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10 Lo Ping Road, Tai Po,
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http://new.theease.org/

The 4th EASE International Conference was successfully held at Beijing

Dongdong Zhou and Jian Wang
(Beijing Normal University, China Mainland)

The 4th EASE International Conference was successfully held at Beijing Normal University, Beijing, China, 16-18, October 2015. The theme of the conference was "Promote Science Education through Research and Reform". This conference covered the following topics: Development of Science Curriculum, Science Education Policy, Science Learning and Teaching, Science Learning Assessment, Science Teacher Education and Professional Development, ICT in Science Education, Historical, Philosophical, Social, Cultural, and Gender Issues in Science Education, Informal Science Education, Public Understanding of Science, Research on Didactics of Physics, Chemistry, Biology and Geography, Development of Teaching and Learning Aids, and Experimental Activities.

The conference was hosted by Beijing Normal University, and the president was Professor Wang Lei, whose major is chemistry education. 700 participants from 12 countries/regions attended this conference. During the great event, 11 keynote speeches were provided by scholars from EASE and international-around. And 460 papers/abstracts were submitted.

At this conference, five science educators from EASE regions were awarded with Distinguished Contribution Awards, two science educators were awarded with Young Scholar Awards, and five article paper authors were given Outstanding Paper Awards.

Distinguished Contribution Award

Zhi-Xin Liu (China Mainland)

Derek Cheung (Hong Kong)

Yeong-Jing Cheng (Taiwan)

Chi-Jui Lien (Taiwan)

Heui-Baik Kim (Korea)

Young Scholar Award

Shen Shuo-pin (Taiwan)

Lina Zhang (China Mainland)

Outstanding Paper Award

Qi Lu, Yanxia Jiang, Jianxin Yao, Yang Deng (China Mainland), Takekuni Yamaoka (Japan)

EASE Conference 2015 in Beijing

Lei Gao (Ewha Womans University, Korea)

The fourth conference of EASE was one of the largest conferences so far, which was held in Beijing, China, my motherland. More than 1,000 people had attended. A number of internationally famous scholars provided speeches, which were really impressive and insightful. This conference was held together with China Chemistry Education Conference; therefore, many professional Chinese chemistry teachers had attended. Attending this conference was a special experience to me, as it was the first time bringing my research to China and joining a Science Education Conference. I felt proud of China, was excited to go to Beijing, and was thrilled to have an opportunity to connect with other researchers.

During EASE, in Beijing, I saw many respected professors, teachers and familiar colleagues. I was able to meet Professor Wheijen Chang again, who is from Taiwan, and had given a speech at EWHA, at 2015 Asia-Pacific International Conference for Physics Education. Furthermore, it was an honor that I was able to receive her book, "Physics Teaching Innovation", as a present. I got to know Professor Yew-Jin Lee, who is from Singapore and showed interest on my research. His kindness and sense of humor was memorable.

As I mentioned above, many Chinese science teachers had joined this conference and presented their researches. Thus, fortunately, I was able to meet a teacher who had been EWHA for a Teacher Training Program back in October, 2014. I also was able to see the members from the last EASE winter school. We missed each other a lot, and looked forward to organizing a meeting of an international research as a group.

I had my presentation at the Poster session, on the last day lunch time of the conference. Several scholars and graduate students paid lots of attention to my explanation of my study. I appreciate everyone's attention and time to listen to my presentation. Additionally, it was an honor to receive constructive comments from other researchers. It was extremely helpful and valuable comments for me. In which it helped me to concentrate more and modify my research to a better direction.

By joining this year's EASE conference, I also recognized that science education research has developed significantly in China. China has become an international field for science education research. As a Chinese graduate student, studying abroad, I feel incredibly proud. I realized that EASE International conference is not only a place to present our research but also a communication platform for all the researchers in the world to have a chance to connect with each other.

After the conference, I had a tour to Mutianyu Great Wall with my Korean friends. All the experiences are deeply stored in my memory. I cannot wait for the next EASE. I look forward to what will come for our researchers at the next conference.

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My Experience Participating in EASE 2015: Full of Excitement and Opportunities

Ji Yoon KIM (Seoul National University, Korea)

Participating in EASE Conference 2015 was one of the most exciting and memorable time of my life. For three days of the conference, various programs allowed me to have interesting conversations with many people from diverse background. I had an incredible opportunity to attend lectures by the researchers whom I could meet only in the books or journals. While having in-depth academic conversation about researches, I had an opportunity to introduce the same research of Korea, which made me feel proud of myself.

I felt so excited when I entered the conference room for the first time. I was honored and excited to participate in such major conference with my advisor, Chan-Jong Kim. However, I was nervous and worried about my research presentation in front of prestige scholars in science education. I presented my topic on the last day of the conference with the title of "The Effects of Cogenerative Dialogue on Middle school Students' Understanding of Scientific Model". Beyond my expectations, many people came to attend my presentation, which made me motivated to talk my topic with more enthusiasm. After my presentation, I felt relieved but at the same time I was not fully satisfied with my presentation. If I were to participate in next EASE conference again in Japan, I would feel confident to make it much better! During the closing ceremony, there was a chance for us to watch photos taken during three days of the conference. Those photos touched me to realize that I am growing to be a beginning scholar step by step. This is only starting. Additionally, there was another chance for us to watch the video of the next upcoming EASE 2016 conference in Japan, which equipped me already with more professional attitude. The experience at EASE Conference held in Beijing was as magnificent as I expected. The conference site of Beijing Normal University has showed the beautiful landscape and scenery. Great conference site, great food, and nice people at Beijing made me satisfied with my first international conference in my life.

After the conference, I visited The Great Wall of China with professors, my research adviser and colleagues. Due to amazing weather, we pretty enjoyed walking The Great Wall of China instead of taking the cable car. This is another factor which made my experience at international conference successful. Cultural visiting is another enjoyable factor. There were other chances to visit educational places but I could not make to visit them. I think that cultural as well as educational visiting after conferences can be attractive factor for more people to come to EASE conference. I am very exciting to attend the 5th EASE conference in Japan, August 2016. I will be ready for it with more professional attitude, better papers, and most excitement!! I want to find myself growing to be professional in science education with other colleagues, professors, and friends. I thank people who provide me with this chance, attending international conference, meeting fantastic people from all over the world, making networks for friendship. I love EASE!

Message from the new President

May CHENG May Hung, (鄭美紅), *Ph.D.*
The Fifth President, East Asian Science Education Association (EASE)
Associate Vice-president cum Registrar,
Chair Professor of Teacher Education,
Department of Curriculum and Instruction
The Hong Kong Institute of Education

It is my honor to be elected as President of EASE for a three year term starting 2016. Serving the EASE community has been my pleasure as I have found myself to be in the company of dedicated science education researchers from different regions. As the Chair of the EASE conference in 2013 in Hong Kong, I was glad to see that EASE had expanded its membership with a total of 349 participants from 12 different regions gathered to exchange ideas and findings in science education. The number of participants and sessions reached new heights at the 2015 EASE conference in Beijing, and I am sure that all the members would be happy to see the growth of the EASE community with each conference. This expansion means that EASE is providing more opportunities than ever for the exchange of ideas and research collaboration.

As the fifth President of EASE, I am in debt to those who have strived hard to establish EASE and have led the Association from strength to strength. Since EASE was first established at the Seoul National University, Korea, the first President, Prof. Masakata Ogawa, the second President, Prof. Jinwoong Song, the third President, Prof. Chi-Jui Lien, and Prof Wang Lei, the most recent President, have demonstrated strong leadership, and EASE has successfully organized many important academic events. Apart from the 2013 Hong Kong conference "Building an International platform for exchange between scientists and science educators" and the 2015 Beijing conference, the EASE community has had success in organizing two other conferences including the first biennial conference (EASE-2009) themed "Science Education for Tomorrow (SET): Voices of East Asia", Taipei, Taiwan; and the second biennial conference (EASE-2011) themed "Lighting the World with Science", Gwangju, Korea. With the aim of enhancing the learning and research experience of postgraduate students working in the area of science education, EASE has run two summer schools, 2010 in Taipei, and 2012 in Beijing, and a winter school, (EASE-APCTP winter school 2014), in Seoul, Korea.

I am glad to work with the new executive group comprising Prof. Young-Shin Park from Korea and Prof. Yoshisuke Kumano from Japan as Vice-Presidents, Prof. Wang Jian from China as Secretary, and Prof. Sung-Tao Lee from Taiwan as Treasurer. With the transfer of the EASE headquarters to Hong Kong, Dr. Wan Zhi Hong has kindly offered his service to be the secretary of the headquarters. I would also like to thank Prof. Young-Shin Park for taking up the chief editorship of the EASE newsletter and for all the colleagues from different regions who serve as editors or contributors. Together with the 20 executive members from the five different regions, I am confident that EASE will continue to develop and make a distinctive contribution to science education.

Last but not least, I would like to thank Prof. Masakata Ogawa and his colleagues who have been working diligently for the preparation of the 2016 conference in Japan. I look forward to meeting you all. Looking into the future, I hope that new partnerships and opportunities for collaboration can be built. Apart from planning for conferences, summer and winter schools, we welcome your ideas and thoughts. Please send in your ideas and suggestions to the executive members in your region or directly to the EASE headquarters at ease@ied.edu.hk. Wishing you all a prosperous year ahead!

Announcing the first issue of Asia-Pacific Science Education (APSE)

Young-Shin Park (International Coordinator of APSE)

We are pleased to announce that the first issue of APSE is published and available online for readers to access and freely download. The first issue demonstrates the diversity of research that APSE seeks to publish. The studies address science education issues in the Philippines, Singapore and Korea, and in the USA with Korean transnational students. In addition, the first issue represents various methodological approaches, including qualitative, quantitative research and mixed methods research designs.

You can find the list of article that the first issue published as below:

- **[Editorial] Asia-Pacific Science Education (APSE): expanding opportunities for publishing science education research** Sonya N. Martin, Hye-Eun Chu
- **The development of a self-evaluation checklist for measuring Filipino students' science giftedness** Aris Larroder, Masakata Ogawa
- **Is it harder to know or to reason? Analyzing two-tier science assessment items using the Rasch measurement model** Gavin Fulmer, Hye-Eun Chu, David Treagust, Knut Neumann
- **An examination of Melody's identities, contexts, and learning in a US science classroom: implication for science education of Asian transnational students** Minjung Ryu
- **Connecting science education to a world in crisis** Kenneth Tobin

We hope that the range of context and topics explored in this first issue will inspire researchers to submit innovative papers that address important issues in science education in Asia that will be meaningful for readers in the Asia-Pacific region and in the international research community. Access the journal at www.apse-journal.com. Enjoy!

2016 International Conference of Ease-Asian Association for Science Education

EASE 2016 Tokyo

August 26 - 28, 2016

Tokyo University of Science, Tokyo, Japan

Innovations in Science Education Research & Practice: Strengthening International Collaboration

Chair of the Organizing Committee
Masakata Ogawa
Tokyo University of Science, Japan

Prof. Masakata OGAWA

It is our great pleasure to invite science educators and scientists, as well as EASE members to the coming EASE 2016 Tokyo Conference (http://ease2016tokyo.jp/). The Conference, co-organized by the Tokyo University of Science, will be held at the Tokyo University of Science, Kagurazaka campus, from August 26th (Fri) to August 28th (Sun), 2016, with an arrangement of pre-workshops and SIG's meeting settings on the 25th (Thu) afternoon. The campus is located at the center of a metropolitan area of Tokyo, and easy to access from most of the key areas.

The theme of the EASE 2016 Tokyo Conference is *'Innovations in Science Education Research & Practice: Strengthening International Collaboration.'* We have already fixed 10 invited speakers from around the world.

Abstract Submission starts on January 15th, 2016
Registration starts on March 1st, 2016
http://ease2016tokyo.jp/

This is the fifth EASE International Conference and the last one of the first round of the conferences for the decade. This means that we are going into the second round and the second decade. We need to make a difference, and we need to try to do something new. From this viewpoint, in addition to our ordinary style and format of the EASE International Conferences (that is, Invited speeches, Oral & Poster presentations, Workshops, Symposia, Demonstrations and Exhibitions), we are planning to provide a special poster session for students, who have just started their research projects (posters on their research proposals), or whose research projects are ongoing (posters on their research progress). This will be a good opportunity for the students to receive comments, suggestions, and recommendations from senior researchers of other regions, and find peers from other regions. The arrangement will serve as a link to the next Summer/Winter School program.

Another idea is to invite undergraduate students or master students who are thinking about the careers of science education research. We will develop a kind of 'student job-shadowing program' for them. Further information will be uploaded in the EASE2016Tokyo website. Please keep checking our conference website, http://ease2016tokyo.jp frequently for the updating the information. Also, early submission of abstract, early registration, and early booking of accommodation are very much appreciated. See you at Tokyo University of Science this summer!

[Tentative Schedule of EASE2016Tokyo]

	August 25th (Thu)	August 26th (Fri)	August 27th (Sat)	August 28th (Sun)
08:30 - 09:30		Opening (08:30-09:10) Plenary 1(09:10-09:50) Plenary 2 (09:50-10:30)	Oral 3 (6 papers / room)	Oral 4 (6 papers / room)
09:30 - 10:30				
10:30 - 11:00		Tea & Refreshment	Tea & Refreshment	Tea & Refreshment
11:00 - 12:30		Oral 1 (4 papers / room)	Poster 1	Poster 2
12:30 - 13:00		Lunch	Lunch	Lunch
13:00 - 13:40	Registration starts	Keynote 1, Keynote 2	Keynote 5, Keynote 6	Oral 5 (4 papers / room)
13:40 - 14:20	Pre-workshops Pre-symposia EM Meetings SIG Meetings	Keynote 3, Keynote 4	Keynote 7, Keynote 8	
14:20 - 15:20		Oral 2 (3 papers / room)	General Assembly	Closing, Awards
15:20 - 15:50		Tea & Refreshment	Tea & Refreshment	
15:50 - 17:50		Workshops, Symposia, Demonstrations	Workshops, Symposia, Demonstrations	
18:00 - 20:00			Banquet	

Invited Speakers (by alphabetical order) with Tentative Titles

Dr. David ANDERSON (Canada)
Professor
Department of Curriculum & Pedagogy
Faculty of Education
University of British Columbia
http://edcp.educ.ubc.ca/faculty-staff/david-anderson/
Current and Future Trends in Science Museum Research for Science Learning

Dr. Claus BOLTE (Germany)
Professor of Chemistry Education
Department of Biology, Chemistry and Pharmacy, Freie Universität Berlin
http://www.chemie.fu-berlin.de/cgi-bin/personen_en?Claus+Bolte
Enhancing Inquiry-based Science Education and Teachers' Continuous Professional Development in Europe

Dr. Chun-Yen CHANG (Taiwan)
NTNU Chair Professor
Professor of the Graduate Institute of Science Education & Department of Earth Sciences,
Director of Science Education Center,
National Taiwan Normal University
http://changcy.com/
e-Learning in Science Classroom: The Good, the Bad, the Ugly and the Future

Dr. May May-Hung CHENG (Hong Kong)
Chair Professor
Department of Curriculum & Instruction
The Hong Kong Institute of Education
Striving to make a change in science classrooms: implications from teacher education

Dr. Ravit Golan DUNCAN (USA)
Associate Professor
Graduate School of Education
The Rutgers University
http://gse.rutgers.edu/ravit_golan_duncan
Learning Progressions in Science: Building coherence across standards, curricula and assessment

Dr. Tetsuo ISOZAKI (Japan)
Professor of Science Education
Graduate School of Education
Hiroshima University
Thinking history of science teaching: From "why" questions to "how" methods

Dr. Sun Kyung LEE (Korea)
Professor of Science Education
Department of Science Education
Cheongju National University of Education
Integrating Education for Sustainable Development (ESD) into Science Education

Dr. Gillian H. ROEHRIG (USA)
Professor, STEM Education
Department of Curriculum and Instruction
Faculty of Education
University of Minnesota, Twin-Cities Campus
http://www.cehd.umn.edu/ci/People/profiles/roehrig.html
Promoting student learning through integrated STEM education

Dr. Sue Dale TUNNICLIFFE (UK)
Reader in Science Education
Department of Curriculum, Pedagogy and Assessment, Institute of Education
The University College London
https://www.ioe.ac.uk/staff/CPAT/GEMS_23.html
Talking and Doing Science in the Early Years: A New Rationale and Implementation in the 21st Century

Dr. BaoHui ZHANG (China Mainland)
Qujiang Scholar Professor
School of Education
Shaanxi Normal University
http://zhangbaohui.snnu.edu.cn
Science Education Research and the Learning Sciences

Why not joining the EASE Alumni Group to contribute to EASE2016Tokyo?

Kazumasa TAKAHASHI[1], Miku YOSHIDA[2],
Taro KAWAHARA[3], Masako YAMADA[3], and Hiroshi UNZAI[3]
Hokkaido University of Education[1], University of Copenhagen[2], Hiroshima University[3]
Contact email address: miku.yoshida@ind.ku.dk

East-Asian Association for Science Education (EASE) has convened four international conferences (2009 in Taiwan, 2011 in Korea, 2013 in Hong Kong, 2015 in China Mainland) since its establishment. The next international conference of EASE will be held in Tokyo, Japan. EASE has also convened Summer School and Winter School Programs for several times. Many doctoral students and master students around East-Asia regions have taken parts in these school programs. "EASE alumni" means mainly for these students. During these past summer and winter school programs, they discussed their own research each other, and also worked together to develop collaborative research proposals. These school programs functioned not only as opportunity for improving their research skills, but also as a place for making friends outside their homelands. In fact, the friendship among the current EASE alumni around East-Asian regions has been maintained after finishing the programs.

As the current EASE alumni, we try to set up an informal meeting in EASE 2016 Tokyo. During a preparation of the conference, we need an organizing committee in order to plan and implement the meeting. We are recruiting the EASE alumni members of each East-Asian region (China Mainland, Hong Kong, Japan, Korea, and Taiwan) as committee members. Some alumni have kindly shown their willingness to join us already, but we need more! If you are an alumni and reading this newsletter, please contact and join us!

Tentatively, we think about an informal (casual) meeting as a place where the EASE alumni could catch up on each other's lives and discuss their current research interests. It is expected that some of the alumni have successfully got positions or changed their research topics since their participations of summer or winter school programs. We hope that we can promote and update mutual understanding and be inspired by researchers of the same generation through this meeting. Of course, the other researchers who are not yet EASE alumni or prospective EASE alumni are welcome to participate in this meeting at EASE 2016 Tokyo!

The EASE alumni are invaluable friends and rival colleagues of the same generation. Discussing with alumni makes us generate motivation for research. Friendly conversation with alumni reaffirms the reason why we value our own research and like to do research further. EASE brought us together from all over the East-Asian regions, so now it is time for the alumni to contribute EASE!

Development and Evaluation of a Practice Model Based on the QUILT Framework in a Case of the State Change: Analysis of Utterance Protocol Using Text Mining

Takekuni Yamaoka & Shinji Matsumoto
The Joint Graduate School in Science of School Education, Hyogo University of Teacher Education, Japan
Hyogo University of Teacher Education, Japan

1. Introduction

Questioning methods and teachers' statements in the class present the opportunity to create a dialogue that encourages thinking activities and interaction among learners. In other words, it is crucial that the teacher's technique organize the content of students' utterances in order to realize the mutual exchange of learning between teacher and students. Thus, a study of the utterance content of both teachers and students, which triggers this organizing, is highly significant. Walsh and States (2005) built an organized program by focusing on the questioning based on the research. The effective Questioning program they developed, the "Questioning and Understanding to Improve Learning and Thinking" (QUILT) framework, organized a variety of teaching strategies. However, the QUILT framework is intended for education in general; it is not a science-specific Questioning framework. As a result, Yamaoka and Matsumoto (2015) developed a science-specific Questioning framework based on the QUILT framework that organized a variety of teaching strategies. Actual examples are shown in **Table 1**. The purpose of this study was to investigate the science-specific Questioning framework based on the QUILT framework that organized a variety of teaching strategies. In this study, two strategies were applied to the Questioning framework: One was the "Puzzling picture," which aims to induce cognitive conflict, and the other was "Think-Pair-Share," which aims to build discussion.

Figure 1. The mystery picture "Balloon in the flask"

2. Process of Analysis

2.1. Subjects of Analysis

Science classes based on the QUILT framework were conducted from January to March 2014 in the 7th grade in Ehime Prefecture public A junior high school. The experimental group used the Questioning framework teaching strategy; the control group did not. A lesson on "change of state in a substance" was tested in 71 junior high school students in the 7th grade to examine the effects of the Questioning framework. The breakdown was as follows: from a total of 71 students (31 males and 40 females), the experimental group contained 34 students, and the control group contained 37 students. Evaluation of the Questioning framework was conducted by qualitative analysis of the utterance protocol using text mining.

2.2. Teaching Strategy

The experimental group attempted to inspire various opinions from the students before actually performing the experiment by utilizing the mysterious picture shown in Figure 1 for the "Puzzling picture" activity, inducing cognitive conflict.

Table 1. The science-specific Questioning framework

Stage	An Actual example	
1: Prepare the Question	Clarify the instructional purpose in a lesson plan, and identify the scientific concept to be covered.	
2: Present the Question	Investigate the Questioning for introducing scientific concepts from the point of view of Question Formats and Question Contents. Furthermore, utilize Yamaoka's (2010) method of classifying the Questioning.	
3: Prompt Student Responses	Induce the Cognitive by utilizing the "Puzzling picture." In light of the activity, carry out actual experiments. In addition, promote dialogue activities by utilizing "Think-Pair-Share."	
	Actual examples of the Questioning teaching strategy, used by the experimental group only.	
	"Puzzling picture"	The "Puzzling picture" began with Divergent Questions like the following: "What do you see in the picture?" After opinions were shared, Convergent Questions like the following were posed: "Can you explain this phenomenon using the concept of particles?"
	"Think-Pair-Share"	Lessons focused on changes of state in substances, aiming for student acquisition of science concepts related to invisible particles. Therefore, the following two Questions were repared: (1) Even though it continues to violently bubble from the bottom of the round-bottom flask, why does the volume of gas in the bottle no longer increase? (2) The gas gathered in the bottle was transferred by a rubber tube to the glass tube, and it puts out the fire. What happens in the glass tube?
4: Process Student Responses	Provide appropriate feedback. Develop and take advantage of both correct and incorrect answers.	
5: Reflect on Questioning Practice	In the next lesson, apply the results of the analysis of Questioning. Furthermore, utilize Yamaoka's (2010) method of classifying the Questioning.	

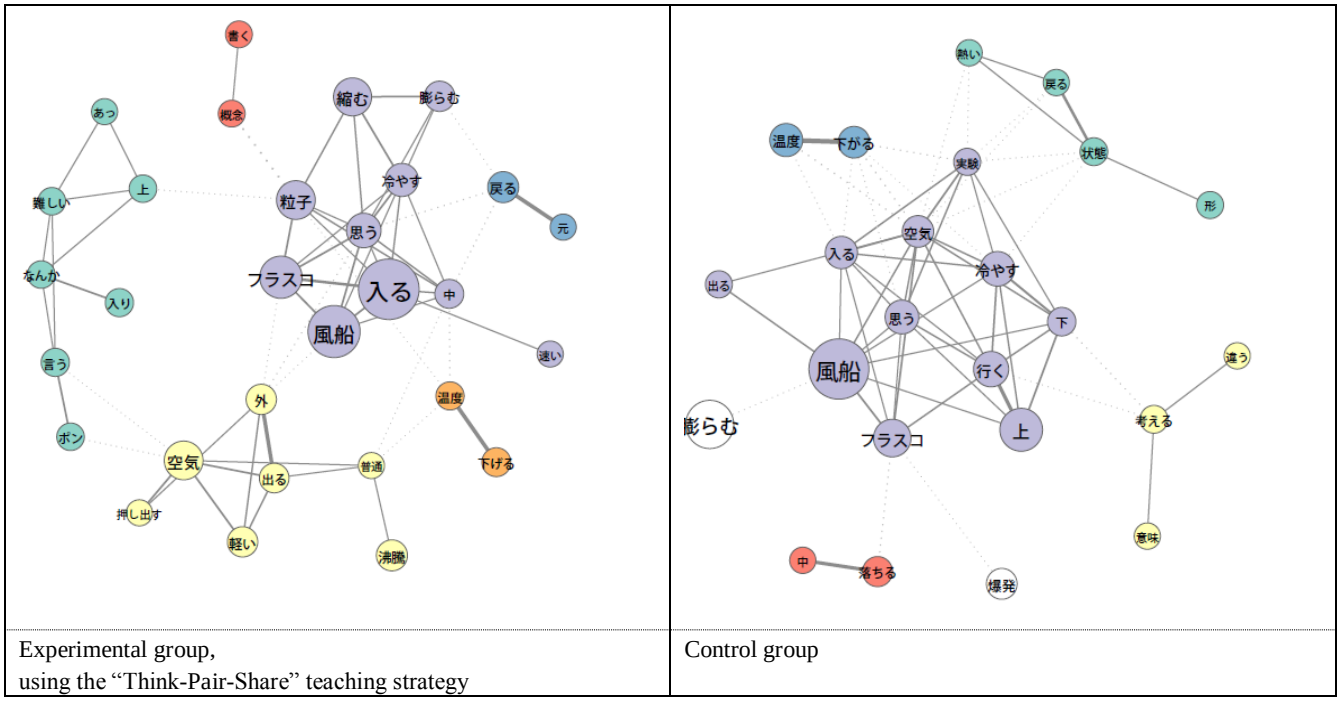
2.3. Qualitative Analysis

In this study, qualitative analysis was mainly performed using the utterances recorded by the IC recorder. The 35 IC recorders (experimental group: 17 units; control group: 18 units) surveyed and recorded the utterances of 71 students (experimental group: N = 34; control group: N = 37), and all of the recorded audio was transcribed as text data. In this study, the object of analysis was this utterance protocol. Actual analysis was conducted after the experiment. And, compared the experimental group using the "Think-Pair-Share" strategy and the control group, which did not use the teaching strategy.

The utterance protocol was analyzed using the text mining technique. The effects of the Questioning framework were investigated by comparing students' understanding in the control group and the experimental group. Text mining techniques were also used to elucidate the themes found in every utterance protocol. This study was performed using the text analysis system KH Coder Ver. 2.Beta.32 (hereafter, "KH Coder"), developed by Higuchi.

3. Results and Discussion

Using KH Coder, the utterance protocol was examined to extract common term patterns. A network of collocation was drawn to tie similar terms from the utterance protocol together, showing the emergence of patterns with lines. The resulting network of collocation for the "Think-Pair-Share" activity's utterance protocol is shown in **Figure 2**.



Experimental group, using the "Think-Pair-Share" teaching strategy

Control group

Figure 2. Networks of collocation for the "Think-Pair-Share" activity

4. Conclusion

In this study, science classes were conducted relying on the science-specific Questioning framework developed by Yamaoka and Matsumoto (2015). Using the utterance protocol of students in practice, the analys of the "Think-Pair-Share" teaching strategy was conducted. Results revealed a tendency among the students to use scientific concepts to describe the phenomena in question, confirming the effect of the Questioning framework. In the future, also in the field of non-state change, we wish to conduct a detailed study on the observed effects of this Questioning framework.

Acknowledgement

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References

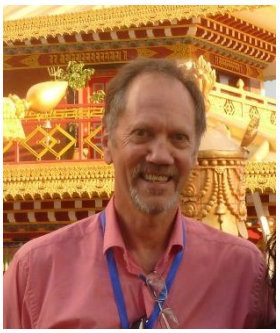
Higuchi Koichi: KH Corder Index page, http://khc.sourceforge.net/, 2014a

Higuchi Koichi: Quantitative text analysis for social research - Toward the inheritance and development of content analysis, 1-16, Nakanishiya publication, 2014b

Walsh, J., & Sattes, B.: Quality Questioning, Research-Based Practice to Engage Every Learner, v -viii, Corwin Press, 2005.

Yamaoka, T.: Trends and Patterns Within the Test Content of Ehime Prefecture's Upper Secondary School Entrance Examinations, 145-154, Journal of Research in Science Education, Vol.50 No.3, 2010.

Transformative Educational Research
Meeting Global Challenges of the 21st Century



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3: Universitas Negeri Jakarta, Indonesia

Science Education for the 21st Century

Science education needs to prepare future citizens for a rapidly changing world that is struggling to find solutions to global crises, chief amongst which are:

- climate change, which is creating catastrophic coastal sea-level rises, decreasing rainfall in agricultural regions and destroying ecosystems; and
- loss of cultural diversity, resulting in extinction of indigenous languages and wisdom traditions and a disconnect between our urban life-styles and the life-sustaining systems of our natural world.

Because we have failed to resolve these crises the United Nations (2015) has established the *2030 Agenda for Sustainable Development* for transforming the world. Education for sustainable development is crucial to achieving this agenda (UNESCO, 2006). 21st Century science education for sustainable development needs to promote the well being of self, family, community, nation, humanity at large, as well as the planet's living systems and other life forms.

Such a socially responsible science education is *multi-disciplinary*; it combines science education, values education and citizenship education. Therefore, in addition to developing students' core science knowledge and inquiry skills, we need to prepare students as future citizens by developing their higher-order abilities. *Critical reflective thinking* is important for identifying the harmful side effects of modern (as well as historic) developments in science and technology. Related to this, *values clarification* enables students to understand the cultural source of habits of mind that govern their everyday decision-making as (uncritical) consumers of science and technology. *Creative thinking* is essential for future citizens to participate in developing innovative solutions to global problems. Future citizens also need the ability to engage in *collaborative decision-making* for resolving conflicting interests, especially ethical dilemmas that are grabbing headlines worldwide:

- technology fuelled economic growth vs natural habitat conservation
- increased food production vs pesticide resistant and high yielding genetically modified crops
- high performance sportspeople (national heroes) vs performance-enhancing biochemical technologies
- investment in renewable energy resources vs polluting fossil/nuclear fuel technologies

The capacity of science teachers to work in multi-disciplinary teams to prepare young people with important higher-order abilities for understanding and resolving complex sustainable development issues depends on science teachers having developed these same abilities. This raises the question of how teacher education programs in our universities and colleges are preparing future science teachers to deal with the sustainable development issues of the 21st Century. This, in turn, raises the equally important issue of the capacity of lecturers and professors who are responsible for developing and implementing socially responsible science teacher education programs.

I wish to address these issues of educational leadership by outlining how transformative educational research is serving as a vehicle for the professional development of science education leaders. This is followed by brief accounts of the transformative research experiences of two science educators - Dr Emilia Nhalivelo (Mozambique) and Dr Yuli Rahmawati (Indonesia) - whose doctoral research I was privileged to mentor and who are now in leadership roles in their respective university teacher education departments.

Transformative Educational Research

Research in science education has evolved dramatically over the past 35 years. When I commenced teaching research methods to postgraduate students in the early 1980s, the starting point was learning to differentiate between dependent and independent variables in order to design instruments for evaluating the impact of teaching innovations on student learning outcomes. Statistical analyses determined the significance of correlations between key variables, with the goal of demonstrating that teaching innovation X contributed to learning outcome Y.

While this *positivist* perspective on research remains popular (mainly in response to government demands for 'evidence-based' research to justify expenditure on education), new research paradigms have entered science education. New paradigm research is transforming researchers' consciousness and enabling them to develop essential higher-order abilities for restructuring science education to meet the challenges of the 21st Century (Taylor, 2013).

The new paradigms of *interpretivism*, *criticalism* and *postmodernism* are based on the premise that educational structures can and should be transformed in response to the needs of a rapidly changing and crisis-ridden world (Taylor, Taylor & Luitel, 2012). The *interpretivist paradigm* provides the researcher with methods for developing reflective understanding of self and others, based on an ethic of care. The *criticalist paradigm* provides methods for deconstructing powerful and invisible (i.e., hegemonic) ideologies and for empowering self and others to develop new policies and practices based on the ethics of social justice, equity and inclusion. The *postmodernist paradigm* draws on the arts to provide exciting new ways to reason (via metaphor, dialectics) and to communicate with others in deeply educative ways (via narrative, poetics, plays, images).

Over the past 20 years, postgraduate researchers in science and mathematics education have been combining these paradigms in creative ways to design innovative research methodologies such as *arts-based critical auto/ethnography*. The creative design space of multi-paradigmatic research allows researchers to draw on any combination of research methods (including positivist methods) (Taylor, 2014).

Novice researchers often experience confusion and perplexity when they first encounter the complex and counter-intuitive nature of the new paradigms. However, with persistence and an open mind, they soon come to understand and value the unique opportunity to engage in an empowering learning process that transforms their hearts and minds (Taylor, 2015). In the first instance, multi-paradigmatic research has a transformative effect on the researcher. Later, as they return to take up leadership roles in their universities, the transformative potential of this research is realised within their institutions and wider communities. The following accounts by Yuli and Emilia illustrate this impact.

Yuli Rahmawati

I am a chemistry teacher educator at Universitas Negeri Jakarta, Indonesia, and in 2013 I graduated with a doctoral degree from Curtin University, Australia. Both my master's and doctoral thesis research focused on understanding reflectively and critically my personal experiences through transformative educational research. I learnt the theory of transformative learning from Professor Peter Taylor who served as my research supervisor. My doctoral study was funded by an Australian Research Council grant which enabled me to undertake a three-year co-teaching investigation of lower secondary school science teaching in Western Australia.

I started to envision myself as a transformative educator when I finished my master's research. I continued this journey into my doctoral research where I designed an arts-based critical auto/ethnographic methodology for investigating my own science teaching pedagogy. In this self-study research I came to understand the powerful role of culture, religion and personal experience in shaping my teaching identity (Rahmawati & Taylor, 2015).

This research was an empowering journey that enriched my personal and professional life by enabling me to examine and re-develop the core values, beliefs and practices that form my teaching identity. During my narrative research writing, I developed three dimensions to my personal theory of transformative learning: constructivism as a pedagogical referent, empowering teacher-student relationships and dialectical thinking (Rahmawati, 2013).

These dimensions have proved to be very important for helping me to remain empowered as a transformative educator in the face of the hegemonic power of the 'technical interest' in my country. In my current teaching practice, my personal experience of transformative learning has helped me to realise that teaching and learning are not simply about developing students' pedagogical content knowledge and skills. More than this, it should engage students in a process of transformation that involves reflecting critically on themselves as they journey towards becoming holistic individuals who can contribute to the development of a 21st century society.

In my institution I am contributing to the introduction of transformative educational research in teacher education. I am also contributing to the Vice Chancellor's Office for Planning and Cooperation Affairs and the Standards Based Education Board. In my various roles, I am endeavoring to enrich existing perspectives, respond to critical issues in educational policy, curricula and teacher competencies, and network with people in other institutions, both nationally and internationally. The main challenge I am facing is negotiating with people who hold hegemonic perspectives.

My current research focuses on transformative learning, ethical dilemma pedagogy, socio emotional learning, character education, cultural studies and 'green' chemistry. I have received a government grant for developing *ethical dilemma pedagogy* (Settelmaier, 2009) in chemistry in relation to Indonesia's new national curriculum that emphasises character education. I am also researching culturally responsive teaching approaches in relation to *ethno-chemistry*.

Emilia Afonso Nhalevilo

I grew professionally from a secondary science teacher to a lecturer at my university. I was taught to be a good builder. I grew up building my career using the blocks that my senior lecturers indicated were the best for my career. Block after block I would use in accordance with their authoritative directions on which particular color, size and block to use. I naturally assumed there were unwritten rules that the whole institution had to follow. No-one would pick a different block because it would not resonate with the institution, the whole condominium.

Sometimes I would ask myself why we should have that particular structure in my country and in my cultural context. But the hegemonic culture always spoke loudest and no doubt formatted my thoughts. I conformed to the notion that we were all supposed to be uncritical technical builders. We were not supposed to be the designers of our neighborhood - our system and practice of education. I was just a technical instrument in the building system. All I had available were the unchangeable blocks from the positivist paradigm to build my practice and my career as an educator.

Not until I embarked on my doctoral research was I invited to go to the edge and imagine a new structure for my own edifice. Then I figured out that to imagine such a structure I had to think of a new architecture for building my career. From the edge, where I enjoyed a privileged point of view, I imagined how the landscape could be and how we could all live in a new condominium of transformation, rather than in uncritical curriculum reproduction (Nhalevilo, 2013).

I analyzed each block I was going to use and I analyzed the potential impact of that building, and so I thought critically of not just finishing the building, not just having a structure, not just resonating with the existing hegemonic culture. Beyond these considerations, I thought of the environment, I thought of beauty, I thought of usefulness, and I thought of the benefits my new edifice could bring to my country. Through my doctoral research I became not only the builder but also the architect of my edifice of teaching. I was transformed (Afonso, 2007).

And that enabled me to be an agent of transformation for others. '*Come to the edge'*, I called to them (Nhalevilo-Afonso, 2013). Enquiring they came and I invited them to imagine new structures, different to the one I had painted. Through envisioning, sometimes just by sharing postmodern horizons of research methodology (Nhalevilo & Ogunniyi, 2014a&b), more of my students are becoming architects. Through breaking down my own walls, I see myself and my students interrogating our curriculum content and format, our languages of teaching. No more plain curriculum.

We started writing poems and narratives of our practice, and we took them to critically adorn the curriculum, both the written and the perceived. With poems we made the curriculum look like crystal buildings and with narratives we made it taste like our culture. And that resuscitated the green smell of the environment.

That artful methodology of painting our curriculum has enabled us to question the *only-one-paradigm unwritten rule* (Afonso & Taylor, 2009). There is a striking difference between looking at blocks or at crystals. With crystals there are a great number of possible colors and sizes. So there are many options to choose from. Since we have to choose we become reflective teachers.

In this transformative voyage, nevertheless, sometimes we struggle, sometimes we stumble, we tremble, and we fear or even despair about

the hegemonic culture still extant.

But we always find ways to draft a new design, and experiment with news ways of expressing and uttering our visions, as I learnt in my doctoral research that envisioning is also an authentic approach to learning. And through envisioning I am designing a style of teaching which, though never perfect, will never again be bound by the uncritical builder that I used to shelter in my early practice.

References

Afonso, E. Z. de F. (2007). *Developing a culturally inclusive philosophy of science teacher education in Mozambique*. (Doctoral thesis). Curtin University, Bentley, Western Australia.

Afonso, E. Z. de F., & Taylor, P. C. (2009). Critical autoethnographic inquiry for culture-sensitive professional development. *Reflective Practice, 10*(02), 273-283.

Nhalevilo, E., & Ogunniyi, M. (2014a). Research as praxis: Perspectives on interpreting data from a science and indigenous knowledge systems project. *African Journal of Research in Mathematics Science and Technology Education, 18*(2), 210-218.

Nhalevilo, E. A., & Ogunniyi, M. (2014b). Reflections on the Science and Indigenous Knowledge Project: Voices from the participants. *South African Journal of Higher Education, 28*(1), 221-235.

Nhalevilo, E. A. (2013). Curriculo local: Uma oportunidade de emanciapacao. *Revista E-Curriculum, 11*(1).

Nhalevilo-Afonso, E. (2013). Rethinking the history of inclusion of IKS in school curricula: Endeavoring to legitimate the subject. *International Journal of Science and Mathematics Education*, *11*(1), 23-42.

Rahmawati, Y. (2013). *Revealing and reconceptualising teaching identity through the landscapes of culture, religion, transformative learning, and sustainability education: A transformation journey of a science educator.* (Doctoral thesis). Curtin University, Bentley, Western Australia.

Rahmawati, Y., & Taylor, P. C. (2015). Moments of critical realisation and appreciation: A transformative chemistry teacher reflects. *Reflective Practice, 16*(1), 31-42.

Rahmawati, Y., & Kohl, R. (2015). Teacher-student dialogue: Transforming teacher interpersonal behaviour and pedagogical praxis through co-teaching and co-generative dialogue. *Learning Environments Research International Journal*, *18*(3), 393-408.

Settelmaier, E. (2009). *Adding zest to science education: Transforming the culture of science classrooms through ethical dilemma story pedagogy*. Saarbrucken, Germany: VDM.

Taylor, P. C. (2015). Transformative science education. In R. Gunstone (Ed.), *Encyclopedia of Science Education* (pp. 1079-1082). Dordrecht, The Netherlands: Springer.

Taylor, P. C. (2014). Contemporary qualitative research: Toward an integral research perspective. In N. G. Lederman & S. K. Abell (Eds.). *Handbook of research on science education: Volume II* (pp. 38-54). New York, NY: Routledge.

Taylor, P. C. (2013). Research as transformative learning for meaning-centred professional development. In O. Kovbasyuk & P. Blessinger (Eds.), *Meaning-centered education: International perspectives and explorations in higher education* (pp. 168-185). New York, NY: Routledge

Taylor, P. C., Taylor, E., & Luitel, B. C. (2012). Multi-paradigmatic transformative research as/for teacher education: An integral perspective. In B. J. Fraser, K. G. Tobin, & C. J. McRobbie (Eds.), *Second international handbook of science education* (pp. 373-387). Dordrecht, The Netherlands: Springer.

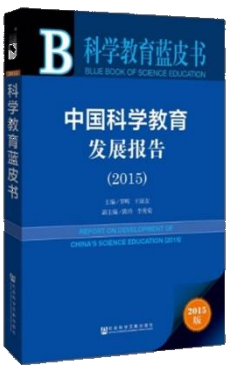
United Nations Educational Scientific and Cultural Organisation. (2006). *Framework for the UNDESD international implementation scheme*. Retrieved from: http://www.unesco.org/new/en/education/themes/leading-the-international-agenda/education-for-sustainable-development/education-for-sustainable-development.

United Nations. (2015). *Transforming the world: The 2030 agenda for sustainable development.* Retrieved from: https://sustainabledevelopment.un.org/post2015/transformingourworld/publication.

New book publication: *Report on Development of China's Science Education (2015)*

Xiuju Li (China Research Institute for Science Popularization, China Mainland)

Report on Development of China's Science Education (2015) is the first biennial report about the science education in China, jointly prepared and produced by the China Research Institute for Science Popularization (CRISP), and many of the country's academic experts. It claims a position among the Blue Book series published by Social Science Academic Press.



This report continually received the support from those related departments and scholars. It is inclusive of the following four sections to each of which an intensive analyses is given: the General Report, Research Report, Evaluation Report and Special Report. It is intensive analyzed that general status, the problems for the development, and some advice for all-sided, continual development of science education in the General Report. The Research Reports analyze the status of science education, citizen science education, science and technology human resources and science education infrastructures. Evaluation Reports analyze the students and adolescents' learning Style, scientific literacy, attitudes towards science and creative imagination. Special Reports analyze the science curriculum and science activities in science and technology museum.

This report accounts for a useful reference for the government policymaking and operation strategy drawing of science education. It is also of values for researchers and workers of science education.

http://www.crsp.org.cn/yanjiubaogao/1109155H015.html

The First China Education Innovation Expo Held Successfully, with Scientific Education as Highlight

Gan Qiuling[1] and Shi Man[2]
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From December 5th to 7th, the First China Education Innovation Expo (hereinafter referred to as Expo) was held at Beijing Normal University. This Expo was led by the innovative, coordinated, green, open and shared development concepts of China's 13th Five-Year Plan, and themed by co-constructing and sharing the education innovations. The Expo originally intended to benefit schools, teachers and students, and parents by discovering, breeding, selecting, applying, and promoting outstanding education innovations. It aimed at systematically innovating, transforming and upgrading China's education practice so as to promote equity in education.

Feature No. 1: an education carnival focusing on the experience

This Expo was a hunt for education treasures, which collected outstanding folk education achievements and co-constructed and shared the education innovation to benefit students. Education authorities of over 20 provinces and cities strongly supported this Expo by selecting and recommending regional education innovations; the National Association of Secondary School Principals (NASSP) of America also recommended a series of innovations and set an exhibition area of the America's future learning center in the exhibition hall; plenty of excellent education innovations were collected thanks to the autonomous declaration of many education units, corporations and individuals and experts and media recommendation. During the three-day Expo, 361 Chinese and foreign education innovations were displayed to the public through 16 education exhibition areas of various themes. A deep discussion was carried out on education innovation and the connotative development of education through four cross-border roadshows, 18 sub forums and 34 themed salons. Educational experts, renowned entrepreneurs, non-profit organizations and investors gathered together. Approximately 8000 participants attended this Expo, and about thirty thousand visitors experienced this education carnival in the exhibition areas, salons and roadshows. Professor Liu Jian, the planner for this Expo, says: "China's education coming into the period of connotative development makes this Expo centered more on links and areas that will directly affect the education quality, which include curricular, instruction, assessment and institutional reform, etc. And this is quite different from some other expos that pay close attention to hardware construction and educational equipment. Most of the displayed education innovations in this Expo comply with basic education laws. They provided new solutions to teaching problems and could be copied, promoted and applied."

Feature No. 2: promoting incubation and donation of education achievements

Different from other education expos, this Expo has laid emphasis on the practice of philosophy for public benefit and tried to discover and breed education innovation projects that suit charitable donations, so as to fuel the education innovations with public funds and promote mass education donation. It will gradually establish a new mechanism, which will widely absorb public funds to promote education innovation and accelerate education development, thus forming a cross-border co-operation platform involving corporations, foundations, schools, governments and educational NGOs. It extensively exchanged and displayed the education innovations of different parties ranging from teachers, principals and teaching staffs to education researchers. It has also respected and protected individual pioneering spirits and stimulated education innovative spirits of the whole society.

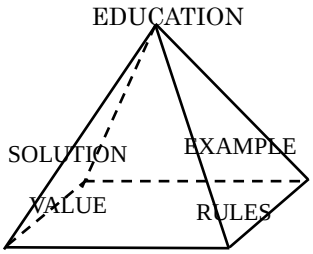
During the Expo, donations to the West reached one hundred million Yuan; the fund for purchasing curriculum resource reached 130 million Yuan; several agencies jointly announced the launch of FoFs for China's Internet education industry, with the initial funds reached five hundred million Yuan. At the same time, a series of start-up projects were matched with the incubators, such as Ling Xi Team with TusStar Incubators, and Pamakids with Zhongguancun Internet Education Innovation Center.

Feature No. 3: proposing SERVE model of China education innovation

To find and promote excellent education innovations and guide its development direction, one should first answer the question that what is good education innovation. Professor Liu Jian held that the answer to that question can refer to the following four criteria. First, good education innovations should have the correct value orientation and the core concept (Values, V for short), and promote the spread of advanced education concept by virtue of education achievements. Second, good education innovations should have clear standard rules (Rules, R for short), and can provide cogent basis for the quality of education achievements, the degree of specialization and the guarantee of competition. Third, good education innovations should have systematic solutions (Solutions, S for short), and provide targeted coordinated service of high maneuverability and remarkable effect for education problems. Forth, good education innovations should have successful application examples (Examples, E for short), and serve as a model during promoting and popularizing education innovation, which will help educational practitioners (users) understand the connotation of education innovation, spread it and learn from each other.

Arrange the four letters according to certain order and form the following formulas:

SOLUTION + EXAMPLE + RULES + VALUE + EDUCATION = SERVE.



SEVER intends to serve education, each school, every teacher and student. The SERVE model of China education innovation proposed by this Expo committee is used to answer the question of what is good education innovation and how to select it, hoping to lead the sustainable development of national and international education innovation fields, express China's voice in basic education and set up China's model to form China's own genre.

Feature No. 4: science education shines brilliantly

This Expo is a comprehensive and multi-theme education expo in which science education became one of the highlights because of its strong interaction. A variety of innovations of science education were shown in the Expo, from Makers, Scientific Inquiries, Science and Tech of STEM, Science Camps, Bilingual Science to Thinking Training, which have attracted a large number of visitors. Among them, the representative ones were:

(1) Maker Movements. In China, Maker education was first initiated in Shenzhen province, and currently has been widely carried out on and off campus all over the country. The pavilion on the theme of "Maker Workshops--the Forefront of Maker Education" exhibited the Maker education achievements of primary and middle schools organized by Shenzhen Academy of Education Science as well as more than 10 Maker education institutions in China. The widely involved fields of the participants include creative arts, open source hardware, 3D printing, robots information technology, etc.. The interactive experiential programs included multi-disciplinary and high-quality Maker courses, covering art, engineering, technology, mathematics and humanity. This thematic pavilion made a great hit During the three-day exhibition.

(2) The fast-growing STEM. A number of Chinese scientific and educational scholars, represented by Professor Luo Xingkai, have been engaged in the science and technology education reform, integrating Science, Technology, Engineering and Mathematics (STEM) since 1996. They have carried out effective action researches, resource development and teacher training, devoted to the implementation of the STEM education in line with China's conditions. This reform has been quite consistent with the development of the international STEM education, and had an impact in the world. They have ever been invited to the US, Germany, Hungary and Thailand for exhibitions. During the Expo, Professor Luo Xingkai hosted the first youth "Integrated Science and Technology Learning" forum, an onsite exhibition and an interactive activity. The exhibition was made in diversified forms and had a lot of highlights: not only a variety of achievements exhibited on the theme pavilion "Technology Inquiry--STEM in China", but also new comprehensive science and technology games and summits were held in this Expo. A large number of teachers and pupils were attracted by these activities, experiencing the charm of science and technology.

(3) Scientific experiment teaching towards "Mass Innovation". Dr. Wei Rui from Beijing Normal University founded the "Dr. Wei Science Education Alliance" to explore a new model of nurturing the achievements in science education, thus promoting the discovery, cultivation and promotion of the innovations of science education as well as its transformation from "Expert-leading Innovation" to "Mass Innovation". At present, Dr. Wei Science Education Alliance have gathered together a group of science teachers from Beijing, Jiangsu, Zhejiang and all over China to nurture, transform and promote their experiments and courses. In this way, the student experimental inquiry activities can be more normalized and the advanced science education theories can be transformed into more practices. The Alliance has already succeeded in nurturing over 10 characteristic experimental courses and a large number of outstanding experimental schemes. During the Expo, the Alliance exhibited several achievements including the science kit for secondary education and scientific experience courses like Cosmetics DIY. As well, it also collected achievements related to scientific experiments. The activities held by the Alliance were widely acclaimed and received active participation. The Alliance donated 3000 sets of science kit to rural schools and launched a teacher training plan combining hands-on experiments and on-line courses with an aim to improve the teaching abilities of rural science teachers.

The First China Education Innovation Expo was a complete success. It was initiated in 2015, and will be held annually. The Expo warmly welcomes worldwide participation. Through joint development, the participants can build a shared international platform of education innovations.

Light Up Science – An innovative program to integrate science learning and English learning

Lan Cong (Foreign Language Teaching and Research Press)
Bob Kibble (The University of Edinburgh)

Introduction

Since 1990s, globalization of education has become an important trend around the world. In China, the government clearly pointed out that we should raise the level of education globalization and train global talents. One way to achieve that goal is to bring a global perspective to the curriculum. Globalization also makes greater demands on intercultural communication skills of future global citizens. In Europe, the principle of "Mother Tongue Plus Two" idealizes European citizens as having at least partial competences in two languages other than their first language. In China, bilingual-type programs have been applied in many subjects, such as science, math, PE for more than two decades.

To cater to the global age, an innovative approach named "CLIL" emerged and has been widely adopted in Europe and far beyond. CLIL stands for Content and Language Integrated Learning, and "refers to a situation where subjects, or parts of subjects, are taught through a foreign language with dual-focused aims, namely the learning of content and the simultaneous learning of a foreign language". Although CLIL has been defined as an "umbrella" term because of different subjects, different types and different models, there are some essential features which distinguish CLIL from other either foreign language-oriented approaches or subject-oriented approaches. Dual-focus is without doubt CLIL's first essential feature. The second important feature is content-driven which is in line with CLIL's definition. In CLIL programs, the language has to be predetermined by the content and will be generated for content learning. Students learn to use the language and use the language to learn the content. This feature distinguishes CLIL from other language-driven approaches which may use content in language learning but mainly aim for language gains and do not necessarily fit into a content subject curriculum.

There are many benefits that CLIL might offer to students: It builds intercultural knowledge and understanding, develops intercultural communication skills, develops multilingual interests and attitudes; provides opportunities to study content through different perspectives; and increases learners' motivation and confidence in both the language and the subject being taught. CLIL also might promote higher order thinking, and enhance flexibility of mind and neuroplasticity. Literatures showed that students involved in CLIL programs improved more concerning language development due to more input and more exposure. However, the research on content development is not extensive and the results are quite varied`.

Philosophy and Objectives

Figure 1. Light Up Science textbooks

To help students better cope with the global age, we developed a six-level bilingual science course adopting the CLIL approach for Chinese primary students. The course, called "Light Up Science", aims to guide students towards becoming global citizens who will be scientifically literate, be open-minded, and be able to communicate science ideas in English. In *Light Up Science*, students learn science mainly through English.

The course focuses on 3Cs-content, communication and cognition. The first focus is science content. Students will gain big ideas and key concepts, experience the inquiry and technology process, develop science and technology skills, and form positive scientific attitudes. These objectives are quite the same with those listed in science curriculum taught in students' native language. The science content provides authentic context for language learning. It is students' desire to understand the science content that motivates them to learn language, and students put just-learnt language to immediate use. This leads to the generation of meaningful communication and the natural acquisition of a foreign language, as opposed to learning language just for the sake of language.

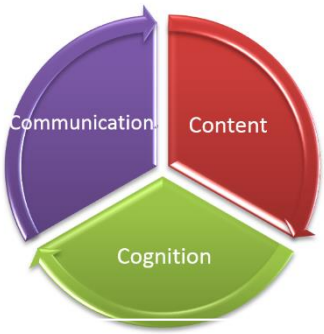


Figure 2. The three focuses of Light Up Science

The second focus is communication. English is not the subject matter, but the main medium used to negotiate the learning process and support content learning. Students will familiarize themselves with science vocabulary, sentence structures and most importantly the universal science discourse patterns, which will prepare them for the intercultural communication and innovation in the field of science and technology in the future. Since the course was designed by international renowned science educators, the course also provides opportunities to study science content though a global perspective.

The third focus is the mental faculty of knowing, or cognition (thinking). Thinking drives the learning process, whatever the subject is. CLIL is no exception: good CLIL practice is driven by cognition too. With Light Up Science, Students will develop thinking skills and are always encouraged to reflect on their thinking processes ("metacognition").

Impact and Implementation challenges

Up to now, Light Up Science is mainly taught by English language teachers who are more competent in English language. Most of the teachers like to teach this course since it is more engaging than traditional language class and provides the authentic context for meaningful communication. However, language teachers usually are not very confident about the science content and tend to use the language teaching pedagogy to teach the science content especially at the start.

Figure 3. Teacher training

To meet the challenges, we provide comprehensive teaching materials, such as Teacher's Book to help them better understand the science content and the relevant methodology. We also offere systematic training to teachers: to explain the course's philosophy and content, to instruct

them on how to organize inquiry-based activities, to guide them to experience inquiry process and learn inquiry skills. Moreover, we always encourage the language teachers to work together with science teachers, especially when they are not sure about the content. Now, teachers are better equipped and feel more confident to organize science activities, and carry out group investigations.

As for students, it is overall a positive experience, although some students might struggle with the foreign language. Most students think the course is interesting and fun. They are always happy to do hands-on activities and feel less pressure when speaking English. Their interest in both science and English and communication skills increases significantly. The globalized science content and ways of learning science brings a different experience to them, and consolidate and extends their normal science class. However, it is no surprise that students tend to use their first language or mix language when expressing complicated ideas and discussing with their friends.

To meet the challenges, the teachers should always encourage students to speak English and create a safe environment where students are not fear making mistakes with the language. However, Chinese should be allowed to be included in the class for deeper understanding.

Conclusion

Light Up Science, a CLIL-oriented program which integrates science learning and English language learning, is generally well-received by most teachers and students. Evidence shows that it is feasible to teach science mainly through English while the first language needs to be included for deeper understanding of science. More qualitative and quantitative research needs to be done to evaluate the program and distill the success factors.

Figure 4. Students having Light Up Science class and presenting their D&T product during a contest

The "Super Science High Schools" in Japan

Manabu Sumida (Faculty of Education, Ehime University, Japan)

Do you know "Super Science High Schools" in Japan?

The "Super Science" high schools (SSHs) designated by Japan's Ministry of Education, Culture, Sports, Science and Technology (MEXT) are set up to train the next generation of human resources for science and technology. The program began in 2002 with 26 designated schools to enhance mathematics and science education. The SSH program's mission is to designated senior high schools that will implement pioneering mathematics and science education to train global human resources of the future. As its scope has expanded year by year, the program has increased the base of science and technology personnel. As of 2015, a total of 203 schools has participated in the program, approximately 4 % of the high schools throughout the country.

"Super Science" for the Gifted Authorized not for the Individual, but for the School

A forerunner among Japan's gifted education policies, the SSH program that has been rolled out nationwide is characterized by its support not for students with acknowledged individual talents, but rather for schools that have been approved as research and development bodies. Basically, designated schools do not select specific students only for the program.

Of the 204 designated SSHs as of 2014, nine were national high schools, 167 were public, and 28 were private. There were 5,031 senior and junior high schools nationwide in Japan in 2013; 19 were national, 3,675 were public, and 1,337 were private. Considering this fact, the organizations that operate designated SSHs were characterized by the high ratio of national schools (around half of the national schools nationwide). Moreover, the ratio of private schools in the program is extremely low at around two percent. Kobayashi et al. (2015) analyzed the geographical relationships among designated SSHs and universities and found out that SSHs are located in the areas where universities have taught foundations for training research personnel (e.g., Ph.D. course).

Who Support the SSHs?

The SSHs designated by MEXT received the support needed to carry out their activities from the Japan Science and Technology Agency (JST). The JST supported activities at the SSHs by purchasing goods and paying the costs of training and teachers for the schools, as well as planning and running academic conferences and disseminating information to the public. It should be also noted that it is possible for SSHs to conduct joint activities with local schools and overseas schools that emphasize science and mathematics, as well as to cooperate with other schools on student activities involving research and academic conferences. The SSH program at a designated school is set at five years, and a school sometimes has its SSH renewed for another five years. Designated SSHs have allocated funds for their activities during that period, and designated schools can use these to undertake planned activities.

There were only 26 designated schools in the SSH program in 2002, the year the program began, but the total had increased to 204 by 2014. The initial overall budget of around ¥ 700 million (approx. US$ 5.8 million) had increased to three billion yen (approx. US$ 25 million).

A Case of Curriculum and Practice at an SSH: The Matsuyama Minami High School

Ehime Prefectural Matsuyama Minami High School (MMHS) has been designated an SSH since 2002. It was part of the first group of SSHs (26 high schools) and one of the only four high schools that have been designated SSHs since 2002. The theme of curriculum development and practice was "cooperation between high schools and universities" for the first period (2002-2005), "developing an international mind" for the second period (2006-2009), and "bonds of science" for the third period (2010-2014). During the third period, the school tried not only to develop students' scientific attitudes and inquiry skills, but also to make a social contribution to the public, along with the students, through the SSH program. In April 2015, MMHS started the fourth period, whose theme is "Science Education for Sustainable Development".

In the third period (2010-2014), MMHS tried to establish a variety of science networks and make a social contribution as a core school in the area. It provided a special subject called "Super Science" that was two units for first-year students (grade 10) and another two units for second-year students (grade 11). As the special subject, the first-year students completed 1) an introductory course in physics, chemistry, biology, earth science, math, or information, 2) an advanced science lecture offered in cooperation with the university (superconductors, environmental chemistry, genetic engineering, or earth and space science), 3) a research project, and 4) an international training in science.

The second-year students conducted mainly research projects (including an interim presentation and a final presentation) in the special subject (i.e., Super Science). They also completed a science internship at the university's College of Medicine, Agriculture, Engineering, and Science. Special instructions on ethics, in cooperation with physical education teachers, and on writing and giving presentations, in cooperation with language teachers, were also provided at the high school.

MMHS aimed to establish a broad network in science and to create a variety of bonds. Firstly, as a "*bond with young students*", MMHS planned and implemented a presentation and exchange meeting on students' research projects with other SSHs and some high schools that have special classes in science and math. The experience of exchanging their research projects with students from different high schools seemed to improve their motivation to study science and pursue a scientific career.

As a "*bond with the world*", MMHS carried out a special science program in Taiwan to develop students' international minds. The Japanese students gave presentations and discussed their research projects with Taiwanese students in English. They also visited universities, science/technology companies, and research institutions in Taiwan. MMHS language teachers also supported the program by teaching the students English scientific vocabulary and improving their speaking performance and communication skills.

Moreover, MMHS established a "*bond with children and local people*". The students guided elementary school children in a nature seminar with science teachers to develop the children's scientific understanding of local nature as well as their leadership skills. They also ran a booth at the university science festival to explain experimental methods to children and their parents. The research project presentations were open to the public.

In addition, MMHS collaborates with prospective science teachers at the university. Special science activities for the science club have been conducted with high school science teachers and prospective science teachers at the university. These activities are open to gifted junior high school students in the city. The collaboration enhances the prospective science teachers' motivation to engage in science education, and they can also improve their skills in teaching gifted students. MMHS hopes to develop the next generation of science education leaders.

To create a "*bond with scientists*", MMHS students visited the advanced research centers at the university and attended special lectures by university professors at the high school. They also visited the university often and participated in a science internship program to study and work with university students. They had opportunities to engage in field research with scientists and to visit specific scientists and laboratories in relation to their research projects. MMHS started a mentor system with its alumni to support students' research projects. Students can use the system to send queries about their research projects by e-mail and receive a special lecture in a specific field. MMHS has a 14-year history as an SSH, and it has started turning out many competent scientists in and out of Japan.

Further information: Sumida, M. (in press). Super Science High Schools-Japanese-style science education designed to augment talented students' individuality and skills. In S. Markic, & S. Ablels (Eds.) *Science Education towards Inclusion*. Nova Science Publishers, Inc.

References

Kobayashi, Y., Ono, M., & Araki, H. (2015). *Overview and verification of effect of Super Science High School*. Discussion Paper, 117, National Institute of Science and Technology Policy. (in Japanese)

The 7th museum-school collaboration symposium was successfully held in Hunan province

Xiuju Li (China Research Institute for Science Popularization, China Mainland)

The 7th Museum-school collaboration symposium (MSCS) has been successfully held in Hunan province, 24th, September, 2015. The 7th MSCS which hold by China research Institute for science popularization, and organized by Hunan Science and Technology Museum aims to provide an international forum for domestic and international practitioners, researchers, administrators and policy makers communicating ideas about improving science learning through museum school collaboration. Nearly 200 researchers, science teachers and museum workers gathered to discuss how to improve students' understanding of science through resources in science museum.

The 7th MSCS invited 4 plenary speakers and 5 keynote speakers, and 22 speakers which made their presentation in two parallel sessions. Through these presentation and discussion in depth, participants can get the basic status of Museum-school collaboration in mainland China. All participants also discussed how to design science activities to promote students' scientific literacy in science museums.

China Research Institute for Science Popularization (CRISP) is a non-profit organization which subordinate to the China Association for Science and Technology. CRISP now stands as a unique national institution dealing specially with studies on science and technology communication in China.

A Lesson Study and more in a regional conference

Hisashi OTSUJI (Ibaraki University, Japan)

The 54th Kanto Regional Conference of SJST (Society of Japan Science Teaching) was held at the College of Education, Ibaraki University, Mito, Japan, on December 5th. Since the Kanto is one of region including Tokyo metropolitan area, the number of the society in this area is over 600. This is why more than 240 participants of teachers, graduates and researchers gathered and had fruitful discussion over 101 presentations, including 13 posters and 6 English presentations.

An unique event, a lesson study, was specially planned. 24 Grade 3 students of the attached elementary school participated in and a teacher gave them a 45 min. lesson in a theater classroom, shown in the photo. In the following discussion, a few of talented old teachers argued a little about the philosophy of teaching science and another teachers proposed alternatie way of instruciton. All participants were satisfied with exchanging ideas over the shared practice.

English keynotes have been appeared before in the society, however, English session was officially called first time in the history of whole society. Some of the foreign graduate students applied and made presentation. This opportunity provided good experience for participants and presenters. Since the Japanese government is promoting to welcome foreign students as a national policy, it is natural for research society to open the door for them. Stimulated by the English session, new format of abstract was introduced to other presentations too. Additionally, the abstracts in PDF format (prohibited to print out) were shared in advance, among the presenters to enhance the discussion of the session. The conference ended successfully with many of the new proposed attempts. http://branch1.sjst.jp/kanto/2015/

Upcoming Conferences

2016 Korean Association for Science Education International Conference
"The Future of Science Education: International Perspectives" January 28-30, 2016
Kyungpook National University, Daegu, Korea

for more information
http://www.koreascience.org/english/2015_conference.asp

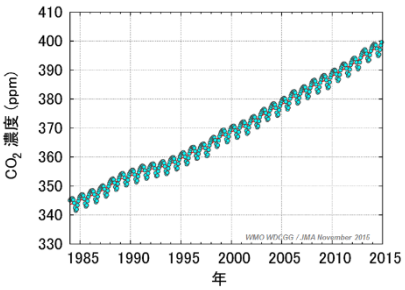
for more inquiry
contact: philoh@ginue.ac.kr

Important dates
Conference dates: January 28-30, 2016
Location: Kyungpook National University, Daegu, Korea
Call for papers: January 7, 2016 (contact Prof. Phil Seok Oh)

Invited speakers
Richard Duschl (USA, Plenary), Mei-Hung Chiu (Taiwan, Plenary), Jim Ryder (UK), S. M. Hafizur Rahman (Bangladesh), Ying-Chih Chen (USA), Kok-Sing Ken Tang (Singapore), Julie Luft (USA), Julia Plummer (USA), Baohui Zhang (China), Wing Mui Winnie So (Hongkong), Manabu Sumida (Japan), Tak-Cheung Lau (Taiwan), Aik Ling Tan (Singapore)

Quiz

The United Nations Climate Change Conference was held in Paris, from 30 November to 12 December in 2015. It was the 21st annual session of the Conference of the Parties. So it is called as "COP21." It is said that one of the causative agents of global warming is carbon dioxide. All questions below are related to carbon dioxide or oxygen.



http://www.jma.go.jp/

Q1. What is the average of the concentration of the world's carbon dioxide now? Answer it in [ppm] and [%] as well.

Q2. The conentration of the world's carbon dioxide goes up and down every year. Why?

Q3. Candle flame has disappeared in a sealed gas collector bottle. Why? Select an adequate answer. (1) All of the oxygen in the bottle was consumed by the flame and becomes 0[%]. (2) The carbon dioxide which came out from the combustionin in the bottle turned off the flame, like the fire extinguisher. (3) Other.

Q4. Before the blood enters the lungs, its partial pressure of oxygen is 40 [mmHg]. After the blood absorb oxygen in the lungs, the partial pressure becomes 95 [mmHg]. This supplies oxygen throughout the body. Calculate the partial pressure of oxygen in the air. Concentration of oxygen is 21 [%] in the air and 1 [atm] is 760 [mmHg].

Conference information / Websites of associations in Japan

The Society of Japan Science Teaching (SJST), founded in 1951, has more than 2,000 members and holds a nation wide regular conference in summer. In 2016, Shinshu Univeristy (in Nagano) is hosting the 66th annual conference from August 5 to 7. The society is consist of nine branches and each of them has regional conference every year, as one of them was reported on page 16 in this issue. http://www.sjst.jp/

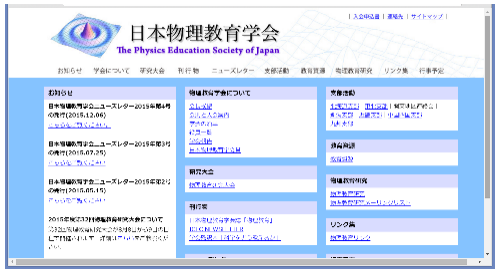
The Japan Society for Science Education (JSSE), established in 1977, is more research oriented than SJST and includes various domains such as Mathematics and Educational Technology. This association is going to have the 40th annual conference from August 19 to 21 in Oita Prefecture. However, please do not forget our biennial conference (EASE2016Tokyo) which is from 26 to 28 (see page 4 and 5). JSSE has 10 branches with regional conferences as well and priovides general information in Chinese and Korean, in the homepage. http://www.jsse.jp/

Coming Regional Conferences of JSSE (First half of 2016)

Date	Branch	Venue
February 20, 2016	Hokuriku-Koshin-etsu	Yamanashi University, Kofu
March 19, 2016	Minami-Kanto	Tokyo Gakugei University, Tokyo
April 9, 2016	Kita-Kanto	Tsukuba Univeristy, Ibaraki
May 28 or June 4	Shikoku	Kagawa Univeristy, Takamatsu
June 4, 2016	Chugoku	Hiroshima Univeristy
June 25, 2016	Tokai	Shizuoka University

The Society of Biological Sciences Education of Japan (SBSEJ), originally founded in 1947, has conference twice a year and the memorial 100th conference is heading in Tokyo, on January 10 and 11, 2016, at Tokyo University of Science, Kagurazaka Campus. Congratulation! http://sbsej.jp/

The Physics Education Society of Japan (PESJ), established in 1953, has about 1,200 members and plans to have 33rd annual conference in Niigata prefecture in 2016. http://pesj.jp/



The Japan Society of Earth Science Education (JSESE) has its root of establishment in 1948 and there is about 560 members now. JSESE is having the 70th annual conference in Tokushima in 2016. Detail will be coming soon.

The Japan Society for Elementary School Science Education, founded in 1957, is a practice based association with more than 2,300 members. Here is a root of the Lesson Study which was introduced to USA by Dr. Catherine Lewis. http://nisshori.com/

The Japanese Society of Environmental Education (JSEE), established in 1990, has been leading the important erea. http://www.jsoee.jp/

Surfing around the Internet, we notice that we are surrounded by a lot of information and chance. The depreciation of the yen may enhance your planning to visit Japan. Further inquiries, please contact the executive members.

Answer of the Quiz

A1. Older generation people learned in our school days that the average of the concentration of the world's carbon dioxide is 380 [ppm] = 0.038 [%]. However, it recently reaches 400 [ppm] = 0.04 [%] as widly broadcasted in 2015.

A2. At summer season for northern hemisphere where more lands are located, more carbon dioxide is absorped by photosynthesis in daytime. The tilt of the earth's axis which causes the season and the deviation of the land in the hemisphere cause the jagged graph ultimately.

A3. When you measure the concentration of oxygen after the flame disappeared, it is still more than 10 [%]. (1) is incorrect. Large number of children tend to select (2), considering carbon dioxside as a fire extinguisher. What happen if you light a candle in a sealed gas collector bottle with 80[%] of carbon dioxside and 20 [%] of oxygen? The answer is given by experiment.

A4. 760×0.21=160 [mmHg]. Human feels headache and dizziness even when there is 13[%] oxygen that makes the flame disappeared. Can you live in the air of 5.2 [%] oxygen? No. The partial pressure will be 40 [mmHg] and you cannot absorb oxygen into your body.

New Executive Members 2016-2018

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Vice-President: Yoshisuke KUMANO
Vice-President: Young-Shin PARK
Secretary: Jian WANG
Treasurer: Sung-Tao LEE
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Korea	Kongju Mun munkongju@gmail.com	Ewha Womans University	9(4) 2016 December 11(1) 2018 March

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