

A Review of the 2012 International STEM in Education Conference

The second Science, Technology, Engineering, and Mathematics (STEM) in Education Conference, held in Beijing from 24 to 27 November, 2012, was to build upon the success of the inaugural STEM2010 conference and create opportunities for educators and researchers from schools, universities, businesses, industries and other private and public agencies to share and discuss their innovative practices and research initiatives that may advance STEM education. Centering around the primary theme of Instructional Innovations and Interdisciplinary Research in STEM Education, the 2012 STEM Conference was intentionally devoted to promote vibrant and extensive sharing of ideas and instructional experiences across the capstone community, through interactive workshop and Showcase, long and short paper sessions, short courses, and poster sessions. This editorial shares the conference planning, structure, and prospects. The subsequent eight papers in this issue document some of the outcomes of the conference, highlighting best papers and selected panel discussions.

1. Introduction

The objective of the second Science, Technology, Engineering, and Mathematics (STEM) in Education Conference was to build an academic community of STEM educators in the world, share best practices, develop and evaluate methods to improve STEM education. The 2nd International STEM in Education Conference was held from 24 to 27 November, 2012 in Beijing Normal University, Beijing, China, with a primary theme of *Instructional Innovations and Interdisciplinary Research in STEM Education*. Specific conference information, including the complete conference program and the proceedings are available at the STEM2012 conference website (<http://stem2012.bnu.edu.cn/>).

The STEM-based curriculum provides students with interdisciplinary learning experiences between the school subjects of science, technology, engineering and mathematics. The International Conference of STEM 2012 in Education creates opportunities for educators and researchers from schools, universities, businesses, industries and other private and public agencies to share and discuss their innovative practices and research initiatives that may advance STEM education. And the Conference was contributed by scholars/academics, teachers (including primary, middle and high school teachers), education officers, industry partners, graduated students, and others interested in the STEM agenda.

The selected papers in this special issue represent the best of all the accepted papers based on the two-phase review from the conference committees. In addition, these papers represent a cross-section of topics related to STEM instruction and related researches, including female students' interactions in middle school engineering project, a cross-curricular approach to STEM, network educational games, STEM-talented students into teacher education programs, science teachers' teaching in Kenya, pre-service teacher conceptual change, and augmented reality 3D technique application in a physics course.

2. Conference development and design

The initial conference was held at Queensland University of Technology in 2010, and the second conference was held at Beijing Normal University in 2012. The STEM conference will be held every two years by four Pacific Rim university partners (i.e., QUT, BNU, UBC, and the fourth partner TBA). The International STEM Education conference is a biennial event and hosting this event will be rotated around the above four partners. The STEM conference main topics of interest include: the innovative methods and models for teaching in STEM; innovation in STEM Research; instrument and equipment development for transdisciplinary integration in STEM; problem solving and innovation in STEM Education; transformation in educational practices through STEM; STEM education of sustainable development; interdisciplinary approaches to popular science education; innovation and practice of STEM instruction STEM; learning science for STEM education; curriculum theory and development in STEM; educational philosophy and theory about STEM; educational policy, leadership and management for STEM; rural education, special education for STEM; educational technology in STEM; teacher education and professional development and training in STEM; comparative STEM Education; and pre-service teaching training in STEM. The mission of

the STEM conference is to promote the sharing of knowledge in the STEM education fields; to create International collaborations for the advancement of STEM education; endeavors in STEM education and so on. Furthermore, the conference also created opportunities for: information and knowledge sharing through paper/poster presentations, symposia, workshops, and innovative showcases; modeling effective pedagogical practices while enhancing content knowledge; sharing research initiatives and outcomes; professional development for educators in a range of educational contexts; and networking between participants.

3. Conference structure

The 2012 STEM Conference contained many of the standard conference components, such as keynote speeches, academic paper presentations, workshops/innovative showcases and poster sessions. All of the submitted papers underwent a thorough double-blind peer review. Workshops and showcases provided a highly interactive platform in order to facilitate all the audiences in discussion and interaction than typically academic conferences. Those sessions included:

1. Science Fiction: Preparing the Way for Scientists of the Future,
2. LEGO Robotics Instruction Workshop (Beginner, Intermediate, Advanced),
3. KIDS' S.T.E.M. CONVENTION: Inspiration/ Investigation/Celebration,
4. 21st Century Framework for Science Teacher Preparation: Using modern technologies to affect science teaching and learning,
5. Integrated STEM Teacher Professional Development,
6. Measure Resistance by a USB Sound Card Cost Only 3 Dollar,
7. The Computer Graphics Teaching Practice and Innovation,
8. PHYSCLIPS: Multimedia Resources for Learning and Teaching Physics,
9. How Digital Technologies in Australian Schools Promote and Develop,
10. 21st Century Skills across the STEM Disciplines,
11. Teaching Calculus in a Flipping Way, and
12. BNU Instructional Innovations Workshop.

During the Conference, there are altogether 8 parallel sessions for 34 long papers, 19 short papers, 13 workshops, 3 innovative showcases and 9 poster papers to present. We aimed at providing sufficient time and opportunity for each author to present and for all participants to communicate and discuss. All the papers included in this proceedings volume were produced after a highly selective review, which represent the status of the most advanced research in STEM education. These papers covered the full range of the conference topics, i.e. Innovative Methods and Models for Teaching in STEM, Innovation in STEM Research, Instrument and Equipment Development for Transdisciplinary Integration in STEM and Problem Solving and Innovation in STEM Education.

4. Conference attendance

The 2012 STEM Conference participants were from all the 5 continents, 20 countries, representing a great number of internationally influential institutions, which has made the conference truly grand in scope and prolific in content. About 200 participants from all over the world got together in Beijing Normal University, shared researches, exchanged ideas, enhanced cooperation and cultivated friendship. Most attendees gave positive feedback about the conference.

5. Conference prospects

The next STEM2014 conference will be held at UBC Vancouver campus from July 12 to 15, 2014. (Web address: <http://pdce.educ.ubc.ca/stem-2014-conference/>) The University of British Columbia is located in beautiful Vancouver, BC Canada. The conference theme will be "STEM Education and Our Planet: Making Connections Across Contexts". In addition, four STEM Pacific Rim university partners (i.e., BNU, QUT, UBC, and the fourth partner TBA) will plan to set up the International STEM Education Association (ISEA) in the near future. Our long-term goal is to cultivate a social network of STEM educators and scholars through continued collaboration, and information dissemination of best practices. Finally, we hope more and more people concern regarding the STEM educational issue.

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