Engaging Engineering Experiences for K-5

Melanie Villatoro P.E., New York City College of Technology

Melanie Villatoro, an Assistant Professor in the Department of Construction Management and Civil Engineering Technology at NYC College of Technology, is a licensed Professional Engineer in the State of New York. Professor Villatoro serves on the Advisory Board of two local high schools; she has served as Program Director for the National Summer Transportation at City Tech for two consecutive years and is passionate about engineering outreach in the K-12 population.

Servena Narine, Daniel Hale Williams Public School 307, The Magnet School for STEM Studies

Servena Narine is a licensed and certified NYC Board of Education teacher. She is the Magnet Resource Specialist at Daniel Hale Williams Public School 307, The Magnet School for STEM Studies. Over the course of her career, she has been a classroom teacher (Grades Pre-K, 1, 2 and 3), Mathematics Coach, technology teacher and mentor. She works closely with colleagues, planning and facilitating professional development activities.

Dr. Diana Samaroo, CUNY - New York City College of Technology

Diana Samaroo is an Assistant Professor of Chemistry at NYC College of Technology. With a PhD in Biochemistry, her research interests are in the area of drug discovery, therapeutics and nanomaterials. Dr. Samaroo has mentored students through the Lious Stokes Alliance for Minority Participation and ACS SEED programs. She also serves on the college's Undergraduate Research and Assessment Committees and is a task force member of the Black Male Initiative.

WORKSHOP PROPOSAL FORM

2015 Annual ASEE K-12 Workshop on Engineering Education
"Authentic Engineering: Representing & Emphasizing the E in STEM"
Presented by Dassault Systems

Saturday, June 13, 2015
8:00 A.M. – 5:00 P.M.
Sheraton Seattle | Seattle | WA

Please complete this form, save it as a PDF file *only* and upload it through the ASEE Paper Management system as shown in the K12 Workshop Presenter's Kit.

All notifications will be by email from the ASEE Paper Management system.
NOTE: To ensure that emails are not obstructed by spam blockers, please make sure to WHITELIST the email addresses: monolith@asee.org and conferences@asee.org and s.harrington-hurd@asee.org.

Direct questions to Stephanie Harrington-Hurd, ASEE K-12 Activities Manager, at s.harrington-hurd@asee.org. Additional workshop details are available at: http://www.asee.org/K12Workshop. Thank you!

Deadline

Friday, January 23, 2015 by 5:00PM EST
Presenters will be notified of acceptance status by March 14.
Late submissions will not be accepted.
Advanced Workshop Registration will open December 6, 2013.

SUBMISSION INFORMATION

Provide the first and last name of each presenter, including affiliations. If there is more than one presenter, designate one person as the organizer and provide only that person's contact information. The organizer is responsible for communicating to co-presenters.

Number of Presenters: 3

Presenter Name(s):

1) Villatoro, Melanie — New York City College of Technology

2) Samaroo, Diana — New York City College of Technology

3) Narine, Servena — Daniel Hale Williams Elementary School

Contact Person's Name: Melanie Villatoro

Contact Person's Email: mvillatoro@citytech.cuny.edu

Contact Person's Phone: 718-260-5578

Contact Person's Alternate Phone: 516-647-3715

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Please provide a one-paragraph bio for each presenter (in the order listed above). The bio should not exceed 70 words and should be written as you would want it to appear on the ASEE website and program materials.

1) Melanie Villatoro, an Assistant Professor in the Department of Construction Management and Civil Engineering Technology at NYC College of Technology, is a licensed Professional Engineer in the State of New York. Professor Villatoro serves on the Advisory Board of two local high schools; she has served as Program Director for the National Summer Transportation at City Tech for two consecutive years and is passionate about engineering outreach in the K-12 population.

2) Diana Samaroo is an Assistant Professor of Chemistry at NYC College of Technology. With a PhD in Biochemistry, her research interests are in the area of drug discovery, therapeutics and nanomaterials. Dr. Samaroo has mentored students through the Lious Stokes Alliance for Minority Participation and ACS SEED programs. She also serves on the college's Undergraduate Research and Assessment Committees and is a task force member of the Black Male Initiative.

3) Servena Narine is a licensed and certified NYC Board of Education teacher. She is the Magnet Resource Specialist at Daniel Hale Williams Public School 307, The Magnet School for STEM Studies. Over the course of her career, she has been a classroom teacher (Grades Pre-K, 1, 2 and 3), Mathematics Coach, technology teacher and mentor. She works closely with colleagues, planning and facilitating professional development activities.

WORKSHOP INFORMATION

Proposed Title:

Engaging Engineering Experiences for K-5

Abstract: Please provide a concise description that includes the workshop's learning objectives (maximum 750 characters). The abstract is used on the ASEE website, program materials, and otherK-12 Workshop promotional activities.

The City University of New York (CUNY) Service Corps mobilizes CUNY students, faculty and staff to work on projects that improve the short and long-term civic, economic and environmental sustainability of New York City and of its residents and communities. Our project was designed to promote **A Better Educated City** by partnering with Daniel Hale Williams Elementary School; recently designated as a Magnet School for STEM Studies**.** During the 2014-2015 academic year, two CUNY students worked to develop and implement an Educational Outreach Program which provided children in grades 1-5 with exposure to Science, Technology, Engineering, and Math

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(STEM) inside their elementary school classrooms. Workshop participants will receive a copy of the Program developed for implementation in their classrooms.

Workshop Description. Please provide a detailed description of the proposed workshop that, at minimum, explicitly addresses the following (maximum 4,000 characters):

a. Learning objectives
b. Hands-on activities and interactive exercises
c. Materials that participants can take with them
d. Practical application for teachers and outreach staff

The purpose of the Program was to increase STEM awareness by providing engaging lessons and activities to students in grades 1-5, which related to their daily lives and supported the school's interdisciplinary unit on the Self. The long term goal of the program is to increase the number of students pursuing STEM-related careers and diversify the profession. The program can be used as a handbook for elementary schools across the nation.

a. Learning objectives

This workshop will provide a detailed description on the Program developed for the elementary school. The Program is composed of in-class lesson plans, after-school programs, and family inclusive activities.

The in-class Engineering lessons were implemented in the 3rd and 4th grade classrooms on a biweekly basis. Each lesson was developed in alignment with the Next Generation Science Standards (NGSS) and relates each topic to Engineering. Topics covered include Evaporation, Predicting Weather, The Senses, Structures and Function, and Transfer of Energy.

The after-school program was offered to 3rd, 4th and 5th graders. The after-school programs were modeled after two local competitions, the West Point Bridge Design Competition and the Future City Competition. These projects required students to model the Engineering Design process. Students used software programs to design their projects, created physical models and prepared oral presentations.

Recognizing the importance of family involvement in a child's success, the Program included interactive STEM related workshops and field trips for families.

Workshop participants will be able to implement any of the program components in their home schools. In addition there will be a discussion on effective assessment measures for short term and long term success of this program.

b. Hands-on activities and interactive exercises

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Workshop participants will have the opportunity to engage in an engineering design challenge using basic classroom materials. This activity will simulate the classroom experience and participants will learn the "engineering in practice" strategy which we have implemented with the elementary school children of all ages.

c. Materials that participants can take with them

Each workshop participant will receive a copy of the Program, including lesson plans, after school program lessons and workshop schedules for their use in their school.

d. Practical application for teachers and outreach staff

Each lesson plan provides a summary of the topic and its alignment with the NGSS, learning objectives, a breakdown of the lesson segments by time, a list of materials needed, and follow up questions. These lesson plans can be easily replicated in any classroom.

Authentic Engineering Connection. Identify and describe how you will explicitly address the ways in which your lesson or activity is representative of the processes, habits of mind and practices used by engineers, or is demonstrative of work in specific engineering fields.[i] At least one of those must be within the first four listed, below; i.e., do not only check "other". Check all that apply:

☒ Use of an engineering design process that has at least one iteration/improvement
☐ Attention to specific engineering habits of mind
☒ Attention to engineering practices (as described in the NGSS/Framework and as practiced by engineers)
☒ Attention to specific engineering careers or fields related to the lesson/activity
☐ Other (please describe below)

Provide a description of how you will explicitly address these aspects of authentic engineering in your workshop (maximum 2,000 characters):

Use of an engineering design process that has at least one iteration/improvement
Attention to engineering practices (as described in the NGSS/Framework and as practiced by engineers)

The after-school programs were modeled after two local competitions, the West Point Bridge Design Competition and the Future City Competition. These projects required students to model the Engineering Design process: Define the Problem, Develop Solutions and Optimize their Design.

For West Point Bridge Design, students are given a scenario which requires a bridge to be built between two cities. Students learn about different types of bridges and how they work. The first

step in their design is a hand sketch which is transferred to the software to simulate loading conditions. Students will learn whether their initial design withstands the given loads and whether their bridge is cost efficient. The next part of the project involved the students building the physical model of their bridge using recycled material. The material was assigned a cost and students were responsible for managing their construction costs. Once finalized, the students prepared an oral presentation, summarizing their project and what they learned through the program.

For the Future City Project, students are given a rubric detailing the required components of the city and they will create a city using SIMCITY software. Working in groups, students then select a portion of their city and build a scale model of their city using recycled material. Students prepare a written report and oral presentation.

The students in the after school program not only experienced the design process but worked collaboratively with other students and developed their communication, both important skills for an Engineer.

Attention to specific engineering careers or fields related to the lesson/activity

Families and children were provided with a workshop highlighting careers in Engineering. A description of the type of engineering, salaries, example of engineering projects, and the required educational steps are discussed. A series of lesson plans are linked to civil engineering and include hands on activities and design challenges.

Diversity. This year is the American Society for Engineering Education's "Year of Action on Diversity." It is essential that we have a diverse engineering workforce to solve diverse problems. To do that and to have an engineering-literate public, it is essential that we reach *every* preK-12 student with high-quality engineering education, drawing on issues of access and equity in the classroom and in the curriculum. Reviewers would like to know how your proposed workshop will address diversity.

Provide a description of how you will explicitly address diversity – e.g., diversity with respect to gender/sex, ethnicity or race, special education inclusion, socio-economic status, or LGBT status – in your workshop (maximum 2,000 characters):

Daniel Hale Williams Elementary School in Brooklyn, NY boasts a very diverse population. The school demographics by gender are about 46% Female and 54% Male, by ethnicity 27% Hispanic, 1% American Indian or Alaskan Native,3% Asian, 60% Black, 7% White, and 2% Multi-racial. The students which participated in the Program included general education students with related services such as speech, counseling, physical or occupational therapy as well as Special Needs students and students on the ASD/Autism Spectrum.

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The students at Daniel Hale represent a population that is traditionally underrepresented in the STEM professions. Participation of the students in this Program is increasing their exposure to the components of STEM and possible career path and their awareness of the local and global problems that Engineers and Scientists engage in daily. This Program helps to prepare students with 21st Century Skills for College and Career Readiness, by fostering collaboration, communication, innovation and creativity and the practical use of technology.

This workshop will discuss the importance of recognizing the various needs of the students and modifying the lessons and activities to engage all students. The workshop will discuss how the program components were modified to provide multiple entry points to adapt to the needs of each student - direct instruction, videos, physical demonstration, hands-on activities, literature, and use of technology like SmartBoards, tablets, and laptops. Language development and vocabulary acquisition was supported through the use of thinking maps, word walls, rhythm and repetition. The after school program and family activities encouraged students and parents from varying walks of life to engage in discussion and work collaboratively.

Are there any online components to the proposal or presentation? (Note that these online components may only be available to presenters or those who have their wireless subscriptions, since wireless may not be available during the workshop sessions.)

☐ No
☒ Yes

Please describe:
The workshop will require internet access for the presenter as it may include links to videos and online resources.

Grade Level Target Audience (check all that apply):
☐ Primary (EC–2)
☒ Elementary (3–5)
☐ Middle School (6-8)
☐ High School (9-12)

Maximum Number of Participants:
25

If this number is greater than 25, please describe how your workshop will equally engage all participants.

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All Seating is Classroom (tables and chairs).

Audio Visual Equipment Requests:
Note: *An LCD projector, screen and podium with attached microphone are provided. Requests for additional equipment or resources (e.g., internet connection or laptops) will incur extra charges. If you do not have additional requests, please indicate with "Not applicable."*

If possible, an internet connection.

Reminder:
Presenters must register and pay the registration fee to support their workshop attendance and audio/video costs.

Thank you for completing this proposal form!
Please review this document prior to submitting it to ensure that all items are complete.

ASEE USE ONLY

Date Received:

Received By:

Proposal ID Number: