

ESD Teacher Education in Asia Quarterly Report

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Welcome Message

Core-to-Core Program “Formation of International Center of Excellence to Promote Teacher Education on ESD”, supported by Japan Society for the Promotion of Science (JSPS), was successfully launched



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Education for Sustainable Development (ESD), in which UNESCO has taken the initiative since 2005, is now undertaken in the Global Action Programme (GAP) on ESD, with the purpose of spreading it worldwide. The overarching goal of the GAP is “to generate and scale up action in all levels and areas of education and learning to accelerate progress towards sustainable development” (UNESCO, 2013). One of priority action areas of the GAP is to increase the capacities of educators and trainers to deliver more effectively ESD so that teacher education institutions are expected to distribute pre-service and in-service training on ESD.

Subsequently, the International Network of Teacher Education Institutions Associated with the UNESCO Chair on Reorienting Teacher Education to Address Sustainability, whose eighth international conference was hosted by the Okayama Regional Centre of Expertise on ESD in November 2014, seeks to spread ESD internationally, based on various national and regional results of ESD. Moreover, international cooperation in education pursues the implementation of ESD in developing countries, especially to promote teacher training on ESD. These requests have highlighted the future direction of international collaboration for the advancement of teacher education on ESD.

This research project as part of the JSPS Core-to-Core Program titled “Formation of International Center of Excellence to Promote Teacher Education on ESD” aims to collaboratively develop teacher training programs on ESD based on lesson study and to propose Asian standards, in coordination with core institutions on teacher education in East Asia (China, Japan, Korea, and Mongolia) and Southeast Asia (Indonesia, Laos, and Myanmar). Based on the development of the programs, it pursues to establish core institutions on ESD, to construct academic networks between these institutions, and to train future generations of researchers on ESD.

We deeply appreciate your participation to share with us this unique experience. We wish that through this journal titled “ESD Teacher Education in Asia Quarterly Report”, experiences will both encourage international cooperation and stimulate researchers to conduct research on ESD in Asian countries.

1st Meeting of the Asian Network to Promote Teacher Education on ESD held in Okayama and Kyoto, Japan

We hold the 1st meeting of the Asian network to promote teacher education on ESD at the Graduate School of Education, Okayama University, and the Faculty of Human Development and Education, Kyoto Women's University, from June 10th to 12th, 2017.

The 1st day of the meeting was a kick-off meeting and a country report session. In the kick-off meeting, participants of core institution discussed general outlines of a joint research. In the country report session, presenters from Myanmar, Mongolia, Laos, Korea, Japan, and Indonesia reported on the present situation and issues of ESD teacher training in each country. They explained the aims and content of the ESD pre-service and in-service teacher training that they had developed. For example, the Laotian team reported that ESD concepts were integrated into the pre-service science teacher training program in their teacher training institution, and prospective science teachers tried to implement of the concepts into the lower secondary science classes as a demonstration lesson. Based on these trials, the Laotian team has recently started to develop ESD teacher training emphasized lessons in the schools. The country reports revealed the situation and assignments of ESD teacher training programs and specified the requirements for the development of an ESD teacher training program that members of the core institutions will develop communally.



Country Report Session

The 2nd day of the meeting was a senior researcher session and a young researcher session for their research presentations. In these sessions, researchers gave presentations about their research on ESD. First, as a keynote speech, Prof. Tomonori Ichinose from Miyagi University of Education, Japan gave a presentation about a new approach in ESD teacher training program entitled “Introduction of the Holistic and Pluralistic Approach for the Teacher Training of Education for Sustainable Development.” Subsequently, 17 researchers reported progress, results, and future plans for their ESD research.

This session was divided into a senior researcher session and a young researcher session. In the young researcher session, some reports focused on ESD teacher training curriculum. For example, Dr. Chankook Kim from Korea National University of Education reported on the development of an ESD teacher training curriculum based on general surveys of Korean teachers' knowledge of ESD. Through enthusiastic academic discussions between the presenters and the audience, all participants shared their own ideas and



Senior Researcher Session



Young Researcher Session

deepened their understanding of frontline ESD research in Asian countries.

The 3rd day was a site observation of prospective teachers' training program on ESD. Participants observed a lecture given by Prof. Junji Miyano at Kyoto Women's University. His lecture was for pre-service teacher training in preschool. From a garden, students collected plants such as petals and leaves to use as teaching materials in their lesson plans for conducting nature games using plants. They then gave a presentation to share the ideas of the lesson plans with each other. The members of the core institutions joined this lecture and observed the students' activities. Direct experience in nature is very important for prospective teachers. These experiences form the basis for teachers to plan and conduct classes and activities in ESD.



Lecture by Prof. Junji Miyano



Fieldwork at garden for teaching materials

Reflections from the 7th International Conference of Network for Inter-Asian Chemistry Educator

The 7th International Conference on Network for Inter-Asian Chemistry Educators (NICE) was held in Seoul on July 26th and 27th, 2017. About 200 participants attended this conference and there are 44 oral presentations and 51 poster presentations. Participants are professors, master and doctor course students, and school teachers, from Korea, Japan, Taiwan, Mainland China, Malaysia, and the Philippines.

Four researchers from Okayama University attended this session and reported research progress and achievement related to ESD. Prof. Hiroki Fujii's keynote lecture titled "Prospective Science Teachers' Training Program Focused on ESD: Exploring Desirable Utilization of Bioenergy" was focused on the development of a prospective science teachers' program on ESD, aimed at helping students learn about the development and utilization of bioenergy. The program's contents included 1) a lecture about high school

chemistry lessons focused on sustainability, and 2) a study tour to sites of a biomass town where bioenergy based on woody biomass is developed and utilized. Evaluation of trials conducted had shown that the program was able to promote students' understanding of the educational significance and concretization of science lessons focused on sustainability.

Mr. Shin Kawakami and et al. presented a research titled "Japan-Korea cooperative lesson on the topic of plant factories in science education: Focus on promoting ESD competency". In this study, science lessons in senior high school aiming to promote students' decision-making as an Education for Sustainable Development (ESD) competency was developed on the topic of the popularization of plant factories. The purpose of the lessons was to help students understand plant factories from scientific viewpoints and make an appropriate judgment regarding utilizations of plant factories. This was the final goal in their decision-making. The series of the lessons was delivered to 33 Japanese students and 34 Korean students in the eleventh grade at senior high school over two days in July 2016. The content of the lesson approached environmental factors related to plant growth from physics and chemistry. The results of a questionnaire conducted before and after the lessons showed that the students acquired correct knowledge and understanding of the science related to plant factories. Based on this knowledge and understanding, they were able to judge future directions of plant factories in mutual connection with science, technology, the economy, social equity, the economy, and the natural environment.

Students' poster presentations were also included in this conference. High school students from Korea, Japan, Taiwan, and Mainland China prepared presentations related energy and environmental in their daily life. Through this conference, Okayama University team got information of new trends of chemistry education in Asian countries, as well as an opportunity to share the idea on science teacher training and science lesson model focused on ESD.



Young Researcher Session 1

Practices of Integrating Education for Sustainable Development into Primary and Secondary Education Curriculum in Lao PDR

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Lao PDR is a rapid socio-economic development through the expansion of large-scale development projects that have caused serious environmental and social problems, thus education strategies should be developed aiming at providing people with environmental knowledge and skills, influence their positive attitudes and engagement in the preservation of the natural resources and environment in the national or institution (college or university) levels.



Key issues (McLaughlin, 2011)

The basic education that defines as primary and lower secondary schools are lack of infrastructure and inadequate pool of qualified preschool teachers in many schools such qualified teachers are often reluctant to work in remote areas (many teachers in the areas came from students who had completed primary or

lower-secondary school education) (McLaughlin, 2011). Also, drop-out rate is still remaining high due to the lack of school readiness especially for children whose first language is not the language of institution and the death of early childhood. In addition, food insecurity and malnutrition are persistent problems related to poor education outcomes.

For the teacher's competence, many teachers have limited general education and little or no training for teaching in specific contents. Some teachers have insufficient time of lessons' implementation such they have to finish learning contents base on provided curriculum (Vilaythong, 2011). While, the contexts in each lesson are basic but consists of many of learning outcomes that leads teachers are not self-confident in teaching. So, many teachers try to resolve problems which will be used for the final examination.

Practices of ESD in Lao PDR (2012-2017)

The practices were started to engage understanding of and attitudes towards ESD in the institution and school levels since 2012-2017. It intended to get science teachers and students understanding of and attitudes on the environmental issues that they have faced. Program was aimed to have teachers classify problems happening in the classrooms and find the ways for their solutions by integrating ESD to their lesson plans.

The framework for developing the program was started by a baseline survey including 14 primary schools in Bokeo province, North Laos as represented as a remote area of education. From these experiences, models were modified and practiced in the institution level (Bankeun Teacher College, an institution who prepare school teachers). On the practice, concepts of ESD were integrated to the curriculum by a group of in-service teachers (CIPP model). Finally, program was implemented in the lower secondary classes of the attached schools of institution to determine model and method of integrating before introduce and explore in widely communities.

Findings

In baseline survey, issues that were discussed including teachers' competence, classroom interaction, unconditional family status, schools' infrastructure and teaching materials, whereas the former was the best significance. Teachers found that there were many difficulties during conducting the lessons as well absent of students, different group of them, and lots of them couldn't speak Lao language fluently. From these impacts, it caused the learning activities went out so slowly; and sometimes teachers jump up to another activity without the understanding of all students. So, they realized that both teachers and students couldn't reach to their objectives of learning.

Based on baseline survey, the ESD context was first integrated into secondary school curriculum focused on biology, chemistry and physics which have taught for secondary school teacher trainee students in Bankeun Teacher College in 2016. Teachers reoriented current curriculum units to address sustainability. The Y project was used (toolkit adapted from Regina Rizzi model (UNECO, 2006)).

At the same time, an implementation of lesson through ESD in Bankeun Teacher College was conducted in teacher trainee's class entitled



Implementation ESD lessons on plan classification

“Environmental management (for second year in education: science teacher trainee students”.

In 2017, the development of lower secondary school students’ learning science through lesson study in the concept of ESD was conducted in two attached lower secondary schools entitled “Plant classification (monocotyledon and dicotyledon)”.

Conclusion

Understanding of ESD was ranged from the majority which focused on the environment, then included the social and economic conceptions. The training program and practices were aimed to get participants understanding of and attitude toward sustainability and ESD. It requires further program should be added to assess their understanding of and practice as such developing the curriculum to include sustainability agenda, and also demonstrate good practices in the institute and/or national level.

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Young Researcher Session 2

Development of Green Chemistry Lesson Model Based on ESD

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Background

Green Chemistry is a design of chemical products and process to reduce or eliminate the use and generation of hazardous substances. In sustainable development, Green Chemistry is an important concept, not only in industry but in our lives. Green Chemistry consists of 12 principles, and it is also known as “sustainable chemistry,” a form of chemistry designed to prevent pollution. It emphasizes the use of materials, processes, or practices that reduce or eliminate the creation of pollutants and waste materials. Green Chemistry can also be used as a platform to discuss sustainable development in the classroom. The objective of this study is to develop a chemistry lesson plan for changing students’ knowledge about chemical quantities; it focuses on two principles of Green Chemistry: “Prevention” and “Atom economy”. Prevention is the prevention of waste, rather than the treatment or clean-up of waste after it is formed. Atom economy is a design of synthesis without unreacted reagents. These principles are important for daily living and for considering sustainable development.

Lesson plan and practice

The study focused on a topic “Quantitative relationship and chemical reaction”. A teacher issued an assignment, “Let’s produce 100mL of carbon dioxide,” and students predicted the amount of reagents for producing 100mL of carbon dioxide. After carrying out an experiment, students compared their results with those of groups and learned the limiting reagent. Students then calculated the number of moles of the reagents they used and the carbon dioxide they produced. Afterward, the students calculated the theoretical

number of moles of reagents to be used for producing 100mL of carbon dioxide. They then tested the unreacted reagents with pH paper and treated it. The objectives of this lesson plan were to: 1) predict the amount of reagents; 2) find unreacted reagents; and 3) treat the unreacted reagents. The learning process is shown in Table. 1.

After the first trial for a senior secondary school chemistry class (n=38) in June 2017, the teacher evaluated the lesson plan by students' impressions of the experiment. The main content of this lesson was "quantity". The percentage of students who wrote about quantity was 64.1%. This result indicated that more than half of the students recognized a concept quantity through this lesson.

Table. 1 Learning process

Learning content	Learning activities	Remarks
Introduction (Previous lecture) Key assignment	Key assignment "Let's make 100mL of carbon dioxide."	Explain how to measure the volume of carbon dioxide using the apparatus.
Preparation of carbon dioxide	Revise preparation of carbon dioxide (Reagents)	Revise preparation of carbon dioxide showing a textbook. Explain sodium carbonate, hydrochloric acid as reagents.
Molar gas volume	Find molar gas volume in current condition (Teacher provides the table of molar gas volume in each temperature and pressure.)	Molar gas volume in standard temperature and pressure (0 °C, 1,013hPa) is 22.4L. Molar gas volume changes in temperature and pressure.
Evolverment 1 Prediction of the amount of reagents	Consider amount of sodium carbonate and 1 mol/L hydrochloric acid.	If students do not have an idea, the teacher provides choices for the amount of reagents.
Experiment	Carry out an experiment following a worksheet.	Direct students to take care of use of hydrochloric acid.
Evolverment 2 Sharing results of each group	Each group records the results (Mass of sodium carbonate, volume of 1 mol/L hydrochloric acid and volume of carbon dioxide) on the white board.	
Discussion	Compare these results and make a finding. [Expected ideas] - Though we use different volumes of hydrochloric acid, the volume of carbon dioxide produced is the same. - As we add excess hydrochloric acid, the volume of carbon dioxide does not change. Convert mass of sodium carbonate, volume of 1 mol/L hydrochloric acid and volume of carbon dioxide to number of moles. Calculate number of moles of reagents with chemical equation.	Lead students to focus on the groups who use the same mass of sodium carbonate and make the same volume of carbon dioxide. Recognizes students' number of moles of reagents which they used excessively, comparing with theoretical number of moles of reagents.
Development Products and unreacted reagent	Consider other products and property (pH, toxicity) in this experiment.	Sodium chloride and water are other products. Students already learned property of sodium chloride.
	Investigate pH value of residue with pH paper.	Confirm expected result, and if they arrived at a different result, direct students to consider causes.
Treatment of waste solution	Using soda or citric acid, neutralize excess of sodium carbonate or hydrochloric acid.	Show the page about treatment of acids and bases in textbook.

Upcoming Conferences

5th Asia-Pacific Expert Meeting on ESD and 1st Asia-Pacific International Colloquium **Learning for a sustainable future: Promoting strategies on whole-institution approaches in schools** **October 11-14, 2017, Luhe Middle School, Tongzhou District, Beijing (tbc), China**

The Chinese National Working Committee for UNESCO on ESD (CNWCESD) will hold the 5th Asia-Pacific Expert Meeting on ESD and 1st Asia-Pacific International Colloquium in Beijing, China. Prof. Tomonori Ichinose from Miyagi University of Education, Japan who is a member of the JSPS Core-to-Core Program “Formation of International Center of Excellence to Promote Teacher Education on ESD,” will go on the platform as a major lecturer. For more information, please visit the website <http://ceteesd.ed.okayama-u.ac.jp/>

2nd Meeting of the Asian Network to Promote Teacher Education on ESD **November 24-26, 2017, National University of Mongolia, Ulan Bator, Mongolia**

The next meeting of Core-to-Core Program “Formation of International Center of Excellence to Promote Teacher Education on ESD”, supported by Japan Society for the Promotion of Science (JSPS), will be held in Ulan Bator, Mongolia. For more information, please visit the website <http://ceteesd.ed.okayama-u.ac.jp/>

First RCE Thematic Conference: Towards Achieving the SDGs **December 5-7, 2017, Okayama Convention Center, Okayama, Japan**

RCE Okayama, Okayama University and the United Nations University Institute for the Advanced Study of Sustainability (UNU-IAS), will be co-hosting “First RCE Thematic Conference: Towards Achieving the SDGs” to be held in Okayama, Japan from 5-7 December 2017. The conference will discuss and launch strategies and activities in the fields of biodiversity, climate change and sustainable consumption and production to identify and make substantial contributions and tangible commitments by the Regional Centres of Expertise on Education for Sustainable Development (RCE) on the UN’s Sustainable Development Goals (SDGs) of the 2030 Agenda for Sustainable Development and the Global Action Programme (GAP) on Education for Sustainable Development (ESD). For more information, please visit the website http://www.okayama-u.ac.jp/eng/events/index_id2041.html

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