



## **Exploring Authentic Engineering With Elementry-Age Youth and Their Parents**

**Mr. David Heil, David Heil & Associates, Inc.**

DAVID HEIL, president of David Heil & Associates, Inc., and founder of the Foundation for Family Science & Engineering, is well known as an innovative educator, author, and host of the Emmy Award winning PBS family science program Newton's Apple. Active in promoting public understanding of science and engineering for over 30 years, he was the lead Editor of the popular book Family Science (1999) and a Co-Author of the recently published Family Engineering: An Activity & Event Planning Guide (2011). David is a frequent national and international presenter on STEM education, is a past Director of Informal Science Education for the National Science Teachers Association, and a past member of the ASEE K-12 Executive Committee.

# 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](mailto:monolith@asee.org) and [conferences@asee.org](mailto:conferences@asee.org) and [s.harrington-hurd@asee.org](mailto:s.harrington-hurd@asee.org).

Direct questions to Stephanie Harrington-Hurd, ASEE K-12 Activities Manager, at [s.harrington-hurd@asee.org](mailto: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: 1

Presenter Name(s):

- 1) Last Heil    First David    Affiliation Foundation for Family Science & Engineering
- 2) Last        First            Affiliation
- 3) Last        First            Affiliation

Contact Person’s Name: David R. Heil

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Contact Person’s Phone: 503-245-2102

Contact Person’s Alternate Phone: 503-789-3440

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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) DAVID HEIL, president of David Heil & Associates, Inc., and founder of the Foundation for Family Science & Engineering, is well known as an innovative educator, author, and host of the Emmy Award winning PBS family science program *Newton's Apple*. Active in promoting public understanding of science and engineering for over 30 years, he was the lead Editor of the popular book *Family Science* (1999) and a Co-Author of the recently published *Family Engineering: An Activity & Event Planning Guide* (2011). David is a frequent national and international presenter on STEM education, is a past Director of Informal Science Education for the National Science Teachers Association, and a past member of the ASEE K-12 Executive Committee.

2)

3)

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## WORKSHOP INFORMATION

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### Proposed Title:

Exploring Authentic Engineering With Elementary-Age Youth and Their Parents

**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.

Participants in this workshop will explore a number of strategies for actively engaging elementary age youth and their parents in authentic engineering practices and design challenges. Attendees will interact with more than a dozen hands-on activities and design challenges from the nationally acclaimed Family Engineering program that foster engineering habits of mind including creative problem solving and designing, teamwork, systems thinking and communication. The session will also explore how to successfully engage professional engineers and engineering students in public outreach and family education activities and events. Participants will leave the workshop with tools and resources that will help them host successful Family Engineering events in their own schools and communities.

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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

Participants in this workshop will explore a number of strategies for actively engaging elementary age youth and their parents in authentic engineering practices and real-world design challenges. Learning objectives for the session are:

- Understand Engineering concepts, practices, and habits of mind as well as their value to young learners
- Understand the important role that parents and other caregivers play in fostering engineering habits of mind and other critical thinking skills in early learners
- Personally experience authentic engineering concepts, practices and habits of mind through hands-on activities and design challenges suitable for elementary age youth and their parents
- Understand the philosophy and goals of the Family Engineering program and how this program can help foster engineering education and aspirations at an early age
- Understand how to reach out to professional engineers and engineering students in the community to engage them as volunteers and role models for families
- Understand how to plan and facilitate a Family Engineering event in school or community settings
- Familiarity with a number of resources and materials available to assist in planning and facilitating Family Engineering events

The workshop will be divided into three main sections. First, participants will be actively engaged in 8-10 self-directed hands-on tabletop activities as soon as they arrive. After about 20 minutes, the participants will be introduced to engineering practices and habits of mind, and the Family Engineering program philosophy and approach. Next Generation Science Standards, ITEEA Standards, and connecting with professional engineers and engineering students will also be covered in this section. This introductory section will employ PowerPoint or Prezi as well as demonstration and resource materials for review. The third section of the workshop will actively engage participants in 2-3 short team-oriented design challenges with discussion of their relevance to engineering education and fostering engineering habits of mind in young learners. Participants will be taken through the planning steps for hosting a Family Engineering event in their school or community and will be given a few handouts to assist them in this effort. Additional resources and materials will be shared that can be accessed online. Both formal and informal educators interested in engineering education for elementary age youth, more actively engaging families, and interacting with engineers and engineering students will benefit from this workshop.

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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.<sup>1</sup> 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):

Using activities from the Family Engineering program, workshop participants will personally experience a number of authentic engineering challenges, concepts, practices and habits of mind and explore ways in which these can easily be introduced through hands-on learning experiences and facilitated events for elementary age youth and their parents. All of the activities presented in the workshop involve creativity in some way – solving a problem, designing a solution, building a prototype, etc. Participants will have the opportunity to personally create, solve, and design both individually and in collaborative teams. Most of the activities are designed to foster confidence and optimism as engineers, and to illustrate the value of applying engineering habits of mind in school and in everyday life. Others are used to illustrate how much of our world has been touched by engineering and to introduce children and their parents to engineering careers and build awareness of the various roles engineers play in enhancing the human experience. As an example, one activity in particular will illustrate systems thinking, communications, and collaboration as the participants work in teams to optimize the assembly of a six-part ballpoint pen under the constraint of time, and every team member having to contribute to the assembly. While workshop participants will have the opportunity to engage directly in these activities they will also learn how to facilitate similar experiences with elementary age youth and their families. In doing so, they will be laying the foundation for future generations to be more confident, creative, collaborative, and communicative as problem solvers and designers and to consider engineering as a potential career.

**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*

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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 Family Engineering program was designed specifically to challenge the notion that only a select few (white males) can do engineering. Activities have been designed to promote diverse perspectives, role models, and approaches for engineering problem solving and design. Creativity and collaboration are hallmarks of authentic engineering and are a part of almost every Family Engineering activity. Family Engineering has proven to be particularly successful in fostering engineering awareness, confidence, and engagement in young girls, minority youth, their parents and other caregivers, including roles models, problem scenarios, and career path examples that both represent and appeal to diverse communities. The program is modeled after an earlier successful program called *Family Science*, which has been successfully engaging under-represented youth and disadvantaged families around the globe for over 15 years. Funded by a grant from the National Science Foundation, Family Engineering was extensively field tested in 8 locations across the U.S. and Puerto Rico and all the program’s educational materials are available in both English and Spanish language editions.

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:

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:

50

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

The activities in the first section of the workshop are all self-directed and every participant will have the chance to explore them at their own pace. The second section of the workshop will be a general presentation for all attendees together. The facilitated design challenges in the third section of the workshop are designed for family event settings accommodating 150-200 attendees. Participants will work in teams of 5-6 modeling how family members will be engaged in these events. Handouts, hands on materials, and other resources will be available for all workshop participants.

All Seating is Classroom (tables and chairs). Presenter requests 8 extra six-foot tables set around the perimeter of the room for the self directed tabletop activities. If this is not possible, then a room set for more than 50 is preferred in order to have extra tables and floor space for roaming among the activities at the start of the workshop.

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.**

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Date Received:

Received By:

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