



Creative Engineering & Programming with MaKey MaKey invention Kits

Beau Vezino, University of Arizona

Beau R. Vezino is a Ph.D. student at the University of Arizona's College of Education. His focus is engineering and science education. Beau currently teaches the science/engineering methods course for pre-service teachers and works on several related research projects. Beau is certified teacher and holds a MS in Education in Curriculum and Instruction (2009) and a BS in Mechanical Engineering (2005). Beau's research focus involves K-12 teacher education related to engineering. He is the curriculum writer and project coordinator for ENGR101MS.

Mr. Scott A Weiler, Amphi Middle School

Scott Weiler has been teaching for 9 years. He currently teaches at Amphi Middle School as the Engineering and Robotics teacher. There, he does Auto Cad through Project Lead the Way as well as develop his own special curriculum. Scott also developed the program to promote STEM among middle school girls, Girl Power in Science and Engineering. He is finishing his Masters of STEM Education.

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: 2

Presenter Name(s):

- 1) Last Vezino First Beau Affiliation University of Arizona
- 2) Last Weiler First Scott Affiliation Amphitheater Middle School
- 3) Last First Affiliation

Contact Person’s Name: Beau Vezino

Contact Person’s Email: beauvezino@email.arizona.edu

Contact Person’s Phone: 4802081967

Contact Person’s Alternate Phone:

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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) Beau R. Vezino is a Ph.D. student at the University of Arizona’s College of Education. His focus is engineering and science education. Beau currently teaches the science/engineering methods course for pre-service teachers and works on several related research projects. Beau is certified teacher and holds a MS in Education in Curriculum and Instruction (2009) and a BS in Mechanical Engineering (2005). Beau’s research focus involves K-12 teacher education related to engineering. He is the curriculum writer and project coordinator for ENGR101MS.

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3)

WORKSHOP INFORMATION

Proposed Title:

Creative Engineering & Programming with MaKey MaKey invention Kits

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.

To invent, to innovate, to create! These are all key aspects of K-12 engineering, yet true open-ended creativity is a challenge for many teachers. With MaKey MaKey kits and Scratch programming as a central tools, this workshop promotes the use of technology, electrical circuits and programming to develop a sense of creativity and design thinking in kids. In a collaborative effort between the University of Arizona’s Colleges of Education and Engineering and local school districts, a middle school workshop with accompanying lesson plans were designed to help teachers develop the skills and ability necessary to teach innovative engineering and programming inside or outside the classroom. Through hands-on activities, this workshop aims to improve teacher’s ability

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to teach creative engineering design with the use of Makey MaKey Kits and computer programming.

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

MaKey MaKey Middle School Workshop Learning Objectives

Participants who attend the workshop will:

1. Become familiar with MaKey MaKey invention kits and Scratch programming software
2. Contemplate the important of developing a sense of creativity and innovation in K-12 students
3. Learn how to integrate computer programming into K-12 engineering
4. Review the educational materials created for the MaKey MaKey engineering activities
5. Consider how K-12 engineering curriculum can embed technology that draws on the interests, prior experience and Funds of Knowledge of the students.

To begin this workshop, participants will be introduced to the MaKey MaKey invention kits and how the kits can be used as tools to innovate and engineer. After this brief introduction, participants will use the kits in small groups to complete the hands-on activity to explore how electricity flows and then manipulate electrical current to create unique, interactive musical instruments with fruit, metal, water, pencil lead or other conductive materials. This activity aims to introduce teachers to the components of the MaKey MaKey kit, how to set it up, and how it interacts with the computer. To conclude this introductory activity, participants will learn about the various activities and projects that teachers have done with the kits and how to develop/sequence their own MaKey MaKey activity.

After this introductory activity, teachers will be introduced to Scratch programming (<http://scratch.mit.edu>). During this activity, participants will learn about and complete some basic programming tasks. Through this interactive learning experience, participants will develop a basic understanding of Scratch and how it can be infused into the engineering design process.

Once teachers have a basic understanding of both the MaKey MaKey kits and Scratch programming, participants will move into a mini “MaKey MaKey Design Challenge.” In

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this activity, small teams of participants will apply their knowledge to begin designing and creating interactive video games that incorporate the MaKey MaKey kits, conductive materials, and Scratch programming.

At the conclusion of the workshop, the presenters and participants will engage in a discussion about the practical challenges involved in promoting unrestricted creativity and the integration technology, programming and engineering design at the middle school level. The presenters will also suggest means to overcome these challenges and make this project a success. Participants will take away hard copies of days activities and be provided with links online for other digital resources.

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):

Design Process

The engineering design process, a central element in K-12 engineering education (NAE/NRC, 2009, Achieve, 2013), is a key aspect of this workshop. Through the context of the MaKey MaKey invention kits and Scratch programming, this workshop helps teachers both understand the engineering design process as well as understanding how to teach it in the context of the middle school classroom. Teachers will learn to help kids creatively design an interactive game/book through multiples iterations and within the constraints and requirements of the project.

Habits of Mind

This workshop focuses on the following engineering habits of mind: creativity, collaboration and communication (NAE/NRC, 2009). The participants’ creativity will be tested as they are tasked with a design challenge that is open-ended and has few restrictions. This creativity is both physical, as they manipulate objects with the MaKey

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MaKey kits and technological, as they write code using Scratch programming. In order to complete the MaKey MaKey design challenge, participants will work in small groups of three or four. Teamwork, communication and collaboration are also essential for this engineering activity. The importance of teamwork will be addressed in the workshop as participants work through the design challenge and is specifically addressed in each of the activities.

Engineering Practices

With the Next Generation Science Standards, engineering practices play an important role in how engineering is taught at the K-12 level (Achieve, 2013). While all of the practices are important, this workshop and accompanying class activities focus on defining problems, designing solutions, engaging in argument from evidence, and obtaining evaluating and communicating information. The “MaKey MaKey Design Challenge” requires students to first define the problem/need and then move through the iterative design process to design the optimal solution for an interactive game/book. Throughout the design process, students are challenged to communicate and evaluate evidence in both small groups and as a whole class to work through challenges and improve their design.

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):

If K-12 engineering education is to be as successful as many claim, we must specifically work to engage and build interest in all students, particularly underrepresented populations. This workshop aims to engage and establish relevancy with a diverse middle school population. As the learning goal states above, participants are specifically exposed to ideas and strategies as well as being engaged in discussion on how to embed technology that draws on the interests, prior experience and Funds of Knowledge of the students. Specifically, this workshop provides strategies and resources for first understanding the community and family knowledge of student and to then using this knowledge to modify and adapt the activities to build on the students strengths, and meet their wants and needs (Moll, Amanti, Neff & Gonzalez, 1992). Finally, the unrestricted

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and open-ended nature of the final design challenge, promotes student choice and ownership of the learning for all students.

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:

This workshop requires the use of several interactive websites (<http://makeymakey.com>, <http://makeymakey.com/piano/>, & <http://scratch.mit.edu>)

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:

20

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.”

Internet Connections

Reminder:

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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:

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