



Novel Engineering: Integrating Engineering and Literacy

Mrs. Lija Yang, Tufts Center for Engineering Education and Outreach

Lija Yang is an Education Specialist and Curriculum Developer at the Tufts Center for Engineering Education and Outreach; she has a M.Ed. in Literacy Instruction K-12 and is a certified Reading Specialist. She has taught 1-4th grades and included engineering concepts and thinking in her curriculum. Her focus is to help teachers gain confidence and experience in STEM and enable them to inspire and teach engineering to budding engineers.

Dr. Meredith D Portsmouth, Tufts University

Elissa Milto, Tufts Center for Engineering Education and Outreach

Elissa Milto is Director of Outreach at the CEEO. She holds two masters degrees in education allowing her to focus on special education and engineering. Currently, she leads Novel Engineering, an interdisciplinary engineering literacy project. Her work focuses on understanding what engineering looks like in elementary and middle school and finding ways to help teachers include open-ended, hands on engineering in their classrooms while paying attention to their students' ideas.

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) Last Yang First Lija Affiliation Member, K-12 Educator
- 2) Last Portsmore First Merredith Affiliation Member, University Faculty
- 3) Last Milto First Elissa Affiliation Member

Contact Person’s Name: Lija Yang

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Contact Person’s Phone: 617-627-5888

Contact Person’s Alternate Phone: 857-234-0317

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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) Lija Yang is an Education Specialist and Curriculum Developer at the Tufts Center for Engineering Education and Outreach; she has a M.Ed. in Literacy Instruction K-12 and is a certified Reading Specialist. She has taught 1-4th grades and included engineering concepts and thinking in her curriculum. Her focus is to help teachers gain confidence and experience in STEM and enable them to inspire and teach engineering to budding engineers.

2) Merredith Portsmore is the Associate Director for Tufts Center for Engineering Education and Outreach. Merredith received all four of her degrees from Tufts (B.A. English, B.S. Mechanical Engineering, M.A. Education, PhD in Engineering Education). Her research interests focus on how children engage in designing and constructing solutions to engineering design problems and evaluating students’ design artifacts.

3) Elissa Milto is Director of Outreach at the CEEO. She holds two masters degrees in education allowing her to focus on special education and engineering. Currently, she leads Novel Engineering, an interdisciplinary engineering literacy project. Her work focuses on understanding what engineering looks like in elementary and middle school and finding ways to help teachers include open-ended, hands on engineering in their classrooms while paying attention to their students’ ideas.

WORKSHOP INFORMATION

Proposed Title:

Novel Engineering: Integrating Engineering and Literacy

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 other K-12 Workshop promotional activities.

Novel Engineering (NE), an NSF-funded project at Tufts Center for Engineering Education Outreach, engages 1st-8th grade students and educators in engineering, using books as a context for client-centered, open-ended design challenges. In this hands-on interactive workshop participants will be introduced to the NE approach and work in groups to apply it to a text. They will use NE to begin to learn how to integrate engineering and literacy, recognize texts as rich context for engineering design, identify problems, scope constraints surrounding the problem, and design and build solutions using found materials. Participants will analyze video of NE students, focusing on their thinking and ideas, and be given sample lesson plans.

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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 Novel Engineering workshop is designed to provide 1-8th grade educators an overview of the tools and experiences needed to integrate engineering design into their existing literacy curriculum using classroom texts as an accessible starting point for client-centered engineering projects. Ongoing NE research has shown that teachers and student find their classroom texts provide rich ground for engaging in engineering design, in additions to supporting and deepening literacy engagement and comprehension. The goal is for educators to be enabled to integrate engineering using an area of strength, which typically tends to be literacy.

Participants will learn ways to integrate engineering design and literacy, using books as the springboard. We will also touch on how to integrate writing as a part of the design process and as a consolidation of student learning. They will learn to identify texts that lend themselves to NE and the myriad ways they can be used. Participants will read excerpts from grade-level texts in order to identify the problems, the needs of the character-clients, scope the constraints, engage in conceptual planning and then design and build prototypes that address the identified problems. We will have mid-workshop shares to gain feedback on designs in order to support iteration and show how effective such moves can be in the classroom. They will share their final design solutions with their groups, as would students. We will transition from building to viewing video of students engaged in NE. Participants will learn to see the productive beginnings of engineering thinking and habits of mind in students and their designs by analyzing vides of students engaged in NE in order to show the process and evolution of student thinking. The overall goal is to help educators understand how to implement open-ended projects that allow students autonomy and ownership of their learning.

We will be using found materials, chosen because of the low cost and accessibility, to design and build prototypes in the same format that is used in NE classrooms. The workshop is designed to not only give participants a hands-on, high-touch experience, but also function as a hybrid classroom, in which educators will learn and engage in the same manner and using the same techniques and materials their students would.

Participants will be given a sample book list with corresponding examples of how the book was used in a classroom and a sample unit. We will also provide a materials catalog of useful and necessary materials for building in the classroom. They will also have access to the NE website, which has further resources, videos and link for in-depth P.D. The workshop will culminate with time to brainstorm ways to begin using NE and get further training.

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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.¹ 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):

The Novel Engineering workshop provides an authentic engineering experience as it guides participants through an open-ended, ill-defined challenge. The NE approach does not frame the problem for participants, mirroring the reality of engineering. Instead participants must frame the problem by reading the text to understand their clients, determining their needs, and identifying the constraints imposed in the context of the book and situation. NE aligns with NGSS as it demands the defining and delimiting of an engineering problem by offering open-ended challenges that have a diversity of possible solutions for which the students need to weigh trade-offs and constraints. This naturally leads into optimizing the design solution by using fair tests and analyzing the data and feedback from those tests to allow for improvement towards a functional solution. As participants brainstorm and design possible solutions with a partner they collaborate to communicate their ideas to one another and to the larger group. The NE approach incorporates a mid-way share-out that encourages iteration, communication and collaboration as ideas are shared, and peers give feedback, suggestions, and ask questions. This process fosters teamwork and deeper thinking as students hold one another accountable to rigorous standards, the text and the character-client choices, and needs. These are addressed by spontaneous argumentation and discussion as teams design and build together. Literacy skills are strengthened as participants engage deeply with the text. They closely reread books to support their ideas and better understand their client, write about their thinking, record their ideas with diagrams, and write for presentations of learning. This also aligns with the literacy strand in CCSS and the close reading of texts for deeper comprehension.

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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):

The Novel Engineering workshop will discuss how the approach lends it self to gender, socio-economic, ethnic diversity, and inclusion in some of the results we’ve seen. NE is uniquely positioned to be appealing to both girls and boys. The research shows that girls are more often drawn to reading and boys more so to building and hands on work. NE brings girls to engineering through the vehicle of reading and brings boys to reading through the vehicle of engineering. The project has documented that students with reading disabilities engage with a text deeply because of the motivation to build a functional solution, as well as seeing how engineering deepens their understanding of the text. As we worked with students at the Carroll School, we documented how students with ADHD, Dyslexia, and other language-based learning disabilities were not only equal to the work at hand, but also highly engaged and successful in both the comprehension of the text and the execution of designing solutions. NE is accessible to all schools and districts regardless of budgets. NE uses found and recyclable materials that can be collected at school or home at not extra cost; bringing engineering to students in cash strapped schools that can’t afford expensive commercial products. The NE approach has been used with a variety of texts: fiction, informational, historical fiction and picture books. The literature that is and can be used for NE is culturally and ethnically diverse. This speaks to a wide audience of students who need to see themselves reflected in the literature they read.

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:
Website access and registration

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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.

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.”

Not applicable

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:

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