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

The Newsletter of
The East-Asian Association for Science Education
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National Changhua University of Education
No.1, Jin-De Road,
Changhua City, Taiwan
+886-4-7232105
Fax: +886-4-7211178

Words from the EASE Headquarters

Call for Nomination, 2013 EASE Distinguished Contribution Awards

The 2013 EASE Distinguished Contribution Awards (DCA) is accepting nomination till April 15, 2013!
The EASE Association desires to recognize and reward individuals who have made significant impacts and extraordinary contributions to science education in the East-Asian regions. The recipients of the Awards should have contributed over a period of at least 20 years of his or her career as a science educator.
Two DCA Awards, either through research (**EASE Distinguished Research Award, DRA**) or through service (**EASE Distinguished Service Award, DSA**). For each, no more than two Awards are given biennially when the EASE General Assembly is held.
The **DRA** should be awarded to an individual who has:

- (a) made extraordinary contributions to science education through research;
- (b) made original and substantial impact on science education through research;
- (c) led to opening of new research areas or methodology in science education; or
- (d) provided notable leadership in promoting science education research.

The **DSA** should be awarded to an individual who has:

- (a) made extraordinary contributions to science education through service;
- (b) made original and substantial impact on science education through service;
- (c) led to opening of new practice areas or visions in science education; or
- (d) provided notable leadership in promoting science education activity.

All members are encouraged to nominate by sending a name or names of nominee(s) to the DCA Committee (sflin@cc.ncue.edu.tw, Executive Secretary of the Committee, Prof. Shufen LIN) along with no more than one page of recommendation for each nominee.
The results will be reached on June 15 or before. The award recipients will be invited to the Awarding Ceremony, which will be held on the 2013 EASE General Assembly or Closing Ceremony of the 2013 EASE Conference in Hong Kong (July 4-6, 2013). (For details please visit the website: http://new.theease.org/)

CONGRATULATIONS !!

We are delighted to inform you good news. Professor Hsiao-Lin Tuan, our executive board member in Taiwan, also the president of ASET, was elected as the newest NARST international coordinator and JSTE editorial board member. She wishes to express her appreciation to you and all EASE members for your support during the election. Let's congratulate Professor Tuan!

An Invited EASE Symposium in 2013 ESERA Conference

The EASE Association accepted the invitation from the European Science Education Research Association (ESERA) Conference, which will be held in September 2013 in Cyprus, to organize an EASE symposium. Five Executive Members from different regions-China Mainland, Hong Kong, Japan, Korea, and Taiwan will participate in the symposium.
The title of the symposium is, "Research Updates from the East-Asian Region- View scientific concept, teaching/learning, and evaluation from complementary perspectives." This symposium will broadly present and discuss updating science education research and practices in five regions. Each presentation will be presented by science educators from their respective region.
Five presentations will be presented by: 1. Prof. Enshan Liu, Beijing Normal University, China Mainland; 2. CHENG May Hung, May, WAN Zhi Hong, The Hong Kong Institute of Education, Hong Kong; 3. Manabu Sumida, Ehime University, Japan; 4. Chan-Jong KIM, Min-Suk KIM, Seoul National University, Korea; 5. Hsiao-Lin Tuan, Chung-Hsien Tseng, Graduate Institute of Science Education, National Changhua University of Education, Taiwan.

Editors of the EASE Newsletter

Issues to be in charge	Responsible Editor	Regions
Mar. 2013 (this issue)	Prof. Hyunju Lee (hlee25@ewha.ac.kr)	Korea
Jun. 2013	Prof. Shiho Miyake (miyake@mail.kobe-c.ac.jp)	Japan
Sep. 2013	Prof. Sungtao Lee (leesungtao@gmail.com)	Taiwan
Dec. 2013	Prof. So, Wing Mui Winnie (wiso@ied.edu.hk)	Hong Kong
Mar. 2014	Prof. Wang Jang (wj423@163.com)	China Mainland

The roots of education are bitter, but the fruit is sweet.-----Aristotle

NARST conference is coming!

Sonya Martin, Seoul National University, Seoul

I would like to share some news from NARST President-Elect, Lynn Bryan, about the upcoming NARST conference to be held in Puerto Rico from April 6-9, 2013.

The theme of this year in NARST is "The S in STEM Education: Policy, Research and Practice", offering a chance to discuss, elaborate, or critique the connections between science education and new notions of STEM education. Keynote speakers include Dr. William F. Tate IV, Washington University in St. Louis, "*Research on Ecological Context and Place: Investigating the Landscape of STEM Opportunities*" and Dr. Margaret Honey, New York Hall of Science, "*Design, Make, Play — Growing the Next Generation of STEM Innovators.*" Lynn also wants to encourage EASE members to volunteer to serve on various standing committees within NARST as participation in committee assignments is one of the best ways to get involved in NARST and to influence decisions and policies.

International Committee Chair, Sibel Erduran, reminds EASE members that full name of the organization is now NARST: A Worldwide Organization for Improving Teaching and Learning of Science through Research. Sibel writes that this year the International Committee of NARST has funded 31 scholars from South Africa, Turkey, Sweden, Israel, South Korea, China, Chile, Bangladesh, Cyprus and Lebanon to attend the annual conference. NARST is also sponsoring a grant scheme for science educators around the world to participate in capacity building activities in low-income countries. A new scheme was recently been initiated to support doctoral researchers to attend the PhD schools of other associations. A call has recently been circulated to invite applications for attendance at the SAARMSTE School to be held in South Africa.

More information is available on the website at www.narst.org, and informal queries can be directed to the NARST International Coordinator, Sibel Erduran at Sibel.Erduran@bristol.ac.uk.

I think it is especially important for international members to make their voices heard in organizations like NARST. I encourage EASE members to apply for a Committee, such as the International Committee. To do so, please complete the information requested in the assignment request form: https://narst.org/members/AssignmentRequests.cfm.

The form resides within the Members Only area, so you will be prompted to log in with your username and password. Or, you can visit www.narst.org and click on the link in the Announcements section. You will be asked to (1) provide contact and demographic information, (2) rank order up to three committee choices, (3) provide any additional information about your committee preferences and qualifications (up to 300 words), and (4) upload a two-page vita that highlights your scholarship, service to NARST and service to other professional organizations. Details about each Committee's charge and other information may be found in the NARST Policy and Procedures Manual, which is available at www.narst.org under the left-side tab "About NARST".

We are very pleased to invite EASE members and other science educators and scientists to the forthcoming EASE 2013 conference. This conference will be held at the Hong Kong Institute of Education, Hong Kong, China, on 4–6 July, 2013. Hong Kong, the Pearl of the Orient, is Asia's financial hub for international commerce and a gateway into China, where both Eastern and Western cultures coexist harmoniously. We are sure that you will enjoy the vigor, beauty, modernity, and diversity of Hong Kong.

The theme of the EASE 2013 Conference is "Building an international platform for exchange between scientists and science educators". We hope that the two academic groups of science and science education in East Asia and across the world can be meaningfully and truly integrated at the conference through the active exchange of ideas, research findings, and expertise.

We sincerely believe that the EASE 2013 Conference will be a place where you can share your research interests, build relationships with your colleagues, and enjoy Hong Kong. We look forward to meeting you in Hong Kong in July 2013.

CHENG, May Hung May
Chair, Organizing Committee of EASE 2013 conference
Hong Kong Institute of Education
WONG, Siu Ling Alice
Vice Chair, Organizing Committee of EASE 2013 conference
University of Hong Kong
YEUNG, Yau Yuen
Vice Chair, Organizing Committee of EASE 2013 conference

FOR FURTHER INFORMATION: http://new.theease.org/conference.php

—Welcome to 2013 ASET—

More pictures please visit: http://aps.ncue.edu.tw/ncue_photo/build.html

The Association of Science Education in Taiwan (ASET) would like to invite you to join us for the 29th ASET Annual International Conference. The conference is set on December 12-14 2013, at the National Changhua University of Education in Changhua Taiwan. ASET is the largest science education association in Taiwan, established since 1988. Each year during the conference, we invited internationally renowned scholars as speakers. Last year, there were about 240 presentations in math and science education. The 29th ASET Conference is also one of the activities recognized by the EASE association. The theme of this year's conference is "Science and Mathematics Manpower Cultivation: Key Literacy and Essential Skills for the 21st Century." Further detailed information regarding proposal submission will be announced in early summer. Please book the dates and join us! If you have any questions regarding the conference, please send your inquiries to aset.ncue@gmail.com

~ASET Organizing Committee

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The 63rd KASE conference at Ewha Womans University

Jong-Yoon Park, Ewha Womans University, Seoul, president of KASE

The 63rd KASE (Korean Association for Science Education) conference was held at Ewha Womans University, Seoul, South Korea, on 21–23 February, 2013. KASE was founded in 1976 and has been developed dramatically for the last thirty-six years becoming one of the highest authorities in the Korean Science Education field. KASE holds biannual conferences in summer and winter. About 300 science educators and researchers, science teachers, and graduate students participated in the 63rd KASE conference. We also had foreign participants from Japan, Taiwan and U.K.

The theme of the KASE conference was "The Evaluation of Science Teachers' Professionalism." We had three keynote speakers - Dr. Youngsun Kwak at KICE, Prof. Jeonghee Nam at Pusan National University, and Prof. Sungmin Im at Daegu University – and provided us insightful presentations on quality assurance system in teacher preparation, teacher preparation program evaluation, and Korean national teacher qualification exam respectively.

We also offered different formats of sessions including 137 oral and poster presentations, symposiums, workshops, demonstrations, exhibitions, and round-table discussions. In this year, Incheon Science Teachers Association presented various fantastic science demonstrations that science teachers and educators could implement in their science teaching. One of the distinctive sessions at the conference was “science experiment for the blind.” This session was designed to promote understanding of science educators on the blind students in the science classroom. The group prepared eye models and molecule models in a darkroom, and applicants entered the darkroom and tried to figure it out what the models looked like without any prior information. After the activities, they shared their experiences and feelings.

In order to encourage participation from other countries, KASE offers English presentation sessions and plans to increase more next year. Please join the KASE conference! We are highly welcoming EASE members!

Fig 1. Welcoming remark from the KASE president

Fig 2. Reception

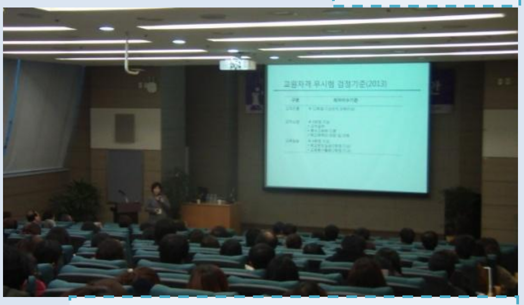


Fig 3. Keynote Speech of Dr. Jeonghee Nam

The 1st International Conference on Argument-Based Inquiry Approach

Aeran Choi, Ewha Womans University, Seoul

The 1st International Conference on Argument-Based Inquiry Approach was successfully held at Pusan National University, Busan, Korea from February 4th to 7th, 2013. The main theme of the conference was “Exploring the Impacts of Immersion Approaches to Argument-Based Inquiry with Particular Emphasis on the Science Writing Heuristic (SWH) Approach.” The organizing committees of the conference were Brian Hand (chair of organizing committee, University of Iowa, USA), Jeonghee Nam (chair of conference coordinating committee, Pusan National University, Korea), Murat Gunel (TED University, Turkey), Wen-Hua Chang (National Taiwan Normal University, Taiwan), Aeran Choi (EwhaWomans University, Korea), Andy Cavagnetto (Washington State University, USA), and SozanHussain Omar (King Saud University, Saudi Arabia).

Brian Hand (University of Iowa, USA) opened the conference with an inspiring key note speech on the title of “Immersion Approaches of Argumentation.” The participants were 70 from the United States, Turkey, Taiwan, Saudi Arabia, and Korea. There were 40 research papers presented followed by in-depth discussions among the conference participants. In addition to the research presentations from Feb 4th to 6th, this conference hosted a professional development program on “Argument-Based Inquiry approach” for 70 secondary science teachers from Busan on Feb 7th. The participant teachers were inspired by science activities using an Argument-Based Inquiry approach and discussed about ways and strategies of implementing an Argument-Based Inquiry approach in their science classrooms.

The next conference is planned to be held in Taiwan in 2015.

Fig 1. Brian Hand (chair of organizing committee, University of Iowa, USA)

Fig 2. Andy Cavagnetto (Washington State University, USA)

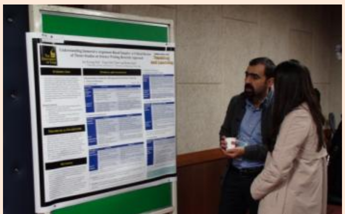
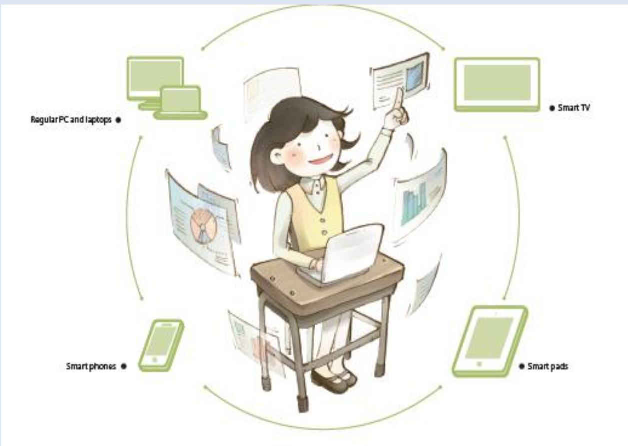


Fig 1. Poster presentation

Digital Textbooks for All Korean Students by 2014

Jeongmin Noh, Korea Education Research and Information Service



With the rapid development of educational technologies, classroom and school environments have been dramatically changed for recent years. Korea is one of the countries in which the educational use of cutting-edge technologies has been much focused on in the school environment. In particular, Korea has built Ubiquitous Learning (U-learning) paradigm which implies an evolved concept of Electronic Learning (E-Learning). The form of U-Learning is focused on the educational environment in which students learn and teachers teach anytime and anywhere. Fortunately, Korea is able to provide high-quality computers and high-speed networks to classrooms and homes. These quality technologies enable education to be delivered to learners and instructors anytime and anywhere.

Based on these ideas, Korean government and researchers have started Digital Textbook project since 2007 and pursued the educational paradigm that enables students to find information for their learning and helps them think creative to communicate and solve problems. Beyond the paper textbook, the digital textbook offers a great amount of information and knowledge with new forms of learning and teaching.

More important, the use of the digital textbook makes student-centered classroom environment and encourages students to participate in and contribute to their classroom learning. Korea Ministry of Education, Science, and Technology considered a new concept of the future textbook, Digital Textbook, as an electronic version of paper textbooks, beyond the limitation paper textbooks offer. Thus, the purpose of the digital textbook is to provide U-learning environment for both students and teachers by closely connecting themselves, and to engage them in classroom activities by sharing ideas and information. The environment of digital textbook also encourages a large amount of communication and interaction among learners and teachers. More important, they can create their own learning and teaching in this environment. It is possible in the digital textbook environment where learners make a note, physically and educationally navigate the textbook, search within the textbook, and have dictionaries and culture books. In addition to these, learners may have unique learning experience of interaction and communication with classroom networks.

There are many important features of the Science digital textbook. For example, the Science digital textbook includes various resources and activities (e.g. video-clips, animation, mini-lab simulation, networked communication tools, etc.) motivating students to participate in classroom learning. It changed teacher-centered classroom instruction to student-centered classroom learning. On the one hand, students in the paper textbook classroom follow what teachers go. On the other hand, students in the digital textbook classroom direct their own learning. The teacher in the paper textbook instructs her students what to do and how to do, but the teacher in the digital textbook facilitates or guides her students to learn in their own ways. For the self-regulated learning, we encourage students and teachers build their own textbooks or materials with an authoring tool in the digital textbook. The digital textbook in Science classrooms expands the learning place outside of classroom area. Students may continue to learn with the digital textbook at homes and other places. It also provides online learning environments like virtual reality or augmented reality for learners to experience science practices, and then they can be familiar with science.

In addition, it has been indicated that students in the same grade and the same classroom have many different levels of understanding science, so that classroom teachers should provide differentiated instruction to each high, middle, and low achievement student. Although it is impossible in the paper textbook classroom, the digital textbook makes the differentiated classroom instruction possible because it offers individualized materials to practice Science.

Fig 1. Digital textbook-based classroom vs. paper textbook-based classroom

Learners in the 21 century are living in Digital environments, so that the school environment should be changed to the new way of that learning is not individual acquisition of knowledge and information any more. Rather, it is a process of being participating and communicating in a certain community (Sfard, 1998). In terms of these, this paper described what the future textbook should look like and how the digital textbook project has made a prototype of the future textbook and implemented it into the classroom practice. It also suggested that the digital textbook may encourage learners to participate in their own learning and contribute to other students' learning by interacting with them. There is no doubt the digital textbook provides more educational opportunities than the paper textbook, and it expands beyond the range of the paper textbook which presents individual knowledge acquisition. In addition, the digital textbook helps students make their own textbook according to their interest and performance levels. Therefore, the future textbook should not be the one that distributes inactive knowledge, but the one that includes abundant learning experience and evolves as an active resource.

Reference

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Promoting Character and Values for Global Citizens in Science Education

Hyunju Lee, Global Institute for STS Education, Ewha Womans University, Seoul

Supported by WCU (World Class University) program through the National Research Foundation of Korea funded by the Ministry of Education, our research team at Global Institute of STS Education has been conducting 5-year project on enhancing scientific literacy for global citizens. We had collaborated with Prof. Joseph S. Krajcik (Michigan State University) for the first four years to develop the foundation of research and we invited Prof. Dana L. Zeidler (University of South Florida) to join our project this year.

Fig. 1. Table of contents in the digitalized textbook

One of our major achievements in this project is to develop the 21st Scientific Literacy Education Program (21st SLEP). Aiming to cultivate global scientific literacy of students, teachers and the public, the 21st SLEP deals with various scientific issues such as environmental issues, climate changes, development of new materials, natural disasters and biotechnology. We are currently developing more programs such as dangerous chemicals and water shortage. In order to share and distribute the 21st SLEP with Korean science teachers, we have developed a digital version of the 21st SLEP as well as paper-based textbook. It is currently available on the web at http://www.gise21.net/SLEP.htm for free.

One of the distinctive features of the 21st SLEP is the emphasis on character and values for global citizens. We believe that character and values are the essential driving forces that serve as general guides or points of reference for individuals to support decision-making and to act responsibly upon global socio-scientific issues. Thus, we identified three key elements and 2-3 factors under each key element in the dimension of character and values: Inter-connectedness (I) and Sustainable development (S) forming Ecological Worldview; Moral and ethical sensitivity (M), Perspective-taking (P), and Empathic concern (E) comprising Social and Moral Compassion; and, Feeling of Responsibility (R) and Willingness to act (W) building Socioscientific Accountability (Choi et al., 2011; Lee et al., 2013).

In addition, we implemented the 21st SLEP for secondary school students, college students, and science teachers, and investigated to what extent the 21st SLEP brings educational effects on improving their global scientific literacy. We also plan to implement the 21st SLEP and to see its educational effects on enhancing students' and teachers' understanding NOS (nature of science) and habits of mind. The brief summary of the studies published in journals are as follows.

(1) Developing character and values for global citizens: Analysis of pre-service science teachers' moral reasoning on socioscientific issues (Lee et al., 2012)

Eighteen pre-service science teachers who registered in a science education method course participated in the study. The instructor presented three SSI (nuclear power generation, climate change, and embryonic stem cell research) over six weeks (using the 21st SLEP). Data sources included audiotapes of PSTs' small group discussions, individual writings on each issue, and videotapes of whole class discussions. We framed the following question for investigation: To what extent do pre-service science teachers in South Korea enact ecological worldviews, socioscientific accountability, and social and moral compassion values when confronting global socioscientific issues?

Our data analyses converged on four prevalent themes reflecting distinct moral perspectives. First, most of PSTs were already familiar with potential dangers and benefits of nuclear power and agreed that we ultimately need to proceed with renewable energy. However, many tended to put priority on making economic profits of their own country and to lesser extent, consider in a global context such as how their actions and decisions may affect others in different places in the world. Second, a large portion of PSTs had egoistic and anthropocentric views; not many students seemed to have ecological consciousness. Third, PSTs were compassionate to under-developed countries which suffered from climate changes caused by other nations, but tended to see it in a third-party point of view and passed all the responsibility to advanced nations. And lastly, PSTs hardly changed their positions after the group discussion, but they became more compassionate to potential development of embryonic cells.

(2) Socioscientific issues as a vehicle for promoting character and values for global citizens (Lee et al., 2013)

We designed a systematic SSI unit (using the 21st SLEP) with a focus on genetic modification (GM) technology and implemented it with a focus on facilitating natural process of nurturing students' character and values as global citizens. We adapted the conceptual framework suggested by our previous works (i.e., Choi et al., 2011; Lee et al., 2012), which explicitly emphasized character and values as one of the major dimensions of scientific literacy for the 21st century and the following question was framed for investigation: What are the educational effects of SSI program on promoting character and values as global citizens?

The 21st SLEP was implemented for 9th grade students over 3-4 weeks and identified its educational effects using a mixed method approach. In order to compile quantitative data, we developed a questionnaire to assess students' character and values on GM issues and administered it to the participants before and after the SSI program. To collect qualitative data, we observed classes with video-taping, recorded student discussion with audio-taping, and conducted semi-structured interviews with 24 students and the teacher.

Results indicated that the students became more sensitive to moral aspects of scientific development and compassionate to diverse group of people who are either alienated from the benefits of advanced technology or vulnerable to dangers of its unintended effects. In addition, the students felt more responsible for the future resolution of GM issues. However, the students struggled to demonstrate willingness and efficacy to participate within broader communities.

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Lee, H., Yoo, J. Choi, K., Kim, S., Krajcik, J., Herman, B. C., & Zeidler, D. L. (2013). Socioscientific Issues as a Vehicle for Promoting Character and Values for Global Citizens, International Journal of Science Education, i-first article.

Towards Learning Progressions in Asian Science Education Research

Seungho Maeng, Kangwon National University

Learning progressions are defined as "descriptions of the successively more sophisticated ways of thinking about a topic that can follow one another as children learn about and investigate a topic over a broad span of time (e.g., six to eight years)" (National Research Council [NRC], 2007, p. 219). Since reported in ***Taking Science to School*** (NRC, 2007), learning progression (LP) became one of rapidly disseminated research agenda in science education among science educators, curriculum developers, or policy makers in the U.S. as well as several European countries. Of interest, we, Asian science educators also have been interested in students' conceptual understanding across the levels from elementary to secondary school (e.g., National Science Concept Learning Study [NSCLS] in Taiwan, see the special issue of *International Journal of Science Education*, vol. 29, issue No. 4). Also, quite a few studies on science curriculum development, the effect of science instruction, and science assessments have been implemented by the researchers in East Asian countries. Learning progression, which is considered an effective way to show developmental pathways of understanding science concepts and practices, can be a candidate to synthesize all of the studies on curriculum, instruction, and assessment in science. The purpose of this article is to introduce how to describe LPs, and in so doing to find key points for further LP research in Asian science education.

According to an extensive review of LP studies by Duschl, Maeng, and Sezen (2011), description of LPs generally consists of lower anchor, upper anchor, and several intermediate steps bridging the two anchors. Lower anchor is a starting point of LPs that children have in mind when they are at the entry of LPs. Upper anchor is an ending point of LPs, which is related to societal expectations about what society wants children to understand at the end of LPs. Lower anchors, usually, are derived from prior studies on children's preconception or pre-existing experience of science topics. Therefore, it is very important to design a validated and appropriate diagnostic assessment in order to decide a lower anchor of an LP and the grade or grade spans when the LP begins. In NSCLS, two-tier diagnostic assessment was used to examine students' conceptual understanding across school grades. Ordered multiple-choice item assessment (Briggs et al., 2006), clinical interview with open-ended written assessment (Mohan, Chen, & Anderson, 2009) are also employed to diagnose and elicit the lower anchors of LPs.

Upper anchors, in many case of LP studies, set the learning goal of LPs to the levels of knowledge and practices based on curriculum/standards documents. Thus the upper anchors in LPs are varied depending upon targeted ending grade of LPs. In other cases, however, the upper anchors are described by adoption of experts' more accurate scientific understanding and highly skilled science practices (e.g., Duncan, Rogat, &Yarden, 2009; Schwarz et al., 2009). And in a few cases, the upper anchors in LPs are drawn from societal expectancy of achievement level for scientifically literate citizen (Mohan et al., 2009).

Between the lower anchors and upper anchors are there intermediate steps in which students follow up with appropriate instructional assistance. Investigating the intermediate steps is in itself related to empirically validating and refining the developmental pathways of LPs. As for the way of identifying intermediate steps, there have been two sorts of LP studies, cross-sectional study and longitudinal study. In the former case, data for intermediate steps are obtained under status quo teaching by cross-sectional design in which assessments are applied to students at different grades and the outcomes of assessments are compared through the grade levels (e.g., Mohan et al., 2009). In the latter case, data are usually gathered through intentionally designed instructional interventions with same groups of students during much longer time periods (e.g., Lehrer &Schauble, 2012). Cross-sectional studies for LPs emphasize more accurate assessment items to examine students' conceptual understanding across grade levels, which are employed to validate and refine conjectural pathways of initial LPs. On the other hand, longitudinal studies for LPs typically set out with pilot work to establish a conjectural pathway and accompany clinical interviews with teaching experiments or teaching sequences, which facilitate students' successively more sophisticated levels of conceptual understanding.

The processes of developing LPs are the road maps to create coherent, comprehensive, and continuous assessment systems that are interrelated with both curriculum and instruction (Maeng, 2012). Berkeley Evaluation and Assessment Research (BEAR) Assessment System is one of the methodological approaches to making the road maps of LPs. BEAR assessment

Goals determine what you are going to be. -----Julius Erving

system consists of four building blocks which are 'construct map – item design – outcome spaces – measurement model' (Wilson, 2005). In the first stage, specifying construct, a construct map is built according to prior studies on students' misconception or the statements of curriculum documents on the topic of LPs. 'Construct' shows a form of continuum from high level of understanding or doing practices to lower levels. The second building block is item design which is to develop assessment items (e.g., ordered multiple-choice items, asking open-ended written responses, or clinical interviews) to gather data and evidence about what students know and can do. The third building block, outcome space is a scoring guide for children's responses to the assessment items. The scoring guide can be to assign numeric scores to each response to assessment items, or to provide annotated examples for coding children responses. The fourth but the most important building block is measurement model which connects scored or coded responses in outcome spaces with the particular locations of a construct map. BEAR assessment system employs Wright maps from Rasch model as a measurement model to interpret outcome spaces and link them with a construct map. Below are examples of Wright map (Figure 1) and its graphical map (Figure 2). Details to interpret the Wright map and graphical Wright map are beyond this article. But in brief, Wright map (Wilson, 2005) depicts the relationship of items' construct to the probability of responses, the locations of respondents according to their proficiencies, and the locations of items based on their difficulties. All of the four building blocks make an iterative cycle in developing LPs. Thus the measurement model isa starting block for the next round of building blocks, and used to revise the initial construct map, and so on.

Learning progressions is still a new domain of research in science education. Especially in East Asian Science Education, we do not have enough experience of studying LPs. However, we already have great research tradition on students' conceptual understanding. Also, we have very strong experience of designing teaching-learning sequences in science. Thus we can make our efforts toward the new strand of science education research, learning progressions. For the research on learning progressions in East Asian Science Education, we need to consider again that LPs should be developed through weaving together science concepts and science practices in the context of using foundational knowledge, and LPs should articulate incremental learning pathways which are involved in iterative assessment tasks and instructional interventions.

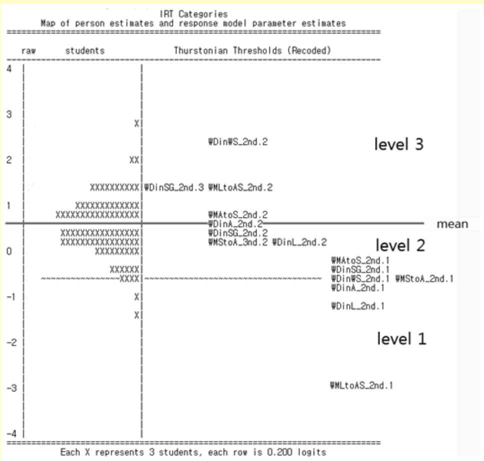

Figure 1. Wright Map (Seong, Maeng, & Jang, 2013)

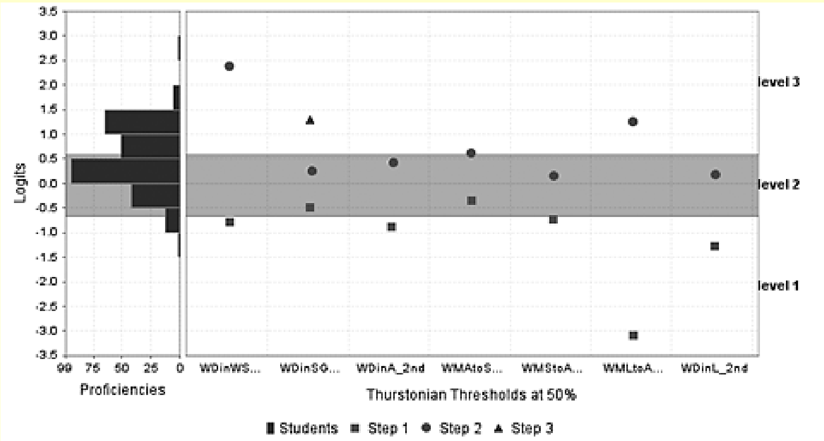

Figure 2. Graphical Wright Map (Seong et al., 2013)

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How We can Promote Science Learning in the Setting of Informal Education: Docents' Expertise

Young-Shin Park, Chosun University, Korea

INTRODUCTION

The number of science museums (science center included) in Korea as well as other countries is increasing and with this comes the demand for engaging and even entertaining educational programming recently. To meet its demand, science museums depend on volunteers to serve as docents (interpreters included) of objects and exhibits in museums. But this is not the solution since docents are the persons who interact with visitors for science communication and they must be differentiated from those who just volunteer for administrative work. We can find educators who are well trained academically and who have extensive knowledge of subject matter and objects but little knowledge of teaching and learning strategies little knowledge about visitors who range from kindergarten to old people including other people who need special needs. If science educators at museum are eager to use docents effectively, it is critical for science educators to understand what docents needs to be prepared and developed to meet the goal of informal setting of science education. For example, docents don't have to repeat the exact same experimentation which can be done in the classroom of schools for students' motivation but they need to offer different experiments depending on the level of visitors for motivation. Science educators need to prepare docents with contents which are linked to exhibit/object-based, literacy of educators at science museum, and some skills of interacting with visitors in delivering content. The reason why I focus on educators' expertise at science museum including docents is that we cannot emphasize 'science education' with only formal science learning at schools and without informal science learning at science museum anymore.

Now, we need to define what 'docent' is. Most of science centers offer guided tours, most of which are conducted by 'docents'. Docents are trained, volunteer teacher-guides who bridge the museum/center objects/exhibit and the visitors (National Docent Council, 2001; Park & Lee, 2011; 2012). Docents are usually considered as educational service today and they are differentiated from 'regular volunteers' in chores. In complex world of museums, definitions of docents vary as interpreters, museum teachers, educators, and tour guides. Even though there seems not to be clear definition of docents and their roles in their working place, it is agreeable for docents as one of science museums' staffs to have a very positive an critical influence on the experience of visitors, especially if they are well trained (Falk & Dierking, 2000). What do we mean 'well-trained"? What problems do docents facing in interacting visitors? As one of science educators or curators in science museum, how can we help docents well-trained? Docents are also as adult educators as well as adult learners of their works as museum enthusiast. Docents might not be expertise in certain subject matter, nor in communicating with visitors who range from kindergarten to the old people not like science teachers teaching science to certain grade all year around. Docent education in science should support opportunities for interactive dialogue focusing on problems to be solved, mysteries to be explored, and gaps in knowledge to be filled.

Given the vital role for docents in science museum, further understanding of docents learning experience and development of expertise is foundation to the growth of informal science educational programming. In this paper, I would like to share my research interest of the current status quo of docent preparation system at science museum education, working conditions docents have as strength and weakness to be considered to develop the structured docent training and professional program, and the pivotal roles of experience docents for the popularization of science in informal setting of Korea in order.

STUDIES about DOCENTS

Case 1: The current status quo of docent education at science museum

METHOD: At the first stage, I selected 4 domestic science museums and 4 international ones (from USA) and compared their docent training program and qualification for being docents through museums' website, emails, and phone calls. At the 2nd stage, I contacted eight different docents and docent training program developers and asked them the following contents; definition of docents, qualification for docents, roles by docents, and perception about docents. At the 3rd stage, I sampled only two docents and two program developers and interviewed them on site in Korea as well as USA with the following protocols; working conditions as docents as science museum such as benefits of being docents and barriers for docents' active roles. Additionally, I collected other data through docents' reflection journals and their practical activities, supporting my desertions in this study.

RESULTS: Docents and docent training program developers hold the perception about docents as the followings; (1) They perceived that they are more than just volunteers so they believe that they need 'expertise' in interacting with visitors; (2) Docents do not have practical channels to communicate of how they can be expertise in interacting with visitors. Docents believe that the pivotal role as docents is considered to interact with docent program developers, managers, or curators as well as visitors and they hope to have more formal workshop or meetings where docents and their managers communicate and share the ideas of how to promote visitors' experience science at museum. (3) Domestic docent training programs are not well structured when compared to those of international ones. Domestic docent training program focuses on taking courses mainly for subject matter knowledge (SMK) with little chances of experiencing pedagogy content knowledge (PCK) for promoting visitors' involvement. We do not have structured guide or manual of docent training where docents learn skills related to topics of how to interact with visitors, what questions to make with objects/exhibition, how to motivate visitors, and how to respond to visitors' question. Whereas, one science museum selected for this study used docent manual where we can find easily content of PCK such as what questions to ask during exhibition tour, what to present to promote visitors' involvement before and after exhibition tour, what objectives to meet during exhibition tour, and so on (Figure 1). (4) Finally, Docents feel that they need to make their own voice officially through interaction with other peers and program developers or managers in their centers. They feel that they need to form the bondages among docents themselves and between docents and program managers/developers to run the educational program effectively.

You have to believe in yourself. That's the secret of success. -----Charles Chaplin

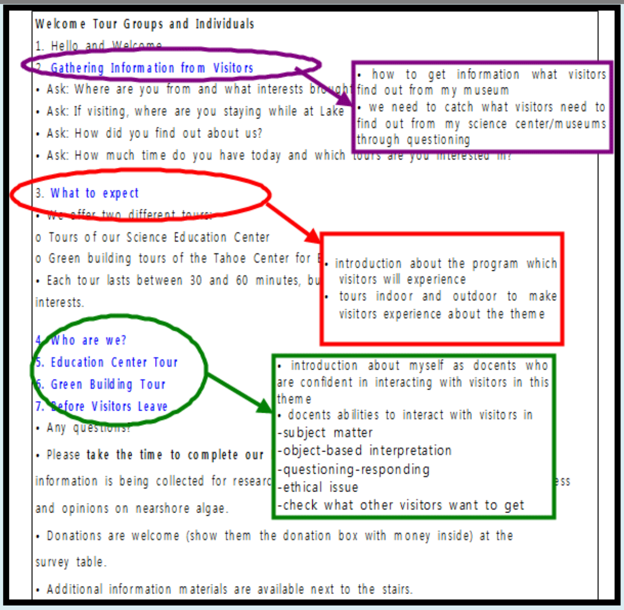


Figure 1. The docent training manual sample

Table 1: The most needed for docents training program

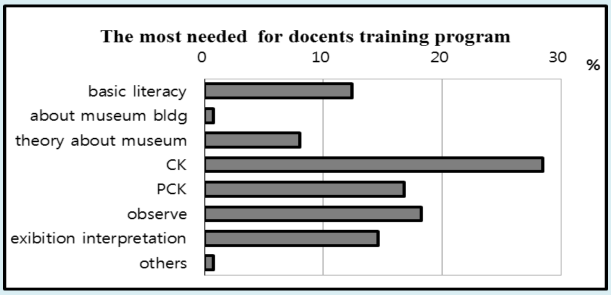


Table 2: The most preferred strategy for docent training

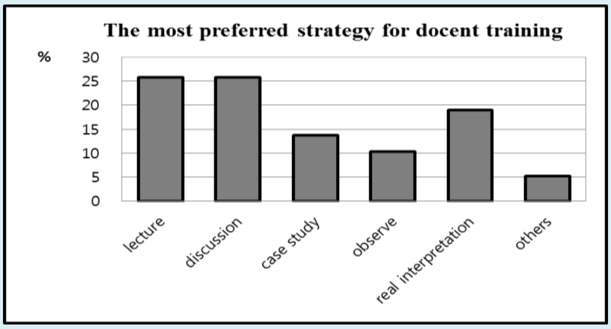
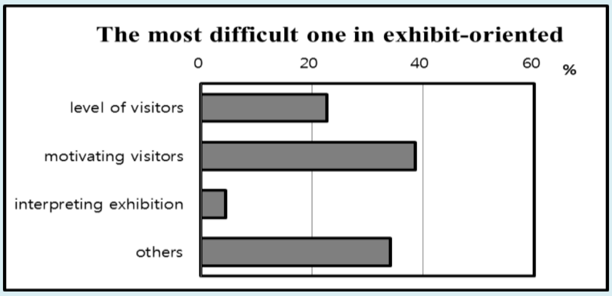


Table 3: The most difficult one in exhibit-oriented



Case 2: The Development of Docent Training and Professional Program in Korea

METHOD: I developed the survey and questionnaire exploring general knowledge about docents' working conditions to be benefits or barriers to be considered in developing structured docent training and professional development program. Fifty-six docents who are working in any science museum in Korea were contacted by email and filled out the consent form to participate in this 2nd study. I also analyzed the current docent training program to be more structured or professional program if any.

RESULTS: On the basis of data from survey, questionnaire, interviews and other artifacts collected in this study, the following results were made;

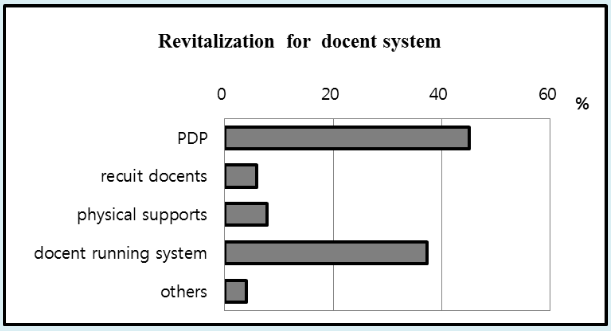
(1) Perception about docents: Docent participated in this study showed that docents are not regular volunteers and docents need to be differentiated from regular ones. Docents need to have more practical knowledge than content knowledge to be expertise as educators at science museum for expertise. Docent selected docent career for their only educational passion not for the job opportunity. However, docents thought that they must be paid with transportation and meals to keep their current working at museum.

(2) Domestic docent training program: It consists of lectures with SMK (30 hours) and observations of experienced docents (10 hours) to learn how to interact with visitors and they felt that learning SMK is the most necessary part for training program but they also felt that the increase of observation time is critical for docents' preparation program (Table 1). Docents added that it is ideal for docent managers or senior experience docents to evaluate if docents are prepared in explaining exhibition to visitors; however, the current evaluation system is not composed of assessment from observation but mainly from written test. The most beneficial program consisted of learning subject matter (39% out of total responses), observing experience docents' activities (25%), and learning how to deliver the exhibition content to visitors such as pedagogy knowledge (20%).

(3) Working conditions as docents: Typical size of visitors for each docent is 20, which is still big size for one docent to interact, so the structured PCK is required for docents to be active in working. The most difficult for docents is how to motivate visitors engaged in their interpretation (17%) and how to manage their interpretation appropriate to the visitors' level (10%).

(4) For revitalization for docent system in science museum, it is critical for centers to provide them with more educational program (45%), to develop efficient docent operating system (37%), provide docents to interact one another freely (8%), and to recruit docents regularly (6%). Despite some problems that docents face, they are satisfied with their working as docents and feel confident in self-respect. **The most preferred evaluation** for docents includes pre-docent's real teaching in the field as well as written test and the most appropriate evaluator is the program developer or manager and the second is experienced docents.

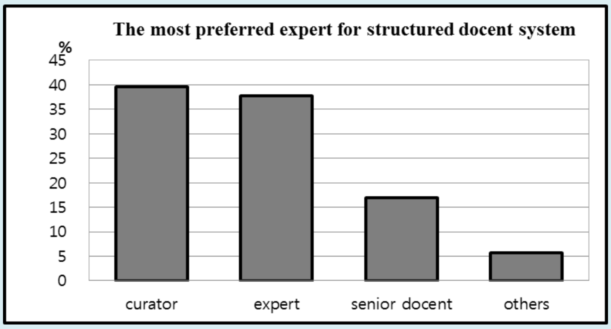
Table 4: Revitalization for docent system



(5) All participating docents in this study responded that they need more educational program while they are working as docents in their centers. The most preferred docent professional program must run as the type of discussion, lectures, case study, and experienced docents' observations. Curators and educational researcher in the centers (40%) and experts in the field (38%) are preferred as the lecturers for professional development program for docents. The senior docents who work in the same centers are the 3rd most preferred as lectures (17%).

(6) The centers which docents belong to are not much helpful for them to keep working as docents. They are not much thinking of their reward as docents since they started to work as 'volunteers' for their own satisfaction of working as 'docents'. However, docents feel that there must be interaction with curators and other researchers who manage docents dynamically and explicitly. Docents want to make their own voices to be reflected in the program which visitors are involved in.

Table 5: The most preferred expert for structured docent system



Case 3: The Development of Docent Training and Professional Program in Korea

METHOD: The purpose of the 3rd study was to evaluate the developed docent professional program in how much this program can promote **docents' expertise.** So it was very important to develop 'intervention' and employ it for docents' developing expertise. There were two experienced docents who work as 'mentors', beginning docents who has been working for years (but not over 4 years) and preservice docents who would be working as docents in the future. I could release the positive impact from interaction among those participants as mentors and mentees. Data were collected by the followings: I ran docent professional development workshop every month for one year with three different contents as follows.

First, docents participating in this study are those who work currently in science museum. So it is critical for them to understand the purpose of science education, the objectives of scientific literacy, and the components of scientific inquiry whose activities they try to deliver while they are interacting visitors (NRC, 1996). Docents participating in this study had chance to share the opinions in groups to form new concepts or change their understandings by bridging into their practices.

The workshop between docents and docents managers

Positioned docent explained the eye structure by dissection with visitors

Second, there were several designed different activities where docents could encourage visitors fully motivated in object-based learning at science museums. This activity consisted of three steps; Visitors (1) make the kit by themselves (2) observe what would happen (3) think why that happened, and (4) share the ideas with docents or other visitors. This activity was aimed to promote docents' abilities to analyze/develop scientific inquiry activity consisting of observation, prediction, and explanation. Sometimes this workshop happened in the lecture room through role plays and discussion or it happened on real museum site as docents' 'informal' learning. Docents learned how to interact with visitors according to their different levels. Interaction between experienced and novice docents were emphasized with their practices on site and reflections.

Third, there was chance for participants to listen to lectures by experience docents in more details about how we define docents, what roles they are supposed to do, how docents collect materials to be presented, how docents organize their materials, how to keep reflection journal, how to communicate with visitors, how to collaborate with other docents, how to interact with other people related to science centers/museums, and how to react to some sensitive issues. All contents were made up of senior experienced docents' experience, practical knowledge to preservice and beginning, novice docents. At this phase, docents' collaborative discussion, practices, reflections were emphasized.

I developed docent professional development program and offered it every month

Docents learned how to bridge their practices into theory through docent workshop offered by me

Fourth, there was one case study where I observed how one experienced and exemplary docent collected materials to be presented, how she organized it before introducing them to visitors, how she had brainstorming to develop presentation, and how she reflected her activity and evaluated it after exhibition tours as a sequence activity.

RESULTS: Docents have longed for this opportunity of sharing commonalities and differences among docents or with senior docents or experts in science education. Docents, more than anything else, enjoyed discussing what they wanted and shared ideas to see if their thought was right or wrong or appropriate or inappropriate. There were very positive responses from docents participating in this study as follows; (1) Docents formed new understandings about science education as well as informal education for science learning, structured skills in interacting with visitors, new definition of scientific inquiry, and skills to promote motivation. (2) Docents developed more practical knowledge obtained through indirect experience of senior experienced docents' interaction with visitors. Senior experienced docents could encourage junior or novice docents to be skillful in interacting with visitors through collaboration by in formal (situated lesson) as well as formal (lectures) learning. Lectures by experts, collaborative discussion between senior and junior docents, and field observation by senior docents with evaluation were preferred as strategies for docent training program, therefore, more informal learning for docent expertise during training program are recommended.

National Docent Symposium in USA. There must be docent association for their profession at work

CONCLUSION & IMPLICATION

For the success of science museum, it is critical to provide good quality of educational program. To meet its need, it is essential to provide good quality of docent training/professional program through which docents can become experts, not just volunteers. For the good quality of docent program, learning by docents must be offered by the types of 'formal' learning as well as 'informal' learning, which means that both must be more purposed and structured chances. Expertise cannot come from only abstract instruction but from problem solving, decision making, and continuous learning. So it is pivotal for docents to be provided with two types of learning; formal learning is important since museum research indicated that the more docent knows about a given theme, the more he/she can engage with the objects in an exhibit. These formal learning chances can create a foundation on which docents' skills are honed and provided a confidence of purpose to continue or expand interest. However, docents at each site seem to construct relevant knowledge base through contextual informal learning and incidental learning. Science educators need to focus how to balance these formal and informal learning for docent professional program. The most important thing is that docents must be offered with chances for them to be expertise while practicing their roles of docents at real context of interacting with visitors (Grenier, 2009; Cox-Petersen, Marsh, & Melbar, 2003).

As a researcher, what I felt during this research is that the alliance between participants (docents here) and the researcher is very critical to explore what I want to ask and how I can find out the solution. For docent expertise, I needed to encourage docents open their mind to release what current working conditions docents were satisfied or dissatisfied, develop workshops on the basis of collected data from docents, and then observe and monitor how docents promote their skills of interacting with visitors through professional development programs. I, as a researcher, explored the question docents hold, developed the intervention, employed it, and monitored if there had been chance in docents' behaviors at museums by observing their practices and discussing any issues on the basis of their collaborative reflections. Collaborative reflections from docents' practices on site can be considered as the most critical factor in docent education for the revitalization of science museum.

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An Exploration of Internship Program Conducted in Science Museum for the International Students from various Universities.

Nelson C. C. Chen, Division of Technology Education, NSTM, Taiwan

National Science and Technology Museum, Taiwan, (NSTM, Pic 1) is a place that offers an informal science education service for visitors with different range of ages. In order to call for extra human resources to assist the various kinds of science camp held in winter and summer vacation, NSTM has been opening lots of internship position for the university students to apply since 2009. Since 2010, among the applicants there were some interns coming from Chosun university of Korea, some from Tech Track Program (TTP) from overseas supported by government, and some were recruited from local university. For instance, A sub- program held by Wa-Sci series, an abbreviation of Wa Science, there are 8 Korean interns, 1 from TTP with English as the native language and 8 from local universities (Pic. 2). Due to the different place and country the students are from, English is the only language to be used when program of science education conducted.

Pic 1: National Science and technology Museum(NSTM) located at Kaohsiung, Taiwan

Pic 2: Group photo of all interns at the airport when seeing each other at day 1.

We believe that well-organized pre-training was an important section for all of the interns. They have to introduce themselves within 3 minutes for setting up a pair of partners so as to help each other while science activity conducted. There were various key roles for the interns to play, such as tutor for group-activities (Pic. 3) and team assistants (Pic. 4) and an on-duty commander (Pic. 5). Each of interns has his/her own position so that they can collaborate with a close cooperation to come up a bonded friendship from a teamwork. No wonder at the time of seeing off when returning back hometown, a farewell was always the scene of drama at the airport (Pic. 6). There have been 6 batches for such a collaborating team work since 2010 till 2012. In order to express the whole scope of internship project, it is classified into several parts:

Part I: Recruitment of new blood.

Referring to the application form of why the students would like to participate with the international internship project, it shows that the purpose and reason of Korean and Taiwanese interns are different. From the viewpoint of Korean interns, major reasons are to know how the informal science education to be conducted, to make a foreigner friend, to learn the teaching skill at the informal science education center, to learn how to apply science concept into daily life and to exchange culture. Taiwanese interns are to meet the need of selected course of school to make foreigner friend and culture exchange. For the intern from TTP are to use Chinese language for communication, obtain the practical experience of internship project.

Part II: How the teamwork is organized

At the first time of the meeting, each of interns has to introduce themselves in a short time with English. It was also found that each intern spend less than 1 minute to let others know who he/she is. After the self-introduction, each intern has to match a pair of his/her partner, and then commence the 2nd round of introduction. The counterpart was in charge of the introduction of his/her partner. The time duration for each introduction was extended to 3 minutes. That was a good method for introduction.

Part III: Pre-training

Pre-training was regularly conducted prior to the commencement of activity. The contents of the pre-training consist of discipline of activity, safety rule, teaching skill, management of studio room, time management and others.

Part IV: What a team assistant does during the time of activity

Being a team assistant, accompany with the campers all the time when the science activity was carried on. Its role is to assist and to take care of the campers. Being a tutor of group-activity section, use a clear and simple tone to instruct the whole process of science activity. Those who are being a team assistant are required to be aggressive no matter how depressed she/he may encounter during the time of camping.

Pic 3: Being a tutor for group-activities

Pic 4: Being a team assistant while group-activities conducted

Pic 5: Being an on-duty commander

Pic 6: a farewell at the airport when departure.

Part V: Reviewing and Reflection

After conducting a section of activity, all interns point out the merits and demerit so that it may keep going or may not keep going in next section.

The outcomes of the internship project, it shows many going points listed as follows.

1. Enhance an opportunity of international friendship
2. An International collaboration with different background groups.
3. Make science activity easily access for the students of non- science background
4. Help the camps use the bilingual language (Chinese and English) when required
5. Form the strong bridge between university and science center as one community to enhance the quality of science literature in one community.
6. Promote university students with skills necessary in an informal setting of science learning.
7. Provide campers with chance to experience multi-culture and understand it.
8. Provide assistant with chance to teach multi-culture campers and promote their understandings about 'learners'.
9. Enhance the science museum to gain extra resource of manpower that also helps the science museum down the expense of manpower, during the peak season.

All in all, an international internship project is really valuable for the university students at the semester break. The youth can develop a good way to help each other as long as opportunity provided, just like the international internship do in NSTM.

A blurb about my life at Seoul National University

Sonya Martin, Seoul National University, Seoul

Hello EASE members! I am excited to have an opportunity to introduce myself to the community and to share some of my research interests with you. I am currently an Assistant Professor in Science Education at Seoul National University. Prior to moving to Korea, I was a tenured faculty member at Drexel University in Philadelphia, where I was PI of a National Science Foundation (NSF)-funded (HRD 1036637) study examining the intersections of gender, ethnicity, and language learning in the context of middle school science.

My project, G-SPELL (Gender and Science Proficiency for English Language Learners), focused on identifying science teacher practices that promoted language learning in the context of science inquiry with English Language Learners. I became particularly interested in exploring ways to improve collaborative teaching between science content and (English as Second Language) ESL teachers to promote beneficial science teaching practices for all students. To learn how to better support science teachers to work with language learners, in 2009-2011, I completed necessary coursework and a teacher practicum in a middle school science classroom to become certified as an ESL K-12 teacher. This experience greatly enhanced my understanding of the challenges classroom teachers face when trying to teach grade appropriate science content to students who have limited language proficiency in the language of instruction.

As a sociocultural researcher, I am interested in understanding the social, cultural and political dimensions of science and language learning. Many of the students who participated in the G-SPELL project had recently emigrated from Asian countries. I wanted to learn more about these students' science education experiences prior to coming to the US. I also wanted to better appreciate the challenges families who immigrate face, so I decided to pursue an international faculty position in an Asian country where I could learn more about science teacher education and where I could experience life as a racial and linguistic minority. I feel very fortunate to have found a good academic fit at Seoul National University!

In Fall 2011, my husband and I moved to Seoul where I am currently learning Korean, teaching graduate courses in science education, and actively engaging in collaborative research with colleagues. Now my research efforts are focused on learning about the experience of immigrants in Korea. Because inquiry activities in school science provide an important social space for immigrant children to learn language and science, I am developing research in K-12 schools to support science teachers to effectively teach science to Korean language learners. I look forward to opportunities to meet and collaborate with colleagues in the EASE organization. Please feel free to contact me any time!

Drexel University, School of Education, Philadelphia, PA
Teaching English as a Second Language Certificate, March 2011
Curtin University, **Science and Mathematics Education Centre,** Perth, Australia
Doctor of Philosophy, May 2005 (Advisors: Drs. Kenneth Tobin&Barry Fraser)
University of Pennsylvania, School of Arts and Sciences, Philadelphia, PA
M.S. in Chemistry Education, August 2002 (Advisors: Drs. Hai-Lung Dai&Kenneth Tobin)
University of Pennsylvania, Graduate School of Education, Philadelphia, PA
M.S. in Elementary Education, Thesis awarded Pass with Distinction,May 1998
(Advisors: Drs. Janine Remillard&Katherine Schultz)
Bryn Mawr College, Bryn Mawr, PA
B.A. in Biology, pre-med with a concentration in Neuroscience, May 1995
(Advisor: Dr. Peter Brodfuehrer)
Teaching Certifications
TESOL (K-12), Elementary Education (K-6), Biology (7-12), Chemistry (7-12)

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Upcoming Conferences

- 2013 NARST Annual International Conference, Apr. 6-9, 2013 @Rio Grande, Puerto Rico
  http://www.narst.org/annualconference/2013conference.cfm
- 245th ACS National Meeting & Exposition, Apr. 7-11, 2013 @ New Orleans, USA
  http://portal.acs.org/portal/acs/corg/content
- NSTA 2013 National Conference, Apr. 11–14, 2013 @ San Antonio, USA
  http://www.nsta.org/conferences/2013san/
- The 7th World Congress of Environmental Education (WEEC), June 9 -14, 2013 @ Marrakech (Morocco)
  http://www.weec2013.org/en/
- The IHPST biennial Conference, June 19-23, 2013 @Pittsburgh, PA, USA
  http://ihpst.net/
- ASERA Conference 2013, Jul. 2-5, 2013 @Te Papa Tongarewa Wellington, New Zealand
  http://www.nzcer.org.nz/asera-2013
- **EASE 2013 Conference. Jul. 4-6, 2013 @ Hong Kong**
  http://ses.web.ied.edu.hk/ease2013/
- ASP 2013 Annual Meeting. Jul. 20-24, 2013@ San Jose, USA
  http://astrosociety.org/education/asp-annual-meeting/
- 2013 International Conference on Education, Psychology and Society. Jul. 26-28, 2013@ Bangkok,
  http://icepas.org/Index.asp.
- ESERA Conference 2013, Sept. 2-5 @ Nicosia, Cyprus
  http://www.esera2013.org.cy/nqcontent.cfm?a_id=1
- ICASE 2013 Borneo. Sep. 29 - Oct. 3, 2013. Kuching City, Sarawak, Malaysia
  http://worldste2013.org/conference.html
- 29th ASET Annual International Conference. Dec. 12-14 2013 @Taiwan

The man who removes a mountain begins by carrying away small stones.--- William Faulkn