E·A·S·E
East-Asian Association for Science Education

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Season's greeting

From Editor-in-Chief of EASE Newsletter

On behalf of the editorial board of the EASE newsletter, I deliver sincere gratitude to all of the EASE members and the readers of the newsletter. I wish all of you a happy and wondrous new year! EASE Newsletter is a quarterly magazine, which deals with a variety of issues in East-Asian regions. The editorial board is composed of one editor-in-chief and five editors as representatives of each region. Each editor collects and edits the articles to share and takes a main editor role in turn. In spite of devotions and efforts of each editor, I believe that there should be a channel to speak out the voices of readers. In fact, you can give your own opinions about the articles, introduce interesting information to share other readers, or suggest good ideas for the improvement of the newsletter.

We are ready to listen to your voice for the robust network and intimate friendship in science education communities of East-Asian regions. Any questions or comments are welcome at any times. Please send an e-mail to me (hjho80@dankook.ac.kr) or other regional editors. Your interest in and contribution to the newsletter can make the world better!

STEAM R&E festival in Korea

Research presentations and competitions of high school students' STEAM project

STEAM R&E Festival was successfully held at National Science Museum, Gwacheon, Korea, 26 November 2016. This is the fifth year of STEAM R&E project and 609 proposals submitted for this and only 130 teams have got acceptance of their proposal and got financial funding by Korea Foundation for the Advancement of Science and Creativity. All of 130 teams started their own researches on last May and finished November. From this year, general high schools were able to make research proposals. Until the last year only science high school, gifted school and science focus school allowed to submit proposals. Therefore 44 teams from general high schools had chance to conduct their own research to solve their questions. In order to support this six-month project, special support team was established and organized the all the sequences of the STEAM R&E project. (Detailed in Page 2)

Upcoming conferences

February 9-11 **The 71st International Conference on KASE** in Seoul, Korea
July 8-11 **International Conference on EISTA 2017** in Orlando, USA
(Detailed in Page 14)

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• **Publisher**
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STEAM R&E Festival in Korea:

Research presentations and competitions of high school students' STEAM project

Yohan Hwang
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Online consulting was conducted during August in 2016. Each team reported their research updates and problem which they confront and professional scientist and science educators provided their suggestions and comments for the project team by email. Intermediate evaluation was held at September. Each project team prepared their oral presentation to present and explain their research progress to evaluators. The purpose of the intermediate evaluation was to provide effective feedback for the team to make better research progress by themselves. The students' satisfaction with the intermediate evaluation was very positive. The highlight of the STEAM R&E project was the festival. All teams presented their research with poster presentation. More than eight hundred people including team member students, teachers, and public participated in this festival. In the festival, students' research presentations, exhibitions related to science experiments, drones experience, and workshop for next year STEAM R&E project applicant. Especially, the topic of the workshop focused in research ethics and research design guideline. The participants' satisfaction with the festival was very positive too.

The 2017 STEAM R&E project submission will open at next March, check the Korea Foundation for the Advancement of Science and Creativity (KOFAC) website if your students have a research question in the context of STEAM

Introduction to
China's High School Curriculum Standards Revision of Physics, Chemistry, and Biology

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Introduction

In 2010, the government released a policy document entitled, Outline of China's National Plan for Medium and Long-Term Education Reform and Development (2010-2020), providing an outline of educational reform and development in China. Within a few years, a new plan for K-16 education, including reforms in grade 10-12 curriculum and national exams for higher education (also known as tertiary education, grade 13-16), has been developed.

Based on this plan, every applicant for higher education will take national exams in six subjects. Three of them, Chinese, Mathematics and Foreign Language, are predetermined. Students can choose the other three subjects based on their interest and the requirements of university that they want to apply for. Each university will declare their requirements for applicants about the subject before the national exams. For example, a medical university would prefer to ask its applicants to take biology test in the national exams, whereas an art college would not.

Align with this plan, a new round of revision of the curriculum standards for senior secondary school was officially launched in 2014 (Ministry of Education, P. R. China, 2014). The key concept of this revision is the **core competences** for students' development. The following is the introduction to Physics, Chemistry, and Biology curriculum standards revision.

Physics

The physics core competences, which are the essential characters and key abilities that students form through physics education consist of four dimensions: *big idea of physics, scientific thinking, scientific inquiry, scientific attitude and responsibility* (Figure 1). The physics core competences organize objectives of the upcoming high school physics standards.

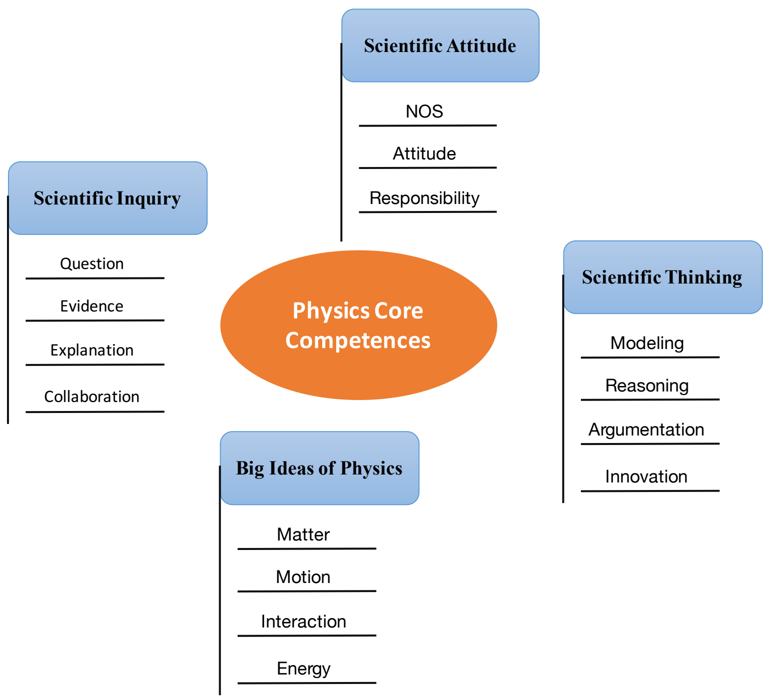


Figure 1. The physics core competences

From Figure 1, we can see that the idea of core competences offered space for interpretation with perspectives of individual subject, which changed the original situation that all subjects' objectives have to be arranged into the same three dimensions. As a consequence, the objectives of physics curriculum standards have the opportunity to be developed and structured purely according to the nature of physics and physics learning. This means that the revised high school curriculum standards have the potential to bring the real physics learning back to the physics classroom.

The big ideas of physics are fundamental conceptual understanding from the perspective of physics. It is a generalization and sublimation of physics facts, concepts and theories. The big ideas of physics were grouped into four: matter, energy, motion, interaction. They settled the conceptual foundation of how to explain natural phenomena and solve real problems. **Scientific thinking** is the cognitive methods of knowing objects' natural character, interrelation, and inherent mechanism. In the view of physics, it is an internalization of the process of questioning, criticizing, modeling, testifying, amending, and putting forward innovative ideas. Scientific thinking includes the following main components: scientific modeling, scientific reasoning, scientific argumentation and innovation. **Scientific inquiry** refers to the ability to ask scientific questions, to present conjectures and hypotheses, to design investigation plan and experiments, to obtain and analyze data, to construct explanations based on evidence, to communicate, evaluate, and reflect the process and result of scientific investigation. **Scientific attitude** covers the positive attitude toward and about science and the responsibility during exploring and applying science. The cultivation of above attitude and responsibility are based on an understanding the nature of science and the relationship between science, technology, society and environment.

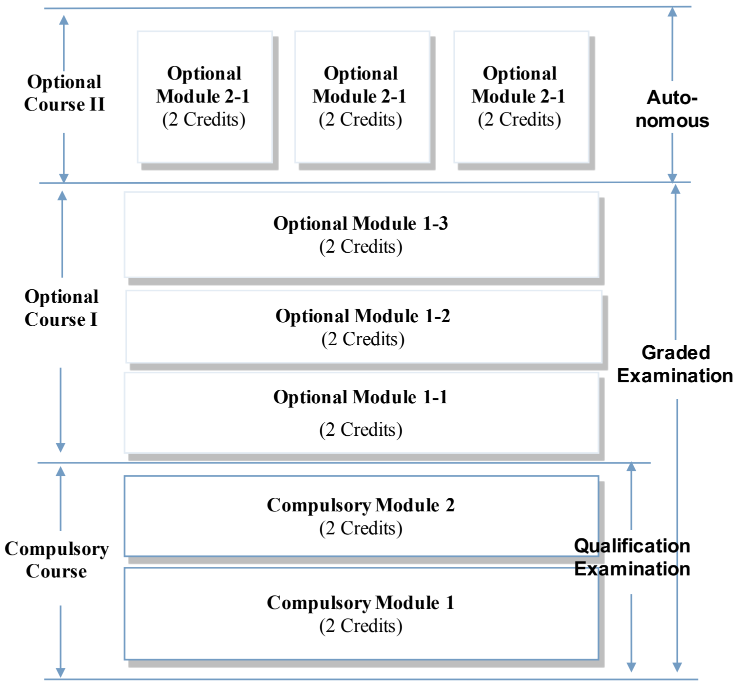


Figure 2. Structure of high school physics course

The content of the upcoming physics standards is organized by a module-span approach (Figure 2). The revision team arranged specific content standards into each module. When zooming into the detail level of the upcoming physics curriculum standards, two trends of content representation can be clearly found: output-oriented and integrated. We take comparable representations with respect to the same content (Table 1) from the upcoming standards and the High School Physics Curriculum Standards (2003) as an example to illuminate how the revision team strives to develop the output-oriented and integrated content standards. In this instance, the revised standard integrated the content knowledge (the particle model, conditions that an object can be viewed as a particle), scientific thinking (the thinking method when constructing a physical model) and nature of science (physical models' function in exploring nature) into a scientific practice - constructing a model. Besides that, the revised standard is closer to an instructive output-oriented performance expectation compared to the old one.

Table 1. An example of the content representation in the upcoming standards and in the current standards

The upcoming high school physics curriculum standards	**(Students are expected to)** engage in the process of constructing a particle model, to understand the meaning of particle and know the conditions that an object can be viewed as a particle; can abstract an object in real context meeting above conditions as a particle model; realize the thinking method when constructing a physical model, and recognize physical models' function in exploring nature. **Example:** To experience the significance of physical models in physics research through studying the particle model, the big bang model or the material microstructure model etc.
High School Physics Curriculum Standards (2003)	**(Students are expected to)** recognize the character of physical models in physics research and experience physical models' function in exploring nature, through the knowledge about the particle model. **Example:** To recognize in what conditions that an object can be viewed as particle.

If there is something more important than the design, it must be the implementation of that design. What kind of physics class has the potential to meet the requirement of developing students' core competences? The upcoming physics standard offered four suggestions to the instruction aiming at facilitating students fulfill their potentials in physics: (1) Determine the goal and content of instruction according to the core competences of physics. (2) Pay attention to the situation establishment in instructional design and teaching practice. (3) Focus on improving the inquiry ability and cultivating scientific attitude and scientific spirit. (4) Help student achieve the physics core competences through the process of problem solving.

To promote an educational process, a matched assessment system examining and diagnosing the learning outcome is of vital importance. To guide the design of a matched assessment system, the physics curriculum standards clearly delineate the progression levels for the assessment developer and other users. 5 progression levels are hypothesized to cover the students' potential performance after study and are designed to link to three different kinds of assessment (Table 2). In addition, the upcoming standards provide progression levels for the four dimensions of core competences, which are the so-called levels of core competences. The levels of core competences can be used informative assessment, instructional design, etc.

Table 2. Performance level and its linkage to course types and examination types

Level	Performance	Course	Examination
Level 1	Students in level one can …	Compulsory Course	Qualification Examination
Level 2	Students in level two can …		
Level 3	Students in level three can …	Optional Course I	Graded Examination
Level 4	Students in level four can …		
Level 5	Students in level five can …	Optional Course II	Autonomous Examination

On scientific research, China has been recently ranked as the No.1 country in Asia-Pacific according to the Nature index (2016). The Chinese Academy of Sciences (CAS) is playing a leading role at the rank of top institutions in physical science, and the institutions from China occupied 3 positions of the top 20 (Nature index, 2016). Considering the brain-drain situation in China, above achievements give credits to the physics education in China. This, with no doubt, is the success of the millions of physics teachers and also related to the entirely reform of China's education–China's physics education is rapidly developing from the top design and bottom practice. However, to many people, how the physics education currently is progressing in developing countries like China is still a mystery (Martin & Siry, 2011). The upcoming high school physics curriculum standard, which has concentrated the accumulation and latest results of China's physics education research, provide a window for observing the development of physics education in China. In addition, the rank in Nature index and the score in PISA provide Chinese physics educator the confidence to hope that the introduction of our upcoming high school physics standards can offer the international science education community an eastern perspective about physics education, which will benefit the whole world.

Chemistry

The ongoing revision of the High School Chemistry Curriculum Standards proposes Chemistry core competence in terms of curriculum objectives, and curriculum content as the basis for the selection and evaluation; in terms of course structure, to meet the diverse needs of student development, set up compulsory and elective courses. Compared with the previous version of the High School Curriculum Standards (2012), it shows the following outstanding features.

1. Optimize the course structure and improve the adaptability and flexibility of curriculum

High school chemistry curriculum consists of compulsory, elective I and elective II three courses. Compulsory courses are what all students must attend and they are the common basis of high school students' development. Compulsory courses (4 credits) are including "Chemical Science and Experimental Inquiry", "Common Inorganic and Its Applications", "Basic Structure of Matter and Chemical Reactions Laws", "Simple Organic Compounds and Its Applications", "Chemistry and Social Development" altogether five themes.

Elective courses I are courses students choose to attend according to individual needs and requirements of the entrance examination and they set three modules, which are "Chemical Reaction Principle", "Structure and Properties of Matter", and "The Basis of Organic Chemistry", 2 credits per module, 6 credits altogether.

Elective courses II are courses students choose to attend and for students who have different interests and different needs for chemical disciplines. Elective II set three open series, which are "Experimental Chemistry", "Chemistry and Society", and "Development of Chemical Sciences", 9 hours to complete each practice, achieving 0.5 credits, up to 4 credits.

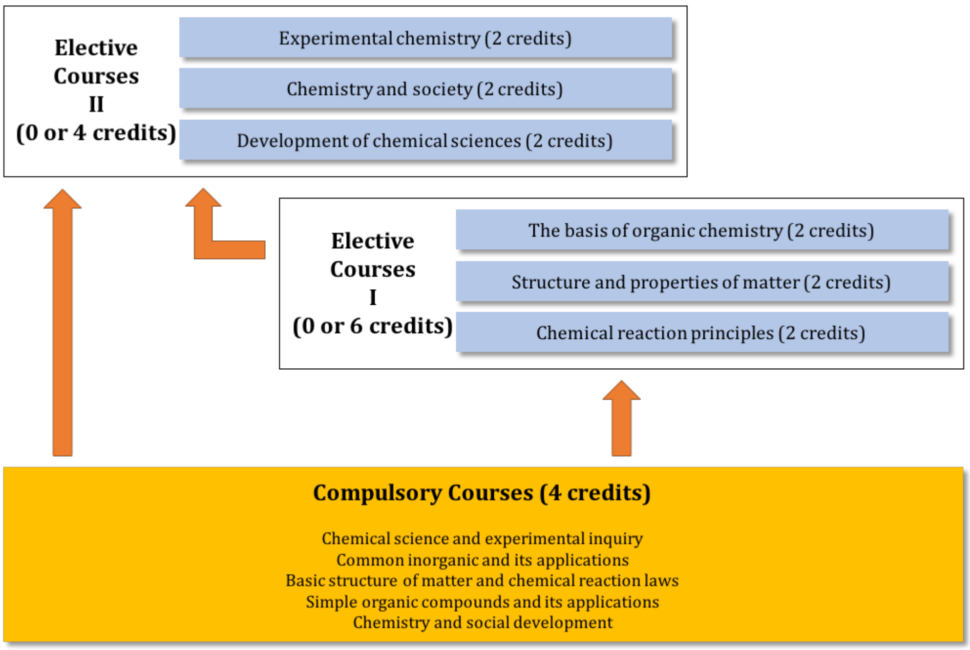


Figure 3. The structure of high school chemistry curriculum

All high school students must attend 4 credits compulsory chemistry courses. Qualified academic proficiency test is based on compulsory courses. Those who select College Admissions chemistry in the total score of academic proficiency test need to attend all three modules in elective courses I to obtain six credits. Elective II are for students to choose to attend freely, granting 0-4 credits.

2. The establishment of student core competence development-oriented curriculum

High school chemistry core competence is an important part for students to develop core competence. Students should have a complete picture of the nature of the chemistry including its key competencies and essential character. Specifically, the study of high school chemistry curriculum can help students from five major aspects of chemistry core competence:

Chemistry Core Competence	Content
Macroscopic and microscopic identification and combination	Understanding the composition, structure, properties and material changes from a combination of macro and micro perspective, and forming the concept of "structure determines the nature".
Perceptions on chemical changes and equilibrium	Understanding chemistry changes and the law of chemical reactions from material change, energy conversion, reaction conditions and the limits of different angles from a dynamic perspective.
Evidence reasoning and model understanding	Presenting possible assumption to prove or disprove by reasoning based on evidence; using models to explain chemical phenomena, revealing phenomena and laws of nature.
Scientific inquiry and innovation	Discover and explore the value of questions, starting from the problem and assumptions to determine the purpose of exploring, exploring design programs, scientific inquiry; good cooperation, dared to question, to be creative.
Scientific spirit and social responsibility	Maintaining a rigorous and realistic scientific attitude and appreciation contribution of chemistry to social development, having awareness of sustainable development and green chemistry concepts, and making the right value judgments to the chemical-related social hot issues.

3. Recommendations for construction of "competence development-oriented" curriculum implementation

The five aspects of chemistry core competence above are the foundation not only to select and organize course content but also to set academic requirements and quality standards basis. First, for selecting the content, highlight the commanding role of the big ideas to promote the transformation of knowledge and ability to competence.

Second, establish competence development-oriented academic quality standards. Each core competence in standards is divided into 4 levels; each content topics set specific academic requirements; for the two stages of required I and elective courses, each sets their own academic quality requirements of 4 levels.

Third, in the compulsory curriculum, for the status quo of the teaching practice that does not pay attention to student experiments, ensuring 10 required experiments; for each compulsory and elective topic, having a selection of some of the recommendations of learning activities, including experimental activities, investigation and discussions and exchange; strengthening the cultivation of students' experimental and practical ability.

Fourth, provide strategic advice and creative suggestions on the topic of teaching, and learning environment to improve the teaching practice of specific guidance.

Biology

Biology curriculum for Grade 10-12 students consists of three parts, including compulsory course, optional course I and II. The compulsory course, on which students are required to spend 4 credit hours (1 credit hour represents 18 class hours), is developed for all enrolled into senior high school. The optional course I is required only for those who want to enter into a university that asks its applicants to take the biology test in national exams. It will take 6 credit hours to learn the optional biology course I. The optional course II can be chose by any student who are interested in biology, no matter whether he/she chose the optional course I or not. The maximum credit hours spending on the optional course II is 6. However, it is also allowed for a student to take neither the optional course I nor II.

Now, the national biology curriculum and its standards are being developed by a panel, including biologists, biological educational researchers, and high school biology teachers. Both the compulsory and optional course I have been designed by this panel at the national level. And suggestions and recommendations will also be given for the local governments and schools to design and teach the optional course II to meet their student's needs by using local biological resources. During the designing process of grade 10-12 biology curriculum, conceptual understanding about the biological big idea is emphasized and integrated into the content standards, as well as into the suggestions for teaching and learning. Taking the grade 7-9 biology curriculum standards and grade 1-6 science curriculum standards with the same principle of focusing on biological big idea into consideration, the progression of learning biological conceptions from grade 1-12 will be established.

Latest News of Curriculum Reform in Japan

Takuya Matsuura
Professor, Hiroshima University, Japan

Japanese Ministry of Education, Culture, Sports, Science and Technology (MEXT) is now building the new course of study (curriculum) for elementary school and lower secondary school and it will be released by the end of March 2017. So, the Central Education Council of Japan will soon report the policy and framework for new Japanese course of study that emphasize cultivating students' abilities through teaching each subject. One of the feature of this curriculum reform is "a way of looking and thinking" of each subject. These have been considered before committee argue the contents of each subjects. On the other hand, the volume of lesson time of each subjects is not so different from present framework (ex. Science: 3rd Grade; 90 hours per year, 4th Grade; 105, 5th Grade; 105, 6th Grade; 105, 7th Grade; 105, 8th Grade; 140, 9th Grade; 140).

Additionally, the new course of study (curriculum) for senior secondary school will be released by the end of March 2018. Basically, the framework of subjects for science are not so different from present one, but MEXT will construct the new selective subject that we call "Research in Science and Mathematics" that apply the ability and knowledge which learn in Science and Mathematics lesson. These trends are also concerned with the University's entrance examination reform, so next curriculum reform in Japan include the big qualitative change.

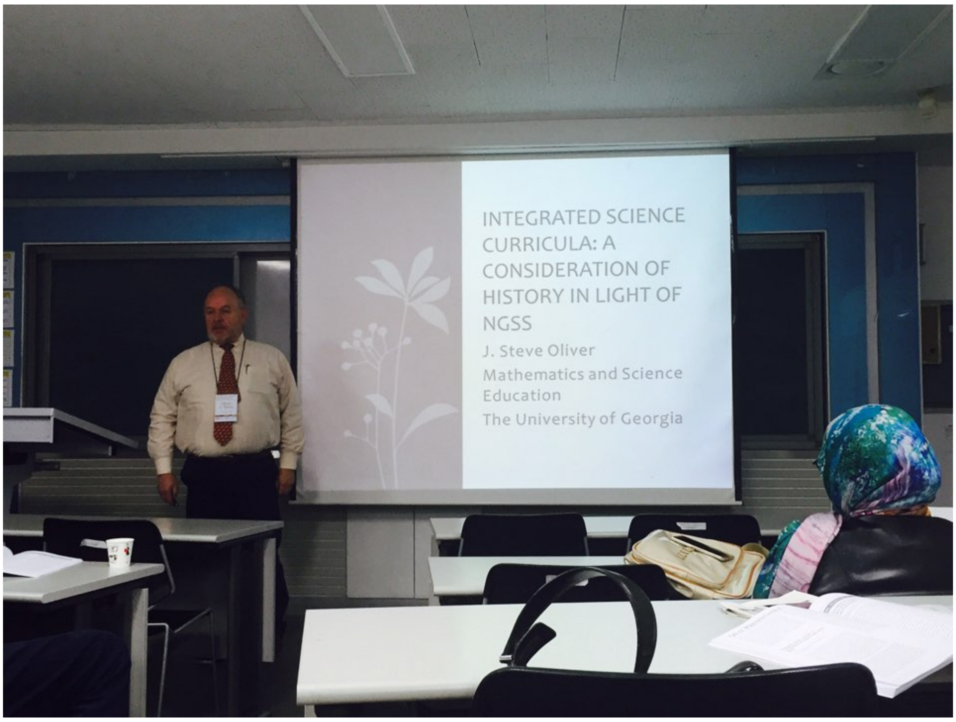
Memories of Asia HPST Conference

My travels to Asia and South Korea

J Steve Oliver
Professor, The University of Georgia, USA

On December 11, 2016, I flew to South Korea to give a seminar at Ewha Woman's University and to attend the ASIA – HPST (History and Philosophy of Science in Science Teaching Conference) at Pusan National University. My travels to Asia and South Korea, specifically, have been happening with regularity over the past few years. During this time, I have developed a deep appreciation of the vibrant science education scholarly culture in South Korea and other Asian countries. My travels are made easier by the fact that I can take a direct flight from Atlanta to Incheon-Seoul on Korean Air.

I decided to submit a paper to the ASIA - HPST conference for several reasons. The HPST conference has been a place at which I have learned a great deal about historical and philosophical issues in science education since the very first HPST conference at Florida State University in 1989. At the ASIA HPST in Pusan, only Michael Matthews and I could claim the distinction of having been at that very first conference. Second, I teach a doctoral course on the history of science education at the University of Georgia (USA) and presentations at conferences serve as a way to help me prepare for future activities like teaching. Not only do I learn a great deal, but I also have to focus on the substance of the presentation I am going to give. At this conference, for instance, one of the keynote speakers (Dr. Darrell Rowbottom) helped me to understand connections between the scholarship of Thomas Kuhn (The Structure of Scientific Revolutions) and Joseph Schwab (The Teaching of Science as Enquiry). Preparing for my own presentation facilitated my exploration of historical science education articles that describe prior attempts to create and implement integrated science curricula. Unfortunately, this history is not one that has many models of success as we move forward.



The EASE conference has also provided me with an important venue through which to meet, learn from and present my efforts in scholarship to science education colleagues. My first experience with EASE came in 2011 at Chosun University in Gwangju, South Korea. I followed this with attendance at EASE in Beijing in 2015 and Tokyo in August of 2016. Dr. Soonhye Park and I have been constructing a manuscript that describes a mechanism for how PCK (pedagogical content knowledge) changes. Soonhye likes to refer to this paper as "the PCK conceptual paper." By submitting this paper for presentation at EASE in Tokyo, we were able to gain valuable feedback to help us judge the clarity of our ideas as well as their potential value. On this trip to South Korea, I was offered the opportunity to give a seminar to the science education faculty and students at Ewha Woman's University. Many of my science education colleagues at Ewha are working on scholarship related to PCK and so I decided to again present the "conceptual paper" to them. In the three months between EASE-Tokyo and the seminar at Ewha, Soonhye and I had revised our ideas and I felt that a new round of feedback would be useful and (again) clarifying. And this was certainly the case. Many questions were asked and clarifications were offered. This discussion will result in improvements to the manuscript which will be submitted for publication in the near future.

Introduction of Journal in East-Asian regions

The Chines Journal of Science Education (CJSE)

The Chinese Journal of Science Education (CJSE) is an official publication of the Association of Science Education in Taiwan (ASET). Since 1998, ASET has been a professional organization of science education teachers and researchers in Taiwan. CJSE was first published in 1993 and has been indexed in the TSSCI (Taiwanese Social Science Citation Index) since 2008. Until September 2016, a total of 24 volumes and 101 issues has been published in CJSE. CJSE is one of the most important journals for Taiwanese science educators.

Currently CJSE publishes four issues every year, with an average of about 16 articles annually. We welcome researchers and graduate students to submit your studies for publication in CJSE. We accept articles in either Chinese or in English in the discipline of science education, mathematics education, e-learning, medical and nursing education, environmental education, energy education, and etc. For English submission, please go to http://aspers.airiti.com/CJSE/WebHome.aspx. Please scan QR code to bring you to the CJSE website.

Upcoming conferences

The 71st General Meeting and International Conference

on Korea Association for Science Education

Bringing Scientific Literacy Forward: National and International Perspectives

February 9-11, 2017 @ Seoul National University, South Korea.
Chairs: Heui-Baik Kim, Professor, Seoul National University, Korea

The Korean Association for Science Education (KASE) is the representative organization of the research community for science education in Korea. Since its founding in 1976, KASE has grown significantly, leading research in the field of science education in Korea and strengthening its place in the international research community. KASE has not only grown quantitatively in terms of its members and the papers published in the Association's official journal, but it has made qualitative progress in its academic activities.
KASE stages annual conferences during the winter and summer seasons. In particular, the winter conference has become established as an academic convention for Korean science educators to communicate and network with internationally renowned scholars in their field and to promote the achievements of our community worldwide.
The forthcoming conference as the 71st general meeting of KASE will be held in Seoul National University for three days (February 9-11) as follows:

Day 1 (February 9): Opening ceremony, Plenary session, Invited speech, Oral presentation and Poster presentation
Day 2 (February 10): Plenary session, Invited speech, and Oral presentation
Day 3 (February 11): Plenary session, Oral presentation, Poster presentation and Closing ceremony

As well, many prominent scholars are supposed to participate in the conference and to give insightful speeches in the conference.

- Brian Hand, Professor, University of Iowa, USA
- Chi-Chin Chin, Professor, National Taichung University of Education, Taiwan
- Dongying Wei, Associate Professor, Beijing Normal University, China
- Richard Lamb, Associate Professor, University at Buffalo, The State University of New York, USA
- Hon-Ming LAM, Professor, The Chinese University of Hong Kong, Hong Kong
- Peter Charles Sinclair Taylor, Professor, Murdoch University, Australia
- Randy L. Bell, Professor, Oregon State University, USA
- William Sandoval, Professor, University of California, Los Angeles, USA
- YEO Ai Choo Jennifer, Assistant Professor, Nanyang Technical University, Singapore
- Yoshikazu Ogawa, Deputy Director, National Museum of Nature and Science, Japan
- Hyunju Lee, Professor, Ewha Womans University, Korea
- Nam-Hwa Kang, Associate Professor, Korea National University of Education, Korea

You can find out more information about the conference from http://www.koreascience.org/english

EISTA 2017: International Conference on
Education and Information Systems, Technologies and Applications

Relationships between Education/Training and Information/Communication Technologies (ICT) are increasing acceleratingly, sometimes in unexpected ways, with original ideas and innovative tools, methodologies and synergies. Accordingly, the main purpose of EISTA 2017 is to bring together researchers and practitioners from both areas, in order to support the bridging process between education/training and ICT communities. The conference will be held in Orlando, FL from July 8th to 11th, 2017. The conference is jointly with:

The 11th International Multi-Conference on Society, Cybernetics, and Informatics: IMSCI 2017
The 21st World Multi-Conference on Systematics, Cybernetics and Informatics: WMSCI 2017
The 10th International Multi-Conference on Engineering and Technological Innovation: IMETI 2017

Conference Website: http://www.iiis2017.org/imsci/
Important Dates
Paper Submission: October 10, 2016
Notification of acceptance: November 23, 2016

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