

United States/United Kingdom (US/UK) Design, Engineering and Technology Collaborative Initiative

Context

- The collaborative efforts of US and UK colleagues have continued regularly since first initiated in the mid 1980's to share materials, products, approaches and strategies to improve classroom teaching and learning practices.
- This Team worked to help teachers use a simple design and problem solving (D&PS) approach that could evolve and deliver age-appropriate "design, engineering and technology" (DE&T) learning activities for children.
- The Team members helped establish and publish TIES Magazine, a pro-active journal that reached some 30,000 educators nationally and internationally and made DE&T approaches practical and valued in teaching and learning.
- The above efforts lead to four National Science Foundation (NSF) grants for preparing "teams of trainers" to help K-6 grade teachers provide DE&T activities for their pupils that resulted in improving science & math test scores.
- The NSF projects helped establish the Children's Engineering (CE) initiative in Virginia (still growing as it approaches its 25th anniversary) and now reaching some 3,000 elementary classroom teachers.
- The above work for grades K-6 informed successful DE&T experiences for grades 7-12, developed with funding and support from the NJSED Workforce Excellence Project and the NYSED *Engineers of the Future* project.

Action

- Starting in its initial phase of work, the US/UK Team helped establish pilot activities and programs in elementary classrooms that served as models for other teachers and schools, an effort that the US/UK Team still pursues.
- The Team initiated ongoing efforts of reviewing past materials and products and vetting current products that support DE&T teaching and learning with the expressed purpose of meeting identified instructional goals & needs.
- The Team established a multi-pronged approach in professional development (PD) training, materials development and revision, and curricular improvement through "planning for progression" to enhance teaching and learning.
- By invitation, the US/UK Team presented and discussed its elementary DE&T program with the Next Generation Science Standards (NGSS) "working group" of the National Academy of Engineers/National Academy of Scientists.
- In 2016 these efforts culminated in the formal linking of the US/UK Collaborative Initiative with the ITEEA and its *Engineering by Design (EbD)* program to enhance and integrate STEM teaching and learning.

Results

- Provided evidence of the efficacy of a "Teachers Training Teachers" program that helps elementary teacher use D&PS/DE&T activities that integrate STEM and provides practical instances that put science and math to work.
- Showed K-6 teachers would adopt and extend a D&PS approach to engage young children in engineering thinking and technology practices that could stage and enhance math and science applications represented in the NGSS.

- Provided examples of growing (a) acceptance of DE&T by secondary school TE teachers, (b) awareness of the potential of T&E for integrating STEM subjects; and (c) potential for DE&T to represent and deliver the NGSS.
- Collaborate with corporations to use, review, improve and share their DE&T *products*, such as PTC's (Parametric Technology Corporation) *Pro-Engineering*, Redfern Electronics' *Crumble*, and TeacherGeek's *TeacherGeek system*.

Upcoming Goals

- Plan for and train a Next Generation of Trainer Teams to be piloted in VA (that would include CE and *EbD* trainers) and then trialed in selected of the 30 other states now implementing *EbD* and Maker Education programs.
- Develop “plans of progression” thru which teachers and students will reach higher levels of knowledge and skills in DE&T practice, Maker Education and STEM teaching and learning.
- Continue developing new materials and redesigning DE&T products and materials that attend to identify instructional goals and that have potential for improving STEM/STEAM and Maker Education programs.
- Develop plans to establish collaborative initiatives and programs with Maker Education colleagues.
- Develop supplemental web-based learning resources such as tutorials and mini lessons on applications of science and math, practical skill development, and how to “teach” science and math concepts through DE&T activities.
- Present at conferences and provide workshops on DE&T and integrated STEM learning.
- Build acceptance for the DE&T approach as essential learning for all students, especially the importance of risk-taking, experiencing and learning from failure in their DE&T activities.