

Guest Editorial II

Connecting Informal and Formal STEM Education in STEM2016

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The 4th International STEM Education Conference was held successfully in Beijing Normal University on October 26–28, 2016. The first International STEM Education Conference was held at Queensland University of Technology in Australia and then the conference was held by partner universities in Asia-Pacific areas biennially. Currently, the application of science, technology, engineering and mathematics in education is gaining momentum, and consequently STEM education application has been widely studied. During 2010 and 2014, three sessions have been held successfully in Queensland University of Technology, Beijing Normal University and University of British Columbia respectively and they are widely acclaimed. The 4th International STEM Education Conference is held jointly by seven universities from Canada, China and Australia with the venue set in Beijing Normal University.

This year, four new members including University of Calgary, University of Sydney, Northeast Normal University and Southwest University joined the conference, which added new impetus in building a solid foundation for the establishment of the academic community. Hopefully, we can establish an International STEM Education Association (ISEA), expand the international influence of STEM conference, improve the service quality of the academic community, further deepen mutual exchanges and cooperation among members and jointly promote further STEM research and development.

The topic “Connecting Informal and Formal Education of STEM” this year aims to accelerate the communication of educators and researchers across the world on STEM teaching practice and research plan, and provide an academic platform for STEM education experts to exchange, communicate, cooperate and share research achievements, progress, innovation ideas and system development experiences. This conference is undertaken by School of Educational Technology of Faculty of Education of Beijing Normal University, and we feel honored to invite about 200 representatives from 15 countries and regions in five continents, representing the top level of STEM academic research.

The 4th International STEM Education Conference contained a series of wonderful academic reports and interactive exhibitions, such as keynote speeches, academic paper presentations, workshops, innovative showcases and poster sessions. All the submitted papers underwent a thorough double-blind peer review. Workshops and showcases provided an interactive platform to facilitate all the audiences in sharing and communication. The conference session included:

1. Maker culture and STEM education.
2. Technology development in STEM education.
3. Innovation in STEM research.
4. Transformation in educational practices through STEM.
5. STEM education of sustainable development.
6. Interdisciplinary approaches to popular science education.
7. Innovation and practice of STEM instruction.
8. Learning science for STEM education.
9. Curriculum theory, development and assessment in STEM.
10. STEM education in informal learning.
11. Educational policy, leadership and management for STEM.
12. Rural education, special education for STEM.
13. Teacher education and professional development and training in STEM.
14. Other related STEM topics.

During the Conference, there are four famous keynote speakers and sixty-eight presenters to share their STEM education researches. These conference papers focused on some important issues in STEM education, such as ICT in STEM education, students STEM Career, STEM pre- and in service teacher education and training, instructional design and practice in STEM education, theory of STEM education, instructional experiences and assessment in STEM education. More specific conference information, including the complete conference program and the proceedings is available at the STEM2016 conference website (<http://stem.bnu.edu.cn/>).

After strict reviewing and voting, we selected two papers of primary and middle school teachers group and 8 papers as the outstanding papers of the 4th international STEM in education conference. Only five outstanding papers are published in this special issue of the IJEE, including 1. *Effects of Hands-on Inquiry Based Learning Using LEGO® Materials on the Learning of Eighth-Grade Physics Students*; 2. *The Study of Teaching Mode in Building Blocks Based on K'NEX*; 3. *Contextualized Science Teaching and Student Performance: The Case of a Kenyan Girls Science Class*; 4. *The Teaching Case Design of STEM Based on the Environment of Combining Museum and School—Water Resources Project*; 5. *Boundary Play and Pivots in Public Computation: New Directions in Integrated STEM Education*

A review of the STEM2016 reveals that more and more scholars pay close attention to five research topics, listed as follows:

1. Interdisciplinary educational design and activities. Interdisciplinary educational design is one of the STEM core elements. Researchers try to design relative learning activities in the real-life problem situation, encourage students to learn by doing and to construct knowledge by themselves.
2. Academic broker role in K-12 school. [1] pointed out the concept of academic broker in STEM2016. They consider that it's a paramount role to connect the different teachers of different subjects in K-12 school.
3. Gender, STEM vocational attitudes, career development, occupational choice. Children are the world future and more and more scholars focus on K-12 students' vocational attitudes, interest in STEM content and careers [2–4]. These studies pointed out that STEM education should be taught from K-12 so that it will take root in students' learning processes and their STEM careers in the future will be better facilitated.
4. ICT-assisted STEM education. Some researchers design and develop softwares and hardwares to enrich STEM instruction, such as science explore platform, STEM APP, STEM educational game and so on, in order to support students' knowledge building [5].
5. STEM teacher education and in-service training. Some universities design and establish the STEM program and promote the STEM teacher education, or hold the STEM workshop to help in-service teacher to understand STEM education.

In addition, the researchers in STEM education are focusing more and more attention on connecting informal and formal STEM education. The International STEM Education Conference is an opportunity for educators and researchers from schools, universities, colleges, businesses, industries and other private and public agencies to share and discuss their innovative practices and research initiatives that may advance STEM education. In this conference, we also continue to promote the establishment of International STEM Education Association (ISEA) and the secretariat shall be set in Beijing. ISEA will hold the conference every two years and the symposium annually. The University of Calgary will hold the STEM symposium in 2017.

References

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