2014 EASE-APCTP Winter School

Research on Science Teaching and Learning in East-Asia

Ewha Womans University, Seoul, Korea

12-18 Jan, 2014

Organized by Department of Science Education, Ewha Womans University

Hosted by KASE

Supported by EASE and APCTP

이화여자대학교 EWHA WOMANS UNIVERSITY

KASE 한국과학교육학회 The Korean Association for Science Education

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

APCTP Asia Pacific Center for Theoretical Physics

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Welcome Message

Welcome to the 2014 EASE-APCTP Winter School

We are very pleased to welcome you to attend the 2014 EASE-APCTP Winter School, which is held at Ewha Womans University, Seoul, Korea, on 12-18 January, 2014.

We have 23 doctoral students, 5 coaches, and 7 professors from 5 different regions in this winter school. The seven distinguished international scholars will deliver speeches on their research expertise in the field of science education. The doctoral students will give individual poster presentations and oral presentations in groups after working with their group members and coaches. We hope that the students will take advantage of intimate settings to share research ideas, strengthen the collaboration, and engage in discussion that will help them advance their research. This winter school certainly enables you to make closer connections with international colleagues as well.

We express our special gratitude to APCTP (Asia-Pacific Center for Theoretical Physics) for their financial supports. We also appreciate colleagues who devoted themselves to organizing the winter school. Without their support, this winter school would not have been possible.

We sincerely believe that the 2014 EASE-APCTP Winter School will be a great pleasure for your academic and personal promotion by providing educational environment with intelligent and friendly colleagues. Wish you a wonderful 2014 EASE-APCTP Winter School!

Sung-Won Kim
Chair, 2014 EASE-APCTP Winter School
Professor, Department of Science Education
Ewha Womans University

Youngmin Kim
President, The Korean Association for Science Education
Professor, Department of Physics Education
Pusan National University

Hyunju Lee
Chair, Department of Science Education
Ewha Womans University

Contents

I. 2014 EASE-APCTP Winter School

Program

Schedule

- Dates: 12-18 January, 2014
- Venue: Room No. B151, Education Building B, Ewha Womans University

The schedule of the winter school is as below.

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<tr><td>17:30-18:00</td><td rowspan="2"></td><td rowspan="2"></td></tr>
<tr><td rowspan="2">18:00-</td><td>Registration</td><td rowspan="2">Banquet
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Edu-B 458</td><td></td></tr>
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Program Description

Lecture

Our distinguished panel of speakers will provide interesting lectures as follows.

Date/Time	Lecture	Room
Monday, Jan 13 10:00-11:00	**From inquiry to scientific argumentation: Research trajectories and future directions** **Nam-Hwa Kang** Korea National University of Education, Korea	BB151
Monday, Jan 13 11:30-12:30	**Development of a Computer-based Measure of Listening Comprehension of Science Talk** **Sheau-Wen Lin** National Pingtung University of Education, Taiwan	BB151
Tuesday, Jan 14 09:30-10:30	**Research Topics in Socioscientific Issue (SSI) Education** **Hyunju Lee** Ewha Womans Univeristy, Korea	BB151
Wednesday, Jan 15 09:30-10:30	**Using qualitative research methodologies and sociocultural theory to shine new lights on challenges in science education** **Sonya Martin** Seoul National University, Korea	BB151
Thursday, Jan 16 09:30-10:30	**The perspective for the elementary science teaching and learning** **Hisashi Otsuji** Ibaraki University, Japan	BB151
Thursday, Jan 16 11:00-12:00	**Systematic Review in Science Educational Research Studies** **Winnie Wing Mui So** Hong Kong Institute of Education, Hong Kong	BB151
Friday, Jan 17 09:30-10:30	**Construct Modeling Approach and Item Response Theory: Theoretical tools for Learning Progressions** **Seungho Maeng** Kangwon National University, Korea	BB151

Program

Get-Acquainted Time

This is the first official meeting to meet all group members in your group and get to know each other including research interests.

Individual Poster Presentation

Individual poster presentation sessions will be held on Monday. All students will bring their own posters with 'A0-sized (841mm x 1189mm) poster' or '15 slides of PowerPoint (A4-sized 3x5)'. We prepare poster boards to put up the posters. Either complete studies or on-going research (including research proposals) will be acceptable. Any topic will be welcomed. Three best posters will be awarded at the end of the winter school.

Poster presentation session is divided into two sub-sessions.

Session 1 16:00-16:50							
1	Nelson C.C. Chen	2	Shih-Hung Fan	3	Lei Gao	4	Hsing-Chung Ho
5	Jinkyu Jung	6	Hak Bum Kim	7	Yong-Gyu Kim	8	Aris Larroder
9	Dongwon Lee	10	Eunhang Lee	11	Solhee Lee	12	Ruei-Chang Lo

Session 2 17:00-17:50							
13	Hyemin Park	14	Jennifer Park	15	Siew Wei Tho	16	Hiroshi Unzai
17	Wei-zhen Wang	18	Chen Yu	19	Masako Yamada	20	Miku Yoshida
21	Jianxin Yao	22	Bo Zhao	23	Ping-ping Zhao		

Program

Group Discussion

Participants are divided into five groups which consist of four or five members each, from five different regions. Each group is required to develop a group research proposal on a common theme to share over several group discussion sessions. We expect that all the participants put their efforts and expertise in developing cross-regional collaborative research proposal.

Group members are supposed to clarify the issue, outline research questions, conduct literature review, and design the methodology for the research proposal. This session will be operated with the guidance of coaches. The proposal will be presented in oral presentation session.

Oral Presentation

Each group will present a group proposal in front of other groups and professors on the last day. 20 minutes will be assigned to each group for oral presentation, including 4-5 minutes for discussion. Presenters are required to perform oral presentation with PowerPoint slides. This would be a great opportunity for all students to receive feedback and comments from other colleagues and professors. One best proposal will be awarded at the end of the winter school.

Culture Visit

One of the specialties during the winter school will be a culture visit. Participants have opportunities to experience the essence of Korean culture and history by visiting historical sites or famous places such as Korean traditional palaces and national museum of Korea.

Your group will decide where to go for the culture visit. Where you go, you will experience more pleasant, enjoyable, and exciting tours with their group members. This culture visit will become a venue to develop friendship among the participants.

Coaches

Hsin-Yi Chang

Associate Professor
National Kaohsiung Normal University, Taiwan

2007 Science Education, University of Michigan, Ann Arbor, USA (Ph.D.)
1997 Science Education, National Taiwan Normal University, Taiwan (M.S.)

Wu Da-Yu Memorial Award, National Science Council, Taiwan, 2013

E-mail: *hsinyichang@nknucc.nknu.edu.tw*

April Daphne Hiwatig

Assistant Professor
Chiba University, Japan

An assistant professor and works under the Twin College Envoys (TWINCLE) Student Exchange Program for ASEAN region, which is spearheaded by the Faculty of Education, Chiba University and funded by the Japanese Government. She also collaborates with assistant professors at the Center for International Research and Education (CIRE), International Office, under the Global Study Program (a 2-week exchange program to Finland, Vietnam, Malaysia, and the Philippines) and the Global Project Work (a course on Japanese Culture presentation).

E-mail: *april.daphne@chiba-u.jp*

Kongju Mun

Ewha Womans University, Korea

2009 Science Education, Ewha Womans University, Korea (Ph.D.)

2012/11 – 2013/10 Postdoctoral researcher, Michigan State University
2011/10 – 2012/10 Research professor, Ewha Womans University
2009/08 – 2011/10 Postdoctoral researcher, Ewha Womans University

E-mail: *munkongju@gmail.com*

Coaches

Eun-Jeong Yu

Seoul National University

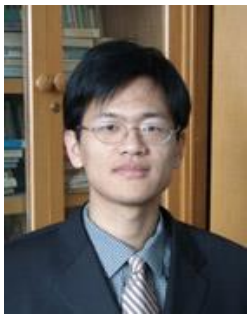
Science Education, Seoul National University, Korea (Ph. D.)
Science Education, Seoul National University, Korea (M. Ed)

2011/08 – 2012/06 Research Scholar of Korean International Teaching Fellow, SUNY Old Westbury, NY, USA

E-mail: *gogil75@gmail.com*

Research Interests: Socio-cultural issues in science education, Identity development of pre-service teacher, scientific literacy in Earth science education, Cross-national comparison in science education, Science gifted education

Rui Wei



Assistant Professor
Institute of Chemical Eduation
Beijing Normal University, China

2008 Chemical Education, Beijing Normal University, China (Ph. D.)
2005 Chemical Education, Beijing Normal University, China (M. Ed).

E-mail: *weirui@bnu.edu.cn*

Research Interests: history and philosophy of chemistry, secondary school chemistry education and teacher education, metaphor and analogy in science education, vocational education in science curricula, and museum science education

Group Members

- **Group 1 (Edu-B 651)**

	Name	Region	Affiliation
Coach	Rui Wei	Mainland China	Beijing Normal University
Students	Nelson C. C. Chen	Taiwan	National Kaohsiung Normal University
	Lei Gao	Korea	Ewha Womans University
	Siew Wei Tho	Hong Kong	The Hong Kong Institute of Education
	Miku Yoshida	Japan	University of Copenhagen

- **Group 2 (Edu-B 652)**

	Name	Region	Affiliation
Coach	Kongju Mun	Korea	Ewha Womans University
Students	Shih-Hung Fan	Taiwan	National Taipei University of Education
	Jinkyu Jung	Korea	Busan University
	Solhee Lee	Korea	Ewha Womans University
	Hiroshi Unzai	Japan	Hiroshima University
	Wei-zhen Wang	Mainland China	Beijing Normal University

- **Group 3 (Edu-B 653)**

	Name	Region	Affiliation
Coach	April Daphne Hiwatig	Japan	Chiba University
Students	Yong-Gyu Kim	Korea	Daegu University
	Jennifer Park	Korea	Seoul National University
	Jian-xin Yao	Mainland China	Beijing Normal University
	Chen Yu	Hong Kong	The Hong Kong Institute of Education

- **Group 4 (Edu-B 657)**

	Name	Region	Affiliation
Coach	Eun-Jeong Yu	Korea	Seoul National University
Students	Hsing-Chung Ho	Taiwan	National Kaohsiung Normal University
	Dongwon Lee	Korea	Busan University
	Hyemin Park	Korea	Korea National University of Education
	Masako Yamada	Japan	Hiroshima University
	Bo Zhao	Mainland China	Beijing Normal University

- **Group 5 (Edu-B 659)**

	Name	Region	Affiliation
Coach	Hsin-Yi Chang	Taiwan	National Kaohsiung Normal University
Students	Hak Bum Kim	Korea	Daegu University
	Aris Larroder	Japan	Tokyo University of Science
	Eunhang Lee	Korea	Ewha Womans University
	Ruei-Chang Lo	Taiwan	National Changhua University of Education
	Ping-ping Zhao	Mainland China	Beijing Normal University

II. Lectures

Lectures

Monday, Jan 13

Lecture 1.

Nam-Hwa Kang

Associate Professor
Physics Education
Korea National University of Education, Korea

2002 Science Education, University of Georgia (Ph. D.)
1996 Science Education, Seoul National University (M. S.)
1992 Physics Education, Seoul National University (B. S.)

E-mail: *nama.kang@knue.ac.kr*

Research Interests: Science teacher education, teacher knowledge and beliefs, epistemologies in teacher education

Title

From Inquiry to Scientific Argumentation: Research Trajectories and Future Directions

Abstract

Inquiry teaching has been one of the major science education goals for decades. However, inquiry teaching in the classroom has not been successful for various reasons including multiple definitions of inquiry in science education community and teachers' beliefs that mediate ideal inquiry into practices. In this lecture, I will be discussing my research program in which my colleagues and I studied science teachers' beliefs and practices in relation to classroom inquiry teaching. The research program focused on philosophical meanings of scientific inquiry and teacher beliefs thereof, i.e., epistemological beliefs. Among the recent research endeavor, we have focused on discoursive practices in scientific inquiry. Thus, I will be introducing a recent research on science teachers' argumentation in the classroom.

Lectures

Monday, Jan 13

Lecture 2.

Sheau-Wen Lin

Dean, College of Science
Professor, Graduate Institute of Mathematics and Science Education
National Pingtung University of Education, Taiwan

1994 Science Education, National Taiwan Normal University (Ph.D.)
1987 Biology, National Taiwan Normal University (M. S.)
1984 Biology, National Taiwan Normal University (B. S.)

E-mail: *linshewen@mail.npue.edu.tw*

Research Interests: Students' learning of science, Science teachers' teaching practices, Professional development of science teachers, Science teacher preparation

Title

Development of a Computer-based Measure of Listening Comprehension of Science Talk

Abstract

The purpose of this study was to develop a computer-based assessment for elementary school students' listening comprehension of science talk within an inquiry-oriented environment. The development procedure had 3 steps: a literature review to define the components of science inquiry, collecting and identifying key constructs of science talk, and developing and verifying an instrument that measured listening comprehension of science talk. The Science Listening Comprehension Test (SLCT), consisting of 35 multiple-choice items, was developed for 3 science inquiry components: identifying questions, designing methods and presenting evidence, and drawing evidence-based conclusions. Students from Grades 4 and 6 (N = 1,080) were recruited and selected through cluster sampling. The SLCT's validity, reliability, and item parameters were found to be reasonable. The SLCT provided rich information about these students' listening comprehension across various ability levels and about 40% of students failed in the test. Students listening comprehension of science talk was predictable with prior scientific knowledge and language ability measures. The results suggest that use of the tool and further research are recommended.

Lectures

Tuesday, Jan 14

Lecture 3.

Hyunju Lee

Department Chair & Associate Professor
Department of Science Education
Ewha Womans University, Korea

2006 Curriculum & Instruction, University of Illinois at Urbana-Champaign (Ph.D)
2000 Physics Education, Ewha Womans University (M. Ed)
1998 Science Education, Ewha Womans University (B.A)

E-mail: *hlee25@ewha.ac.kr*

Research Interests: Socioscientific Issue (SSI) Instruction, Science teachers' professional development, Qualitative methodology in science education

Title

Research Topics in Socioscientific Issue (SSI) Education

Abstract

The incessant occurrence of socioscientific issues (SSI) (e.g. explosion of nuclear power plants, energy crisis, deforestation, unexpected dangers of bio and nano-technology, etc.) gives rise to the call for educating students as responsible global citizens who are able to collaborate and communicate to resolve the issues in just and equitable ways. In order to achieve this, many science educators and researchers have emphasized the necessity and importance of addressing SSIs in the science classroom, and conducted research on various topics such as educational benefits of the SSI instructions, SSI informal reasoning patterns, and influential factors on SSI decision-making. In this lecture, I would like to introduce three empirical studies that I have conducted in the field of SSI education.

First study is regarding Korean pre-service science teachers (PSTs)' decision-making trajectory on SSIs. The guiding research questions were (1) What are the general patterns of PSTs' moral reasoning on SSIs? (2) In what ways do PSTs get into a decision on the issue? (3) What evidences and strategies do they use when they make decisions? Eighteen PSTs who registered in a science education method course

participated in this study. The results indicated five types of decision-making trajectories (Type A–Type E). Major characteristics of each type and its implications will be discussed.

The objective of second study was to observe how and to what extent SSI instruction contributes to cultivating character and values as global citizens. We implemented a SSI program on genetic modification technology for 132 ninth-grade students over 3–4 weeks. Results indicated that the students became more sensitive to moral and ethical aspects of scientific and technological development and compassionate to diverse people who are either alienated by the benefits of advanced technology or who are vulnerable to the dangers of its unintended effects. In addition, the students felt more responsible for the future resolution of the genetic SSI. However, the students struggled to demonstrate willingness and efficacy to participate within broader communities that entailed action toward SSI resolution.

The third study explored six experience science teachers' personal practical knowledge, which had been piled up over the past several years of teaching SSI. Results presented two major categories in terms of teachers' motivation for teaching SSIs. One was SSI-oriented group, mainly motivated by SSI itself. The other was teaching-oriented group which paid more attention to the educational benefits that addressing SSIs could bring. It was also noticeable that their motivations for teaching SSIs influenced on their understanding of SSI, purposes of SSI teaching, and use of SSI teaching strategies.

Lectures

Wednesday, Jan 15

Lecture 4.

Sonya Martin

Assistant Professor
Earth Science Education Department
Seoul National University, Korea

2011 TESOL Certification Program, Drexel University
2005 Science Education, Curtin University (Ph.D.)
2002 Chemistry Education, University of Pennsylvania (M.S.)
1998 Elementary Education, University of Pennsylvania (M.S.)
1995 Biology, Bryn Mawr College (B.S.)

E-mail: sm655@snu.ac.kr

Research Interests: Globalization, Urban education, Cogenerative dialogues, Teacher education, Video Analysis, Second language acquisition, multicultural education, Teaches' professional development, Teacher research, Program evaluation, Sociocultural theory

Title

Using Qualitative Research Methodologies and Sociocultural Theory to Shine New Lights on Challenges in Science Education.

Abstract

In this presentation, I describe the how qualitative research methodologies and the application of diverse sociocultural theories can support researchers to expand our understandings about how lived experiences shape the ways in which science is taught and learned. By offering an autobiographic narrative about becoming a science education researcher, I demonstrate how lived experiences can inform beliefs and practices related to science teaching and learning. In telling my story, I address the need for research methodologies and theoretical lenses that engage teachers and students in reflecting on their experience so that they may change them. Specifically, I stress the need to provide teachers and students with tools (including video analysis and cogenerative dialogues) that position them as agents for positive change in their own science classrooms. Throughout my presentation, I highlight examples from previous and current research as an introduction to various tools that are effective in helping researchers and educators to identify problems and work collaboratively to solve them.

Lectures

Thursday, Jan 16

Lecture 5.

Hisashi Otsuji

Associate Professor
College of Education
Ibaraki University, Japan

1995 Integrated Science and Engineering, Tokyo Institute of Technology (Ph.D.)
1992 Graduate School of Education, Chiba University (M.E.)
1990 Chiba University (B.E.)

E-mail: otsujih@mx.ibaraki.ac.jp

Research Interests: Cultural study on science education, Auto-/Ethnography

Title

The Perspective for the Elementary Science Teaching and Learning

Abstract

Science education researchers can be like an economic critic who does not know the real field of manufacturing industry, if he/she was not conscious of the characteristic of children, their cultural background of living, the profession of teachers or the characteristics of teaching and learning. On the precious opportunity to present a message to young promising researchers of science education, and with the feeling that I do not want you to be such critic, I try to show you the view of teaching and learning of elementary science. Participants will notice that the aims and the ways of elementary and secondary science are completely different, during my mini-lesson of "balance" which is generally considered very easy.

Lectures

Thursday, Jan 16

Lecture 6.

Winnie Wing Mui So

Head & Professor, Department of Science and Environmental Studies
Associate Dean, Graduate School
Hong Kong Institute of Education, Hong Kong

2011 Psychological Studies in Science Education, University of Hong Kong (Ph.D.)
1996 Psychological Studies in Science Education, University of Hong Kong (M.Ed.)
1993 Psychological Studies, University of Wolverhampton, UK (B.Ed.)

E-mail: wiso@ied.edu.hk

Research Interests: Inquiry learning in science, General studies and liberal studies, Integrating IT in science, Project-based learning, Teacher education and development

Title

Systematic Review in Science Educational Studies

Abstract

The quality of educational research has been a concern in recent two decades. Critiques have been made by researchers that intervention research that includes fatal flaws in its research design as not being appropriate for guiding educational decisions. Recently, researchers have begun to place more emphasis on assessing study quality, and have assigned more weight to sound studies when evaluating overall research evidence which is similar to the systematic reviews first used in the field of medicine. This lecture is about an introduction to systematic review in the area of science education, taking argumentation as an example to provide practical experience f or participants to start their first systematic review in science education.

Lectures

Friday, Jan 17

Lecture 7.

Seungho Maeng

Postdoc
Division of Science Education, College of Education
Kangwon National University, Korea

2008 Science Education, Seoul National University (Ph.D.)
2004 Earth Science Education, Korea National University of Education (M.A.)
1993 Earth Science, Seoul National University (B.Sc.)

E-mail: seunghom@gmail.com

Research Interests: Classroom Discourse Analysis, Learning Progression, Geo-cognition

Title

Construct Modeling Approach and Item Response Theory: Theoretical tools for Learning Progressions

Abstract

In this lecture, I seek for understanding of construct modeling approach and item response theory as theoretical tools for development of learning progressions. For this purpose, I introduce the meaning of learning progressions and the exemplars of learning progression studies. Then as for the way of developing and validating the learning pathways, construct modeling approach and item response theory as a measurement model of the construct modeling approach are explained in detail. Finally the study of learning progressions for plate tectonics that I have conducted so far is described as an exemplary study employing construct modeling approach and Rasch model of item response theory.

III. Individual Posters

Individual Posters

16:00 – 17:50, Monday, Jan 13

Poster Presentation Session 1

16:00-16:50

P1	**Cooperative Learning of Science Conducted at Science Museum** Nelson C. C. Chen (National Kaohsiung Normal University)
P2	**The Personal Pre-service Teacher Design the Innovative Experiment: Take the Fifth Grade Science and Technology Field for Example** Shih-Hung Fan (National Taipei University of Education)
P3	**How energy concept is shown in new science curriculum of China, Korea and the USA** Lei Gao (Ewha Womans University)
P4	**Exploring text reading of refraction concept understanding via eye tracking technique** Hsing-Chung Ho (National Kaohsiung Normal University)
P5	**Cooperative Learning of Science Conducted at Science Museum** Jinkyu Jung (Pusan National University)
P6	**Awareness of Science Educators about the Learning Situation of Visually Impaired Students through Scientific Inquiry in the Darkroom** Hak Bum Kim (Daegu University)
P7	**The Influences of 'Science Seed Festival of Hope' on the Teacher Dispositions of Preservice Science Teacher** Yong-Gyu Kim (Daegu University)
P8	**The Science Giftedness Education from a Locus Deductive Perspective** Aris Larroder (Tokyo University of Science)
P9	**The effect of a mentoring program on beginning science teachers' teaching practice** Dongwon Lee (Pusan National University)
P10	**The relationship between moral sensitivity and reasoning on socioscientific issues in High School Students** Eunhang Lee (Ewha Womans University)
P11	**The characteristics of problem based learning that effects on middle school students' science self-efficacy development** Solhee Lee (Ewha Womans University)
P12	**The influence of conjecturing-centred inquiry teaching on vocational high school students' mathematical learning achievements** Ruei-Chang Lo (National Changhua University of Education)

Poster Presentation Session 2

17:00-17:50

P13	**Development of SSI program to improve teachers' affective domain levels of evolutionary theory** Hyemin Park (Korea National University of Education)
P14	**Enhancing science teacher practices in classrooms with linguistic minorities using focused observations and cogenerative dialogues** Jennifer Park (Seoul National University)
P15	**The Effectiveness of Remote-Controlled Laboratory System for Primary Science Education** Siew Wei Tho (The Hong Kong Institute of Education, Sultan Idris Education University)
P16	**Student's cognition of models on scientific reasoning-comparison of junior secondary school students with college students** Hiroshi Unzai (Hiroshima University)
P17	**Development of a Learning Progression for Energy in Chemical Reactions in Secondary School** Wei-zhen Wang (Beijing Normal University)

Individual Posters

16:00 – 17:50, Monday, Jan 13

Poster Presentation Session 2		
17:00-17:50	**P18**	**Teaching about bioethical issues in high school classroom: Chinese biology teachers' perceptions and practices** Chen Yu (Hong Kong Institute of Education)
	P19	**Research on history of *Rika* (School Science) education in lower grades of elementary schools in Japan** Masako Yamada (Hiroshima University)
	P20	**Cultural Differences of Teachers' beliefs and their own Professional Development** Miku Yoshida (The University of Copenhagen)
	P21	**Inquiry on the students' Understanding of Energy Concept** Jianxin Yao (Beijing Normal University)
	P22	**Design and implement of a curriculum for developing high school students' understanding of scientific inquiry** Bo Zhao (Beijing Normal University)
	P23	**A study on middle school biology teachers' professional development of modeling instruction** Ping-ping Zhao (Beijing Normal University)

P1. Cooperative Learning of Science Conducted at Science Museum

Name Nelson C. C. Chen
(Co-author: Chia-Ju Liu)

Affiliation National Kaohsiung Normal University, Taiwan, R.O.C.

E-Mail nelson@mail.nstm.gov.tw

Science museum offers an informal science learning venue for publics to obtain a direct and practical learning experience of science at their own willingness. There are also groups from schools requesting a short term hands-on program of science activity to assist the students to learn more about science concepts when they visit science museum. How can the science communicator or instructor proceed the science course and how to evaluate the results of what the students in a team have learned. At the very beginning, the group is allocated by a game to several small teams for cooperative learning. The researcher designs a Portable Learning Credit (PLC) card for individuals who take turn to have a contest consisting of order in classroom, oral expression of science inquiry, competition of each sub-item activity. Each individual can keep his/her learning credit score wherever he/she is relocated in the science program. More than 20 groups visiting since museum have been conducted and surveyed with an in-deep interview, the results show as below:

1. From the view points of teachers, each individual has the opportunity to cooperate with others as PLC is applied to each one.
2. Each individual can contribute his/her performance with PLC.
3. There is no longer a so-called high achievement or low achievement individual while PLC applied.
4. PLC assists the individual to achieve the goal of cognition of science, affection of collaboration and skill of technology.
5. Each individual can sustain his or her credit by PLC during the time of learning wherever he or she is located or cooperated.

P2. The Personal Pre-service Teacher Design the Innovative Experiment: Take the Fifth Grade Science and Technology Field for Example

Name Shih-Hung Fan

Affiliation National Taipei University of Education, Taiwan, R.O.C

E-Mail librafan101@hotmail.com

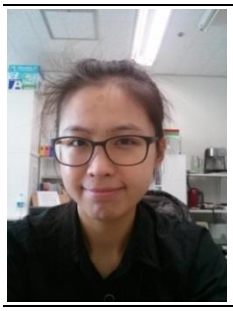
In this study, the personal pre-service teacher knows how to internalize PCK knowledge, using the science experient, teaching methods and "5 why" scaffolding asking strategies, then designing the innovation experiment in the elemantery school fifth and sixth grade science courses through the apprenticeship of guiding professor and science teachers. The personal pre-service teacher goes to a large elementary school in Taipei for teaching. With innovation and experiment teaching classes in 4 classes, 107 students are observed by the fifth and sixth grade students improve their test whether teaching the construction of scientific concepts and logical reasoning abilities.

The personal pre-service teacher internalize PCK professional knowledge and accept the apprenticeship of guiding professor and science teachers. The personal pre-service teacher use Vee map and "5 why" scaffolding asking strategies. The personal pre-service teacher combine units and daily life then design fifth and sixth grade
science and technology innovation experiments "acid-base Tsuburi". The personal pre-service teacher use ANCOVA test in learning sheets and use interpretive analysis through the teaching videos.

The results shows:

1. After the ANCOVA test, F value = 2.020, p =. 016 <.05, reacheda significant level. It means innovative experimental teaching fifth grade students can improve learning ability and process skills, but also enhance the feasibility of innovative experimental programs.
2. When the personal pre-service teacher teach innovative experiment, he finds that students will have different viewsor and comments when they solve the same problem, but ultimately, the students can together summarize the main scientific concepts─"Anthocyanins as natural acid plants Indicator. "
3. This study examines the current through the fifth and sixth grade students' experimental learning performance of science and technology, in addition to strengthening the capacity of the researcher's experimental design, but also to provide a science teacher, academic and research units as a research reference Basis.

P3. How energy concept is shown in new science curriculum of China, Korea and the USA



Name Lei Gao

Affiliation Ewha Womans University, Korea

E-Mail laniegao@gmail.com

Energy concept is a major interest of science. And energy related issues have personal, social and environmental implications that may help to enhance students' interest in science education. Teaching the energy concept became a challenge for teachers, and understanding the energy concept became a challenge for students, because students have a lot of misconceptions related to the nature of energy. However, there is a lack of consensus about what energy concept is among the scientists and science educators. In this study, we conducted comparative analysis on how energy concept has been shown in the new science curricula in Korea, the United States, and China with respect to the following four aspects: the definition of energy concept, the contents related to energy, the basic ideas of energy concept (conservation, transformation, transport, and degradation), and the issues related to energy concept. As a result, we found out distinct prospective of each country how the energy concept is reflected into its science curriculum. We believe that our findings would be helpful to figure out the way to improve students' awareness on the importance of understanding the energy concept.

P4. Exploring text reading of refraction concept understanding via eye tracking technique

Name Hsing-Chung Ho
(co-authors: Tien-Tang Chang, Ming-Hsun Shen, Chia-Ju Liu)

Affiliation National Kaohsiung Normal University, Taiwan

E-Mail newage@gm.tnfsh.tn.edu.tw

The aim of this study was to explore students' refraction concept understanding via eye tracking technique. There were twenty university students participated this study. All of them completed post-test, eye-movement calibration, eye tacking experiment, and post-interview. When students read specific text about refraction concept, they would shift their attention on different contents in the screen, including illustration, textual description, and formula areas. This study mainly investigate students' pattern of reading text via scan path of eye-movement data among different areas, and found the correspondence between mental thought and viewing behavior. The results showed that students most viewed on textual description area, however, they paid attention to formula and textual description areas while they need to judge which one formula is correct. On the other hand, this study found that students reconstructed refraction concept through illustration area. The result showed that students understood refraction concept again according to traditional illustration in textbook. Another discussion will present in the post presentation.

P5. Cooperative Learning of Science Conducted at Science Museum

Name Jinkyu Jung

Affiliation Pusan National University, Korea

E-Mail wlsrb090@gmail.com

The children before the stage of formal operations (aged 12) suggested by Piaget are traditionally not able to solve a:b::c:d analogical tasks with their analogical reasoning because they don't use higher-order relations. However, Post-piagetian claim that a failure of solving a:b::c:d analogical tasks related to the view of Piagetian is due to difficulty of objects of a:b::c:d analogical tasks for children and if the objects are familiar and children understand task, children are able to solve the a:b::c:d analogy tasks. So, in our study, we investigated the ability of Korean elementary school students' analogical reasoning with a:b::c:d analogy tasks. Our results showed that students of age 7, 9, 11 were able to solve classical and physical causality a:b::c:d task, using their analogical reasoning with higher-order relations. So we support the view of Post-piagetian about children's analogical reasoning, and insist that various materials, teaching methods should be developed for children's creativity with their analogical reasoning.

P6. Awareness of Science Educators about the Learning Situation of Visually Impaired Students through Scientific Inquiry in the Darkroom

Name Hak Bum Kim

Affiliation Daegu University, Korea

E-Mail mak9@nate.com

The purpose of this study is to investigate the changes in the perspectives of science educators on the learning situations of visually impaired students through scientific inquiry in a darkroom. Twenty-four science educators who came to the annual conference of the Korea Association for Science Education(KASE) volunteered to participate in the scientific inquiry activities in the darkroom. They were encouraged to touch models of 'the molecular structure of water' and 'the structure of eyes' and discussed during the inquiry activities. Surveys were done before and after the darkroom activities, and the discussions during and after the activities (which were recorded) were collected and analyzed. As a result, first of all participants became more appreciative of the ability to see the beautiful nature and humbled about the amount of help from other people. Secondly, participants recognized that science education for visually impaired students is both very feasible and necessary. Also, some of them who had an experience of teaching the blind students and thought that they fully understood the learning situation of visually impaired students were especially surprised by the fact that they did not actually understand how it was like to be a visually impaired student and responded that they were able to more deeply comprehend the learning situation of visually impaired students through these activities. Lastly, through this experience, participants became resolute to try to more deeply understand not only the visually impaired students, but also other students with various learning disabilities. Science educators who participated in this scientific inquiry in the darkroom appreciated seeing the beautiful world, understood more deeply the learning situation of visually impaired students, and became more resolute to try to become more conscious of all students with disabilities.

P7. The Influences of 'Science Seed Festival of Hope' on the Teacher Dispositions of Preservice Science Teacher

Name Yong-Gyu Kim

Affiliation Daegu University, Korea

E-Mail zzag007@naver.com

The purpose of this study was to test the influences of 'Science Seed Festival of Hope' on the teacher dispositions of pre-service science teacher. 'Science Seed Festival of Hope' is a informal science education to experience scientific activity and comprehend the principals for disabled students as well as students. This study was administered to pre-service science teacher who participated in 'Science Seed Festival of Hope'. These pre-service science teachers were participated on survey about teacher dispositions.

The result of this study showed that informal education has a positive effect on the teacher dispositions. Especially, the two parts of dispositions intrapersonal-oriented dispositions and interpersonal-oriented dispositions are influenced by experience of 'Science Seed Festival of Hope'. In intrapersonal-oriented dispositions, the preservice science teacher's self-management and reflective practice are improved and In interpersonal-oriented dispositions, respect and collaboration are advanced.

So, we concluded that 'Science Seed Festival of Hope' is an effective strategy for preservice science teacher to improve their teacher dispositions.

P8. The Science Giftedness Education from a Locus Deductive Perspective

Name Aris Larroder

Affiliation Tokyo University of Science, Japan

E-Mail nelson@mail.nstm.gov.tw

Science giftedness education faces a paucity of research available (Wilson, 2009; United Nations Educational, Scientific, and Cultural Organization or UNESCO Asia-Pacific Programme of Educational Innovation for Development, 1992), scant information (Callahan, 2009), an urgent need to revisit and evaluate both existing and new gifted education programs (Monks, Heller, & Passow, 2000) and inadequate framework (Larroder & Ogawa, in press) for benchmarking purposes towards a quality and equitable education for the gifted in science. The above-mentioned challenges remain despite the adoption of the Salamanca Declaration for an inclusive education, signed since 1994 by representing 92 governments and 25 international organizations, spearheaded by UNESCO. The Declaration laid the Framework of Action which advocates 'a change in social perspective' and formulated guidelines of action at the international, regional and national level with the end goal to be ultimately implemented in school systems. Peters (2003) also found out that of eight major gaps in research literature on inclusive education, attention to social context is the most significant of all. This paper therefore investigated the nature and extent of Salamanca Declaration's enactment from international to local setting taking into consideration the major issues in basic dimensions of giftedness education namely conception, legislation, identification, provision, and teacher's professional development from a locus deductive approach. This study employs mixed method approaches such as document analysis, content analysis, case study and cognitive phenomenology. In international scene, focusing on Southeast East Asia Ministry of Education Organization member countries more specifically, status of science giftedness was as curtained while on the national level with Philippines as a target country, the science giftedness implementation, practice and experience was assessed. The inter-school study validated checklist to identify science giftedness among Filipino secondary students while a classroom case study provided an insight on approach in teaching science gifted. Perspectives of various stakeholders were also elicited on the basic dimensions of giftedness education. Science giftedness education implementation from various loci remains sporadic which requires further promotion and research.

P9. The effect of a mentoring program on beginning science teachers' teaching practice

Name Dongwon Lee

Affiliation Pusan National University, Korea

E-Mail 2nd-potato@hanmail.net

Beginning teachers have difficulty in planning and implementing science lessons. Continuous professional development programs are needed to support beginning teachers and assist them in applying their knowledge bases regarding science teaching and learning to classroom contexts. Mentoring has been suggested as an effective method of teacher professional development for beginning teachers in science education research. This study investigated how a mentoring program influenced beginning science teachers' teaching practice. The one-year program consisted of one-on-one mentoring meetings, science education seminars, mentoring group discussions, and self-evaluation activities. The participants were six beginning science teachers and six mentors at the secondary school level in South Korea. All mentors had more than 7 years of teaching experience and had strong science content backgrounds, while the beginning teachers had 5 years or fewer. Each beginning teacher's lessons were evaluated by using RTOP (the Reformed Teaching Observation Protocol). Each mentor provided feedback to their mentee during the one-on-one mentoring meetings. The beginning teachers and their mentors also discussed theories of science teaching and learning and various instructional methods based on constructivism in the science education seminars. The group members discussed instructional methods and skills and affective aspects to support beginning teachers through mentoring in the mentoring group discussions. For self-evaluation activities, all teachers participated in the study were asked to write in journals related to one-on-one mentoring meetings. Each one-on-one mentoring meeting was audio-taped and transcribed for analysis. The beginning teachers' and mentors' journals and lesson plans were also collected as data sources. This study showed that a mentoring program focusing on teaching practice brought about changes in their teaching practice. This study also highlighted the importance of interactions between mentors and beginning teachers during the mentoring process and the necessity for systematic and long term mentoring program.

P10. The relationship between moral sensitivity and reasoning on socioscientific issues in High School Students

Name Eunhang Lee

Affiliation Ewha Womans University, Korea

E-Mail eunhanglee@gmail.com

This study explores the relationship between moral sensitivity and reasoning using socioscientific issues (SSI) instruction. We developed a 10-hour SSI program unit for high school students. 202 high school juniors completed their worksheets with various questions in every class. The analysis of the students' written data indicated four patterns of moral sensitivity. The students (1) recognized moral aspects of a situation, (2) were aware and felt empathy for how possible resolutions may affect other people, (3) anticipated possible consequences in society, such as side effects, and (4) examined different perspectives of a situation. Using these four patterns of moral sensitivity, we scored. We also scored students' reasoning considering the aspects of socio-scientific reasoning (SSR): complexity, perspectives and inquiry. We examined the relationship between moral sensitivity and reasoning on SSI by regression analysis. The regression analysis revealed statically significant relationship between moral sensitivity and reasoning on SSI. This result suggests that the students' moral sensitivity supported their reasoning on SSI as a result of the SSI instruction.

P11. The characteristics of problem based learning that effects on middle school students' science self-efficacy development

Name Solhee Lee

Affiliation Ewha Womans University, Korea

E-Mail solhee@ewhain.net

This study was to investigate the characteristics of Problem based learning(PBL) that effects on development of students' science self-efficacy, and examine how middle schoolers' science self-efficacy to being developed while involved in a PBL environment.

For this research, the researcher designed 10 PBL programs based on the National Sciences curriculum for developing students' science self-efficacy. Twenty-nine students in grades 9 had taken part in PBL-program, but 17 students(n=17, 12 boys, 5 girls) agreed with further participation of the research.

Based on qualitative research, the primary data sources were 2 sets of post interviews. At first, Researcher interviewed 17 students when whole programs had just completed. And six months later, researcher interviewed them again. Every interviews were transcribed right after each interview have finished, analyzed with Strauss & Corbin's method(2007). For triangulation, students' portfolios, instructor's reflective journals were also used as materials for analysis.

As a result, the researcher found out that students constructed their self-efficacy beliefs through four characteristics in PBL environment, which are 'authentic problems', 'ill-structured problems', 'peer group study', 'sharing solutions with peers'. First, giving students 'authentic' and 'ill-structured problems' was conditions precedent for students' science self-efficacy development. Second, through 'peer group study', students could be facilitated to develop their science self-efficacy. Third, students' present science self-efficacy could be transferred to the future by 'sharing solutions with peers'.

P12. The influence of conjecturing-centred inquiry teaching on vocational high school students' mathematical learning achievements

Name Ruei-Chang Lo

Affiliation National Changhua University of Education, Taiwan

E-Mail 0919167952@yahoo.com.tw

This study is aimed at examining the influence of conjecturing-centred inquiry teaching on vocational high school students' mathematical learning achievements. The research design adopted in this study is the quasi-experimental, non-equivalent pretest-posttest design. The experimental group is one of the classes with thirty-nine girls of the third author which receives the conjecturing-centred inquiry teaching, whilst the control group is another class with thirty-nine girls of the same teacher receiving the traditional expository teaching. The conjecturing-centred inquiry teaching integrates the conjecturing process (Chen & Lin, 1998, which contains posing a conjecture, examining/rebuttal, confirming the conjecturing), into the 5E inquiring learning cycle (Bybee & Landes, 1998), which consists of five stages including engagement, exploration, explanation, elaboration and evaluation. The research period is a whole academic year. The instruments of assessing students' learning achievements are the six period examinations in the academic year which are transformed to T scores and compared with all the thirteen classes of the same grade, and four self-designed tests for pretest, posttest and delayed test which are analysed and compared within the experimental and control groups by means of ANCOVA.

The research results reveal that, compared with the traditional expository teaching, conjecturing-centred inquiry teaching has significantly improved students' mathematical learning after a whole academic year. Moreover, from the results of the six period examinations, the average scores of the group of conjecturing-centred inquiry teaching show a trend of going backward first, then upward. A probable reason should be that both the teacher and students need time to adapt themselves to the new pedagogy. Once they get used to it, not only the students' performance towards mathematics gets improved, but also they could actively construct more meaningful mathematical knowledge through the process of inquiry.

P13. Development of SSI program to improve teachers' affective domain levels of evolutionary theory

Name Hyemin Park

Affiliation Korea National University of Education, Korea

E-Mail hmpark@blue.knue.ac.kr

The most widely acceptable theory in biology is evolutionary theory (Swarts *et. al.*, 1994*)*. To understand about biology, biologists have concentrated evolutionary explanation (Dobzansky, 1973; Rutledge & Mitchell, 2002). Although many countries emphasize the learning of evolution (Rutledge & Warden, 2000), teachers and students had low achieved about the conception of evolution and not well accepted it (Bishop & Anderson, 1990). Many researchers tried to change from misconceptions of evolution to scientific conceptions, but most of these attempts were beyond their capacity(Bishop & Anderson, 1990; Nehm & Reilly, 2007).

To resolve these problems, many researchers have to treat biological evolution with cognitive domain and affective domain (Eisner, 2003), but many studies have researched the acceptance and conception of evolution without whole affective domain about evolution education. To suggest effective strategies in evolution education without individual beliefs in social and cultural impacts, it is important to identify students' affective level of evolutionary theory before evolution class (Cobern, 1994; Goldston & Kyzer, 2009). In order to identify them, it is necessary to develop an instrument for assessing their affective levels.

Education technique that dealt with affective domain directly helped students to decrease their attitudes that were negative about achieves before classes (Ingarm & Nelson, 2006). But teachers' acceptances of evolutionary theory were low level (Miller et al., 2006; Rutledge & Warden, 2000, 2002) and they didn't know how to teach their students who believed creationism (Mckechie et al., 2002). So, it is necessary to develop teacher education program related to SSI to improve their affective domain about evolutionary theory.

Given the centrality of evolution to all biology, it should also be possible to assess students' understandings of evolutionary theory in other biological contexts. Because evolutionary theory has the potential to affect how individuals examine and perceive all areas of biology, successful evolution education should manifest itself not just in contrived testing situations focused specifically on the topic of evolution, but also in more authentic contexts. Student perceptions of evolutionary theory may also affect their responses to some socioscientific issues (Sadler, 2005).

This study has three research contents:

1. Development an instrument to assess affective domain level about evolutionary theory.
2. Development the teacher education program related to SSI to improve their affective domain level about evolutionary theory
3. To verify effectiveness of program, assessment of biology teachers' affective domain level about evolutionary theory by pre- and post-test using the developed instrument.

P14. Enhancing science teacher practices in classrooms with linguistic minorities using focused observations and cogenerative dialogues

Name Jennifer Park
(Co-author: Sonya Martin)

Affiliation Seoul National University, Korea

E-Mail jennifercpark2@gmail.com

With the increased number of English Language Learners (ELL) in the U.S. that are mainstreamed in K-12 classrooms, the need for all teachers to have the knowledge, skills and dispositions to effectively teach ELL students is greater than ever. Although a variety of professional development, training and intervention models for pre-service and in-service teachers have emerged in recent years (e.g., Echevarria, Short, & Vogt, 2008; Lucas, 2010; Walqui & van Lier, 2010) there is still a dearth of research that focus on preparing mainstream teachers to work with ELLs (Cohran-Smith & Zeichner, 2005; Zeichner, 2010). The presented poster describes a grant-funded model used to support urban middle school science teachers to effectively teach ELL students in inclusive settings. The model incorporates assessments of classroom science and language instruction using *Sheltered Instruction Observation Protocol* (SIOP) and *Reformed Teaching Observation Protocol* (RTOP) instruments to assess teachers' practices. Researchers supported teachers to reflect on the results of the protocol observations in conjunction with group analysis of video captured from the teachers' science classroom to enhance discussion about different components of the SIOP and RTOP protocols. Furthermore, teachers and students were engaged in cogenerative dialogues, structured discussions in which participants reflect on events shared in the classroom, often with a focus on replaying video clips from the classroom. The intent of these discussions is to improve science teaching and learning practices through collaborative reflection. Analysis of quantitative and qualitative data sources indicated that (1) observations supported teachers to identify significant challenges in teaching ELL students science; (2) teachers reported shifts in awareness about needs of ELLs based on video reflections; and (3) cogenerative dialogues provided a valuable social space for teachers and students to share perspectives, foster positive relationships, and develop language proficiency. Supporting reflection on co-teaching practices that can improve science teaching in linguistically diverse classrooms

P15. The Effectiveness of Remote-Controlled Laboratory System for Primary Science Education

Name Siew Wei Tho

Affiliation The Hong Kong Institute of Education, Hong Kong
Sultan Idris Education University, Malaysia

E-Mail s1103379@s.ied.edu.hk
thosw@fsmt.upsi.edu.my

The research aims to provide a critical evaluation of an innovative context of remote-controlled laboratory (RCL) system which is specifically designed and developed to employ technology-enhanced inquiry for the development of scientific knowledge, skills, values and attitudes that related to primary science education. The first part of this study is to design and develop of an innovative context of RCL system through technology-enhanced inquiry for Hong Kong primary science education. However, it is hard to evaluate this innovative system just based on the design or development itself. As a result, this RCL system is firstly applied and evaluated by Hong Kong student teachers who have studied the science education and related teaching training courses. Then, a critical evaluation using in a real classroom setting will be conducted as the second part of the study. RCL activity is a subset of technology enhanced learning (TEL) which is employing latest and innovative technology that can be potentially applied into science education context particularly in primary level. The RCL system is commonly divided into two major parts, namely, hardware and software. The hardware part consists of the data acquisition system, digital input or output (IO), camera, and various types of sensors. The software part executes data logging as well as controls and displays the real-time experiment on the computer screen via the Internet. The application of the RCL system is aimed at studying certain scientific principles that related to topic "Adaptation of plants to the environment" by conducting inquiry experiments through the RCL system. The underlying scientific concepts and principles closely match the General Studies curriculum of Hong Kong primary education as recommended by the Education Bureau of the HKSAR. Moreover, I shall assess if these RCL activities can offer an effective, meaningful and fun learning to primary students in my further evaluation study.

P16. Student's cognition of models on scientific reasoning -comparison of junior secondary school students with college students-

Name Hiroshi Unzai

Affiliation Hiroshima University, Japan

E-Mail hiroshi-unzai@hiroshima-u.ac.jp

Reasoning skills are major contributors to academic and everyday life success (Zeineddin & Abd-El-Khalick, 2010). As a consequence, the development of students' scientific reasoning skill is one of the goals of science education (MEXT, 2008). This study focuses on model-based reasoning as scientific reasoning which is highly regarded in recent years. Model-based reasoning is the reasoning that constructs new models for explanation/prediction of phenomena or gives a new explanation/prediction of phenomena with existing scientific models. Recent years, acquisition of the metaknowledge (e.g. understanding the nature and purpose of models) called "metamodeling knowledge" is encouraged at scientific reasoning (Schwarz et al., 2009). This study focuses on the metamodeling knowledge of junior secondary school students and college students. In addition, this study focuses on their viewpoints for various scientific models in science classes.

In order to achieve the purpose of study, based on the model definition of Schwarz et al. (2009), I defined scientific models as a representation that abstracts and simplifies a system by focusing on key features. Schwarz et al. (2009) defined metamodeling knowledge from the viewpoint of the nature and purpose of models. Based on this viewpoint, I focused on four aspects in metamodeling knowledge that are followings: models can be used to explain/predict phenomena (factor 1); models can represent key features of phenomena (factor 2); models have limitation for explaining phenomena (factor 3); models are tentative (factor 4). To investigate learners' viewpoints for scientific models and metamodeling knowledge, I prepared two students questionnaires. To investigate learners' viewpoints, one of the questionnaire asks to classify lots of scientific models and to answer the reasons of that classification. The other one is 20-items pencil-and-paper questionnaire which requires participants to respond on a five-point scale to investigate metamodeling knowledge.

The questionnaires were administered to 105 junior secondary school students and 89 college students. The results of this analysis revealed following: 1) Junior secondary school students and college students identify models based on the science content framework. 2) Junior secondary school students identify scientific models based on the more concrete viewpoints than college students. 3) All mean scores of metamodeling knowledge of junior secondary school students are lower than that of college students. 4) At the four mean scores of metamodeling knowledge of College students, factor 1 (models can be used to explain/predict phenomena) is the lowest factor. 5) At the four mean scores of metamodeling knowledge of junior secondary students, factor 2 (models can represent key features of phenomena) is the highest factor. The mean score of factor 4 (models are tentative) is lower than factor 2 (models can represent key features of phenomena) and factor 3 (models have limitation for explaining phenomena).

Based on the results of this analysis, science teachers have to let junior secondary school students realize that model is tentative at science lessons. Junior secondary school students need to realize that models are useful for explanation/prediction although models have limitation to enhance his/her scientific reasoning skill, through using models to explain/predict phenomena.

P17. Development of a Learning Progression for Energy in Chemical Reactions in Secondary School

Name Wei-zhen Wang

Affiliation Beijing Normal University, China

E-Mail vijane@126.com

Few can argue the importance of energy education. In the National Research Council's (NRC) Framework for K-12 Science Education (2012), energy is discussed as a core idea and as a crosscutting concept. The Next Generation Science Standards (NGSS) provide more specific disciplinary core ideas and performance expectations about energy in chemical processes from elementary through high school.

Energy is a word that is often used in schools but has many misconceptions surrounding it (Erickson, 1979; Duit, 1981; Watts, 1983; Black & Solomon, 1983; Solomon, 1983; Brook & Driver, 1984; Kesidou & Duit, 1993; Solomon, 1985; Johnstone et al., 1977; Boo, 2001). Considering energy is a concept that should be learned throughout one's life (U.S. Department of Energy, 2012), researchers have begun to think about learning progressions for energy (Lee & Liu, 2010; Jin &Anderson, 2012; Liu & McKeough, 2005). Teachers also lack an overall understanding of energy and how to teach important ideas about energy. Traditional courses and pedagogical approaches for teaching energy are often overly simplistic and not aligned with energy concepts in physics and ecology. Researchers have tried to develop an energy course and new approaches to improve energy teaching (Nahum, et al., 2007; Amin, et al., 2012). There has been considerable research on students' naive conceptions about energy, but little research has been done at the middle school and high school levels about what students can learn and understand about energy (Rogat, 2011).

This study has three purposes. First, to analyze the topic energy in chemical reactions (ECR) and try to understand what can be learned at the high school level and to suggest a progression for the teaching and learning of energy in chemical reactions. Two specific problems should be solved for this purpose: (1) What knowledge is most important that should be understood in this topic? (2) In secondary school, from lower grades to higher grades, what performances can students be expected to show proficiency in? The second purpose is to develop a measurement instrument, to collect and analysis data to validate the initial learning progression and adjust it. Third, according to the learning progression, I plan to raise new approaches to improve energy teaching and give a series of example of instructional design from grade 9 to grade 12.

The topic energy in chemical reactions (ECR) is closely linked with chemical thermodynamics, butnot just limited to thermodynamics. Thermodynamics is useful when thinking about macroscopic systems but is not so useful about the microscopic structure of matter. However, both matter (understanding energy at matter level) and particles (recognizing energy at the particle level) are two cognitive key points for energy learning.

Curriculum standards have been analyzed about this topic from seven countries and regions to build a cognitive model to answer the question of what high school students can do and understand about energy in chemical reactions. The model includes cognitive key points and performance expectations. Besides energy resources, the amount of energy changes and the forms of energy, systems and surroundings, matter and particles are also considered as cognitive key points that determine the level of understanding. Performance expectations in this study are classified into four categories: (1) use of examples to describe; (2) use of mathematical expression, development of explanatory models to explain and predict; (3) conduction of an investigation to analyze and evaluate; and (4) design devices and approaches to improve. I hypothesize detailed cognitive levels for learning energy in chemical reactions with the help of this model, and for designing approaches to assess energy learning to clarify and improve the model for further studies.

P18. Teaching about bioethical issues in high school classroom: Chinese biology teachers' perceptions and practices

Name Chen Yu

Affiliation Hong Kong Institute of Education, Hong Kong

E-Mail s1102702@s.ied.edu.hk

Promoting students' moral reasoning and decision-making has been regarded as one of the essential targets of science education for achieving a functional level of scientific literacy. As such, some scholars argued in favor of including ethics in science education. The first justification is that teaching about ethics in science classroom can increase students' ethical awareness, ethical knowledge and ethical reasoning in science, and may make students to be better people who are more likely to make morally right decisions. The second justification is that students need necessarily ethical principles to deal with ethical issues occurred during science inquiry and to make reasoned moral decisions. Third, science and ethics are interrelated in many cases. Facilitating students to discuss the ethical issues of science can help them to better perceive the nature of science that science is a kind of human endeavors and to some extent reflect science practitioners' personal interests or values. Fourth, students' interests in science can be improved through learning with those controversial issues. Therefore, science teachers are strongly encouraged to talk about ethics in classroom.

Teaching science through socio-scientific issues (SSI) has been suggested in accumulating articles. The negotiation of SSI always involves moral considerations. Thus, learning with SSI can provide students with the opportunities to discuss the ethical aspects of science. Several existing studies have investigated teachers' perceptions on the instruction of socio-scientific issues and on the discussion of ethics in classroom. Several other studies have explored the possible relationships of teachers' perceptions on some aspects of SSI instruction and their practices. However, few related studies have been conducted in Mainland China. Therefore, there is a need to investigate how Chinese science teachers perceive and implement addressing SSI, in particular the ethical aspects of SSI, in classroom and the factors that would mediate science teachers' perceptions and practices of SSI instruction in Mainland China.

The aim of this study is to investigate Chinese biology teachers' perceptions and practices of teaching about bioethical issues in high school classroom and the possible mediating factors. The factors that will be explored include SSI contexts, textbook and curriculum, the culture of school, and Chinese traditional culture. The main guided questions include: (1) how Chinese biology teachers perceive on bioethics and on the instruction of bioethical issues in classroom? (2) how Chinese teachers plan and implement bioethical issues instruction? (3) whether and how would the above factors mediate Chinese teachers' perceptions and practices? (4) how do the bioethical issues instruction impact students' biology knowledge and moral reasoning? In order to answer these questions, survey research and case study method will be used. The findings will be useful for supporting Chinese teachers to consider including ethics through SSI, in turn, to cover more goals during science education.

P19. Research on history of *Rika* (School Science) education in lower grades of elementary schools in Japan

Name Masako Yamada

Affiliation Hiroshima University, Japan

E-Mail d134437@hiroshima-u.ac.jp

Rika (School Science) had not been taught in lower (from first to third) grades of elementary schools from 1881 to 1940. Therefore some elementary school teachers and professors of normal schools had engaged in the 'teigakunen Rika tokusetsu undo', which means the movement to establish a subject for teaching science in the lower grades of elementary schools. This movement was based on the Western ideas of science education. As a result of the 'teigakunen Rika tokusetsu undo', the subject known as 'Shizen no kansatsu' (Observation of Nature) was established in the lower grades of elementary schools in 1941. After the Second World War, the subject Rika was reorganized and should be taught from the first grade to sixth grade of elementary schools by the Course of Study in 1947. In 1989 the subject Rika in the first and second grades of elementary schools was disappeared, instead the new subject known as 'Living Environment Studies' was established. It is said that the ideas of 'teigakunen Rika tokusetsu undo' were embraced to 'Shizen no kansatsu', and 'Shizen no kansatsu' formed the basic foundation of current Rika education in elementary schools.

We don't have the subject Rika for the first and second grades of elementary schools. Through analyzing the history of Rika education, I would like to reconsider whether Rika should be taught to pupils who are in these grades or not, and why? What kind of Rika should be taught in these grades?

The schemes of this study are as follows: Firstly I analyze whose idea had been adopted, and how the ideas had been put into practice in 'teigakunen Rika tokusetsu undo'. Especially, I focus on elementary schools attached to higher normal schools. Secondary, I review the ideas of Nature Study by Bailey and others who were American in order to know how the ideas of Nature Study as the Western ideas of science education assumed influence on Rika in the lower grades of elementary schools in Japan. Thirdly, I analyze the ideas and practices of 'Shizen no kansatsu'. Finally I describe what the ideas had been adopted and how the ideas had been put into practice in the subject Rika which had been established in the lower grades of elementary schools by the Course of Study.

Rika was taught in the lower grades of the Elementary School Attached to Nara Higher Normal School for Women's from 1920 to 1940 and the Elementary School Attached to Hiroshima Higher Normal School from 1931 to 1940 even though there was no law to impose the subject Rika in the lower grades of elementary schools at that point. The teachers in each school had their own ideas of Rika in the lower grades of the elementary schools. These ideas were put into practice by themselves in each school.

P20. Cultural Differences of Teachers' beliefs and their own Professional Development

Name Miku Yoshida

Affiliation The University of Copenhagen

E-Mail miku.yoshida@ind.ku.dk

Previous studies have shown that teachers' beliefs have a strong influence on teachers' classroom performance (Pajares 1992). Teachers' beliefs, however, are not isolated cognitive qualities but rather part of a complex, nested system (Bryan 2003). According to Mansour (2009), teachers' beliefs have to be studied in a context, because the relationship between beliefs and practises is complex and context dependent. One of the important contexts is culture. E.g. teachers' professional development (PD) has been shown to be the result of a complex interplay between interrelated domains that represent not only personal attributes (such as teachers' beliefs) and practice, but also involves external factors (Clarke and Hollingsworth 2002). Therefore, in order to fully understand teacher's PD, we must examine the context of the teachers' PD.

As the cultural context is important to be considered in order to understand teachers' beliefs, purpose of this research is to examine how science teachers' beliefs affect their PD by looking at cultural differences between Japan and Denmark guided by the following research question:

What are the differences between the beliefs of Danish and Japanese science teachers working in contexts that are conducive for PD?

The research will be conducted by a use of ethnographic methods. Interviews and classroom observation involving the science teachers in each school are considered to be used to explore the different emerging characteristics of teacher beliefs in Denmark and Japan. The research will focus on in-service science teachers at lower middle schools in Denmark and Japan because lower middle schools offer science lessons for all students and middle school teachers in both countries are trained in general (as opposed to specialized) science.

P21. Inquiry on the students' Understanding of Energy Concept

Name Jianxin Yao

Affiliation Beijing Normal University, China4

E-Mail yaojxhappy@163.com

Energy, as one of the core concepts in science education, is still far from been well understood by many students. As learning progressions can offer a coherent framework for teaching and learning, this article presents the research on a multidimensional learning progressions of energy concept, based on the revise of the initial learning progressions proposed by Xiufeng Liu et al. (2005) and Neumann et al. (2013). Considering the hierarchical complexity (facts, mappings, and multivariate relations) and the aspects of energy concept (form, transfer and transformation, dissipation and conservation), we designed the multidimensional learning progressions framework as the construct of assessment. Then based on the translation and adaptation the diagnosis items of Trumper (1998), Singh & Rosengrant (2003) and Neumann et al. (2013), we developed ECPA (Energy Concept Progressions Assessment), a series of questionnaires including Multiple-Choice items, Two-tier diagnostic assessment items, and Open-Ended questions to assessment students' energy understanding. Using this tool, a empirical research on N = 1033 Beijing students from grade 8 to grade 11 was carry on to testify the hypothetical multidimensional learning progressions of energy concept. The Rasch analysis indicates ECPA is a reliable tool for assessing students' energy understanding (person reliability = 0.88; item reliability = 0.99). The results of t-test on items' difficulty measurement show: (1) significant difference between each complexity level, but (2) only the "form" is significant different from other aspects of energy understanding. Then two regression analyses were conducted: the first one assessed how the complexity of the items can predict items' Rasch difficulty measurement, and the second assessed how the aspects of energy understanding that items belong to can predict items' Rasch difficulty measurement. The result of linear regression reveals that hierarchical complexity is able to predict the items' Rasch difficulty measurement; $r(39) = 0.811$, $p < 0.0001$, and have stronger predictive ability than aspects of energy understanding; $r(39) = 0.546$, $p < 0.001$. In the end, a discussion about the core issue of learning progression research – what is progressing in learning progression, is made.

P22. Design and implement of a curriculum for developing high school students' understanding of scientific inquiry

Name Bo Zhao

Affiliation Beijing Normal University, China

E-Mail zhaobobnu@126.com

The understanding of scientific inquiry is an important element of scientific literacy. The last version (2011) of Standards of Biology for middle schools of mainland China request students have proper understanding of scientific inquiry. This ongoing research focuses on the curriculum and instruction. Based on existing theories of scientific inquiry, this research attempt to design a curriculum for high school students to develop their understanding of scientific inquiry as well as guide their practice. Literature review on scientific inquiry has been done and related concepts have been determined to be the core content of the curriculum. Further literature review will be done concentrating on curriculum and instruction. The frame of curriculum has been generally constructed. Specific teaching activities of some units have been designed, including literature searching and reading, questioning as well as making plans for evidence. The instruction has begun and students' performance is observed and recorded. Further arrangement and analysis need to be done. More discussion and advice about this research or topic are sincerely welcome.

P23. A study on middle school biology teachers' professional development of modeling instruction

Name Ping-ping Zhao

Affiliation Beijing Normal University, China

E-Mail pinggsshyxqa@126.com

Current reforms in science education encourage engaging students in authentic scientific practice, it is advocated that science education should be conducted from a modeling-based perspective. But previous studies have shown that many teachers have limited knowledge of models and modelling which can affect the effectiveness of modeling instruction. And the modeling instruction in middle school biology classroom has not been systematically studied. So, the aim of this research is to promote middle school biology teachers' professional development of modeling instruction. In order to achieve this goal, we plan to : 1) develop framework of knowledge of models and modelling based on previous studies; 2) develop a Likert-type scale questionnaire and a questionnaire with open items on models and modelling based on the framework and construct a criteria for assessing understanding levels on models and modelling; 3) develop a questionnaire on situation of middle school biology teachers' modeling instruction; 4) construct educative curriculum materials which include activities about knowledge of models and modelling and teaching cases about modeling instruction; 5) develop teacher education on the basis of educative curriculum materials and explore teachers' learning by pre-test and post-test comparison. Until now, three instruments have been developed initially: the Likert-type scale questionnaire with 53 items, the interview with eight open items, and the questionnaire on situation of teachers' modeling instruction with five open items. We expect that middle school biology teachers can use modeling instruction effectively based on the existing and subsequent studies.

IV. General Information

Information

Maps

Fig 1. Ewha Campus Map

Limousine Bus & Other Buses:
Ewha Womans Univ. Back Gate

Subway Station:
Ewha Womans Univ.

**More information is on the website: http://www.ewha.ac.kr/english

Information

Fig 2. Education Building, B1

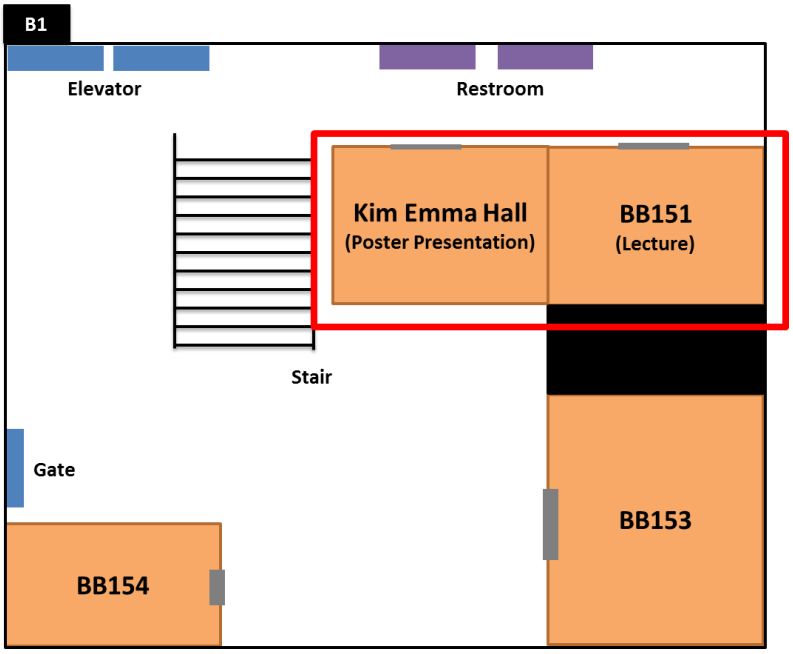
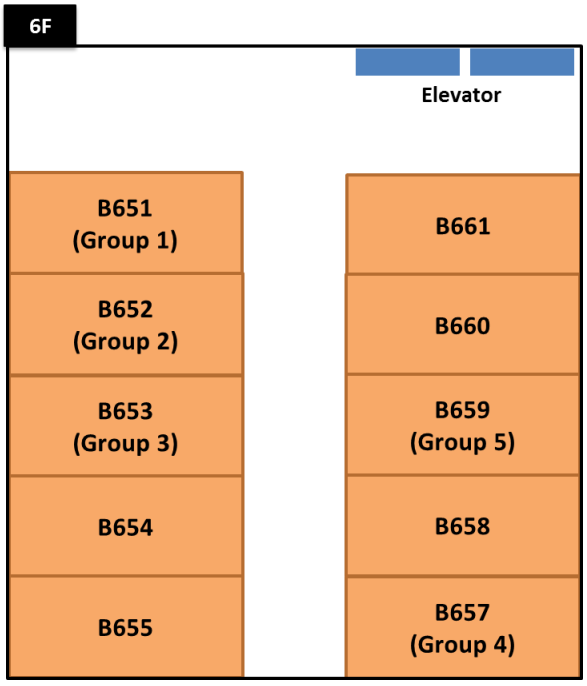


Fig 3. Education Building, 6th Floor

➔ There is **NO Restrooms** on the 6th floor.

➔ You can use Restrooms on the 4th floor.



Information

Printing Service

- Time: 09:00-12:30, 13:30-17:00
- Place: Edu-B 455
- If you need a printer for prompt use during the night time (21:00-24:00), we can offer printing service at Dormitory Room # C604 (Call at 6549).

Meals

- Light breakfast will be served every day. We also provide 5 days of lunch (Mon-Fri).
- Lunch: **Jin-Gwan Restaurant** (Mon-Fri)
  - We will provide 5 Food Coupons. (All are printed in different colors)
- Each person will receive a card of 25,000 KRW for eating dinner for 3 days (Tue-Thurs).

	Sun	Mon	Tue	Wed	Thurs	Fri
Breakfast	x	o	o	o	o	o
Lunch	x	o	o	o	o	o
Dinner	o	o	select	select	select	o

Information

Dormitory

- All rooms for students include 2 beds. Students will share a room with a designated roommate.
- Professors and Coaches use single rooms.

	Room #	Ext. (02-3277-XXXX)	Name	
Coach	C505	6534	Rui Wei	
	C408	6521	April Daphne Hiwatig	
	C409	6522	Hsin-Yi Chang	
	C410	6523	Kongju Mun	
	C411	6524	Eun-Jeong Yu	
Student	C303	6499, 6500	Hak Bum Kim	(Vacancy)
	C304	6501	Bo Zhao	Hiroshi Unzai
	C305	6502	Siew Wei Tho	Hsing-Chung Ho
	C306	6503	Ruei-Chang Lo	Dongwon Lee
	C501	6527, 6528	Nelson C. C. Chen	Jinkyu Jung
	C502	6529, 6530	Shih-Hung Fan	Yong-Gyu Kim
	C601	6543, 6544	Jian-xin Yao	Aris Larroder
	C401	6511, 6512	Wei-zhen Wang	Jennifer Park
	C402	6513, 6514	Ping-ping Zhao	Hyemin Park
	C403	6515, 6516	Chen Yu	Solhee Lee
	C701	6559, 6560	Masako Yamada	Lei Gao
	C702	6561, 6562	Miku Yoshida	Eunhang Lee
Staff	C604	6549	Jisu Mok	Soo-A Kim

Contacts

Hong Kong

Professor	Winnie Wing Mui So	The Hong Kong Institute of Education	wiso@ied.edu.hk
Students	Chen Yu	The Hong Kong Institute of Education	s1102702@s.ied.edu.hk
	Siew Wei Tho	The Hong Kong Institute of Education	s1103379@s.ied.edu.hk

Japan

Professor	Hisashi Otsuji	Ibaraki University	otsujih@mx.ibaraki.ac.jp
Coach	April Daphne Hiwatig	Chiba University	april.daphne@chiba-u.jp
Students	Masako Yamada	Hiroshima University	d134437@hiroshima-u.ac.jp
	Miku Yoshida	University of Copenhagen	mikuyoshida9@gmail.com
	Hiroshi Unzai	Hiroshima University	hiroshi-unzai@hiroshima-u.ac.jp
	Aris Larroder	Tokyo University of Science	siraris1024@yahoo.com

Mainland China

Coach	Rui Wei	Beijing Normal University	weirui131@163.com
Students	Jian-xin Yao	Beijing Normal University	yaojxhappy@163.com
	Wei-zhen Wang	Beijing Normal University	vijane@126.com
	Ping-ping Zhao	Beijing Normal University	pinggsshyxqa@126.com
	Bo Zhao	Beijing Normal University	zhaobobnu@126.com

South Korea

Professor	Sung-Won Kim	Ewha Womans University	sungwon@ewha.ac.kr
Coach	Kongju Mun	Ewha Womans University	munkongju@gmail.com
	Eun-Jeong Yu	Seoul National University	gogil75@gmail.com
Students	Jennifer Park	Seoul National University	jennifercpark2@gmail.com
	Dongwon Lee	Busan University	2nd-potato@hanmail.net
	Hyemin Park	Korea National University of Education	air1735@nate.com
	Lei Gao	Ewha Womans University	laniegao@gmail.com
	Hak Bum Kim	Daegu University	mak9@nate.com
	Solhee Lee	Ewha Womans University	sciosori@gmail.com
	Eunhang Lee	Ewha Womans University	eunhanglee@gmail.com
	Jinkyu Jung	Busan University	wlsrb090@gmail.com
	Yong-Gyu Kim	Daegu University	zzag007@naver.com

Taiwan

Professor	Sheau-Wen Lin	National Pingtung University of Education	linshewen@mail.npue.edu.tw
Coach	Hsin-Yi Chang	National Kaohsiung Normal University	hsinyichang@nknucc.nknu.edu.tw
Students	Nelson C. C. Chen	National Kaohsiung Normal University	nelson@mail.nstm.gov.tw
	Shih-Hung Fan	National Taipei University of Education	librafan101@hotmail.com
	Hsing-Chung Ho	National Kaohsiung Normal University	newage@gm.tnfsh.tn.edu.tw
	Ruei-Chang Lo	National Changhua University of Education	0919167952@yahoo.com.tw

Ewha,
Where Change Begins

세계를 향해
미래를 향해
변화가 시작되는 곳, 이화

이화여자대학교
EWHA WOMANS UNIVERSITY