus on the chemistry and physics class rather than the honors courses, because of the aim of this study, to get women and minorities interested in scientific careers. In the honors classes there is a very low percentage of minorities, where as there is a large percentage in the chemistry and physics class. Moreover, the chemistry and physics students are also younger and more impressionable. We developed two lessons for this class. One was on modeling, looking into scientific discovery of properties of a system to the discovery of an atom. Principles in physics such as force, speed, and momentum were learned hands-on by making cars out of film canisters. Students also learned how to trouble-shoot, getting their cars to travel in a straight line in order to test on speed, velocity, etc. The second lesson focused on Newton’s three laws of motion. Students had to demonstrate the three laws and make calculations, using hot wheel cars and straws to make a car powered by a balloon.

In the second year, the Chemistry team developed learning activities targeting content areas based on new science standards, including simple machines, gas laws and bonding. Altogether, the Chemistry team developed 22 learning activities for the introductory physical sciences (chemistry and physics) course at Freedom High School. These included four developed by volunteers from one of our industrial partners, Binney & Smith (Crayola), demonstrating fundamental chemical properties applied to things the students have experienced their whole lives but not appreciated from a science standpoint. These activities cover virtually all of the topics covered in the course with a good integration into that course content. These have been adapted to the different ability and interest levels found in the high school student population. Our project provided much of the materials for experimental activities, including liquid nitrogen, a Van de Graaff, a bowling ball pendulum, and countless other supplies. Fellows helped students working with “dangerous” materials, such as liquid nitrogen.

Fifty-one students from the lowest ability level classes traveled with the Freedom Chemistry Team traveled to Corning, NY, to visit the Corning Glass Museum. Tours emphasized the science aspect of glass making and composition. The goal was to show the students that the chemistry that they are learning, even the seemingly most basic principles, are important to their everyday world.
Another initiative built on Ms. Frederick’s outreach activities to middle schools. Honors level (and later academic level) high school students developed presentations for middle and elementary school students as enrichment activities related to topics in their curricula. These outreach programs were a valuable teaching/learning experience for both groups of students.

Computer Science and Engineering Team at Harrison-Morton Middle School (HMMS), Allentown, PA
Dr. William M. Pottenger, Assistant Professor, Faculty Team Leader
Jesse Wolfgang, Graduate Teaching Fellow (Years 1 and 2)
Chris Janneck, Graduate Teaching Fellow (Year 2)
Phil Garcia, Undergraduate Teaching Fellow (Year 1)
Lisa Dychus, Undergraduate Teaching Fellow (Year 2)
Mark Dilsizian, Undergraduate Teaching Fellow (Year 2)
Mirna Galdamez, Undergraduate Teaching Fellow (Year 3)
Donald Stahl, STEM Teacher (Years 1-3)
Christopher Scappaticci, STEM Teacher (Year 1)
Jennifer Walz, STEM Teacher (Years 2 and 3)

In this first year, The HMMS CS team developed Flash-enhanced web pages to assist Mr. Stahl with teaching Microsoft Word to his sixth grade classes, improving substantially on previously existing material. The new pages hold the attention of students longer and thus assist them in better learning the material. The project purchased a site license for Macromedia Studio MX for HMMS. Teaching fellows led a workshop introducing teachers to the basics of Flash, including how to use shape tweens and create buttons to be used in simple animations. During two advanced sessions teachers the graduate fellow taught HMMS teachers how to use Flash to create quizzes. For Mr. Scappaticci’s class, the team developed a new bridge building lesson utilizing the West Point Bridge Design software package. Students first experimented with different bridge designs in a simulated computer environment. After creating an acceptable design, students built their design out of K-NEX, then balsa wood. The students thus learned about the advantages of using computer simulations for developing and testing designs, before creating an actual bridge. This lesson was developed in collaboration with Wayne Ogorzalek, an engineer at Air Products. To expand upon the bridge building lesson, two field trips investigated the design of actual bridges. In each trip, approximately 150 HMMS students visited a bridge along route 33 as well as The Engineering Research Center for Advanced Technology for Large Structural Systems (ATLSS) at Lehigh University. The ATLSS center is responsible for monitoring this bridge for structural ware and tear. With this trip the students got a chance to see how the material they learned in class is applied locally in the “real world.” A second field trip to the bridge also featured a stop at Lehigh’s Virtual Reality Lab. In the lab, the students helped construct a rollercoaster in a virtual environment.

After Dr. Pottenger brought a couple of ER1 mobile robots from Lehigh (used in a first year engineering course he had taught), the teachers saw the tremendous potential for robotics generating excitement technology, mathematics and science in an integrated curriculum. With help from the project, HMMS bought eight ER1s and started developing a curriculum. The team then developed then created include a two week summer camp on mobile robotics using ER1s. At this camp, students had the opportunity to work with the robots and to complete various science-related tasks. For example, they worked in teams to remotely control the robots to grasp, transport and weigh rock samples of various densities. Encouraged by the success of the robotics program at Harrison-Morton, Allentown School District Assistant Superintendent Dr. John McAdams decided to proceed with a district wide middle-school technology curriculum development initiative based on the HMMS mobile robotics curriculum. Originally, this curriculum included activities such as measuring the lengths of the school’s various hallways and
programming the robots to traverse the halls. Then it developed into an initiative to establish a Martian Landscape and Mission Control Center in what used to be a storeroom in the basement of HMMS. Students will operate the robots remotely from the Mission Control Center (or remotely via the web) in order to learn the math/science concepts. A website depicting these exciting developments can be found at www.allentownsd.org/HM/TechnologyLiteracy/MartianLandscape/index.htm.

Computer Science and Engineering Team at Broughal Middle School, Bethlehem, PA
Dr. Glenn Blank Associate Professor, Faculty Team Leader
Sally Hiestand, Graduate Teaching Fellow (Year 1)
Donna DeMarco, Graduate Teaching Fellow, Kutztown University (Years 2 and 3)
Adrian Ramsay, Undergraduate Teaching Fellow (Years 1-3)
Jonathan Morgan, Undergraduate Teaching Fellow (Years 1-2)
Nicholas Moukhine, Undergraduate Teaching Fellow (Year 3)
Maryann Kearns, STEM Teacher (Year 1)
Wayne Neveling, STEM Teacher (Years 1 and 3)
Aileen Morgan, STEM Teacher (Years 2 and 3)
Jane Carr, STEM Teacher (Years 2 and 3)

In the first year, the CS team at Broughal developed a lesson on misconceptions about computer science using multimedia from the CIMEL project, for six sixth grade technology classes. Through the three-day lesson, we asked students about their current impressions of computer science and people who worked in the field, and talked to them about what computer science is really like. The students took pre and post tests to measure their attitudes before and after the classes. The results were mixed, in part because of the vocabulary of the multimedia too sophisticated (i.e., words like “misconceptions” went over their heads), especially since many of the students were Spanish-speaking.

The project purchased a site license for the Macromedia suite of web development tools (Flash, Dreamweaver, Fireworks, etc.). Students in Ms. Kearns' class began using Flash to create their own multimedia presentations. We made our own Flash tutorial available, along with teaching fellow assistance. The teaching fellows developed new multimedia and mini-lessons on the Internet and working with graphics files.

In the second year, the Broughal CS team developed a curriculum for the sixth grade technology curriculum with web-based materials and Flash multimedia. Students learned spreadsheet basics through analyzing an airplane trip. Part of this project involves using various web sites to gather airplane performance data (speed, fuel consumption) and geographical information (distance and heading between two points), then the use a spreadsheet to calculate time and cost to compare the three planes. In year 3, this curriculum was enhanced with materials from NASA (http://futureflight.arc.nasa.gov). For the seventh grade technology curriculum on animated web page development, students created their own animated pages on the topic of cell mitosis. One seventh grader describes her experience: “I created this web page in my 7th grade technology class which is instructed by my teacher as well as student teachers from Lehigh University right across the street. I used a program called Dreamweaver to create this page. Dreamweaver allows students to create web pages using HTML code and signs.”

By the end of the program, the CS team at Broughal had created 5 completely new curricula in the Technology and Industrial Arts classes. Each course teaches one or more technology tools in the context of a science, technology or engineering topic:

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<tr>
<th>School Year</th>
<th>Class</th>
<th>Curriculum</th>
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<tr>
<td>2003 – 2004</td>
<td>6th grade Technology</td>
<td>Research and Preparing Reports, Avionics</td>
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Initially, the curricula were developed as a joint effort between the teaching fellows and teachers. The teaching fellows taught a number of the lessons the first time the course was taught. Now that the curricula are in place, the teachers have taken ownership and are taking the initiative to enhance the courses. We have attained sustainability in these courses and the teachers will continue to improve the courses with each year. In a new building (under construction in 2007), Broughal will become a Science and Technology magnet school for Bethlehem Area School District; the curricula we have developed play a key role in the plans for this school. Below is a description of each curriculum.

**6th grade Technology: Research and Preparing Reports, Avionics**
This curriculum introduces students to the field of avionics. Using word processing and spreadsheet applications, students research a specific area of avionics. The first year, we developed a web quest for the students. The teachers determined the web quest was too “boring” for the students and discovered the NASA website. They incorporated various activities from the NASA site to make the online experience more engaging for the students. Undergraduate fellow Nick Moukhine (a graduate fellow in our continuing GK12 project) added an activity that has students demonstrate pitch, roll and yaw.

**7th grade Technology: Research and Web Site Design, Mitosis**
Taking into consideration that the existing seventh grade science curriculum is a study of the life sciences it was decided that the topic of cell mitosis would enhance both the existing science curriculum and through technology enable the students to create web pages and animations. To this end, a curriculum to teach the students to create web pages and animations in Macromedia Dreamweaver and Flash was designed. Students became adept at using virtual share to both send and receive all work, enabling the students to eliminate any paper trails and become very technologically advanced. The curriculum also incorporates the Appleworks, Inspiration, Keynote, and iPhoto software, but increasingly emphasizes the use of complex animations and interactive programming with ActionScript.

**6th grade Industrial Arts: Bridge Design with West Point Bridge Designer**
The 6th grade is learning the engineering design process and using the West Point Bridge Design software to design and test bridges (an idea borrowed from the HMMS CS team). The students test their bridge design via simulation (a truck driving across their bridge), then improve their design based on the tension and compression forces exerted on each section of the bridge. The students are actively engaged and enjoy the class. However, Mr. Neveling noticed that students were having trouble visualizing the concepts of tension and compression. So we modified the curriculum using K’Nex bridge building kits, adding lessons on tension and compression using manipulatives (marshmallows) and K’Nex. Students now build a bridge with K’Nex and then test its strength using West Point Bridge Design.

**7th grade Industrial Arts: Robotics**
The 7th grade is learning the software design process and how to program ER1 robots, purchased in a partnership between this project and the school. These robots have sophisticated vision, speech and hearing capabilities and a simple “if-then” structured programming interface. The students learn to design a solution before programming, a very important concept in software engineering, by developing flowcharts to program the robots’ behaviors. The students were excited about using the robots, but found the flowchart process tedious. So we modified the lesson so that students list all steps and decisions on paper in a first draft, then draw the corresponding flowchart as a second draft. Breaking down the process improved student interest and learning. Another change is that each student is responsible for part of the
flowchart (the design to get to one city in a four-city road rally.) The students then physically walk through each other’s flowcharts to make sure they are complete and accurate. These team building activities further enhanced the effectiveness of the curriculum.

8th grade Technology: Research and Preparing Multimedia Presentations, Technology
In this curriculum, students must answer an essential question: “Does life influence technology, or technology influence life?” They research a topic of interest (cell phones, music, automobiles, etc.) and then put together a multimedia presentation that supports their answer. The students use a number of different applications including Inspiration, Keynote, Dreamweaver, Flash, garageBand and iMovie. The intermediate result is a website and the final product is an iMovie demonstrating their expertise in their technology topic. Ms. Carr organized an excellent scaffolding website for the students.

6th grade designing & testing bridges  7th grade building & programming robots

Computer Science Team at Dieruff High School, Allentown, PA
Dr. Glenn D. Blank, Associate Professor, Faculty Team Leader (Years 2 and 3)
Sally Moritz (née Hiestand), Graduate Teaching Fellow (Years 2 and 3)
Chad Neff, STEM Teacher (Years 2 and 3)
Tom Derhammer, STEM Teacher (Years 2 and 3)

• In response to a recommendation from our NSF site visit urging us to put a CS team at a high school as well as to the developing research agenda of graduate teaching fellow Sally Moritz, Dr. Blank secured supplemental funding making it possible to establish a new team at Dieruff High School. The main focus of this team was the development of a novel “design-first” curriculum to introduce Java programming. The design-first curriculum was developed and improved successfully over four semesters at Dieruff High School. Graduate fellow Sally Moritz also developed tools for the curriculum which form the basis of her Ph.D. research. She constructed an integrated development environment (IDE) using freely available software—the Eclipse IDE combined with DrJava, an interactive Java processor for students, and LehighUML, in which students create UML class diagrams. LehighUML also generates code stubs from class diagrams, thus supporting students as they moved through the development process from design to coding. Results using the curriculum and tools have been disseminated through several publications and conference presentations, and shared via the web with other high school and college teachers (see www.lehigh.edu/stem/teams/dieruff/). A high school teacher in the Seattle area plans to use our curriculum and Java development environment. Ms. Moritz also shared her expertise in a Database class, teaching entity-relationship modeling and SQL. She also helped in a computer literacy class required for all ninth-grade students, using portions of CIMEL multimedia introducing the breadth of computer science and creating video clips of CS/IT professionals at Lucent Technologies describing what they do.

The Dieruff team also collaborated with PPL employees. In a field trip to PPL headquarters in Allentown, students saw a demonstration of PPL’s Geographic Information System (GIS), which maps the location of all electric distribution lines and equipment, and all customers connected to the grid. PPL’s GIS expert explained how much of the supporting data was stored in a back-end database (Ms. Moritz later reminded the Database
class students about this point when she emphasized the pervasiveness of databases systems) and also showed how his team worked in NYC after 9/11, mapping the entire area affected by the attack, including infrastructure (subway, water and sewer, electrical lines, etc.) that was damaged and repaired, traffic into and around the area, and other critical data. PPL also hosted students who shadowed an employee for a day. Students spent the day with PC support technicians, software developers and business analysts and got hands-on experience. As one student said, “This was an awesome experience because I actually got a chance to do the type of work that I want to do. I’ve always been interested in computers, but now I’ve got a better idea of the different areas I can pursue in this field.”

![Student Chris Kirk with PPL employee Ron Miller](image)

Finally, PPL conducted résumé writing and interviewing workshops. Students submitted résumés to apply for one of three actual jobs; PPL volunteers chose the six best, and then interviewed those students in front of the class. This experience helped the students think about what they can do now to better prepare for finding the job or career they want, whether they will start working after high school or after college; it also gave them a head start on applying for summer or after-school jobs.

Earth Science Team at Harrison-Morton Middle School, Bethlehem, PA
Dr. Horace Moo-Young, Associate Professor, Faculty Team Leader (Year 1)
  Dr. Jennifer Swan, Professor, Faculty Team Leader (Years 2 and 3)
  Ted Dufrense, Graduate Teaching Fellow (Year 1)
  Rene Waterman, Graduate Teaching Fellow (Year 2)
  Michael Gyamfi, Graduate Teaching Fellow (Year 3)
Melodie Kent, Undergraduate Fellow (Years 1 and 2), Graduate Teaching Fellow (Year 3)
  Lola Ademosu, Undergraduate Teaching Fellow (Year 3)
  Rebecca Resnick, Undergraduate Teaching Fellow (Year 3)
  Samuel Vaughan, STEM Teacher (Year 1)
  Joan Preston, STEM Teacher (Years 1-2)
  Jessica Donahue, STEM Teacher (Years 2-3)
  David Moyer, STEM Teacher (Year 3)

In the first year, the graduate fellow showed HMMS students how dark colored surfaces absorb energy and light colored surfaces reflect energy. The demonstration consisted of getting two pieces of aluminum cut in 4 in squares, fairly thin with painting one the sides of one square black. A 250watt light bulb was then shone on the aluminum squares, which were suspended in the air. The students then one at a time felt the temperature difference between the aluminum square that had one side not painted black versus the aluminum square with the one side painted black. Students were so excited and intrigued by the demonstration that many wanted to take part in the demonstration over and over again. The graduate fellow also presented a lesson on weather,
discussing the layers of the atmosphere and different types of clouds. A Weather Jeopardy game used materials from the lesson. The undergraduate fellow developed a Marshmallow Solar Cooker Presentation. While presenting the solar cooker in class, students were asked several concept questions to reiterate the purpose of the presentation. Students were very interested because not only were they able to identify the components of the solar cooker, but they thought it was cool that we were roasting marshmallows. After the presentation, the students created their own solar cooker on a smaller scale. Students enjoyed this hands-on experience and were able to identify the importance of each component of the solar cooker.

In the second year, the graduate fellow developed lessons on air pressure, air resistance, Bernoulli’s Principle, and the properties of flight. The students performed several in-class demonstrations. Together with Dr. Frank Petrocelli from Air Products, the team presented activities using a solar cell to generate electricity and power an electrical motor. Students determined the maximum weight that the motor can lift, and calculate the power produced.

Undergraduate and later graduate teaching fellow Melodie Kent, an African-American student, spearheaded a science banquet to recognize exceptional student work in the 7th grade science class. With over 170 attendees, the entire night was dedicated to exposing parents and students to “fun science,” including everything from metal fluorescent burning presentations to liquid nitrogen ice cream demonstrations. The banquet was initiated to increase parental involvement and raising student’s awareness of science education, and because of its success, it became implemented by three other schools in the Allentown/Bethlehem area. The HMMS science banquet reprised with similar resounding success in year 3.

In year 3, a goal was to improve students’ reading and writing better, because the team realized that their poor performance in math in science was largely due to their inability to totally comprehend the assignments set before them. As part of all of our labs, the students received a lab notebook where they record all of the labs that we give them to perform and then they have to explain their observations. The students performed and recorded results from about 15 labs ranging from capturing hydrogen, capturing oxygen to measuring shadows. Along with the labs, the students have technical and leisure writing assignments to get them in the practice of writing scientific and non-scientific ways. One technical assignment was entitled “How to Sharpen a Pencil” and the students really hand a hands-on experience with the importance of being clear with directions and not assuming that all knowledge is common. A leisure writing assignment let the students write about their parents and how they use math, science, technology, and/or engineering in everyday life—and the students were surprised to see that no matter if their parent is a housewife, or an aeronautical engineer, they use one or all of those subjects in some fashion. At first, the students didn’t like to write because they were afraid of their spelling issues and some of their language barriers, but now the students enjoy writing time and they treat their lab notebooks as not only scientific papers, but personal journals where they can practice bettering their writing skills and also write about topics that interest them.

Mathematics Team at Harrison-Morton Middle School, Allentown, PA
Dr. Bennett Eisenberg, Professor, Faculty Team Leader (Years 1 and 2)
Dr. Susan Szczepanski, Faculty Team Leader (Year 3)
Patrick Gorman, Graduate Teaching Fellow (Years 1 and 3)
Jeanine Hoff, Undergraduate Teaching Fellow (Year 1)
Ellen Lempereur, Undergraduate Teaching Fellow (Year 3)
Karen Baurkot, STEM Teacher (Years 1-2)
Donald Battle, STEM Teacher (Years 1-3)
Joan Service, STEM Teacher (Year 3)
Early on, the math team decided that we would have the most impact in the schools where students were doing poorly in the standardized mathematics tests. We also decided to integrate math and science, jointly with the Earth and Environment team. The first topic for the year was statistics. To enliven the material we took surveys from the class and did our analyses on them. The statistical surveys went well. A test on the statistics section of the book was given to the students and student did much better than students in past years. The next topic was whole number operations including integer exponents. The graduate fellow showed a movie about powers of ten and the size of the universe. The fellows created a game of mathematical jeopardy in which categories of questions corresponded to topics the students have studied so far this semester such as fractions, estimation, and decimals. The card-based “24 game” helped students learn about order of arithmetic operations. This game had an unexpected benefit in that many of the students needed a review of basic arithmetic. Seeing the potential, HMMS worked with our project and Suntex International to enroll in the online version of this game for the third year of the project, further improving basic math skills through the incentives of the game.

In subsequent years, the math team developed a number of activities for 6th grade students using graphic calculators, demonstrating topics recently learned in class or to introduce new topics. The HMMS Math and Science teams collaborated to create an after-school program that meets once a week. It is a peer tutoring system, where sixth graders are assisted by eighth graders in a variety of subjects, and also features engaging science and math activities, including a four week bridge design project in which students had to work in teams to design and build a bridge out of straws and masking tape to hold as many pennies as possible.

In the second year, the Math team developed learning activities for sixth and seventh graders working with balance scales and the use of decimals and the metric system, baking cookies and the use of fractions, the game of Battleship and the coordinate system, dice and the number line, model cars and the rate of change, and shadows and proportions. The fellows also helped at the robotics camp for HMMS students developing mathematical activities related to moving robots along the floor as well as taking a trip to Mars, determining how long the trip would take, how many meals to take, and how to take a certain number of pounds of miscellaneous items.

In the third year, activities and projects were integrated into the 6th grade math curriculum with much more efficiency than in previous years. The main topics covered by our activities are data analysis and interpretation, number sense, order of operations, fractions, decimals, geometry, early algebra and graphing techniques, and probability and statistics, etc. Most activities we use are one- or two-day activities used to enhance topics already covered in the classroom. This is partly because of a tight calendar that the Allentown School District follows for their math program. The team expanded its outreach to gifted math students, challenging them with long-term projects and challenging problems to help them think outside the box.

The Physics team chose the subject of aviation, creating a complete core unit based on the subject of aviation. Dr. DeLeo presented a program on space flight, using this as an introduction to both astronomy and the aviation unit. The fellows performed demonstrations setting up hands-on activities, modeling the way sunlight strikes
the earth, the separation of light into colors, and the use of air pressure to implode a metal can. The graduate fellow introduced materials from the Lehigh University Outreach Center such as slinkies and oscilloscopes.

In the second year, the team deployed a full version of the aviation curriculum (now available at www.lehigh.edu/teams/fountain/). A favorite aviation lesson at both schools focused on the construction of paper airplanes. The lesson actually focused on axes of control, wing shapes, control surfaces, and specialized types of aircraft. By giving the students different paper airplane designs, we were able to get these ideas across, and also keep the students excited. For aviation, the essential concepts are the four forces that act on an airplane: gravity, lift, thrust, and drag. In order to help the students grasp the lift concept, we build model wings using just a piece of paper, a straw, fishing line, and a fan. By physically building a wing and observing it rise as air passes across it, the students have a better shot at understanding how the design of the wing is crucial for flight. To demonstrate thrust, we build simple air engines using balloons, straws, and fishing wire. The students experiment with different sizes and shapes of balloons, different amounts of air in the balloons, and alter other variables to observe which provides the most thrust. The Fountain Hill students were taken to a nearby park for “Flight Day” to try out their various models of planes and gliders.

The Fellows often brought equipment and educational materials from the Science Outreach Center which Team Leader Dr. DeLeo has developed over many years to support outreach activities to many schools in the Bethlehem area. During the spring of 2004 alone, he gave 16 presentations at these two schools to a total of over 600 distinct children (plus, some experienced multiple programs). These programs include “Light, Sound, Color, and the Nature of Matter” and “Astronomy and Space Travel.” Prof. DeLeo also gave presentations describing the operation of a remote weather station which he and the School Principal (Mr. Joseph Rahs) installed on the roof of Fountain Hill Elementary School. Each third grade class has a remote receiver that records wind speed and direction, temperature, relative humidity, rainfall, etc. He also led a large-scale program called “Timeline: Planet Earth!” in which each grade level follows a theme. For example, the Kindergarten classes were provided with an 18x18x5 inch Plexiglas container and colored sand. They place a sand layer in the display container every day or so, and embedding in the layer an object that relates to the time of its placement, thus demonstrating how digging down through the layers of the Earth is like going back in time.

In the third year, the teaching fellows expanded the range of their teaching to include biological science in fifth grade classes at Fountain Hill (studying the difference between vertebrates and invertebrates) and to third grade classes at Spring Garden (studying the weather and the composition of the earth). The fellows helped the young students to explore science beyond what can be found in their textbooks and in the books they have found so far in their library.

Technology Team at Regional Academic Standards Academy, Bethlehem, PA
Dr. William M. Pottenger, Assistant Professor, Faculty Team Leader (Year 3)
Maryann Kearns, STEM Teacher (Year 3)
Ryan Siu, Undergraduate Teaching Fellow (Year 3)

To begin disseminating successful results from the project, this new team spun off innovative activities at Broughal and HMMS Middle School, using ER-1 robots and Flash. Lehigh students in a first year Engineering course helped to demonstrate capabilities of the robots. The team also arrange for field trip to the Blake Shuttle launch at Harrison Morton Middle School.