NEWSLETTER

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Achievement of promoting energy science and technology education of primary and secondary schools in the regional centers of the southern and eastern regions




This promotion plan is to undertake the national teacher-training and teaching promotion plan of national energy science and technology implemented by Professor Wu jun-qi of National Central University, which is entrusted by the Ministry of Education, wherein Professor Xu ke-lin of National Kaohsiung University of Science and Technology and Professor Tsai chih-chung of National Kaohsiung Normal University conduct the jobs of the course development and the teacher-training of the southern and eastern Taiwan in this regional center. In order to implement and improve the operation of energy science and technology education of primary and secondary schools in this region, this center has been implementing the promotion of energy science and technology education of the southern and eastern regions through "partnership" mode over the past three years. In this center, the promotion of energy science and technology education is implemented across the fields of discipline (STEM, Science, Technology, Engineering, Mathematics), and this center develops integrated courses of energy science and technology education, to cultivate systemic thinking in teachers' teaching and students' learning for practicing in the life. Therefore, this center develops six sets of teaching module curriculum and three sets of display teaching aids, and shares these resources to the promotion schools in the region, successfully not only promote the teaching resources of the energy science and technology education of this center, but also develop schools' standard or characteristic courses.

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Grass-roots science activity for kids in Japan

Koki Horita, Ryosuke Imamura, Makoto Kobayashi, Sakura Nagata, Shunichi Ono, Kazuma Oomori
Graduate school of education, Hiroshima University

We are managing the Kid's Science Club that was launched by our elders about ten years ago, and present this grass-roots activity for kids in Japan.

1. What's Kid's Science Club?

Some university students who want to become the science teacher visit elementary schools and local community centers etc. and are doing science activities that use low-cost materials with children. The purpose of our activities is as follows;

① Provide opportunities for children to like and/or enjoy science.

② Nurture university student's ability to teach science to children.

2. Activities

If we just teach the science knowledge and theory that is the same as traditional school science class. Therefore, through making something for science activities, we try to inform children that science is interesting. We would like to introduce what kind of activity we have done in recent years.

1) Let's make air canon (Case 1)

The purpose of this activity is to make children realize presence of invisible air. First, we show the demonstration experiment that use giant air cannon (Figure 1) with clear air and smoked air. Second, children make their own small air cannon and do experimenting (with smoked air, collapse a tower made of paper cup, shoot the flame of candle). The reactions of the children as follows. They were surprised at the giant air cannon with smoked air. They were actively experimenting and enjoying. They had doubts that: what will happen if we change the shape of the opening of their air cannon into the triangle or star. They realize the invisible substance called air.

Figure 1 giant air canon

2) Let's make long spinning top (Case 2)

The purpose of this activity is to know mechanism of long spinning top by using something familiar materials. First, we explain to children that mechanism of long spinning top through the experiment gyroscopic effect by bicycle wheels. Second, we let children experience making longer spinning top by cardboard and skewer. Children were interested in mechanism of long spinning top. Also, they were able to make longer spinning top. So, they were able to think of long spinning top as familiar through this activity.

3) Let's make hot air balloon (Case 3)

The purpose of this activity is to know the nature of the warmed air through the creation of a hot air balloon. First, we teach children about the relationship between heat and air through the experiment (Figure 2). Next, let them make hot air balloons using what is familiar to children (Figure 3). Children were excited when hot air balloon made by themselves flew. Also, we were able to experience the state of the warmed air by touching hot air balloons they made.

Figure 2 Experiment with children

Figure 1 Making a hot air balloon

4) Mystery of static electricity（Case 4）

The purpose of this activity is to know how to make and store electricity by using something familiar. First, we teach children that electricity is generated by rubbing objects through the experiment "Electric jellyfish". Second, we teach children that we can store its electricity through the experiment "Capacitor made of plastic cup or PET bottles" (Figure 4). Children were able to make and store electricity and enjoy it. So, Children were able to think of electricity as familiar through this activity.

Figure 4 Experiment with children

Achievement of promoting energy science and technology education of primary and secondary schools in the regional centers of the southern and eastern regions

Chin-Chung Tsai
National Kaohsiung Normal University

This promotion plan is to undertake the national teacher-training and teaching promotion plan of national energy science and technology implemented by Professor Wu jun-qi of National Central University, which is entrusted by the Ministry of Education, wherein Professor Xu ke-lin of National Kaohsiung University of Science and Technology and Professor Tsai chih-chung of National Kaohsiung Normal University conduct the jobs of the course development and the teacher-training of the southern and eastern Taiwan in this regional center. In order to implement and improve the operation of energy science and technology education of primary and secondary schools in this region, this center has been implementing the promotion of energy science and technology education of the southern and eastern regions through "partnership" mode over the past three years. In this center, the promotion of energy science and technology education is implemented across the fields of discipline (STEM, Science, Technology, Engineering, Mathematics), and this center develops integrated courses of energy science and technology education, to cultivate systemic thinking in teachers' teaching and students' learning for practicing in the life. Therefore, this center develops six sets of teaching module curriculum and three sets of display teaching aids, and shares these resources to the promotion schools in the region, successfully not only promote the teaching resources of the energy science and technology education of this center, but also develop schools' standard or characteristic courses. During these operations, a total of 312 energy science and technology education seed teachers were recruited, including 126 teachers from elementary schools, 46 teachers from junior high schools, and 59 teachers from senior secondary schools, wherein 54 sessions of teacher related study or workshop were held and the total number of participants was 1,150.

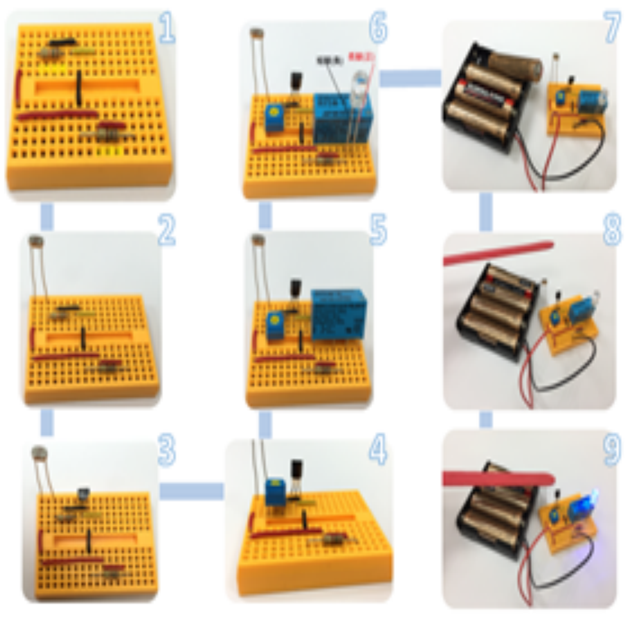
By way of related resources and assist from the Ministry of Education, there are great progresses for the promotion schools in this region, wherein the schools can promote energy education independently, such as Yangming elementary school, Zhongshan industrial and commercial secondary school, Chiang kai-shek senior high school, Yizai elementary school etc., develop school-based and characteristic courses and implement the energy education promotion activities to share the experience or coach cooperative schools to promote energy education. The following are brief introductions of the three schools' promotion results and characteristics.

1.Chiang kai-shek senior high school

Chiang kai-shek senior high school develops multiple elective courses "Biomass energy – choice after globalization. Sustainable resource development" and "Special topic of science and art maker" for second-year students, with experienced course teachers of promotion energy education, and decorates booths in the celebration activities, to open to all teachers and students to participate and get energy science and technology knowledge. As for the achievement exhibition of this year, Chiang kai-shek senior high school will hold the hands-on activities of "light induction energy-saving lamps", and make e-books of combination of the following installing demonstration films and written description to upload to the cloud through FlipBuilder Flip PDF Professional software, and the people can download through the scene rendering QRcode.

2.Yangming elementary school and Yizai elementary school

The two excellent schools integrate the energy education module provided by this center, local characteristics of individual schools, enterprise resources and scientific and technological resources, to develop the standard curriculum of school energy education. For example, Yizai elementary school integrates the wind power generation into the third unit of the natural course "the air and the wind" for teaching, and cooperates with FETnet to use the latest cloud IBEACON technology for teaching, so as to successfully develop the module courses of "north wind and the sun", and Yizai elementary school will hold the hands-on activities of "small wind power lighthouse" in the achievement exhibition of this year; and Yangming elementary school implements many activities of energy education promotion and competition, moreover, Yangming elementary school will show creative works of energy vehicles in the achievement exhibition, and implement teaching observation and promotion activities at remote townships to help with the course development and implementation activities, so as to get great echo.



Maker education at Taiwan

Yao-ming Chu
National Kaohsiung Normal University

Chu yao-ming, director of the Institute of Industrial Technology Education of National Kaohsiung Normal University, through the process of design and production, effectively forms the teaching strategy of integrating inquiry spirit and creativity. Current maker promotion plan covers the period from elementary school to senior high school, and the teachers and students product and originate together, and make up a professional development community. By way of the school and the network community, they product, create, discuss, share and learn with each other, so as to catalyze the speed of course, teaching and learning.

The plan also echoes the spirit of Anderson et al. (2001) about the revised model of learning, teaching and evaluation, to emphasize that the acquisition of knowledge requires a variety of cognitive processes. Knowledge acquisition is not only the process of memory and understanding, but also the higher level process of application, analysis, evaluation and creation. Moreover, through the teaching design and arrangement, it is important for students having learning opportunity, because the students have complete system thinking to the overall learning content, there is a possibility of in-depth problem analysis and innovation in the future.

The main spirit of the maker has three stages, namely: willing to do, willing to create, and willing to share. "Willing to do" is the first stage of the maker, and the main thing is to have fun with the production process. Hands-on experience for creation is a way to give the maker a quick sense of accomplishment. "Willing to create" is the second stage of the maker, although many digital processing machinery production, open network resources and community sharing make it easier to product, in addition to imitate and study the process, the makers can integrate personal expertise and point of view to adjust the work creation. "Willing to share" is the third stage of the maker, also an important spiritual representative of the maker. This stage mainly lies in publishing the learning process and originating product in the real community, network communities, or maker fair, wherein the makers share their creation stories and knowledge with like-minded people and also stimulate more ideas or review their own creation and technology method, to acquire new knowledge and ideas. This is the point to the attraction of the maker. Through continuous experience, observation and reflection, establishing own rich knowledge experience, and then adjusting own learning strategy, which is an important view of the theory of experience learning. Through hands-on teaching, students learn knowledge, theory, and practical phenomena in operation, and establish their own important learning experience.

The program is supported by the Ministry of Education and the K-12 Education Administration to set up the maker education demonstration center of the elementary and high schools in all counties. The demonstration center deals with the teacher workshop of maker education for the new digital manufacturing technology, provides teachers in the county and city schools to understand how digital maker technology can be used in the course teaching, and keeps the 12-year core curriculum as the spindle of the spirit to integrate into the course teaching policies in every field, including STEAM (Science, Technology, Engineering, Art, Mathematics), Project-base learning and combination of creativity and practice teaching. In the 12-year curriculum, it is emphasized that teachers should guide students to learn spontaneously, and observe and perceive problems from the life situation. Therefore, the learning mode of the maker education is the strategy of concrete practice.

Transforming pedagogy in teaching science with a second language

Valerie W.Y. Yip
The University of Hong Kong

Since the implementation of the fine-tuning policy on Medium of Instruction (MOI) in 2009, the readiness of Hong Kong science teachers in teaching science literacy with the use of English has always been a concern. Norris and Phillips (2003) point out that science literacy has both fundamental and derived senses. The fundamental sense refers to a component that stresses on the students' cognitive development, habits of mind and use of various means to understand science ideas and get engaged in discussing issues related to science; whereas the derived sense is to acquire scientific knowledge with the use of the fundamental sense.

Science teachers should possess the subject matter knowledge and know how to teach with appropriate languages (Lee, Lewis, Adamson, Maerten-Rivera & Secada, 2008). Nevertheless, in a national review on teaching literacy development (Luke et al., 2003, p.118), subject teachers are found to have 'insufficient knowledge of the language and literacy demands of their discipline', and therefore they just teach without much understanding. Although a number of local teacher training programmes have been in place, the challenges for in-service teachers to teach in a second language (L2) are still enormous.

To better understand the transforming pedagogy, a project examining the practices of an award-winning teacher was carried out. The lessons taught in L2 were videotaped and analysed against those taught in first language (L1) that had occurred before the implementation of the policy. Results show that despite the teacher put more emphasis on science language acquisition in L2, for instance on the vocabulary and sentence patterns, the classroom oral discourse decreased to a certain extent. A decrease in the level of questioning, fewer students' responses and reducing group interactions were the major results of using L2. A follow-up interview with the teacher indicates a strong need for ongoing teacher professional development, despite their teaching experience in L1, is essential for them to meet the challenges of this language reform.

Lee, O., Lewis, S., Adamson, K., Maerten-Rivera, J., & Secada, W. (2008). Urban elementary school teachers' knowledge and practices in teaching science to English language learners. Science Teacher Education, 92(4), 733-758.

Luke, A., Elkins, J., Weir, K., Land, R., Carrington, V., Dole, S., Pendergast, D., Kapitzke, C., van Kraayenoord, C., Moni, K., McIntosh, A., Mayer, D., Bahr, M., Hunter, L., Chadbourne, R., Bean, T., Alvermann, D., & Stevens, L. (2003). Beyond the middle: A report about literacy and numeracy development of target group students in the middle years of schooling. Canberra: Department of Education, Science and Training.

Norris, S.P., & Phillips, L.M. (2003). How literacy in its fundamental sense is central to scientific literacy. Science Education, 87(2), 224-240.

Empowering students with a critical eye for science news

Jessica S.C. Leung
The University of Hong Kong

The rapid advancement of science and technology demands citizens of the 21st century to have the ability to critically engage in scientific and technological related issues, e.g., artificial intelligence and designer baby. For a majority of the individuals in a society, the media (including the social media) constitutes their main source of information about science and technology. A recent research alarmed us that fake news diffused significantly farther, faster, and more broadly than true news (Vosoughi, Roy, & Aral, 2018). How can we, as science educators, empower students with the ability of critically evaluate science news?

Science news is typically associated with frontier science, where debate is still ongoing within the science community. It would be unrealistic to expect students to evaluate science news according to their understanding of science (i.e., science content knowledge). An informed conception of the nature of science (NOS) is generally assumed to be necessary for evaluating science news, yet prior studies suggested that a more informed NOS understanding does not necessarily guarantee a better evaluation of science news (e.g., Leung, Wong, & Yung, 2015). Students tend to focus on the cognitive aspects of science than on the social or epistemological aspect of science in their evaluation of science news (Leung, Wong, & Yung, 2017), which is reflective of their secondary science schooling.

Nevertheless, it is too early to jump to the conclusion that NOS understanding has little or no association with students' evaluation of science in the media without knowing the reasons for why NOS understandings are not referenced by students in their evaluation of science news. Future research along this line will be essential to understand how NOS understanding can better integrate to the science curriculum in a way to empower our students to critically evaluate science news without falling prey into media's agenda.

Leung, J. S. C., Wong, A. S. L., & Yung, B. H. W. (2015). Understandings of nature of science and multiple perspective evaluation of science news by non-science majors. Science & Education, 24(7-8), 887-912.

Leung, J. S. C., Wong, A. S. L., & Yung, B. H. W. (2017). Evaluation of science in the media by non-science majors. International Journal of Science Education, Part B, 7(3), 219-236.

Vosoughi, S., Roy, D., & Aral, S. (2018). The spread of true and false news online. Science, 359(6380), 1146-1151.

School Visits and Observations of Science Lessons during the Fourth Sino-German Didactics Dialogue Conference at IPN, Kiel, Germany

Ding Bangping
Capital Normal University

The fourth Sino-German didactics dialogue conference was held during May 29th to June 1st, 2018, in Leibnitz Institute for Science and Mathematics Education (IPN, Kiel), Kiel University, Kiel, Germany. The conference was jointly sponsored by Leibniz Institute for Science and Mathematics Education (IPN, Kiel) and the Institute for Quality Development at Schools Schleswig-Holstein (IQSH, Kiel). The theme of the conference was 'General Didactics, subject didactics & Empirical Educational Research'. Nearly 80 people took part in the conference.

Figure 1. The Photo of All Participants of the Conference

Professor Hilbert Meyer and Professor Barbara Moschner, both of Carl von Ossietzky University (CvO., Oldenburg), jointly convened the opening session of the conference. As the host of this conference, Professor Olaf Koller, managing scientific director of IPN, Kiel University, welcomed the participants from China, Singapore, the Nordic countries, Switzerland, as well as Germany. Ms. Karin Prien, minister of the Ministry of Education, Science and Cultural Affairs of Schleswig-Holstein, Dr. Thomas Riecke-Baulecke, director of the Institute for Quality Development at Schools Schleswei-Holstein (IQSH, Kiel), Dr. Ilka Parchmann, vice-president of Kiel University, and Professor Peng Zhengmei, of the Institute of International and Comparative Education, East China Normal University (ECNU), all addressed the opening session respectively.

Professor Peng Zhengmei, as one of the founders of the Sino-German didactics dialogue conferences, addressed the plenary conference with his keynote entitled 'Global Learning in China since 2001'. Three other keynote speakers were Professor Dr. Susanne Prediger, of Technology University in Dortmund, Germany, entitled 'Fostering language learners in subject matter classrooms—different research approaches and outcomes'; Professor Deng Zongyi, of the National Institute of Education, Singapore, entitled 'Didactics and/or curriculum—German and US-American influences in Chinese didactics'; and Professor Anna-Katharina Praetorius, of University of Zurich, Switzerland, entitled 'Instructional quality—An International perspective'. Eight panels (including 16 short lectures in all), and three poster-sessions (including 16 posters in all) were also presented at the conference. Professor Ding Bangping, Director of the Center for Science Education Research, Capital Normal University (CNU), gave a short lecture at Panel 4 (the theme was 'Perspectives in Science Education'), entitled 'Actual Developments in

Science Education in Mainland China: A Reflective Perspective'.

At the closing session of the conference, it was announced that the fifth Sino-German didactics dialogue conference would be hosted by Anhui Normal University, Wuhu, China, in late September 2019.

In order to enable participants to know more of learning, teaching, and schooling in German schools, the conference hosts in Germany (IPN, Kiel; IQSH, Kiel; and CvO., Oldenburg) especially arranged two-day school visits previous to the conference per se. On May 29th and 30th, the Chinese participants consisting of 15 teachers and PhD students (from East China Normal University, Shanghai; Anhui Normal University, Wuhu; Guangzhou University, and Capital Normal University) visited 4 German schools in both Hamburg and Kiel, accompanied by their German hosts. The schools we visited were Friddrichsort Integrated Community School (Integrierte Gemeinschaftsschule Friddrichsort), Kiel; Hamburg Modern School (Moderne Schule Hamburg), Hamburg; Kiel Scholar School (Kieler Gelehrtenschule), Kiel; and Louisenlund Boarding School (Internatsgymnasium Louisenlund), Kiel. Part of the school visits included observations of science lessons. The following is a brief report of some science, mathematics, and MINT lessons observed by Prof. Ding Bangping, of Capital Normal University; Ms. Gu Juan, a PhD student of East China Normal University; Dr. Ren Ping, of Guangzhou University, and Mr. Zhuang Xiao, a PhD student of Capital Normal University, respectively.

Lesson Observations in a German Gymnasium

(By Ding Bangping, Capital Normal University, Beijing, China)

School visits were an important part of this conference on Sino-German didactics dialogue, because didactics is a science of education rooted in schooling, teaching, and learning. On May 30th, 2018, we visited Kiel Scholar School (Kieler Gelehrtenschuler), Kiel, Germany, a gymnasium of nearly 700 years old, as we were told. The headmaster, Mr. Schoneich, and his management team gave us a warm welcome as we arrived at the school at 9:00 in the morning. The school management team had been well prepared to receive us—each of the visitors was given a piece of yellow paper on which was printed a list of activities for our visit. Following a brief but warm welcome, two Grade 11 students (a boy and a girl) showed us around the school—the school gym, the science labs, the oldest building of the ancient gymnasium, and the school sports ground, etc.

Next, from 10: 25 until 12: 10, in the morning (with a recess time from 11: 10-11:25), we were divided into groups and led into classrooms for lesson observation. On the piece of yellow paper, 12 lessons were listed for our choice to sit in on. These lessons included biology, foreign languages (English, Greek and Latin), physics, mathematics, chemistry, art, and sport, etc., in different classes. This means that those lessons were 'business as usual' and there was no 'special rehearse' for the visitors. After the lesson observations, we went back to the meeting room at 12:15 at noon for the 'final talk', in which the head master, vice-head master, an assistant to the head master, a leading science teacher, and 4 student representatives gave a detailed introduction of the school to us in their own perspective and answered questions from us. The meeting was closed at 13:10 in the afternoon. Then we were led into the school cafeteria for lunch together with them.

I observed first a chemistry experiment lesson, given by Mr. P in the lab to Grade 7 students. Both the students and their teacher were in white (although dirty) gowns, and working like chemists in the lab. The task of the lesson was to make an experiment with copper and concentrated sulfuric acid solution. Lab materials and equipment were copper ribbons, concentrated sulfuric acid solution, balloons, Bunsen burners, and test tubes. The students, both male and female, were doing the chemical experiments in groups and collaboratively, and their teacher was very conscientiously checking to see how the experiments were done by each group. To my surprise, these 13 years old in Grade 7 were doing chemical experiments like real scientists! The lesson lasted 45 minutes.

Figure 2. A Chemical experiment lesson (1)

While observing the lesson, I noticed students' workbooks that they were recording data in while doing the experiments. Dr. Thomas Riecke-Baulecke, who accompanied us to observe the lesson, told me that students' workbooks are of most importance in their study of chemistry. Although there were chemistry textbooks for students' use that I found sitting in the window sill, the students seldom referred to them. One girl's workbook contained a table of contents, and I took several pictures of her work (See Picture 3 below), which recorded her yearlong work of having the chemistry lessons, sometimes with formative assessment assignments in it. It was amazing to find that each student's workbook looked like the notebook of a scientist. In comparison to these German students, Chinese middle school students don't study chemistry until they are in Grade 9 (usually 15 year old)—two years later than German school students.

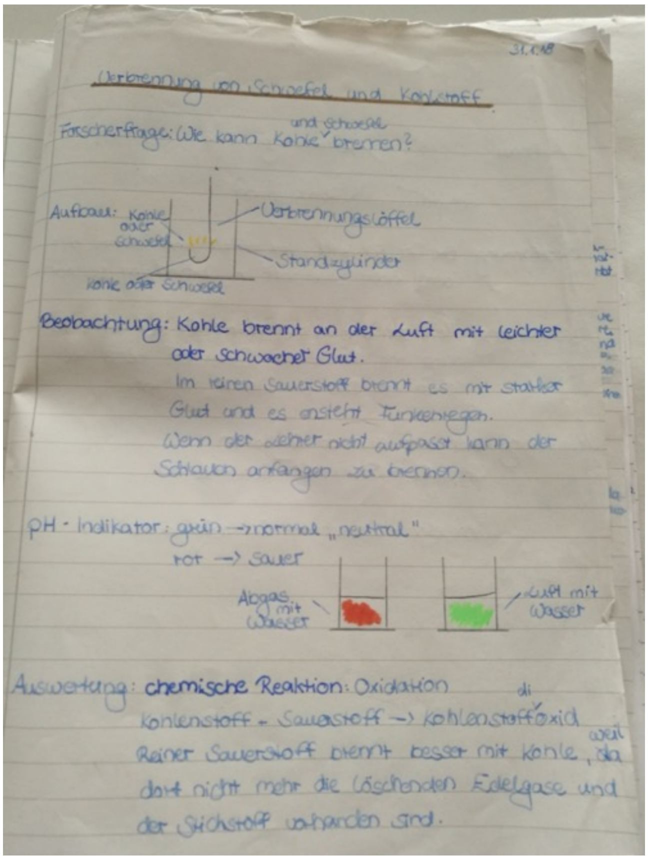


Figure 3. A Page from a Student's Workbook

Figure 4. A Chemical experiment lesson (2)

After the morning break, I observed an English lesson given to a class of Grade 6 by Mr. H. The lesson was focused on the translation from English to German, a method familiar to Chinese teachers of English. The students were studying and learning well, and I was especially impressed by the relationship between teacher and students in the class. The teacher was questioning one student after another in class and asked them to say English with the phases they had learned in previous lessons and then to translate them into German. Unlike in the chemistry lesson, wherein they did not refer to the chemistry textbooks, each student of English in the class used the English textbook in hand. Then we also entered one mathematics class for a while, and observed the maths lesson, as well. The woman teacher taught well, and the students studied attentively. Then the biology class that we observed for a few minutes was impressive, too. The teacher and the class were having a discussion of the situations concerned with their own body (See Gu Juan below), and obviously the students were very active and interactive in expressing themselves. It seems that there were no visitors sitting among them; all was as natural as it could be.

An Eye-opening Biology Lesson in a German Gymnasium

(By Gu Juan , PhD. student, East China Normal University, Shanghai)

This biology lesson lasted 45 minutes. The students in the class were 6 graders (about 12 years old). The topic of the lesson was ‘My body belongs to my own’, a topic somewhat similar to a physical hygiene lesson in the primary school in China. The objective of the biology lesson was to make the students (n=30) aware of the protection of their body. The class could be discerned to consist of 3 stages. Stage One was the introduction given by the teacher, Ms. J, a lady of about 40 years old. She wrote on the blackboard the topic sentence—‘My body belongs to my own’, and then she asked the class what were their ideas that arose after they saw the statement. Most of the students were able to express such ideas as ‘I can do whatever I want to do onto my body,’ or ‘Others cannot be allowed to touch my body without my consent’, etc.

Figure 5. The biology lesson of the 6th graders (1)

In Stage Two, the teacher handed out each of the students a piece of paper, on which were written 12 statements describing 12 situations concerned with the body that the teacher had designed before the class (See table 1 below). The students were asked to read the statements about the situations, and think about whether they were reasonable or not, and to give their reasons for each. The students were encouraged to discuss the situations and the statements among themselves.

Table 1. Class discussion situations

Situations	Reasonable	Unreasonable
1.Someone praises my looks.	I feel happy	
2. I often hear someone speak evil of me.		No. Such thins cannot be admitted. I will report to the police.
3. Someone is dogging me.		
4. The PE teacher gives me a physical help when I am exercising with equipment.		
5. The teacher encourages me by giving me a light pat on the shoulder.		
6. Someone strokes me on the different parts of my body without my consent.		
7. My loved one hugs me warmly.		
8. The doctor touched me when giving me an examination.		
9. I could get on the car without knowing the driver.		
10. A man stares at me lovingly for a long time		
11. A fellow student mocks my looks.		
12. I would pry into my private parts and/or expose my genitals under the circumstances of keeping secrets or when being threatened.		

Then, after the teacher gave her instruction, the students immediately plunged into thinking and discussion. The atmosphere in the class was robust and lively, with some of the students gesturing as they interacted among themselves. A few minutes later, the teacher led the students to discuss about the situations listed in the table above one after another. The students all agreed on statements 1, 4, 5, 7, and 8, while disagreeing to statements 3, 6, and 12, and thought that some measures should be taken to deal with them. As to the rest of the situations left, the students thought that it just depended upon the specific circumstances. Following this, the teacher instructed students to give special considerations to statements 3, 6, and 12, and put forward possible strategies to deal with them. With regards to the situation 3, the students proposed some simple methods to judge whether being dogged or not, such as changing the pace of the walking, shifting to other paths, or thronging into the crowds. The teacher felt that the ideas of the students were practically mature, so she gave more focus on the situations 6 and 12.

Figure 6. The biology lesson of the 6th graders (2)

In regard to the latter two situations, the teacher simply asked the class whether they should keep them secret when encountering them, and to whom they should refer themselves for help. The students all regarded them as nasty secrets, but they could not tell nice secrets from nasty ones anyhow. As regards to the question as to from whom they should seek help, they uttered out several alternatives one after another: the family, friends, teachers, and professional bodies of childhood protection, etc. Next, the teacher informed the students of the phone number seeking help for children when they are being encroached, and cautioned them that sometimes their relatives and familiar elders may do unfriendly behavior to them. Once this happens, it is imperative that they should not keep it secret.

In stage 3, the teacher summarized the learning content by referring to the written words in the textbook, and instructed students to differentiate nice secrets from nasty ones and think about them as assignments after the lesson. The form of the assignments was also a pre-prepared piece of paper for each student, on which were listed 8 situations for them to discriminate from.

The whole lesson was well structured, and the articulation of the three stages was natural and smooth. The teacher always regarded herself as a guider, encouraging her students to take active part in the discussion and express themselves freely. Compared with their Chinese counterparts, these German students behaved more freely and actively, and consequently there happened some mishaps in class that temporarily interrupted the lesson. The biology teacher cautioned or alerted the students in question by eye contact or speech, rather than leave them to themselves, which was in contrast to my previous impression [of German teachers], however. The behavioral students responded immediately to the teacher and conducted themselves well again.

All in all, this was an eye-opening biology lesson, which helps me understand more specifically the day-to-day teaching and learning within German classrooms.

Observing Physics and Mathematics Lessons in a German Gymnasium

(By REN Ping, School of Education, Guangzhou University, Guangzhou, China)

On the morning of May 30th, 2018, we observed a physics lesson in Grade 7 at Kiel Scholar School (Kieler Gelehrtenschule). There were 19 students in the class. The physics teacher, Mr. J, wanted to teach his students the important physics formula, F=m*a. It means that the Force of the object=Mass of the object*Acceleration of the object. Firstly, he clearly explained the theory of Newton's second law of motion and told the students the constant acceleration could be written as a. Then he required his students to do a series of physics experiments and to get the force of different types of weights. The students were required to weigh different types of weights by themselves by using an electronic balance and to get their acceleration by using a special physical instrument. Actually, he did not spend too much time in teaching the students the meanings of physics terms in the formula, but gave them enough time to weigh these weights and to calculate their force by themselves. As I could see it, the students used these physical instruments in a professional way and quickly wrote down different numbers in their exercise books. In the physics lesson, the students were divided into different groups and they communicated with each other all the time. Therefore, it was a little noisy in the classroom. On my understanding, the teacher would like to give freedom to his students and to arrange different tasks to students on one hand. On the other hand, the students were able to take good advantage of their freedom and to finish their learning tasks successfully in accordance to the teacher's requirements. In general, the students learned to use the physics formula by solving their instructional tasks and actively participated in the teacher-student interactions.

Figure 7. A Physics Lesson of Grade 7

The next lesson we observed was mathematics in a Grade 10 class. It is interesting to find that the mathematics teacher firstly taught an online mathematics course instead of the conventional classroom instruction. As far as I know, using multi-media facilities and different kinds of software are not frequently seen in Germany's classrooms. After the online instruction, the teacher gave his students some tasks and required them to answer these mathematics questions. Then, the students began to communicate and discuss with each other. At the same time, the teacher began to walk around the classroom and tried to help them deal with their difficulties that arose.

However, in the corner of the classroom, there was a male student who suddenly attracted my attention, because he was sitting alone, with no deskmate. A student told me quietly that he had been punished by the mathematics teacher and had been separated from other students, since he often disrupted the classroom order. As the mathematics teacher told me later on, setting strict discipline in class is able to ensure effective instruction.

Figure 8. A Mathematics Lesson in a Grade 10 class

No matter in the physics lesson or in the mathematics lesson, it is obvious that both of the physics and mathematics teachers gave their students the freedoms to learn and let them practice the knowledge by themselves. And the students were used to solving instructional problems within teacher-student interactions and had strong competence in solving different instructional tasks. The purposes of teaching in the German didactics tradition are centered on Bildung, which focuses on a process of individual formation. Our classroom observations provide some significant enlightenment for further study on school pedagogy in Germany.

MINT Curriculum: A Native Comprehensive Model of Science Education in Germany

(By Zhang Xiao, PhD student, Capital Normal University, Beijing, China)

Similar to STEM education in the USA and other countries, what is called MINT education in Germany has been on the rise over the recent years. MINT is an acronym meaning Mathematics (Mathematik), Computer Science (informatik), Science (Naturwissenschaften), and Technology (Technik). The rise of MINT education is a response to the shortages of talents in the field of mathematics, computing, science, and technology in Germany. Many universities have offered enrichment courses regarding MINT to school children. For example, Technical University of Berlin has offered a one-year course in MINT, and Technical University of Munich also has planned to offer such courses.

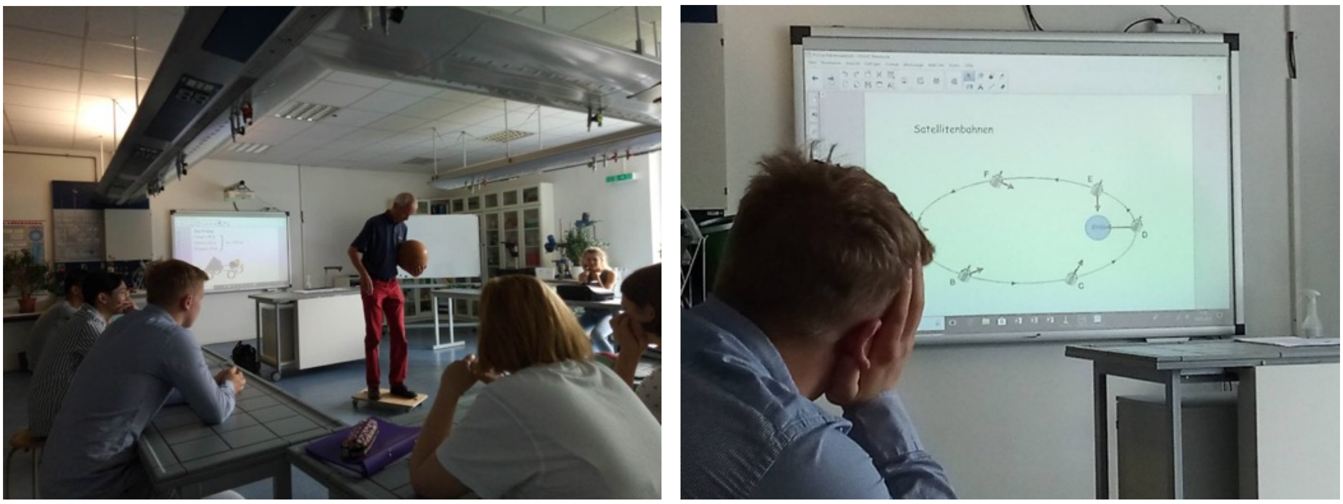


Figure 9. A lesson of MINT in a German School

In 2016, the federal government of Germany, state governments of Germany, and several companies joint hands in launching a MINT project in boarding gymnasiums. The project aims to choose talent and gifted students in mathematics, information technology, and science and give them a special education. In the conversation with some German teachers, the present author (Zhang Xiao) comes to know that the MINT project has been carried out only in three boarding gymnasiums, and more schools have introduced MINT just as extracurricular activities rather than put it into their timetables.

For example, in a boarding gymnasium (Internatsgymnasium Louisenlund) that the present author (Zhang Xiao) visited on May 30th, 2018, the MINT course was opened in 2016. Under the leadership of the school principal, the MINT course has become a specialist one in the gymnasium and one of the major tractions to excellent students. The school has set up a research team to select students outstanding in mathematics and science for taking part in the MINT study.

During the visit to the school, the present author (Zhang Xiao) observed one MINT lesson, which was given by a physics teacher. The lesson was about the launching of the rocket and its related problems. It consisted of three stages. In stage one, the teacher demonstrated a common physical phenomenon. Standing on a skateboard, the teacher was throwing a basketball in a horizontal direction. Due to the interaction of forces, the skateboard moved backward. In stage two, the teacher gave a brief explanation about the physical phenomenon, and then gave the students two-page handouts, asking them to complete the assignments by solving the problems concerned. Part of the content in the handouts was concerned with the knowledge the students had learned already, but part of it were problems to be solved on their own. In completing the handouts, the teacher walked across the groups and offered assistance to the students when necessary as they were trying to solve the problems. In stage three, students gave answers to the problems on the handouts, and finally solved the practical problem on the launching of the rocket. And finally, the teacher wrote down the process and its results briefly on the blackboard.

On my observation of the lesson and in my brief conversation with the teacher after the lesson, I summarized my perceptions about the MINT lesson as follows: (1) the MINT lesson was comprehensive in nature. The teacher led the students to conduct a study on the launching of the rocket in class. In doing so, the problems are concerned with science, especially with related research on physics. On the other hand, the handouts given by the teacher were full of much mathematical calculation. The students first of all had to finish the deduction of the mathematical formulas and calculation, and then they could solve the practical problems with the launching of the rocket. (2) The MINT course was kind of theoretical. As mentioned above, the MINT curriculum is tailoring for the students good at mathematics, science, and technology, so the depth and difficulty of the leaning content are relatively big. As regards to the NINT lesson we observed, it was quite theoretical in terms of mathematical calculation and physics formulas used, and the complexity of the practical problems that the students needed to solve. And (3), the MINT curriculum is highly open-ended. In the lesson we observed, the teacher spent only about five minutes on demonstrating the physical phenomenon. In most of the time after that, the students were trying to solve the problems on the handouts on their own or discussed with their fellow students. The teacher only used a little time to explain the answers toward the end of the lesson.

Putting together, these scenarios of lesson observations above provide us with a relatively whole picture of how German students learn science and other subjects in school. We could sense the culture of science pervasive in these schools, as was found in the pictures of scientists on the walls in the corridors in the science buildings, in the chemistry, physics, and biology labs, and especially in the process of learning and teaching science on the part of science teachers and students. As we observed, whether they were doing experiments or having a discussion, the students behaved like real scientists.

New Curriculum Plan For Senior High Schools Will Be Implement In China

Yanning Huang
Capital Normal University

China's ministry of education has promulgated the curriculum plan for ordinary high schools and the curriculum standards (2017) for some subjects. The following is the document content. High school education is a key period for students to form their own personalities and develop independently, and it is of special significance to improve national quality and cultivate new people who take on the great responsibility of national rejuvenation. Ordinary high school curriculum is an important carrier to achieve the goal of educating students in high school, embodies the national will and plays a key role in the implementation of the fundamental task of moral education. All localities should conscientiously implement the spirit of the 19th national congress of the communist party of China and put Xi Jinping's socialist thoughts with Chinese characteristics in the new era into the curriculum. We should strengthen organizational leadership, systematically plan and comprehensively promote the curriculum reform of ordinary high schools, and constantly improve the quality of education and teaching. To face the relevant responsible comrades of local education administrative departments and all ordinary high school teaching and research personnel, principals and teachers, to carry out training work in a planned and step-by-step way, to promote the concept of educating people in ordinary high school courses, and to deepen the reform of education mode. We should strengthen the management and guidance of curriculum implementation, strengthen the guarantee of conditions, and ensure that the curriculum is fully opened and put into place. We should comprehensively strengthen teaching and research work, innovate teaching and research methods, create conditions, stimulate teachers' enthusiasm to carry out teaching and research, and promote the effective implementation of the curriculum. We should pay attention to the overall connection between the curriculum reform of ordinary high schools and the comprehensive reform of the college entrance examination, promote " teaching", " examination" and " recruitment" to form a joint educational force, and promote the comprehensive and personalized development of students

The Trends of Science Education through STEAM

Young-Shin Park
Chosun University

Recently I had chances to visit Thailand and Japan to talk about STEAM education of Korea. It was good chance for me to organize research and education of STEAM to be more understandable to science teachers as well as educators. On the basis of my research and education of STEAM, I focused on what is the purpose of science education in 21st century with the 4th industrial evolution. When I ask or I am asked of the purpose of science education, we answer that all people are needed to be equipped with competencies to make decision if the issues they face are right or wrong. For this, we need to know about what issues are, we need to demonstrate its process logically if necessary, we need to argue and develop claims on the basis of evidences from those experimentations, but finally we need to give up those products if they are against ethics, which is called 'scientific literacy'. But now we need to extend the meaning of scientific literacy. Students need to know how to apply the concepts which they learn. Students understand some concepts and they can argue why those issues are critical or not with the use of those concepts, but we cannot be confident if students can have abilities to use concepts they learn in reframing the problems which they face, applying those concepts, and finally producing some solutions practical to those problems.

STEAM is the dominating educational policy in Korea for the last 10 years. Government put the emphasis of developing STEAM programs and employing them into the classroom with much fund. But science teachers from K to 12 have been struggling to understand, develop, and implement STEAM programs as envisioned by the government. The MOE (Ministry of Education) of government, however, did not give enough time for science educators to research what STEAM education is and why we need STEAM but it spent much fund for science teachers to develop STEAM programs to be implemented since STEAM has been introduced to science educators as well as science teachers. There had been trials and errors in settling STEAM education down into the context of STEAM program. Science has been taught through other 4 disciplines as tools, but surely the other 4 disciplines can be contents in certain points (MOE, 2009). What do we expect from students through STEAM education? So far, we equip students with inquiry skills to find the answers from their curiosity. But making students to be satisfied with the results from curiosity is not the purpose of science education. We need to equip students to be more creative problem solvers from the issues they face from daily lives in the community. There are some conditions to make STEAM successful in Korea on the basis of my research and education.

First, smart class is critical one. Schools got the fund to renovate classrooms to be appropriate to implement STEAM there. For example, technology is basic one for students to do brainstorming at standing tables around the walls of the classroom. After brainstorming as a group, students come to the sitting tables to do investigation. Students also can use technology to collect the data and represent them. Students also use technology and engineering to develop the solution. However, the smart class is appropriate for science investigation but not yet for engineering practices. Therefore, the more supports for engineering in STEAM must be given to be practically solved.

Second, PBL (Project-Based Learning) is another pivotal condition for STEAM. In PBL cycle, students must be motivated to design the investigation to find the best appropriate solution from issues risen from the community. Without motivation, students will lose their interest to make the most effort to find the solution. STEAM has been employed for students' interest in doing science to solve the low rank of affection domain in students of Korea in PISA and TIMSS. On the basis of their interest in doing science by SSI (social scientific issue), students can be much more motivated to solve the problem which is from their daily lives in the community. Therefore, only students' interest is not our focus but students' willingness and engagement beyond their interest. PBL can be completed by SSI at the beginning of that cycle (Park & Hwang, 2017).

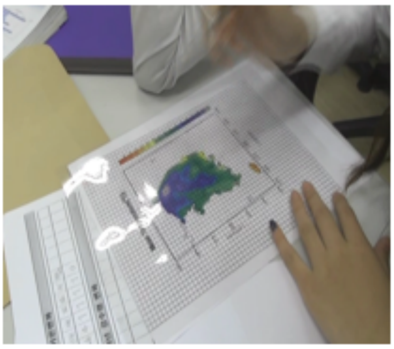
Third, STEAM in Korea put the emphasis of three phases in completing STEAM program. Situated problem is one where students can be motivated to do science. Creative design is another where students have chances to design the investigation scientifically, technologically, and engineering. The last one is emotional touch where students have opportunities where they interpret science with more views beyond science itself.

Fourth, we need to have clear and explicit 5 components of STEAM with enough periods of blocks for one unit. As I mentioned, STEAM can be starting from SSI in the community and it must last more than a few blocks of classes. We cannot include 5 components of STEAM into one block. Therefore, STEAM program must consist of enough blocks of time as PBL lasting several blocks of classes.

Lastly, if I add one more condition for successful STEAM program, assessing STEAM program is not only for students' interest. We need to assess students' understandings of science concepts. We also need to assess students' competencies for engineering practices through design loop. We also need to assess students' disposition supporting the other competencies. In summary, we need to assess concepts and inquiry skills, engineering practices as well as technological skills, and other attitude through STEAM. I can say that there are three essential thinking to make STEAM successful; scientific thinking, computational thinking, and emotional thinking. I want to introduce how we can promote those three thinking skills through STEAM program with concrete examples. Through those contexts which I mentioned, I would like to address the followings; what kinds of outcomes we can expect students to learn from STEAM program.

Scientific Thinking

The goal of science education is scientific literacy which means when people face SSI from daily lives, they need to make decision if it is right or wrong. To meet this goal of scientific literacy, we teach students science as inquiry. To equip students with competencies to be literate scientifically through scientific inquiry, students should have concepts basically (Contents-ON). In addition, students can demonstrate experimentation through which they collect the data (Hands-ON). Students can discern evidence from data to be supportive their claims during the process of argumentation (Minds-ON). Science has commons with arts in that they are from creativity and imagination but they differ each other in that science is logical but art doesn't have to. If Hands-ON mainly is emphasized without Minds-ON, then scientific inquiry can sound cookbook science, which is not acceptable anymore. We need to equip students with two different skills; procedural skill for experimentation and thinking skills for argumentation. This thinking is called scientific thinking consisting of logical thinking and critical thinking in order.

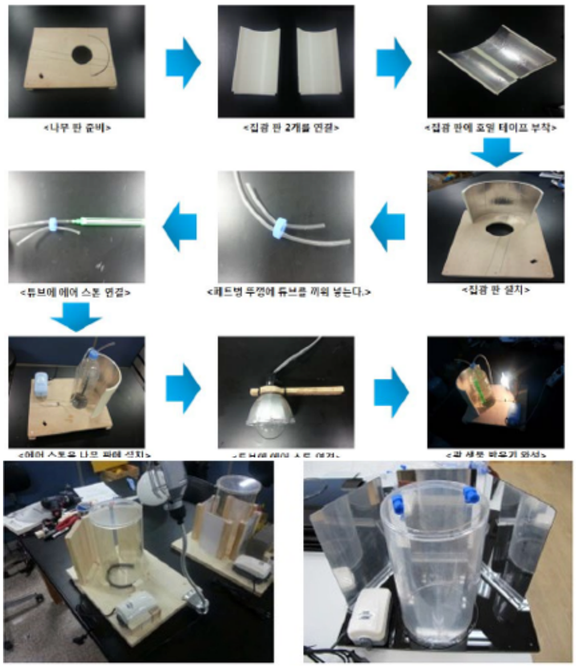


These experiments are for forming and confirming some concepts of climate change.

In this climate change of STEAM program, students had chances to figure out what kind of data they cllect to figure out that there is change in climate of their city. Students collected the data from webstie of Korea atmospheric science research center and used some as evidences supporting the claim; there is climate change in even Korea, even my city. Students desinged the experimentation to figure out what green house effect is and what gas is main factor for global warming. Therefore, students selected three different blak materials; black paper, black plastic, and blak film. Within the same time lapse, students collected the data, transform it, and interpret it to answer the questions. Students need to have skills of how to collect the data, how to discern evidence from data, and how to use evidence to support the claim. Students have same cliams with different evideces or different claims with different evidences. Students in groups can evaluate their claims by supporting, refuting, redefining and etc. Logical thinking comes first and critical thinking comes later, which are called 'scientific thinking'.

Computational Thinking

Students has chance to design the equipment to consume CO2 through photosynthesis by using biomass in the bioreactor.



This is how students apply and use their concepts to produce outcome as the solution

After learning global warming, green house effect and gases, and climate change, students become to know that it is very urgent to save the Earth from climate change. Then how? (decompose) Students come to an end of designing the equipment for consuming CO2 to grow green algae through photosynthesis to produce oil as alternative energy (abstraction). Green algae is more effiecient than corn as alternative energy in Korea. Every chemial factory must found photobioreactor which use biomass to produce oil in students' residence area. However, every area and every chemical factory doesn't have to make photobioreactor for CO2. There must be some clear conditions to use photobiorreactor to solve the problem. Students calucalted what shape is more efficient for photosynthesis. Students decided to use mirros of hexagons surrounding the photobioreactor. How can we know that photosynthesis is happening now? We can know it by its color. The green algae changed dark green from light one in its color for two weeks, this was observable by naked eyes. However, students thought about how to check its photosynthesis gradually to stop it automatically when green algae is ready to be dried to produce oil quantitatively (algorithm and automation). Once students completed developing equipment of photobioreactor, they could make decision if resident area is appropriate for installing this euipqment, how much CO2 could be consumed to provide how much of oil could be produced, and lastly how much this solution could be helpful for climate change in the community (simuation).

In this process of concept application, students experinece a series of computaoinal thinking practices. Wing (2006) stated that everybody use computational thinking in daily lives. Therefore, it is very necessry for people to be familiar with computational thinking. ISTE & CSTA (2011) also defined that computational thinking is consisted of 9 components; data collection, data analysis, data representaiton, decomposing, abstraction, algorithms and procedures, automation, simulation.and parallelization. Weintrop et al.(2016) released that computational thinking can be emphasized for promoting the component of technolgy and engineering of STEM and produced the model of CT in STEM. It was happy time for me to share my experience in education as well as research in STEAM education in Thailand and Japan through their internationaol and local science education conference.

There was a chance for a few scholars in STEAM education to get together to share the ideas at ISET 2018 in Thailand in May 6 to 8th.

I had a chance to talk about STEAM with students at Ehime University, Matsuyama, Japan, on May 26th.

I am eager to share the ideas of common issues in science education from the international views such as STEAM, SSI and more. Through EASE conference at Taiwan this year, I would like to initialize the symposium through we share the common issues from international views. It will be great motivating to make symposiums where all representing scholars from each research area to share their own research and education through international conferences. I am excited to promote EASE association professional and enjoyable places for everybody to be involved in.

Upcoming conferences

The 74th KASE(Korea Association for Science Education) Conference
The past, present and future of Korean Science Education

July 26-28, 2018 @ Daegu National University of Education, Daegu, Korea

The 74th KASE conference, one of the largest conference in science education in Korea, will be held in Daegu, the central part of Korean peninsula. The main theme of the conference is "the past, present and future of Korean science education" and the forefather of science education in Korea, Prof. Seungjae Pak, will deliver a speech and Prof. Jongsuk Park will stand on the stage as a keynote speaker.

Conference Website: http://www.koreascience.org/

Important Dates
Deadline for submission of abstracts – 2 July 2018
End of early-bird rate for conference – 18 July 2018

Keynote Speakers
Prof. Seungjae Pak, Daegu University, Korea
Prof. Jongsuk Park, Kyungpook National University, Korea

Inquiries to: karse@knue.ac.kr

The 42nd JSSE Annual Conference

August 17-19, 2018 @ Shinshu University, Nagano, Japan

The 42nd Annual Conference of Japan Society for Science Education (JSSE) will be held at Shinshu University (Nagano Education Campus), Nagano, Japan in August 17-19, 2018. The conferences have featured symposia, contributed papers and interactive sessions. For more information, please visit the website http://www.jsse.jp/jsseam/modules/note4/
The Japan Society for Science Education (JSSE) was founded in 1977 to contribute to the progress and diffusion of "Education in/about science" and "Education by scientific and technological methods." For this reason, the areas of research covered by the JSSE are inherently broad (please see the Profile page). With greater attention being focused on a science-technology-information based society, the promotion of the "nation-building on the basis of innovative science and technology" policy by the Japanese government, the lack of interest in science among children and the general public, and the current growing attention to science communication, the JSSE has further expanded its areas of research in recent years.

Inquiries to: jsseam42@gmail.com

2018 International Joint Conference of East-Asian Association for Science Education and Association of Science Education in Taiwan

November 29 – December 2, 2018 @ National Dong Hwa University, Hualien, Taiwan

2018 EASE & ASET International Conference will be held at the National Dong Hwa University, Hualien in 2018. The theme of the conference is a dialogue between the local and the global. This conference is co-hosted by EASE and ASET, and there are a number of prominent scholars around the East-Asian regions. The paper submission is already opened and the deadline of submission is 1 July.

Keynote Speakers
Cheng May Hung, The Education University of Hong Kong
Yoshisuke Kumano, Shizuoka University
Jeonghee Nam, Pusan National University
Mei-Hung Chiu, National Taiwan Normal University
Hu Wei ping, National Demonstration Center for Teacher Training Development

November 29 - December 2, 2018
National Dong Hwa University, Taiwan
For more information, visit:
http://2018ease-aset.ndhu.edu.tw/en/

Or contact:
Chia-Ling Chiang, clchiang@mail.ndhu.edu.tw
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Registration information coming soon!

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