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JSPS Core-to-Core Program
Formation of International Center of Excellence
to Promote Teacher Education on ESD

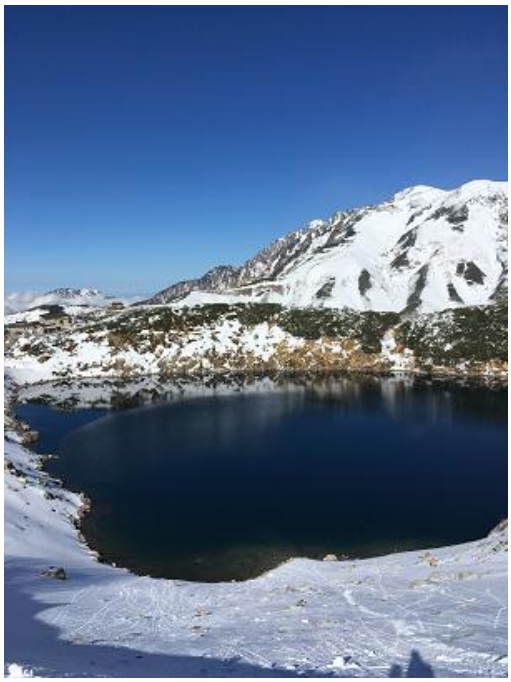
4th Meeting of the Asian Network to Promote Teacher Education on ESD

Meeting Proceedings

University of Toyama

Toyama, Japan

June 9-12, 2018



Welcome Message

Dear colleges and guests,

I am very glad to see the successful launch of the 4th Meeting of the Asian Network to Promote Teacher Education on Education for Sustainable Development (ESD). The meeting, supported by the Japan Society for the Promotion of Science (JSPS), will be held at University of Toyama, from June 9th to 12th, 2018. On behalf of all participants, and in particular on behalf of those who have come from overseas, I would like to thank especially Dean Nobuyuki Ohkawa, Vice-Dean Yo Tokuhashi, and Professor Toru Doi at the Faculty of Education, University of Toyama, and the meeting officers for inviting us and welcoming us to this august international forum.

The purpose of this meeting is to discuss the integration of teacher education with ESD and the development of training programs for teachers. The members of our joint research project from Asian seven countries have developed some guidelines and recommendations to reorient teacher education in Asia to address sustainability. It is hoped that the meeting will both encourage international cooperation and stimulate researchers to conduct research on ESD for achieving the Sustainable Development Goals (SDGs).

I deeply appreciate your coming to share with us this unique, memorable experience in this beautiful city Toyama, Japan.

Sincerely,

Hiroki Fujii
Professor, Graduate School of Education, Okayama University, Japan
Director, Okayama University ESD Promotion Center
Coordinator of the JSPS Core-to-Core Program “Formation of International Center of Excellence to Promote Teacher Education on ESD”

PROGRAM

S-1 to S-9: Senior researchers' presentation
Y-1 to Y-4: Young researchers' presentation

1st day, June 9th (Saturday)

Name of Rm	Lecture room 112, Faculty of Human Development, University of Toyama
9:30 – 12:00	Meeting (For research project members)
12:00 – 13:00	Lunch
12:30 – 13:00	Registration
13:00 – 13:10	Opening Yo Tokuhashi, Vice-Dean, Faculty of Human Development, University of Toyama Hiroki Fujii, Coordinator, JSPS Core-to-Core Program "Formation of International Center of Excellence to Promote Teacher Education on ESD", Okayama University, Japan
Country Report Chair Shigeyoshi Watanabe, Kumamoto University, Japan	
13:10 – 13:30	C-1 Indonesia **Students' perception and the strategy of infusing ESD on pre-service physics and science teacher curriculum in Indonesia** Wijaya, A. F. C., Indonesia University of Education Rusdiana, D., Indonesia University of Education Hariyono, E., Indonesia University of Education Muslim, Indonesia University of Education
13:30 – 13:50	C-2 Japan **Prospective science teachers' training programs incorporating ESD: Based on Lesson Study** Hiroki Fujii, Okayama University
13:50 – 14:10	C-3 Lao PDR **Integrating curriculum to address sustainability in Lao PDR** Sompong Siboualipha, Bankeun Teacher Training College
14:10 – 14:30	C-4 Mongolia **Activities for sustainable future** Dulguun Jalgalsaikhan, National University of Mongolia Burmaa Banzragch, National University of Mongolia Oyuntungalag Orsoo, Institute of Teachers' Professional Development Munkhjargal Ochirbat, Orkhonschool of Mongolia Uuriintuya Dembereldorj, Institute of Teachers' Professional Development
14:30 – 14:50	C-5 Myanmar **ESD practices in Myanmar education** Yin Mar Win, Sagaing University of Education San San Maw, Sagaing University of Education
14:50 – 15:20	Refreshment
15:20 – 16:00	Discussion & Feedback Derek Cheung, The Chinese University of Hong Kong, China Sun-Kyung Lee, Cheongju National University of Education, Korea

Research Presentation 1 Chair Kazutaka Yamada, Okayama University, Japan	
16:00 – 16:20	S-1 **An analysis of characteristics of collaboration among the participants of the Dreaming Eco School Project** Hyungson Ju, Korea National Open University, Korea Jaeyoung Lee, Kongju National University, Korea Suejung Jung, Korean Environmental Education Program, Evaluation and Research Center, Korea Jungnan Kwak, Korean Environmental Education Program, Evaluation and Research Center, Korea Yeona Son, Dankook University, Korea Kangseok Kim, Sungshin Girls' High school, Korea
16:20 – 16:40	S-2 **A trial of music composition on a theme of the marching season from spring to summer around the Japan Islands (An interdisciplinary class for the university students toward the cultural understanding in ESD)** Haruko Kato, Gifu Shotoku Gakuen University, Japan Kuranoshin Kato, Okayama University, Japan
	S-3 **Toward the development of study programs on the seasonal cycles of weather and climate systems around Japan on ESD** Kuranoshin Kato, Okayama University, Japan Yusuke Kuwana, Okayama University, Japan Hideki Morishita, Okayama University, Japan Haruko Kato, Gifu Shotoku Gakuen University, Japan Kazuo Otani, Okayama University, Japan
16:40 – 17:00	S-4 **Comparison with the current state of the alien species problem and description of textbooks in Japan** Toru Doi, University of Toyama, Japan
17:00 – 17:20	Y-1 **Education for sustainable development (ESD) learning material development for science secondary school curriculum** Wijaya A. F. C., Indonesia University of Education, Indonesia Muslim, Indonesia University of Education, Indonesia
17:20 – 17:40	Y-2 **Integrating a curriculum for the secondary teacher education program which majored in biology at Bankeun Teacher Training College to address sustainability** Sompong Siboualipha, Bankeun Teacher Training College, Lao PDR
17:40 – 18:00	Refreshment
18:00 – 20:00	Banquet at University Restaurant

2nd day, June 10th (Sunday)

Name of Rm	Lecture room 112, Faculty of Human Development, University of Toyama
8:40 – 9:00	Registration

Keynote Speech 1 Chair Sun-Kyung Lee, Cheongju National University of Education, Korea	
9:00 – 9:40	K-1 **A pedagogy for hope: science and sustainability** Ralph Levinson, Institute of Education, University College London, UK
Keynote Speech 2 Chair Tomonori Ichinose, Miyagi University of Education, Japan	
9:40 – 10:20	K-2 **Japanese experience on ESD and teacher education for ESD** Katsunori Suzuki, ESD Resource Center of Japan, Japan
Research Presentation 2 Chair Kuranoshin Kato, Okayama University, Japan	
10:20 – 10:40	S-5 **Lesson trial of the content plant body at elementary school science: Focusing on promoting pupils' scientific thinking** Hironori Kanae, Elementary School attached to University of Toyama, Japan
11:40 – 11:00	S-6 **Development and practice of ESD program to understand local environmental issue by high school students** Kiyoyuki Ohshika, Aichi University of Education, Japan
11:00 – 11:20	Refreshment
11:20 – 11:40	Y-3 **In-service teachers' perception towards Education for Sustainable Development (ESD) in Myanmar** Yin Mar Win, Sagaing University of Education, Myanmar San San Maw, Sagaing University of Education, Myanmar San Aye, Sagaing University of Education, Myanmar
11:40 – 12:00	Y-4 **Implementation form of "Global Action Program" in school** Dulguun Jalgalsaikhan, National University of Mongolia, Mongolia Burmaa Banzragch, National University of Mongolia, Mongolia Oyuntungalag Orsoo, Institute of Teachers' Professonal Development of Mongolia, Mongolia Munkhjargal Ochirbat, Orkhonschool of Mongolia, Mongolia Uuriintuya Dembereldorj, Institute of Teachers' Professonal Development of Mongolia, Mongolia
Research Presentation 3 Chair Kiyoyuki Ohshika, Aichi University of Education, Japan	
12:00 – 12:20	S-7 **Possibility of using Omoshiro Jikken (the fascinating experiment) to teach science** Shinichi Furihata, Tokyo University of Agriculture and Technology, Japan Sachi Kawamura, United Graduate School of Tokyo University of Agriculture and Technology, Japan
12:20 – 12:40	S-8 **Proposal of a procedure to make student teachers recognize their gained skills and competencies of ESD** Hironori Sasaki, Chugokugakuen University, Japan

12:40 – 13:00	S-9 **Introduction of the effectiveness and barriers of school-enhancing education for sustainable development in Japan** Tomonori Ichinose, Miyagi University of Education, Japan
13:00 – 13:30	Closing Hiroki Fujii, Coordinator, JSPS Core-to-Core Program "Formation of International Center of Excellence to Promote Teacher Education on ESD", Okayama University, Japan
13:30 – 14:30	Lunch
14:30 – 16:30	Workshop for Young Researcher

3rd day, June 11th (Monday)

9:30 – 12:30	School Class Observation on ESD Attached Elementary School and Junior High School, Faculty of Human Development, University of Toyama
12:30 – 14:00	Lunch
14:00 – 16:00	University Class Observation on ESD Attached Farm, Faculty of Human Development, University of Toyama

4th day, June 12th (Tuesday)

9:30 – 16:00	Excursion on ESD: ESD Activity in Local Community

1st day, June 9th (Saturday)

- Country Report
- Research Presentation

C-1 Indonesia

Students' Perception and the Strategy of Infusing ESD on Pre-service Physics and Science Teacher Curriculum in Indonesia

Wijaya, A. F. C., Rusdiana, D., Hariyono, E., and Muslim
Indonesia University of Education
agus.fany@gmail.com

Abstract Expanding on the concept of Education for Sustainability Development (ESD) that according to the community's problems and the geographic conditions of Indonesia is indispensable now. Teachers have an important role to touch learner's brain and heart effectively in purpose. In that way, teacher potentially became an agent of change in creating more sustainable future through their classroom with their future generation skills and knowledge. Indonesia's Society and environment crisis need to be handled and solve in an appropriate way, which is education ways, so that preparing teacher with ESD literacy has to be initiated as soon as possible. On the other hand, students must be taught the art of living sustainably right from early childhood. Now a day, people are not living with environmentally sustainable lifestyles due to lack of knowledge, lack of potential skill or tradition, and lack of community spirit. The students are to be taught the practical skills needed to help and solve the local environmental issues. That so, literate them with ESD perspective is a key to prepare them facing the future. Through several studies and research on pre-service physics teacher program within several academic years in order to identify three main goals in the first year research stage, those are students perception on ESD, re-orienting lecturer curriculum, and developing themes and learning materials. As a result, it revealed that in common students perception on ESD can be classify into two out of three different stages (Lane, 2010), that is, the majority of the students' perception are on the Selection stage and the small part of them are on the Organization stage, while there are no students has a perception on the Interpretation stage. The students in the highest year hold the highest stage of the perception. This situation is affected generally by expectation and cultural aspect while emotional and motivational aspects have an effect in a small part of the students' perception on ESD (McLeod, S. A., 2007). Through a critical and transformative model, students were able to reconstruct the way to learn and also to design teaching and learning proses in Physics infusing issues of ESD. The 1st year students performed a new way to come up with their own ideas based on the theories in order to solve the issues which has been provided. On the other hand, 3rd year students were able to deconstruct and reconstruct the way they teaching and learning design on Physics not only providing a practice issues on applying physics in daily live, but also infusing ESD issues in a different integrated curriculum ways. The 1st year students changes were their way to learn from acquiring information into inquiring information, while the 3rd year students transform their teaching orientation from instructivism in to constructivism way. Finally, the process of a critical and transformative model gave an alternative way to infuse the ESD in pre-service Physics teacher education. The Volcano Learning Project (VLP) as an innovation in project-based geoscience learning is the focus on this program. This program not only supports the strengthening of geoscience knowledge but also emphasizes how prospective teacher students can contribute to solving problems related to volcanic phenomena in Indonesia. Students are given the opportunity to interact with the environment and society in solving environmental problems associated with the volcano. The three main pillars of VLP: think critically, reasoning logically, and create productively.

Students Perception

Our lifestyle, somehow influence by our environment. In contemporary civilization, the environment surrounding also influence the development process. The future generation who are supposed to be the future decision makers, may take an action for changes in their way interact with environment. Deal with the environment as a life style is not the only thing the young generation should align. In a very dynamic condition of the earth, they should be balance their perspective with economic and social development dimension too. In the era of industry 4.0, we faced a big challenge to build a new life style in one side, and conserve the sustainable condition on the other side. As the fourth industrial revolution, Industry 4.0 connected to the current trend of automation ad data exchange in manufacturing technologies. It includes cyber physical systems the internet of things, cloud computing and cognitive computing. This revolution, since the mechanization, water power, and steam power stage (Industry 1.0) change into mass production, assembly line, and electricity power stage (Industry 2.0), and Computer and automation stage (Industry 3.0), given the pathway, surely, to develop effectively, but the main problem is, does it sustainably?

As a developing country, Indonesia rapidly develop the nation through many dimensions, infrastructure, industry, economic, education, etc. Generally, development goal is to make people can life better. Nothing wrong with this perspective, otherwise, we need to enrich this perspective with two basic characteristics, it should be sustained and ethical. To become a sustainable development, we need to consider that the benefits that we are getting now, should be transferred to the next generation. While, ethically, we also need to think about whatever the benefits, a person or a species enjoyed, should not harm other individuals or species. Those two characteristics should be socialized to all citizen in order to prepare and enhance the quality of live in Indonesia. Education for sustainable development (ESD) can be the proper way to reach this target. However, ESD is not a really familiar term for Indonesian compare to environmental education. This situation driven by the lack of knowledge of the educational practitioners how to infuse the ESD terms and issues into the curriculum. We all agree that education should play an important role in enabling people to live together in ways that contribute to sustainable development (UN, 2012; p.6). That's why, we should be encourage education to transfer every benefits that development process gave us, to the future generation properly and proportionally.

In order to implement sustainable development, it is necessary to develop the ideas further in terms of defining what sustainable means and the relevance of development and distinguishing it from environmental education (Johnston, 2007; p.9). What we know, somehow, reflecting what we stand for. Without knowing what we do, we will not got a meaningful achievement. To educate people about ESD, we need to know where are they stand for now. Prospective teachers are the key point to spread out the ESD efficiently, effectively, and for sure, sustainably. Pre-service teachers positioned themselves as agents of change, with a responsibility to help effect meaningful change in their society (Down, in Unesco, 2007; p.9). As the next classroom manager who will influence hundred or could be thousand future generations, prospective teachers will determine where the next generation will go. When the pre-service teachers understand how perception affects communication, communication can be done in complete manner (Lane, 2010). Understanding the perspective of prospective teacher on ESD can lead us to the appropriate communication approach and also appropriate knowledge, attitude, and skills.

Commonly in Indonesia, pre-service teacher program utilized with the concurrent curriculum. In concurrent curriculum, students learn educational material and subject matter material (such as Natural Science, Social science, Physics, or Chemistry, etc.) in the same time, the highest the level the deepest the material. In the 1st year stage, students learn basic material both educational and subject matter, while in the 4th year stage, students are directing to implement what they have already learn both in administrational and practical aspects. In the 2nd and 3rd year stage, the curriculum provide a bridging condition to elaborate the subject matter into a teaching and learning material, while the broadness of subject matter became more complicated. These characteristics became a basic consideration to provide the proper way to introduce the ESD approach.

Table 1 The perception process stages (Lane 2010)

No	Stages	Sub-stages
1	**SELECTION** (we select from the environment the stimuli to which we will attend)	**Salience** (stimuli that are selected from the environment based on their interest, use, and meaning to us)
		Vividness (stimuli that are selected from the environment because they are noticeable)
2	**ORGANIZATION** (categorize the stimuli we have selected from the environment to make sense of it)	**Schemas** (mental templates that enable us to organize and classify stimuli into manageable groups or categories)
		Figure-ground [a portion of the stimuli selected from the environment is the focal point of our attention ("figure") and the rest is placed in the background ("ground")]
		Proximity (when we group stimuli that are physically close to each other) & **Similarity** (tend to group elements together based on size, color, shape, and other characteristics)
		Closure (filling in the "missing pieces" to form a whole or complete picture)
3	**INTERPRETATION** (assign a meaning to the stimuli)	**Expectancy** (what we expect to perceive / accustomed to seeing stimuli in certain ways and therefore often don't perceive the obvious)
		Familiarity (How familiar we are with the stimuli)

By involving students from various levels, ESD delivered with several steps, which are: introducing ESD as an approach to view daily issues (different level different way of introduction), identifying some issues connected to the lecturer materials and concept, discussing the connection lecturer material with the problem solving possibilities, and elaborating the idea within the classroom. On the first stage introduction, lower level (1st and 2nd year) student introduced into the ESD approach with the real case of ESD issues closed to their daily live. For example: they count each different kind of vehicles across the university main road and then try to identify which vehicles gave the biggest pollution and what should we do to reduce the effect of the pollution. The higher level (3rd and 4th year) students introduced into the ESD approach within articles and implementations models related to the lecturer material that they have been learn. In this approach, students equipped by several scientific articles (journal and books) related to the lecturer material, and then we asked them to provide some ideas how to infuse the ESD term into Physics-science secondary school curriculum.

The next steps, which are identifying, discussing, and elaborating the idea, implemented in the same way within all levels of students. In identifying step, after introducing the ESD approach, we asked students to mentioning and classifying the issues connected to the lecturer materials and concepts. Furthermore, the students try to deliver their finding in a small group discussion to come up with specific idea and its reasons. Finally, in the last stage, we asked students to presenting their small group ideas into a real representation (such as media, students learning materials, etc.) and make a classroom discussion as an elaboration step. Ideas that comes up in the final steps are the evidence of students' perspective on ESD. As a results, Students' perception condition on ESD provided by Figure 1.

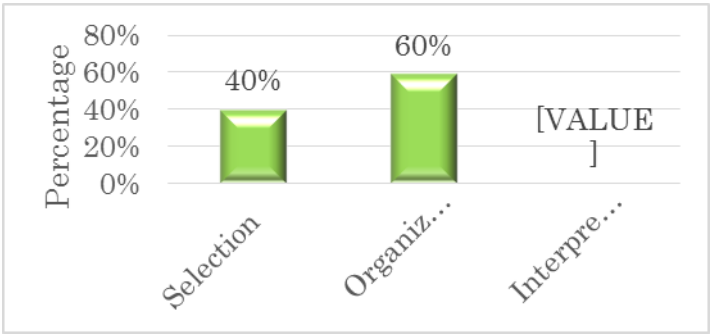
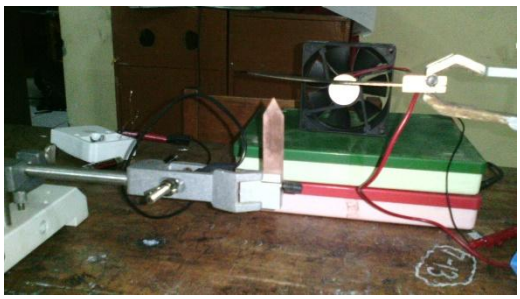


Figure 1 Students' perception stages

In general, students understand the schema and or "the illustration" of ESD with proximity and closure meaning with their own perceptions. There were no students idea classify as an interpretation stage, which means, the students interpretation on ESD are no longer assign a meaning to the stimuli. Figure 2 provide an example of students' idea on different context and different stages. Figure 2 (a) shown that students come up with teaching demonstration media to explain how we can separate and clean an oil pollution in at the river issues. Here, they provide the media to explain how water and oil will separately differentiate when we put in the same container, this idea explain how conceptually different magnitude of fluid density can affect the position of the fluid in the container. However, this idea cannot support what the problem need, that's why, this idea classify into selection stage of perception. This idea shown us a stimuli that are selected from the environment because they are noticeable.

Response on Figure 2 (b) and (c) shown how the student ideas related to their perception on ESD that classify into organization stage. In Figure 2 (b)., students come up with an idea of another teaching and learning demonstration media on how to prevent overheated in a stoves. In this product, students choose the bimetal characteristics to be the thermometric properties with regard to the issue. This idea has a portion of the stimuli selected from the environment is the focal point of our attention ("figure") and the rest is placed in the background ("ground"). In line with the Figure 2 (b), Figure 2 (c) students come up with the worksheet for teaching and learning activities, their try to answer the challenge to control the food waste that came from the students' lunch box issue. In this idea, students try to correlate the thermodynamics concept with the proper lunch box container design to keep the food good. From the idea, clearly we can found the mental templates that enable us to organize and classify stimuli into manageable groups or categories.

(a)



(b)

Lunch Box Design

In school there are many cafeterias that can provide food for students at school, but there are still some students who prefer to bring home-made food made by their parents. Food tastes better when they are still warm/cold. The problem with bringing food from home is that the food goes cold/warm quickly because the container cannot maintain the temperature of the food.

Your task is to design a lunch box that students can use to bring food to school and still keep it warm. Remember to use materials that can help to maintain the temperature. Write down the materials you will use and why you chose the material. Make a cross section view and a side view of the lunch box.

Name of Lunch box: _____

Material	We chose this material because ….

(c)

Figure 2 Students ideas on ESD

When we classify the Students' perception based on their level, figure 3 shown us the profile as follow:

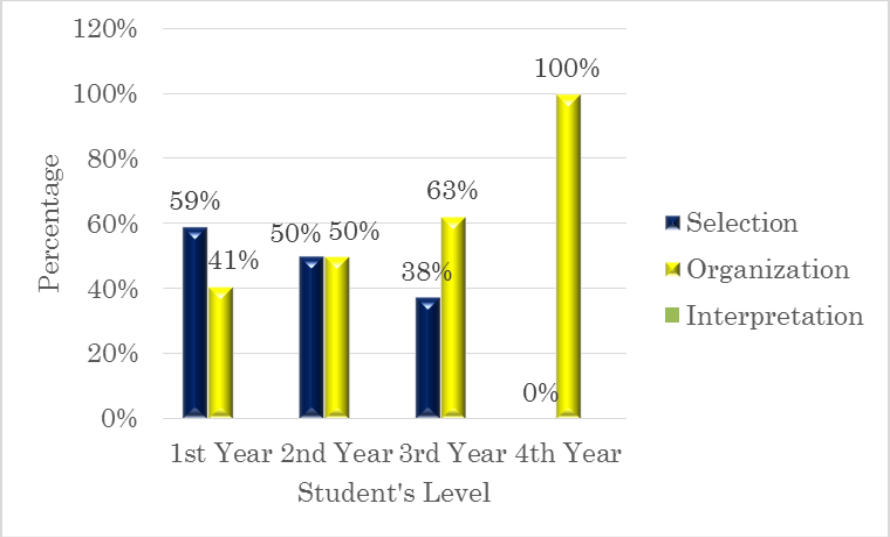


Figure 3 Students' perception stages based on students' level

Students' perception growth is parallel with their level of study length. The characteristics shown in this data reveal that students' learning experience in university level, naturally develop their stage of perception. However, the Interpretation level did not develop, since the students' cognitive development somehow become a hindrance in perceiving ESD. This was likely to happen due to social and cultural background of the students. The structure and unstructured interview reveal that the tendency to view a problem in a separate way became one of the factor that drive their idea into those stages. This condition influence socially developed within their interaction among the students in their own level and also the culture that awakened automatically through the experience presented at each level.

Furthermore, to reveal how the students' perception can developed, we need to elaborate more what kind of influences that related to the students' perception. Figure 4 presents data derived from the interview and field notes along the lecturer process. The profile shown that generally expectation and culture factors influence the students' perceptions in all level.

Motivation as a reason or reasons for acting or behaving in a particular way and emotion as a strong feeling deriving from one's circumstances, mood, or relationships with others, basically came from interaction among students. On the other hand, expectation factor as believing that something should be a certain way, influences the students' perceptions through what they had learn from the classroom experiences. While, the culture factor as the ideas, customs, and social behavior of a particular people or society, influences the students' perceptions through their surrounding environments. Figure 5 presents

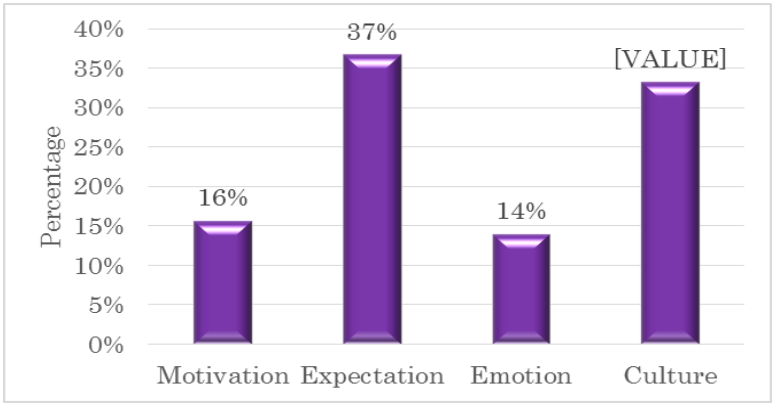


Figure 4 Influence on students' perception

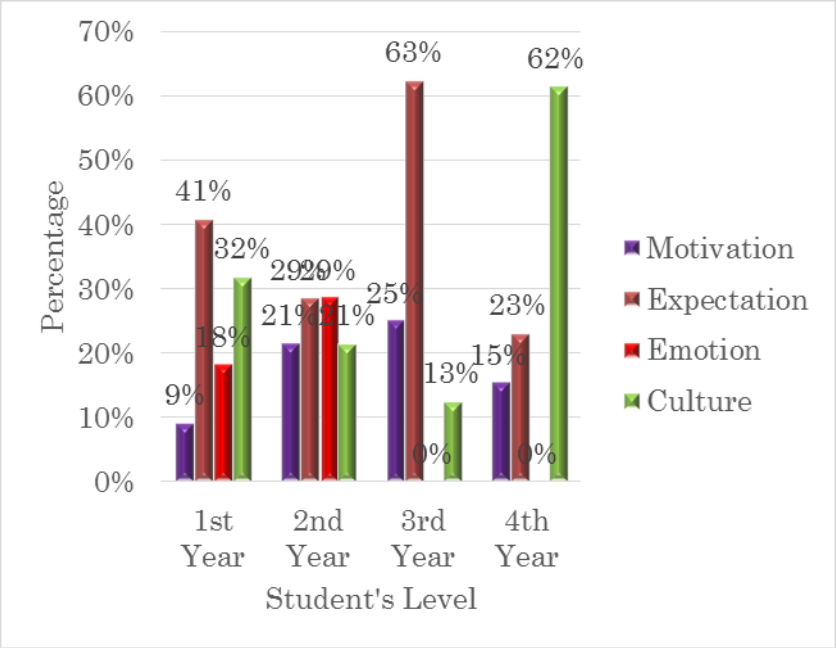


Figure 5 Influence on students' perception based on students' level

how each factors proportion in each level in order to clarify how can each these factors influence the students' perceptions.

Back to the characteristics of the curriculum of pre-service teacher in Indonesia that adhere to the concurrent curriculum, expectation factor changed dramatically with the cultural factor because of their experiences on teaching practices and school environment interactions. While, motivational factors developed since their expectation factors also developed, which was influenced by the development of their pedagogical knowledge. Furthermore, the emotional factor showed a decrease. This happened because as they learned, students developed motivation through interaction, and used less emotion in learning. On the other hand, cultural factor shaped by the experienced that student got along the teaching and learning process in the initial level. In the 2nd and 3rd level we can call it as a transitional equilibrium stage, in this stage, students try to comparing and finding a new condition and situation. In this case, the 1st year students influence by their culture in senior secondary school, while the 4th year students influence by the new culture in the university level.

Students' perception on ESD majority is on the Organization stage and the small part of them are on the Selection stage, while there are no students has a perception on the Interpretation stage. The students in the highest year hold the highest stage of the perception. This situation is affected generally by expectation and cultural aspect while emotional and motivational aspects have an effect in a small part of the students' perception on ESD. Physics Education Department Curriculum has an appropriate structure to lead students' Perception on ESD, however it still need to enhance the portion on how we reorientation of education towards sustainable development rather than "implementation" term only. Cultural factor as the biggest influence to the higher stage of the perception need to be packed properly in a transitional equilibrium stage in order to enhance the students' perception as early as possible in order to develop proper ESD literacy in our students.

Infusing ESD into Curriculum

Environmental Education (EE) has been more popular than ESD. This finding revealed from the

previous research. Each approach involve values. EE encompasses raising awareness, acquiring new perspectives, values, knowledge and skills, and formal and informal processes believed to change behavior in support of an ecologically sustainable environment. In terms of teaching about environmental problems in science subjects, Environmental Education is not sufficient to meet the needs envisaged for a sustainable development (Loughland, 2006). In other words, ESD is not intended to replace EE but to enrich it. ESD also involves topics outside the common EE subject matter and is often problem-based. According to this understanding, Education for Sustainable Development promotes the development of critical thinking, the creation of protective attitudes and an active participation in decision-making. It is not only stimulated and inspired from the ecological sphere, but from the social and economic spheres. The following comparative table outlines some of the main differences between EE and ESD.

Sustainability cannot be separated from education. Education and sustainability are interconnected, but ESD and Education somehow come up for many confused. ESD load with it the attached idea of implementation programs that are locally relevant and culturally appropriate. As we know, ESD as a sustainable programs should be take into consideration of local economic, societal, and environmental conditions. According to the situation, ESD will take many forms (Padmanabhan and Rao, 2011). There are three areas that directly Education affects sustainability: Implementation, Decision Making, and Quality of Life.

National scope of sustainability can be limited or enhanced by the level of education attained by the nation's citizens. Development option are limited when the number of unskilled and illiterate nation's citizens high. In fact, at that situation, the country should buy most part of their needs from other countries with a very hard currency. Furthermore, to fulfill the hard currency leads the country to do a very high exploitation on their natural resources. That's why, an educated workforce is the key for moving beyond an extractive and agricultural economy (Sharma, 2006). This is how the education affects sustainability in an implementation areas.

When the citizens well educated, the 'greener' development options will also expands. Citizens can act to protect their community by acquiring what, why, and how to solve their problems by collecting and analyzing data. In order to create ecologically literate citizens to adequately address environmental problems, there is a logical connection between sustainability education and engaging students in the community, which can serve as a relevant forum to address sustainability issues (Bowling, 2011). Good community-based decision can lead into social, economic, and environmental well-being, for sure it is depends on educated citizens.

When the sustainability develop in a nation based on their education, there is no doubt, will also improve the citizen's quality of life. Economic status can raised life condition, lower infant mortality, and also improves the educational attainment of the next generation, and for sure, it will improves the next generation's change into social and economic well-being. The improvement of education quality affected both national and individual implications.

The characteristics of ESD is multidisciplinary discipline including implicate capacity building for critical thinking and problem solving. Skills, global perspectives, and also knowledge deliver in ESD. Diversity, culture, and gender should be considered when we implement ESD. It is participatory and is based on learning with peers. It can give smaller gains that are of deep significance (Sungoh, 2007).

Millennium Development Goals aim to improved quality of life, promoting of human right, commitment towards environmental sustainability and education resulting in sustainable development deliver by ESD. Characteristics of Education for sustainable living are (Singhal and Shrivastava, 2004):

- It makes people understand the interdependence of all living beings and the consequences of their actions.
- It increases awareness about the environmental issues and complex system which have a bearing on sustainable development.
- It develops people's competence, attitudes and values, enabling them to associate themselves

actively in the process of sustainable development.

To infuse ESD into curriculum, there is several consideration should be done. When ESD is an isolated societal issue to be squeezed into curriculum, then we cannot expect a big progress will be made. Rethinking the whole system on a participatory basis and seeing things differently as a changing the educational paradigm steps need to be considered. Analyzing the formal education from the perspective of sustainable development incorporate with underlying issues, needs, and challenges to put ESD into practice should be the first stage need to be done. Incorporating sustainable development as a central theme in formal education and give it an enhanced profile, fostering increased quality of teaching and learning, facilitating links and networks, exchange and interaction among various stakeholders of ESD will help in the effective implementation of ESD in formal education system (Reddy and Reddy, 2003)

Based on the characteristic of pre-service teacher curriculum in Indonesia, there are three different approach possibilities to infuse ESD into curriculum:

- ESD on Curriculum

  The first approach to infuse ESD into curriculum is putting the ESD's issues as a theme for Teaching and Learning activities. In this approach, subject content derived the issues that can be infuse into curriculum. Frame work of 10 ways to integrate curriculum (Fogarty, 2008) can be consider to implement it into practice. The goal of this approach is identifying competencies and content of science curriculum align with ESD. For example, in Earth and Space Science Course, students asked to learn about volcanism disaster risk reduction based on the condition of the nearest volcano to their place to be a part of specific activities on volcanism's chapter. This approach is suitable to a subject matter courses, which are difficult to put another subjects or chapter on it.
- ESD in Curriculum

  Another approach of infusing ESD on curriculum is assigning ESD as a part of subject content. Here, we can put an ESD material as a part of course's subjects or a chapters. The goal of this approach is Identifying ESD content that fit into science teacher competencies. Holistic Curriculum perspective can be the frame work to implement this approach, covered there different perspectives, which are: changes to formal curriculum development process and/or frameworks; action to improve the graduate profile and student learning experiences; and strategic enhancement activities to improver teaching and learning practice. For example, in the Curriculum Study and Instructional Design of Physics course, students learn specifically the term of ESD in a new chapter. They explore ESD from different kind material such as journals, books, and other material connected to ESD issues. This approach is suitable to an educational courses, which are possible to put another subjects or chapter on it.
- Curriculum of ESD

  The last approach that could be considered to infuse ESD into curriculum is use ESD as a subject. When we have an opportunity to design a new material on curriculum, it is suitable to propose ESD as a new subject or part of the curriculum independently. For example, to enhance in-service teacher knowledge and understanding of ESD, South-East Asia Ministry of Education Organization (SEAMEO) on their Quality Improvement of Teacher Education Program (QITEP) in Science organized Environmental Education for Sustainable Development (EESD) Course. In this course, in-service teacher has an opportunities to elaborate more their understanding and knowledge of EESD.

Volcano Learning Project (VLP): A Potential Learning Program to Support the Success of ESD in Indonesia (ESD on Curriculum)

Earth and Space Science is one of the lecture subject in physics education program. This lecture subject classify as the transitional equilibrium stage in the curriculum. As the recommendation of the previous research, this stage became the important stage to enhance the students' awareness on ESD. Earth and Space Science learning material covered not only the earth science or geoscience, but also space science or astronomy. Those two learning material coverage can be delivered within ESD on Curriculum approach.

The Volcano Learning Project (VLP) as an innovation in project-based geoscience learning is the focus on this program. This program not only supports the strengthening of geoscience knowledge but also emphasizes how prospective teacher students can contribute to solving problems related to volcanic phenomena in Indonesia. Students are given the opportunity to interact with the environment and society in solving environmental problems associated with the volcano. The three main pillars of VLP: think critically, reasoning logically, and create productively.

As a simple virtual simulation model, VLP has developed to accommodate futuristic geoscience learning. VLP as a software provides an opportunity for students to take advantage of technology facilities (Palma, 2014), interaction with a wider and access more diverse range of authentic information sources based on the real data of volcanic activity in Indonesia which less underutilized as a learning resource. This model becomes a virtual media to provide knowledge about geoscience and can be used to exercise the geosciences skills to equip students to be more capable to solve the problems based on the real of geological data (Wysession, 2014), to describe basic geosciences phenomena in the various contexts (Fermeli, 2014), to get better understanding the science behind phenomena (Luo, 2016), and help students to understand volcanic activity that cannot be directly observed (Harpp, 2005). Become a hope, the software capable of supporting the physics student has a high-level order thinking (Chang, 2010).

As a learning Program, VLP begin with classroom activities of exploration on VLP software as an interface and volcano characteristics discussion. The next activity is a group discussion on 'Know more your volcano' project. In this activity, student asked to come up with volcanos' issues to be discussed, such as volcano disaster mitigation, economic value of volcano natural resources, etc. Furthermore, students construct a proposal as group discussion product which will then be used as the basis for conducting field studies.

To implement what their already construct in the proposal, students conduct a field study activities. In this activities, they visited the nearby volcano to study more about the characteristics of volcano, the culture of surrounding community, and ecological profile around the volcano. That so, they are not only learn the volcano as an object but also find out how the volcano affect to the cultural and ecological profile around it. In this field study, students do some observation on the volcano and ecological features to find out its characteristics and profiles. Furthermore, they do some interview with the people who lives around the volcano to explore their experience and perspective related to the activities of the volcano.

Figure 6 VLP classroom activities in earth and space science courses

Figure 7. VLP field study activities in earth and space science courses

Finally, to measure students' predicting skills and students' sustainability awareness as an impact of learning activities using VLP, the final test using predicting skill test and also filling out the sustainability awareness is done. Hereby, the statistical analysis on the students' predicting skills.

Table 2 Description of physics students predicting skills by using paired sample test

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95 % Confedence Interval of the Difference Lower	Upper			
Pair 1 Pretest-Posttest	-3.229E1	21.39988	4.36823	-41.32804	-23.25529	-7.392	23	.000

The result revealed, based on paired sample test (Table 2), VLP learning program significantly influence students' predicting skills. It shown that significant value (2-tailed) of 0.000< 0.050, which mean that VLP learning program on Earth and Space Science Course can improve students' predicting skills. Furthermore, we can discuss more on each ability in predicting skills as follow:

Table 3 Profile of student ability in developing predicting skills.

Aspects	Average ability (%)
Ability to processing information	89.16
The ability to present data in graphical form	59.72
Ability to formulate conclusions	66.67
Predicting skill based on data	66.67

As shown on table 3, the ability to process information (89.16%) is the highest ability students can achieve, which mean students' skill on gathering, reading, and compiling data got a biggest effect as the VLP program implemented. On the other hand, students' skill on translating data into another form became the lowest achievement, as shown on the data of the ability to present data in graphical form (59.72%). While students' skills on interpreting and analyzing data was the fair achievement, as shown on the data of formulate a conclusion and predicting skill (66.67 %). This condition lead us to conclude that understanding the data from the graphical representation is easier than making a graphical representation. In line with Francis (2014), that drawing a graph as a visual representation requires an understanding of the content, context, and construction. Also Evagorou (2015) said that the success of drawing graphs is closely related to the science process skill, especially in making the conclusions and prediction.

There were 15 items questionnaire to profiling students' sustainability awareness consist of 3 different perception on sustainability attitude, value, and practice in their daily lives (Hasan, 2010).

Table 4 Students' sustainability awareness

Item	Statement	Total 'Yes ' Response	Percentage Response
Sustainability Practice Awareness			
3	I always discuss about environmental problems with my friends	12	40.77%
9	I composting the food residue to become fertilizer	5	
10	I do not use plastic bag to wrap things	9	
13	I deliver informations on environment to my family members	14	
14	I involve in the environmental awareness activities in school	13	
Behavioral and Attitude Awareness			
1	I read about environmental issues in the mass media	18	76.92%
6	I appreciate biodiversity	22	
7	I concern about smoke that is omitted by vehichels	24	
8	I try to reduce amount of waste at home by collecting materials that can be recycled	12	
11	I conserve the use of electric energy at home	22	
12	I conserve the use of water supply	22	
Emotional Awareness			
2	I concern about environmental problems at my place	22	93.27%
4	I feel dissapointed with air pollution	25	
5	I feel dissapointed with river pollution	26	
15	I aware my responsibility towards environment	24	

Table 5 Categories of Sustainability Awareness

No	Percentage Response	Categories
A	0.0 – 39.9	Practices that seldom or dislike to be done
B	40.0 – 69.9	Practices that are done/ happened moderate/medium
C	70.0 – 100.0	Practices/feelings that are most likely one/happened

This students' response on the questionnaire of sustainability awareness appears as an influence of VLP learning program on Earth and Space Science Course. To analyze it, we need to interpret the data based on the students' preferences of responses as shown on Table 5 (Hasan, 2010).

Based on Table 5 interpretation, the result revealed students' awareness categorized as a Practices that are done/ happened moderate/medium on the sustainability practice awareness aspects, while behavioral and attitude awareness and emotional practice awareness aspects categorized as the highest category, a Practices/feelings that are most likely one/happened. It can be conclude that students' sustainability awareness has been developed by the VLP learning program well. Nevertheless, the gap between emotional, attitude and behavioral aspects with the practice awareness need to be noted as an improvement window on the VLP learning program implementation into the future.

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C-2 Japan

Prospective Science Teachers' Training Programs Incorporating ESD: Based on Lesson Study

Hiroki Fujii
Okayama University, Japan
fujii-hi@okayama-u.ac.jp

Abstract The purpose of this study was to develop and conduct a prospective science teachers' program on ESD based on Lesson Study and to evaluate the merits and values of the program based on the evolution in their understanding of science lessons. On the basis of Stufflebeam's CIPP evaluation model, the program was developed for third-year undergraduate students in the science education department. After conducting a two-month trial of the program, it is believed that the program promoted their understanding of science lessons, namely, what science teachers should help pupils acquire through science lessons incorporating ESD. This is a significant merit of the program that was developed.
Keywords ESD, science teacher training program, Lesson Study, CIPP evaluation model

Introduction

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 its worldwide spread. 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 programs on ESD (e.g. Mckeown, 2012).

During this time, Okayama University, which holds the UNITWIN/UNESCO chair programme in research and education for sustainable development and participates at the Okayama Regional Centre of Expertise on ESD authorized by the United Nations University, has tackled teacher education on ESD; therefore, we have advanced the pre-service teachers' training programs at the undergraduate and graduate levels, as well as in-service teachers' training programs, in cooperation with the boards of education (Yutani & Fujii, 2014).

Highlighting the pre-service science teacher programs, we incorporated the contents, such as the ideas and purposes of ESD, the linkage between science education and ESD, and examples of science lessons on ESD, into the compulsory courses, "Elementary Science Education Methodology" and "Secondary Science Education Methodology". In the content of the linkage between science education and ESD, for example, we introduced how to link science education and ESD with the consideration of the purposes, contents, and activities of science as a subject, individually or as a learning system. Through these program developments, we revealed that science teacher education on ESD should be based on Lesson Study and should also be linked to teachers' professional knowledge of education and scientific literacy related to the major themes of ESD, such as climate change/energy problems, biodiversity, and prevention of natural disasters.

Presently, we have been developing two new prospective science teachers' training programs on ESD. First, we focus on the program with a special emphasis on Lesson Study over a compulsory course of two months, "Elementary Science Education Methodology Development" and "Secondary Science Education Methodology Development", in which third-year undergraduate students enroll and participate directly

following school practice for one month. In these courses, students conduct Lesson Study such as creating a lesson plan, practicing demonstration lessons, and reflecting on the lessons that are practiced in order to practically learn the science education methodology. Moreover, they are required to incorporate the ideas and purposes of ESD into units and topics of science lessons in such a way that students will want to practice and complete them.

Second, we focus on an elective course offered at the undergraduate and graduate levels, "Science Education and ESD", which has the aim of training talented science teachers; the course helps students learn about the development and utilization of bioenergy. The students registered in this course take a lecture which cover junior and senior high school chemistry lessons focused on sustainability (Fujii et al., 2012) and visit sites of a biomass town where bioenergy based on woody biomass is developed and utilized. Moreover, they are required to expand their ideas of how to incorporate the idea and purposes of ESD into the contents and topics of science lessons.

In this report, we will present the development, trial, and evaluation of the aforementioned first prospective science training program.

Program Development

To develop a prospective science teachers' training program, we adapted a framework informed by Stufflebeam's Context, Input, Process and Product (CIPP) evaluation model (Stufflebeam, 2003), which has been used for the evaluation of curricula and educational programs as a management-oriented evaluation tool. The CIPP evaluation model can provide the key information necessary for making a decision on how to develop curricula and educational programs; therefore, the model provides a systematic perspective on the development, practice, and evaluation of ongoing program development (Nozawa, 2012).

The CIPP evaluation model is composed of four components: context, input, product, and product evaluation. The context evaluation is often referred to as needs assessment. It asks the question, "What needs to be done?" and helps with the assessment of problems, assets, and opportunities within a defined community and environmental context (Stufflebeam & Shinkfield, 2007). It clarifies the objectives of program development. The input evaluation prescribes a project to address the identified needs. It asks the question, "How should it be done?" and identifies procedural designs and educational strategies that will most likely achieve the desired results. It defines the structure and contents of the program. The

Table 1 Procedure of program development adapting the CIPP evaluation model

Context evaluation
We identified the needs of university teachers and students for school science lessons incorporating ESD and the topics that students must learn to be able to provide such science instruction; therefore, we conducted initial quantitative assessment using a questionnaire.
Input evaluation
We created a plan for the teacher training program corresponding to the identified needs, reviewed relevant literatures, and considered the advice and expertise of individuals such as other university teachers. Also, we created a framework to evaluate the plan and confirmed whether it meets the needs that were identified.
Process evaluation
We monitored the program process and potential procedural barriers, and identified students' needs for program adjustments, that is, their current questions and difficulties related to the processes of Science Lesson Study incorporating ESD. Therefore, we observed Lesson Study activities and kept a log of activities, interviewed the students, and reviewed their self-reflections. Also, we provided advice relevant to the students.
Product evaluation
We measured, interpreted, and judged teacher training program outcomes; therefore, we conducted an initial quantitative assessment using a questionnaire for university teachers and students and reviewed the students' self-reflection through group interview and their final reports.

process evaluation monitors the project implementation process. It asks the question, "Is it being done?" and provides an ongoing check on the project's implementation process. It documents the process and provides feedback regarding (a) the extent to which the planned activities of the program are carried out and (b) whether adjustments or revisions of the plan are necessary. The product evaluation identifies and assesses project outcomes. It asks the question, "Did the project succeed?" and is similar to an outcome evaluation. It measures, interprets, and judges a program's outcomes by assessing their merit, worth, significance, and probity.

Referring a previous example of program development (Zhang et al., 2011) used the CIPP evaluation model, we conducted a procedure to analyze the information obtained in each component and to carry out the development, practice, and evaluation of the program (Table 1).

Prospective Science Teachers' Training Programs Incorporating ESD

The "Elementary Science Education Methodology Development" Course

We organized a compulsory course titled "Elementary Science Education Methodology Development" as a training program for prospective science teachers. Sixteen third-year students belonging in the Department of Science Education, Faculty of Education, Okayama University, registered themselves for the course. Moreover, this course had a duration of two months (from December 6, 2016 to February 7, 2017) and was held just after one month's school practice; it consisted of 32 hours in total (four hours per a week for eight weeks).

Table 2 shows the learning objectives and syllabus planning of the course. On the basis of school practice experience, the students conducted a lesson study activity, which included making lesson plans, practicing demonstration lessons, and reflecting on practiced lessons, in order to gain a practically understanding of science education methodology. In addition, they were required to incorporate their own ideas and the purposes of ESD into science lesson units and topics that the students wanted to practice.

Context Evaluation

In order to set up the purposes of the program, we conducted the initial quantitative assessment by an administering questionnaire to 16 students and two university teachers (Table 3). The students' representative quotes were enclosed in quotation marks (""), while the number of respondents as multiple-response items were indicated in parenthesis.

Regarding Question 1 ("Is it necessary to conduct elementary science lessons incorporating ESD?"), all the students responded positively. The total number of responses to the question "Why do you think so?" was 17. A variety of reasons were provided, which were derived from various aspects of society, especially tackling environmental problems (9) (e.g., "The environmental problems are causing a grave situation."). Moreover, they were described based on the aspect of children's development (7) (e.g., "The pupils can think about systems of environment, energy, and so on.").

Regarding Question 2 ("What kind of elementary science lessons incorporating ESD should be practiced?"), the total number of reasons provided was 23. These reasons were described based on the aspect of learning objectives (9) (e.g., "In the lessons, we should help pupils think about what they can do to the natural environment."). Moreover, they were described based on the aspect of learning contents (9), especially natural disasters (4) (e.g., "Emphasis on natural disaster topics") and resources/energy (3) (e.g., "We should discuss the period of years within which energy will be depleted.") Moreover, they were described based on the aspect of learning methods (5) (e.g., "[In the lessons]…we should help pupils solve problems involving the natural environment along with the law of nature. This is an advantage of science lessons.").

Regarding Question 3 ("What should you learn to practically conduct the above-mentioned elementary

Table 2 Course "Science Education Methodology Development" as prospective teacher training program on ESD

Learning objectives
The students will learn science education methodology through Lesson Study.
Syllabus planning
1st: 1) Reflection on experienced school practice and completed science education courses and 2) Attendance of a lecture on the social background of the promotion of ESD, ideas and purposes of ESD, and an exemplar of elementary science integrating ESD 2nd to 4rd: Selection units and topics for lesson design and then development, presentation, and modification of lesson plan 5th to 7th: Demonstration of a lesson and reflection of its effect 8th: Presentation of learning outcomes

Table 3 Questionnaire used for context evaluation and product evaluation

Q1Is it necessary to conduct elementary science lessons incorporating ESD? Why do you think so?
Q2 What kind of elementary science lessons incorporating ESD should be practiced?
Q3 What should you learn to practically conduct the above-mentioned elementary science lessons in school?

science lessons in school?"), the total number of responses provided was 24. The reasons described were based on the aspect of research on a particular subject matter (12), especially research on materials for the lessons (7) (e.g., "I need to understand the business efforts extended in the development of energy.") and research on ESD (5) (e.g., "I should gain knowledge on the essentials of ESD through my own efforts."). In addition, the relevant descriptions were based on the aspect of research concerning teaching methodology (6) (e.g., "I have to understand the results of ESD and the points in it that can be improved; I should also understand what ESD lessons are currently being carried out in schools."). On the other hand, some responses were related to the students' own behavior (4) (e.g., "I will take action with regard to energy problems and thus show the appropriate actions to pupils.").

Thus, it is believed that: 1) many students understood the necessity for science lessons that incorporated ESD based on the aspects of tackling environmental problems as well as children's development of thinking; 2) they thought that these science lessons should deal with natural disaster and energy/resources contents and enable pupils to think and also teach how to act; and 3) they thought that, by conducting these science lessons, they would gain an understanding of ESD itself through the examples in lessons and related teaching materials.

Input Evaluation

Corresponding to the identified needs, we made a plan for a teacher training program for prospective science teachers. In addition, we referred to the relevant literatures and expert advice provided by university teachers from the Department of Science Education. First, in order to enhance the students' understanding of ESD, we intended to explain the social backgrounds of the promotion of ESD and its idea sustainability and introduce examples of elementary science lessons that incorporated ESD (Shinkosyuppansya Keirinkan, 2015). Second, we intended to support the students' Lesson Study activities, which they utilize to enhance their understanding of the main topics in ESD, such as climate changes/energy, biodiversity, and natural disasters, and develop their understanding of why and how we incorporated ESD into science lessons; that is, we intended to introduce them to the learning objectives and learning contents/methods of science lessons on ESD. Finally, we created a framework in order to evaluate and confirm whether the plan met the needs.

Process Evaluation

Through the processes of the program, we helped students reflect on their school practice experience and science education courses that they completed. Subsequently, the students first took a lecture about the social backgrounds underlying the promotion of ESD, the ideas and purposes of ESD, and examples of elementary science lessons that had incorporated ESD. Second,they selected units and topics for lesson

Table 4 Units and topics of elementary science lessons incorporating with ESD

Third grade	Working of Wind and Rubber Pupils try to stop handmade car at a specific location through the use of energy of rubber and understand the way their project utilizes energy.
Fourth grade	Season and Living Things Pupils understand that animals and plants are changing their shape and surviving their life, corresponding to the four seasons.
Fifth grade	Running Water Pupils consider levees that are the strongest and eco-friendly and understand the relationship between nature and human beings.
Sixth grade	Landscape and its Change Pupils reflect on why a famous Japanese volcano, "Sakurajima," has connected to the main island and discover the greatness of nature.
	Utilization of electricity Pupils understand the bidirectional linkage between electricity and energy converted into electricity.

Figure 1 Unit "Running water": A model of the strongest levee

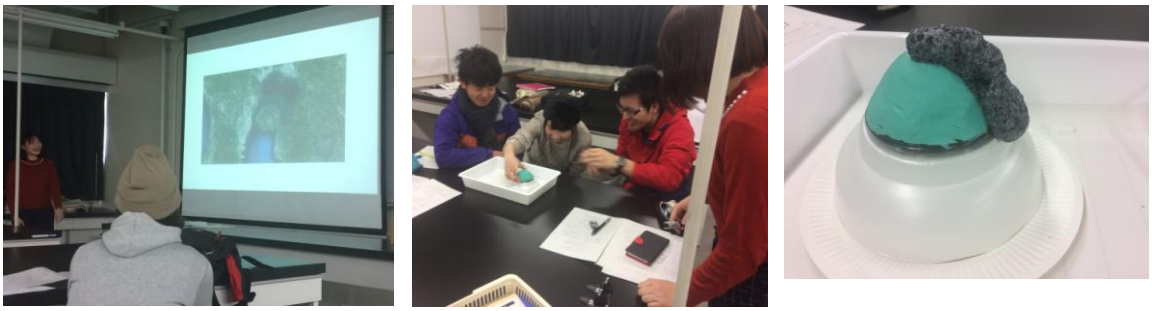

Figure 2 Unit "Landscape and its change": A lava flow model of the volcano "Sakurajima"

making (Table 4), and then presented and modified their lesson plans. Third, they demonstrated their lessons, which were based on the lesson plans they had created, and reflected on their own lessons (Figure 1 and 2). Finally, they presented the learning outcomes of the program.

In the above-mentioned second step, we conducted the process evaluation and monitored the program process while placing a special emphasis on the students' activities. In actuality, they often asked themselves the question "What is ESD?" They also had many questions and talked about their difficulties regarding the setting up of the learning objectives and the framing of learning contents. We provided them with the minimum necessary amount of advice and helped them improve their own problem solving.

Product Evaluation

We conducted the same initial quantitative assessment by administering the questionnaire to sixteen students and two university teachers. Regarding Question 1, all the students responded positively again. The total number of reasons provided in response to the question "Why do you think so?" was 18. The

number of responses to the item based on the aspects of children's development was nine; it focused on promoting children's cognitive development and behavior (e.g., "Because through science lessons that incorporate ESD…I think that children might change and deepen their view of nature and the environment near them as well as living things. Moreover, the children might change their behavior and their attitude toward the environment near them.").

Regarding Question 2, the total number of responses was 26. The responses based on aspects of the learning objectives of science lessons with ESD (6) were, for example, " [Science lessons that incorporate ESD] should help children acquire the competencies necessary for the future and basic ways of thinking about these competencies," "I think that, considering science lessons from various aspects, we need to carry out education and lessons in order to enable our decision making," and "In science lessons that incorporate ESD…it is necessary to help children change their self-recognition from being *human being centered* to being *human being in nature*." Furthermore, the responses based on aspects of learning contents (11) were included not only in those related to the subject matter itself (e.g., energy/natural resources) but also in those related to the organization of teaching materials. An example of the later was as follows: "If we find a familiar natural phenomenon that is useful for ESD, we should incorporate it into science lessons as teaching material." Furthermore, there were various responses regarding the aspect of learning methods (9). Their descriptions were categorized into problem solving, for example, "[For science lessons incorporating ESD] …it is very important for children themselves to inquire how to solve problems by using the basis of previous learning experiences." and lessons with realistic emotions (e.g., "The lessons should provide an opportunity to help children think about how the learning contents are relevant to their own lives and help them gain real feelings.").

Regarding Question 3, the total number of responses was 26. The responses regarding aspects of research concerning the subject matter of science lessons with ESD (13) were categorized on the basis of learning of materials for lessons (5), learning ESD itself (3), and learning how to incorporate ESD into teaching materials (3). An example of the later was "The most important thing is researching the subject matter. I need to inquire about and determine the parts of the science lesson units into which we can incorporate aspects of ESD." Moreover, there were responses about the teaching methods (9), especially with regard to learning how to incorporate ESD into teaching methods (4) (e.g., "I need to consider what content we allow children to grasp, in terms of approaching aspects of ESD."). Furthermore, there were some responses on research concerning children (4), especially children's thinking in ESD lessons (3) (e.g., "Considering children's thinking….I have to be able to look at and think about things from various viewpoints and standpoints.").

Subsequently, we reviewed the students' self-reflection at the end of the course (verbal data) and their final written reports (descriptive data). These data showed results that were very similar to those of Question 3 of the questionnaire.

Findings

After conducting a two-month trial of the program, it was concluded that the program promoted the students' understanding of science lessons incorporating ESD.

First, the students understand the necessity of science lessons incorporating ESD better, especially with regard to aspect of children's development. Regarding the reasons for elementary science lessons' incorporation of ESD, they pointed out not only the promotion of children's thinking but also behavior. Second, about desirable practices for science lessons incorporating ESD, the students imagined various ideas for learning objectives, contents, and lesson method. For example, they pointed out that the setting up of learning objectives should place a special emphasis on promoting a view of nature that is in accordance with the motto "Human being in Mother Nature." Moreover, they mentioned that it was

necessary to organize the teaching materials utilized in science lessons incorporating ESD. Finally, the students understood more clearly the necessity of their own learning in order to conduct science lessons with ESD. In particular, they mentioned the importance of researching the subject matter and teaching methods as well as the process and expandability of children's thinking.

Thus, it was shown that, by understanding what ESD is, the students enhanced their understanding of what science teachers should help pupils acquire through science lessons that incorporate ESD; that is, they gained an understanding of setting up appropriate learning objectives for science lessons incorporating ESD. This is a significant merit of the program that was developed.

This program focused on the development of each unit and lesson but not the curriculum. One of the future potential directions for training programs for prospective science teachers with regard to ESD is to foster students' understanding of science curricula that incorporate ESD. We should face this difficult task while promoting the circulation of idea between the research on ESD curricula and school lessons and the research on ESD teacher education. For this reason, the Lesson Study should be used as a tool both for driving innovations in teacher training programs with ESD and for developing ESD instruction of the teaching professions.

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C-3 Lao PDR

Integrating Curriculum to Address Sustainability in Lao PDR

Siboualipha Sompong
Bankeun Teacher Training College, Lao PDR
Somepong55@gmail.com

Abstract This report outlines the team's recommendations for building a comprehensive new system of professional education anchored in a practical, cross-disciplinary approach to continuous learning throughout the life cycle of a sustainable development. Throughout this report, issues in education and special needs from baseline survey were considered to develop training on ESD, it integrating and conducting model lessons. The first professional training was conducted and intended to help Laotian science teachers understand the ESD and its integration into science lessons. The program also aimed to enhance trainers' knowledge of and attitudes toward ESD. Within the program, trainers were expected to analyze science (biology, chemistry, and physics) lesson plans that incorporated the idea of sustainability as well as to develop model lessons. In a model lesson, teachers were expected to develop analyzing skills on issues and lessons. At the same time, they developed a research lesson focusing on developing students' learning outcomes and enhancing their attitude towards ESD. A research lesson suggested that integrating ESD should be included with Mapping Curriculum. So, the following study purposed to map an existing curricular, implement issues' identification and association with it requirements, connect identified issues with learning outcomes, and identify it opportunities for integrate ESD. Recently, teachers have continued to map, identify, connect and integrate it requirements to a science and mathematics curricular, and demonstrated lessons based on lesson study cycle.

In the training, framework for developing the program was informed by Stufflebeam's (2003).

A curriculum for the secondary teacher education program which majored in Biology at BTTC was mapped in order to college's calendar. The model used for mapping was included 1) Essential questions, 2) Content, 3) Skill, and 4) Assessment.

From the assessments after lessons, students gained an understanding of what makes insects a unique part of the animal kingdom and how they compose into bodies' systems. They received an introduction to the types of arthropods groups by studying main organs in systems to classify insects or other arthropods. They gained an understanding of how insects' adaptations help them survive and thrive in a variety of habitats. They could introduce to the many roles insect play in natural communities. Furthermore, students could be able to define endangered or extinct, identify relationship between insects and their habitats, identify human activities that harm insects and suggest ways to protect them by working in group to promote by creating posters.

Keywords Lao Education, ESD, CIPP, Mapping Curriculum

Introduction

Education System in Lao PDR

Lao People's Democratic Republic (Lao PDR) is a land-locked, ethnically diverse and mountainous country with an estimated population with 6.8 million (The United Naition in Lao PDR, 2015). The majority of population lives in rural villages. The country is situated between China, Myanmar, Vietnam, Thailand and Cambodia, that its geography is one of mostly rugged mountain terrain with 47 percent forest and only 4 percent arable land (Benveniste, Marshall, and Santibanez, 2007). The economic and social progress in Lao PDR is needed to rely on important source of human capital which referred to

country's young population. Based on King and Walle (2005), the 41% of its roughly 6 million people, the ages are between 0 and 14; 19 years old for the median age; while 5-19 age group is expected to keep growing at rates of 7-8 percent in the next few years.

Lao PDR has an education system very much influenced by its colonial heritage (MacKinnon and Phonesavanh, 2014). The country is now in transition from an agricultural economy to an industrialized economy, moving toward a market economy and privatization. Education and training are very important for preparing citizens for this transition. The immediate educational policy in Lao PDR is to develop quality human resources to meet the needs of the socioeconomic development of the nation. The government has begun to reform the education system, with the goals of linking educational development more closely to the socioeconomic situation in each locality, improving science training, expanding networks to remote mountainous regions, and recruiting minority teachers.

General education, vocational and technical education, and higher education are consisted of in the formal education system. General education includes preschool (childcare for children up to 2 years old and kindergarten for children aged 3–5) and 12 years of primary and secondary education combined – divided into primary (five years of schooling for children aged 6–10), lower secondary (four years for children aged 11–14) and upper secondary (three years for children aged 15–17), and the basic education is defined as primary and lower secondary school, and comprises nine years of education (McLaughlin, 2011).

There are eight Teacher Education Institutions (TEIs) offering pre-service training for future pre-school, primary and lower secondary teachers (Benveniste, Marshall, and Santibanez, 2007). Five of these are Teacher Training Colleges (TTC), while three are Teacher Training Schools (TTS). TTCs prepare trainees for secondary school teaching (11+3), issuing high level certificates. TTS train future pre-school and primary teachers (11+1, 8+3 and 5+4). Graduates receive medium level certificates. It is envisioned that in the near future these institutions will be harmonized as Teacher Training Institutions (TTI). In addition, the Faculty of Education at the National University of Laos (NUOL) offers a degree level program for upper secondary teachers.

According to Vegas (2005), teacher working conditions or the context under which teachers are expected to perform their jobs, play an important role in determining school outcomes meanwhile, it has been well established that good working conditions help support classroom teaching as well as foster learning. The typical Lao classroom appears to be strongly structured through lesson-planning and instructional time is well prioritized (Benveniste, Marshall, and Santibanez, 2007). In principle, teachers place great emphasis on developing thinking skills and problem solving. In practice, the primary method of instruction in Lao PDR schools is frontal lecturing, copying lessons on the blackboard and encouraging recitation and memorization. Students are mostly passive recipients of instruction, while there is some opportunity for copying exercises there is comparatively little time devoted to practical exercises or application of knowledge. Efforts could be channeled into modernizing the pre-service and in-service teacher training curricula to better equip teachers with child-centered teaching and learning methodologies.

Bankeun Teacher Training College and the Performance of Training System

Bankeun Teacher Training College (BTTC) was established and agreement of Ministry of Education and Sports by its initially known named as the Local Teacher Training School in 1968 then was improved and development becoming as (BTTC) since 1990 to present. Bankeun Teacher Training College (BTTC) is on over at road No. 10, KeunNeua village, Thoulakhom District, Vientiane Province. It is far from the capital about 70 kilometers, with approximately 167.006 square meters and is surrounded by villages and fields. The landscape is a plain area that is well-suited to the livelihood of staff, teachers and students). BTTC, now has 144 staffs with 72 females, and total number of students is 1633, included female students number is 1003.

BTTC has the role and mission of building and maintenance of kindergartens, primary teachers, secondary school teachers and bachelor degree. Also, college has developed faculty personnel of the College of teachers to have the knowledge, skills, and ethics of teaching and learning arrangements to meet the objectives of course. One more major is to build teachers education for creative thinking and rank number one of study the biology and Lao language teachers. In addition college has the goal to become a university of education as a center of development and a center of excellence in the future and also to promote multi-faceted cooperation in the establishment of regional and international linkages to promote national culture and environmentally friendly.

According to the content of the college's development policy from 2016-2020, BTTC has placed institution's development policy in order meet the target goal to become a university of education as a center of development and a center of excellence in the future The policy lays on continue to follow the plan of the Teacher Training Department to carry out the upgrading of the general education of teacher training standards are provided, especially in the maintenance of a teacher training course, ensuring a continuous vocational development system, with the improvement of the network for the development of a teacher-training school, such as a demonstration school, a college campus experience. There is also improving teaching and learning by focusing on student performance and also using various laboratories, including more academic learning centers. The main deal on encouraging all teachers to improve their own teaching in the form of doing (Lesson Study) and UBD teaching is various noted.

In order to be successful the action plan, BTTC has considered the development of teacher personnel, teaching courses, teaching methods, how to manage and evaluate curricula is essential and urgent for teacher training college. To ensuring the quality of teacher training and creating a centre of excellence, considered as a challenge and an important job for staff in teacher training institutions. The institutions use approved courses; establish pre-schools, primary seminars and experience-training schools to develop the career-oriented development of teachers in society, the region and the international community. So, study on ESD and it integration have been considered to develop both curriculum and teaching-leaning outcomes since 2012 to present.

Key Concepts on Education for Sustainable Development (ESD)

ESD is education that is concerned with transforming today's society, so as to achieve sustainable societies in the future (UNESCO, 2012). To achieve this, ESD reorients existing educational program towards sustainability. This involves rethinking what is taught and how it is taught. ESD involves the formation of values, skills, attitudes and behaviors that prepare learners to anticipate, think critically, and tackle and resolve problems relating to sustainability.

According to the enforcement plan, the goals of ESD are: "*1) everyone can enjoy the benefits of high-quality education, 2) the principles, values, and actions needed for sustainable development can be taken into all fields of education and learning, and 3) education and learning can bring the changing of people's actions for realizing a sustainable future in the aspects of environment, economics, and society.*" (Liaison Committee among Ministries and Agencies on UNESCO (2006). These concepts relate to the natural, social, and economic environments surrounding human beings, regions, societies, nations, etc. Moreover, concepts like circulation, diversity, ecosystems, symbiosis, preservation, respect for life, continuity of life, etc., are also mentioned (NIER, 2007).

The objective of ESD is to equip learners with the necessary skills, knowledge and compassion to act responsibility for a sustainable future. It enables learners to understand the challenges and transgressions faced in the social, environmental and economic spheres (Pillai & Achilles, 2015). In this study, we tried to explain the meaning of sustainable development and described its most obvious features to the participants (science teacher trainers) and then the practices of ESD integrated on their current curriculum that they are teaching.

One of the key features of the last decade has been the growing awareness of the process of

globalization. Globalization is manifesting itself on several levels: economic, ecologic and social (Sleurs, 2008). From this feature, they were introduced to the new opportunities and also new and often unexpected challenges and problems considered from a global perspective, such as global warming, climate change etc.

Practices of ESD in Lao PDR

The practices have started since 2012 to present which purposed to engage understanding of and attitudes towards ESD in the institution and schools levels. The first performing was implemented by a baseline survey to examine the 14 primary schools in the north Laos about problems or issues in education systems in 2012. Then, data on education system issues were used to consider for a technical training to improve and resolve teaching-learning outcomes by integrating of ESD into curriculum. In 2016, a training was implemented. Participants were introduced to the understanding of and attitudes towards ESD and the ways to integrate it to their institute's curriculum. In the same year, a model of lesson was conducted in the institute. After that, in 2017, an investigated of ESD was implemented cooperated between institution and school teachers by integrated ESD to the primary science's curriculum. At the end of year, institute's curriculum was integrated to address sustainability. Finally, in 2018, team have continued to add ESD on science and mathematics' curriculum and implemented lessons to the classes. However, few developments are currently prepared to design and implement integrated solutions that would promote sustainable development in BTTC. Even within development-related programs focusing on problem solving, often discouraging practical connections across communities of expertise. So, the practices should include more communities, institutions and diverse schools' conditions.

Applying CIPP (Context, Input, Process, and Product Evaluation) Model

To identify successful of program providers' learning needs and beneficiary, the context evaluation components were implemented using CIPP (Context, Input, Process, and Product evaluation) model which applied from Stufflebeam (2003) and Zhang et al. (2011). According to Zhang et al. (2011), the input evaluation component can help prescribe a responsive program that can best address the identified needs, while the process evaluation component monitors the program process and potential procedural barriers, and identifies needs for program adjustments. Finally the product evaluation component measures, interprets, and judges program outcomes and interprets their merit, worth, significance, and probity. Holland (2011) suggested that a more comprehensive evaluation model for assessing service-learning based on goal-variable-indicator-method design, which can be best characterized as an objectives-based evaluation approach. So, our context evaluation model was adapted from this CIPP model as described in the following methods.

Research Purpose

This report outlines the team's recommendations for building a comprehensive new system of professional education anchored in a practical, cross-disciplinary approach to continuous learning throughout the life cycle of a sustainable development. Throughout this report, issues in education and special needs from baseline survey were considered to develop training on ESD, it integrating and conducting model lessons.

The first professional training was conducted and intended to help Laotian science teachers understand the ESD and its integration into science lessons. The program also aimed to enhance trainers' knowledge of and attitudes toward ESD. Within the program, trainers were expected to analyze science (biology, chemistry, and physics) lesson plans that incorporated the idea of sustainability as well

as to develop model lessons.

In a model lesson, teachers were expected to develop analyzing skills on issues and lessons. At the same time, they developed a research lesson focusing on developing students' learning outcomes and enhancing their attitude towards ESD.

A research lesson suggested that integrating ESD should be included with Mapping Curriculum. So, the following study purposed to map an existing curricular, implement issues' identification and association with it requirements, connect identified issues with learning outcomes, and identify it opportunities for integrate ESD.

Recently, teachers have continued to map, identify, connect and integrate it requirements to a science and mathematics curricular, and demonstrated lessons based on lesson study cycle.

Research Team Building and Limitation

The baseline survey was to assess the teachers' perception, attitudes and their training need in education, and the status of literacy learning skills of primary students to promote the effectiveness of teachers' performance. The survey was conducted in north Laos (Bokeo province) in (2012). The finding of this survey was to informing the future support for improving in-service teacher training, teaching and learning science and mathematics.

In a professional training, we selected a teacher training institute (Bankeu Teacher College, BTTC) to enroll teacher trainer participants in a training course. A training program was focused on nine science teacher trainers included with 3 of each biology, chemistry and physics teachers; and 3 science classes were selected for the implementation of model lessons. The program contents covered of an overview of ESD in teaching and learning, issue analysis, lesson plans analysis, and a development of lesson plans based on ESD. Program was conducted on 8-12 February 2016.

To develop a model lesson, 7 biology teachers from BTTC and 5 school teachers from attached schools were included. The two science classes were used as implementation of a model lesson. Program contents were covered by introduction of ESD and Lesson Study, Issue analysis, Developing a lesson plan, and Implementation if a research lesson. Program was conducted on January to April 2017.

In September to November, 2017, an existing curricular was mapped, identified, connect, and integrated by ESD concepts based on Schreiber and Siege (eds.) (2016 and UNESCO MGIEP (2017) models.

Finally, a selected curricular was mapped, identified, connected and integrated it requirements, and demonstrated by teachers on March to May 2018.

Research Methodology

The baseline survey was conducted to sort out general problems in education, special needs of school teachers and analysis of literacy learning skills of students in Bokeo province (2012). The methods and instruments were indicated in Table 1.

The framework for developing the training program was informed by Stufflebeam's (2003) Context, Input, Process and Product (CIPP) evaluation model. The instruments to assess this CIPP model and program outline were specified in Table 2.

To develop a model lesson, teachers were briefly introduced an understanding of Lesson Study and ESD integration, and including issue analysis, lesson analysis, developing new lesson with ESD integration, analysis of teaching-learning materials, conducting and observing new lesson. Then, teachers implemented issue analysis and lesson analysis, developed, conducted and evaluated a research lesson.

In September to November, 2017, an existing curricular was mapped, identified, connect, and

integrated by ESD concepts as indicated in Figure 1.

On the same way, biology curricular was mapped, identified, connect, and integrated as a method mentioned.

Table 1 Methods and instruments

Methods	Instruments	Comments
General problems in Education by interview school teachers and observe schools	The individual note	The data was recorded by team survey to the individual note that focused on main problem which they've encountering and special need in education.
Student tests on the basic knowledge of third grade	The test of Lao Language, World Around Us and Math	The pupils in fourth grade were asked to do a test of these three main subjects.
Group interview: Assessment of school teachers' perception, attitudes and training need	Interview guides by filling in the questionnaire	Group interview was conducted with school principals
Observe school teachers conducting the classes	Observation sheets	Data was gathered of all classroom observation that focuses on grade 1- 3.

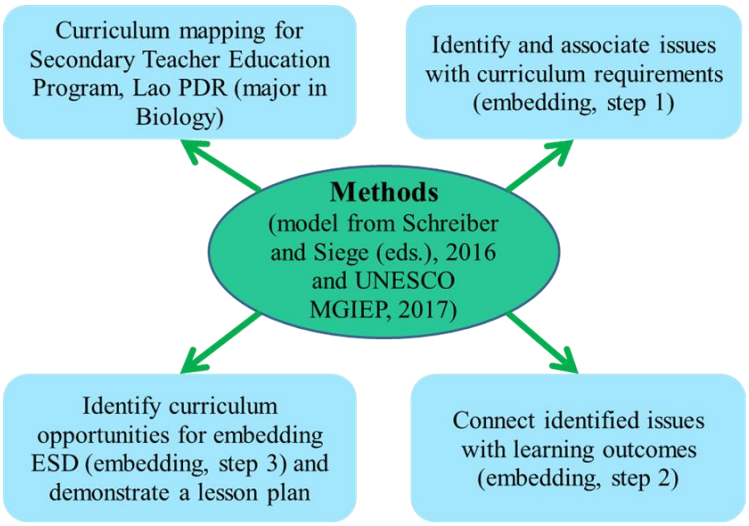


Figure 1 Mapping, identifying, connecting and integrating curriculum

Results and Discussions

Baseline Survey

General problems in education

- Teachers' competence: hard to engage students whose first language was not Lao to participate in learning and teaching, some of them were not ready to teach subjects they are not competent or familiar with, difficult to teach the multiple classes in a day or many subjects without any orientation or guidance.

- Classroom interaction: overcrowded of students, maintaining eye contact with students, not participate in activities, repetition after teacher, writing on the blackboard, answer the questions, point students to demonstrate in front of class, low quality of assessment each student learning outcomes.

- Unconditional family status and student's health: Hard daily lives such as some of them have to follow their parents to work in the fields (banana fields).

- Schools' infrastructure and teaching materials: insufficient teaching materials while there is over loading textbooks or even they have some materials, but they are not familiar with them.

Table 2 Training program for science teachers at Bankeun Teacher Training College on February 2016.

Dates/times	Title/Activity	Method	Facilitator
08/02/2016	Training course on understanding as theme of ESD		
8:00-9:00	Register and open ceremony	-	- Chairman
9:00-10:30	Teachers' conception and aptitude assessment and pre-test	Assessment	Sompong Siboualipha
10:30-10:45	Coffee break		
10:45-12:00	ESD and ESD lessons	Lecture	Sompong Siboualipha
12:00-13:30	Lunch		
13:30-14:45	Competences of ESD	Lecture	Sompong Siboualipha
14:45-15:00	Coffee break		
15:00-16:30	Competences of ESD (cont.)	Lecture	Sompong Siboualipha
09/02/2016	Training course on understanding as theme of ESD		
8:00-10:30	Integration of ESD into lesson plan	Lecture	Sompong Siboualipha
10:30-10:45	Coffee break		
10:45-12:00	ESD and ESD lessons	Lecture	Hiroki Fujii
12:00-13:30	Lunch		
13:30-14:45	Integration of ESD into lesson plan (cont.)	Lecture	Sompong Siboualipha
14:45-15:00	Coffee break		
15:00-16:30	Integration of ESD into lesson plan (cont.)	Lecture	Sompong Siboualipha
10/02/2016	Training course on understanding as theme of ESD		
8:00-10:30	Issue analysis	Workshop	Sompong Siboualipha
10:30-10:45	Coffee break		
10:45-12:00	Lesson Study	Lecture	Sompong Siboualipha
12:00-13:30	Lunch		
13:30-14:45	ESD lesson Plans	Lecture	Hiroki Fujii
14:45-15:00	Coffee break		
15:00-16:30	Lesson Study (cont.)	Workshop	
11/02/2016	Develop ESD lesson plans		
8:00-10:30	Develop ESD lessons	Workshop	Participants
10:30-10:45	Coffee break		
10:45-12:00	Present ESD lessons (1)	Workshop	Participants
12:00-13:30	Lunch		
13:30-14:45	Revise ESD lessons (1)	Workshop	Participants
14:45-15:00	Coffee break		
15:00-16:30	Present and revise ESD lessons (2)	Workshop	Participants
12/02/2016	**Conduct ESD lessons and feedback**		
8:00-09:30	Conduct and observe lesson (1)	Teaching	Participants
09:30-10:30	Conduct and observe lesson (2)	Teaching	Participants
10:30-10:45	Coffee break		
10:45-12:00	Conduct and observe lesson (2)	Teaching	Participants
12:00-13:30	Lunch		
13:30-14:45	Feedback to each lesson	Workshop	Participants
14:45-15:00	Coffee break		
15:00-16:30	Post test, Post assessments, group interview and reflection to the program	Assessment	Sompong Siboualipha

- From the classroom observations, the teaching-learning was implemented. 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, it was sure that both teachers and students couldn't reach to their objectives of learning.

- On the other hand, almost of teachers didn't use any teaching materials except the text books on their hands and following the activities on them. Almost of them still used teacher center learning way to process their daily classes. Similarly, some of them could not make a better relationship to their students mean as some of them didn't see or take care all of students showed as students never volunteer to answer the questions or doing activities by them. They couldn't see all of their student could get the understanding of lesson or not. Sometimes, the explanations to the lessons were not clear and didn't focus on the important points. Otherwise, some of them could encourage their students to pay attention and join all activities during the classes especially in mathematic lessons, WAU and Lao Language.

- To get a better teaching and learning, teachers should use various activities and teaching aids or materials to probe their teaching and get an enthusiastic to their students. Teachers also should give various examples which related to students daily life or using concrete objects when teaching.

Special needs of school teachers included with the following list:

- A specific technical training on how to used and creates concrete objects or/and teaching aids/materials modifying from the used in their daily life.
- A training how to provide the best teaching-learning for the special need of students.
- How to encourage students to love writing and reading and also participate with all activities in the class, and
- Need to train of how to implement the lesson in a double or triple class as well as possible.

A Development of Science Teachers' Competences on ESD in Bankeun Teacher Training College (using CIPP Evaluation Model)

Key findings from the analysis of questionnaires relating the four evaluation components were as follows.

The data was collected in a survey within 9 science teacher trainers (BTTC) on 8th February 2016. A total of 9 science teacher trainers (included with 2 females) were asked to have an assessment to probe their perception, attitude and practice in literacy teaching.

Context Analysis (analysis of pre-test)

A pre-test was used as an assessment for participants' training needs and understanding of ESD. The Fig.2 is showing the questions assessing the trainers' understanding of ESD indicated by the percentages of correct and wrong answers.

Problems currently encounters to the institute (the most pressing environmental, societal and economic issues) were included with: low scientific background of students, low income of staff, not balance in recognition of education, incorrect usage of environmental resources, lack of good environmental conservation and protection, other factors such as climate change, disasters, global warming, air pollution, drought disaster, hunger, some species of endangers and near extinction.

Competences/skills participants that participants were expected from this training program (range 0-3) were indicated in table 3.

Input Evaluation

For the input evaluation component, the program contents were prescribed, corresponding to the identified training needs such as critical thinking and problem solving, acquiring these skills would allow the trainers to develop innovative learning opportunities within science lessons etc. The Input Contents

was started by introduction to ESD and ESD lessons. Contents and activities for this part of program were described in order below.

1) An introduction of Education for Sustainable Development (ESD)

From a lecture, "ESD supports five fundamental types of learning to provide quality education and foster SD such as 1) learning to know, 2) learning to be, 3) learning to live together, 4) learning to do, and 5) learning to transform";

→ Participants discussed and presented the components of ESD

2) Competencies for Education for Sustainable Development (ESD) teachers

There are three overall competencies: 1) teaching, 2) reflecting/visioning, and 3) networking. The five domains of competencies were explained to the participants as well knowledge, systems thinking, emotions, ethics and value, and action.

√ Participants demonstrated on knowledge building for the ESD competencies regarding to holistic approach, envisioning change, and achieving transformation.

Once, on knowledge building, participants were asked to play a game by putting the cards which should be belong to the competences statement given.

3) Integration Sustainable Development into Education: the participants were introduced into the relationships between BTC's vision and principal of ESD and then integrated context of ESD model and completed filling the statements into Table 4.

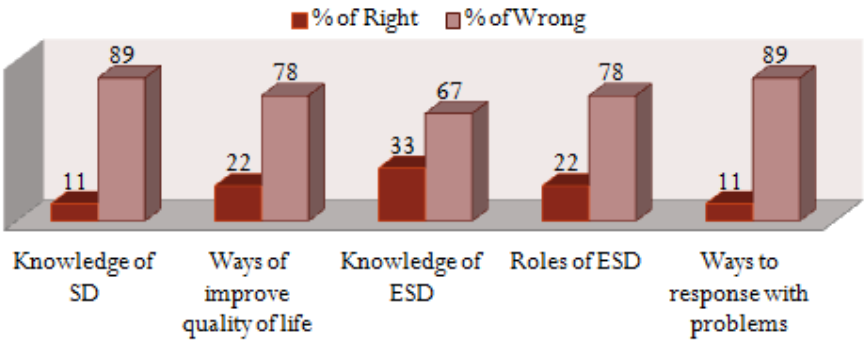


Figure 2 Percentages of respondent to the pre-test questions

Table 3 Competences/skills respondents expect from this training program

Range of expectation	Competences
2.3	Context rational thinking
2.7	Critical (systems) thinking and problem solving
2.7	Adopt research methods responding to the project goals
2.3	Co-operate with different people
2.7	The know-how to develop innovative learning processes
2.7	Integration sustainable development into education
2.6	Issue analysis
2.7	Using ESD to support qualitative learning-teaching
2.4	Reorienting curriculum
2.6	Lesson study and analysis based on ESD
2.4	Teaching and learning materials analysis

Process Evaluation

The Y project (Lecture and seminar)

√ Teachers reorient current curriculum units to address sustainability. The Y project was used (toolkit adapted from Regina Rizzi model (UNECO, 2006).

- Three lessons were identified: 1) Rubbish disposal, 2) The heat produced by black box, and 3) Soil and

its characteristics.

Issue analysis

Three groups of participants were set (Biology, Chemistry and Physics). In analysis, we divided into three parts such as issues, causes and findings. The findings of each group were concluded in the following list.

Table 4 Basic components of ESD (A case study in BTTC)

	Environment	Society	Economy
Issues	Air pollution due to throwing garbage reckless	- Depression - Natural disasters and plague - Filthy, infectious	- Cannot run any business such as: restaurants, quest house... - Low productivity - Waste money to cure - Slow economic growth
Knowledge	- Find out the causes of pollution - Find the ways to manage and reduce pollution - Get to know the characteristics of good and bad environments	- Everybody should know and understand environmental problems - Know how to confront and response to natural disasters - Building knowledge to community on the garbage disposal	- Running business adapted to environment - Running mixed business - Revenue from the sale of garbage
Skills	- Building knowledge to related units for study and improve garbage disposal - Ways to classify and recycling - Ways to manage	- Open opinions to everyone on how to improve - Capacity on adaptation and resolve problems primarily - Create rules and ways to improve garbage disposal by sharing ideas with communities	- Capacity on reduce, reuse, and recycle - Capacity of how to make profit from garbage
Perspective	- Good environment, should not throw garbage reckless - Environment should be kept clean in future - Garbage control and prevent	- Gathering information from communities on the environmental problems - Good social, Good health, Good management on waste! - Sustainable social consumption	- Campaign and/support activities in social - Create natural tourist sites with a campaign of waste management - Sustainable consumption
Values	- Separate before dispose, Reduce waste, Reduce pollution! - Reduce waste with 3R (Reduce, Reuse, Recycle)	- Good health, decrease depress on air pollution - Good hygiene , good life - Consciousness in maintaining good environmental - Worthy waste, creating good society! - Good pollution's control for community with all participation	- Good economics, good environments - Promoting products that are environmentally friendly

Group 1: Rubbish disposal (Biology group)

Issues	Causes	Findings
1) Students couldn't classify and mange waste	1) Students did not understand types of waste and attitude toward waste management	1) Educate to students 2) Fieldwork study to the disposal sites (survey the sources, causes and effects) 3) Encourage students give ideas on the waste management in groups and then summarize

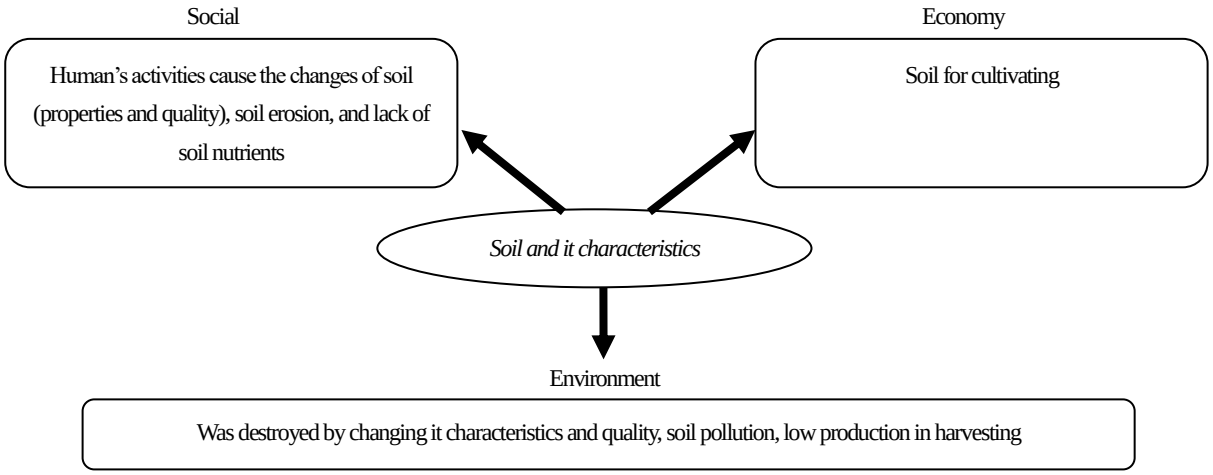
Group 2: The heat produced by black box

Issues	Causes	Findings
1) Students cannot explain and understand the experiments results	1) Many students don't read the lesson before class 2) They are not interested in	1) Ask students to read lesson before class as their home works (set the points to read) 2) Stimulate them by giving score

2) Students don't know how to use the knowledge about heat to their daily life	learning 3) Not participate in any activities 4) Too many members in a group work 5) Too many contents/topics for learning in a session	3) Try to give opportunity for all of them to pay attention in activities 4) Reduce group size and divide into sessions 5) Classify and order the more important of contents/topics which should be learnt in a class or at home as home works or individual works etc. 6) Building students' attitude toward heat and energy from natural

Group 3: Soil and its characteristics

- Problem: Students cannot explain the characteristics of soil
- Causes:



- Findings (Teaching and learning processes):

+ Economy: Educate/raise awareness students to choose the right soil for captivating to increase productions

+ Social: Raise awareness and attitude toward soil protection to students and social

+ Environment: The knowledge on soil and causes of pollution, types of soil and usage of each for the right plants on cultivation

Lesson Study in this lecture session, Siboualipha started to motivate participants by using discussed questions such as: 1) before you conduct a lesson in your class, what did you prepare for?; 2) how did you prepare?; and 3) how did you assess your lesson after the class? After the discussion, we summarized that steps to conduct a lesson include with PLAN (design a better lesson), DO (teacher conducts the lesson while other teachers observe it), and SEE (teachers reflect on the lesson together). Members in each group analyzed issues and topics that would be taught (Fig.3-5). Topics or lesson that they have choose consist of 1) Rubbish disposal; 2) Soil and it characteristics; and 3) The heat produced from black box.

Products Evaluation

Evaluation of ESD lessons' conduction

The feedback of each lesson was implemented by all participants. Each of them shared and exchanged ideas toward three lessons by separated into advantages and things to improve as indicated in the following inclusions.

Rubbish disposal (Lesson plan)

#Advantages:

- Meet all objectives of teaching and learning
- Both teacher and students have good interaction; and students are interested in each activity as they

all participated and shared ideas in discussion.

- Almost of them understand the contents of lesson learned as well as rubbish disposal, and it basically management.

Things to improve:

- Time management in each activity
- Few students didn't understand lessons such as: rubbish types (hazardous chemicals, waste recycled and/or transform).
- Activities in lesson are basic. We should apply more scientific skills to students for practice and think critically.
- Very simple teaching/learning materials
- Activity to create conscience, attitude, and perspective on sustainable development is just a basic in learning to transform.
- Teacher should provide more activities to support learning in create conscience and campaigns for students and community.

Soil and its characteristics (Lesson plan)

Advantages:

- Meet all objectives of teaching and learning
- Both teacher and students have good interaction; and students are interested in each activity as they all participated and shared ideas in discussion.
- Almost of students understand contents shown as they can identify types of soils and describe their properties
- Students have attitude on agriculture land used and choosing the suitable plants to produce high quality of products and save land.

Things to improve:

- Time management in each activity
- Knowledge area is very basically because they have used only one property (property to absorb water) to identify type of soils.
- Teacher should provide more activities to get students think critically
- Scientific skills should be added more to support transformative learning.
- Activity to create conscience, attitude, and perspective on sustainable development is just a basic in learning to transform.
- Very simple teaching/learning materials
- Teacher should provide more activities to support learning in create conscience and campaigns for protection agriculture land used.
- Should provide fieldwork activity to support students' learning especially in some local agriculture lands.

The heat produced from black box (Lesson plan)

Advantages:

- Meet all objectives of teaching and learning
- Both teacher and students have good interaction; and students are interested in each activity as they all participated and shared ideas in discussion.
- Almost of students understand the lesson especially term of heat absorption and dissipation, and heat produced from black box...
- Teaching-learning materials are very suitable for students' learning.

Things to improve:

- Time management in each activity

- Should add more activities to get students think critically
- Activity to create conscience, attitude, and perspective on sustainable development is just a basic in learning to transform.
- Teacher should provide more activities to support learning to create conscience and campaigns for students and community to save energy or use renewable energy.

Analysis of post test

A post test was used as an assessment for Product evaluation based on the participants' training needs and understanding of ESD. According to an analysis in a pre-test (7 questions), one more question was added to a post test (From this experience, what are differences between your past teaching plan and this lesson plan based on ESD?). Analysis of percentages of right and wrong answers was indicated in Fig.6. Problems that pressing their community are drugs, township development, the expansion of agriculture land used, deforestation, odor pollution, the garbage increased, poverty, improvement of teaching/learning materials, improvement of lessons, and create innovative learning experiences. For the competences/skills that participant gets the most benefit from this training program specified in table 5.

An assessment for participants' participating in ESD program

At the end of program, participants were asked to do a check list (YES or NO) of how they participated or what they did during program. A check list was included with 15 questions specified in the following list. From this assessment, we found that all of them responded to YES for these questions. It means that all of them have well participated and worked for ESD as a primarily experiences. In conclusion, participants have:

- contributed to identification of a problem or issue,
- investigated the issue using a range of different knowledge resources,
- proposed realistic strategies for what needs to be done,
- helped with decision-making on what to do next,
- been able to work co-operatively with colleagues,
- identified social, economic, environmental and cultural aspects of the issue,
- identified why and how these different aspects are contributing to the issue,
- exposed to the importance of ESD,

Figure 3 Teachers analyzed issues and topics which will be taught for lesson study (PLAN)

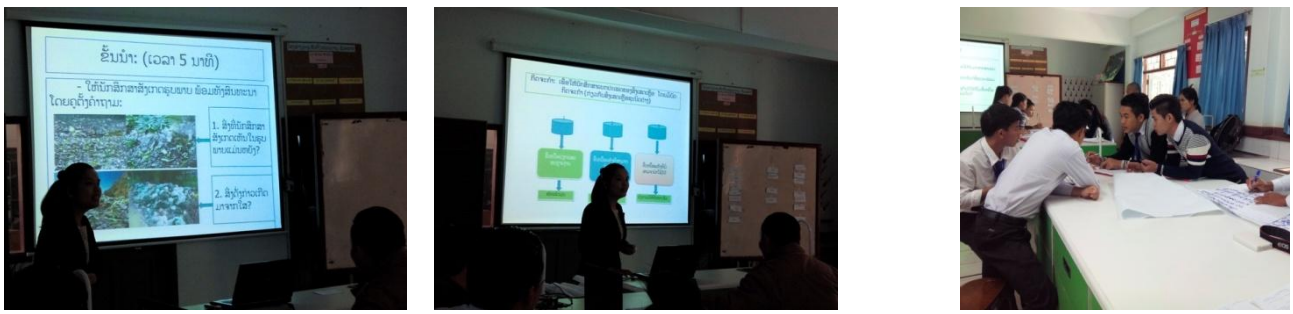


Figure 4(a) Teaching and learning ESD lesson (Biology: Rubbish disposal) (DO)

Figure 4(b) Teaching and learning ESD lesson (Chemistry: Soil and its characteristics) (DO)

Figure 4(c) Teaching and learning ESD lesson (Physics: The heat produced from black box) (DO)

Figure 5 Feedback session to each lesson plan after conducted in classrooms

- realized that ESD build their commitment and capabilities to implement and develop their lesson plans,
- developed an understanding of the contribution of Education for Sustainable Development to quality education,
- developed an understanding of how to implement ESD as s cross-curricular theme,
- developed an understanding of the relevance of all subjects to ESD and how integrating ESD into subject teaching, and
- developed the skills to use a variety of teaching and learning approaches to achieve the wide range of ESD objectives.

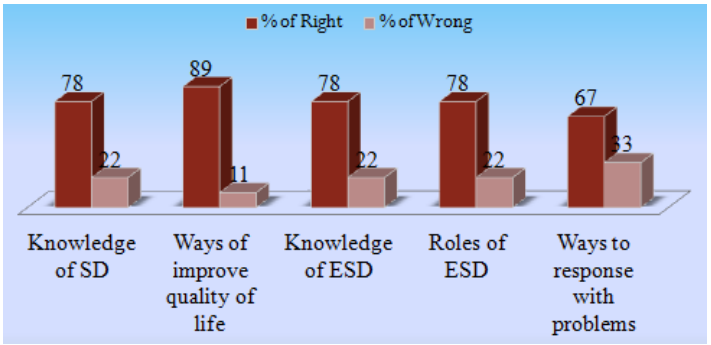


Figure 6 Percentages of respondents to the post test questions

Table 5 Competences/skills that participant gets the most benefit from this training program

Range of benefit	Competences
2.4	The ability to look at a certain topic from different viewpoints ("context rational thinking")
3.0	The capacity for critical (systems) thinking and problem solving
2.8	The capability to adopt research methods responding to the project goals
2.6	The ability to co-operate with different people
2.6	The know-how to develop innovative learning processes
3.0	Integration sustainable development into education
2.4	Issue analysis
3.0	Improve quality of teaching and learning by using ESD to support
2.3	Reorienting curriculum
2.4	Lesson study and analysis based on ESD
2.4	Teaching and learning materials analysis

From this comparing, we realized that respondents understood the most on how to do to improve everyone's quality of life, including that future generations; followed by an understanding of SD and ESD definition and how they can make it happen, and the roles of ESD in societies, environment, economics and cultural, respectively.

On the same way, after investigated ESD, respondents could identify problems that currently encounter to their institute.

Furthermore, participants' understanding of ESD was ranged from the majority which focused on the environment, then included the social and economic conceptions that corresponds with a study of (Summers, 2013).

Due to our study was the first started in Lao PDR, so our participants' understanding of ESD is still basic.

The most successful competences that benefit to them are the capacity for critical (systems) thinking and problem solving; integration sustainable development into education; and improve quality of teaching and learning by using ESD to support.

In critical thinking and problem solving, respondents demonstrated the most in issue analysis by choosing problems that encounters to their institute, then they tried to find the causes and effect and ways to resolve systematically with all dimensions (environmental, social and economic) as in the three lesson models.

However, until the development of this training, the program team had not considered developing the curriculum to include the sustainability agenda. It was just aimed to get participants understanding of and attitude toward sustainability and ESD. 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; and applied and explored to their colleagues or other institutions.

An Implementation of Environmental Management Lesson for Science Teacher Trainees through ESD in Bankeun Teacher College

Subject: *Environmental management (for second year in education: science teacher trainee students).*

- Problem: Low learning outcome of student including their perception and aptitude towards environmental issues.

- Causes: Low scientific skills in students, don't know how to use the connection between daily life to lesson or lesson to daily life, some of them don't play attention to activities provided, insufficient activities to encourage students.

- Finding (by integrating ESD): Provide more activities to individual students, encourage

learning-teaching base on problem solving to resolve problems that they encounter in the daily life to live more sustainability, for example, using 3R technique to reduce garbage, etc.

To integrate ESD into curriculum of this learning unit, teachers provided:

- Teaching-learning strategy: analyze figures by group activity, survey the disposal site of garbage (in curriculum).
- Example of previous learning event: classify garbage types in figures given and then take a survey the disposal site around the institute (in curriculum).
- Integrating ESD: 1) Take a survey the disposal sites and collect some of them to classify (observe the source of garbage), 2) compare the sources, types of each type between figures and garbage that students have collected and then classify them into groups (using vocabulary cards matching to the expression), and 3) give details of management of controlling of each type in concept of sustainable development (take a survey b interview friends to find the ways of garbage disposal, and present their findings).

A pretest and post test of students' performances on this lesson were compared by percentage of write or wrong on the answers as specified in Figure 7 and 8. The figures showed that there are high percentages on the post test.

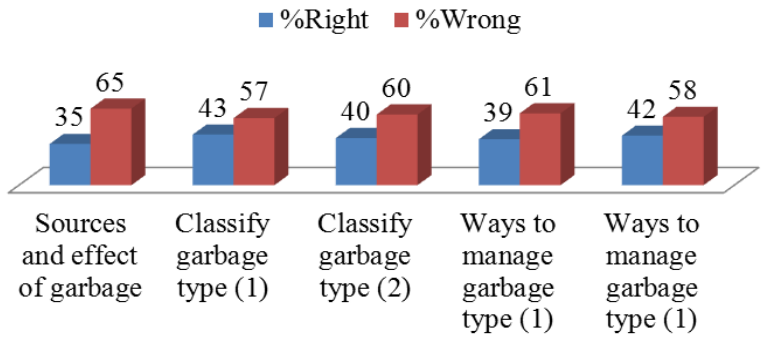


Figure 7 A pre-test to students learning garbage disposal

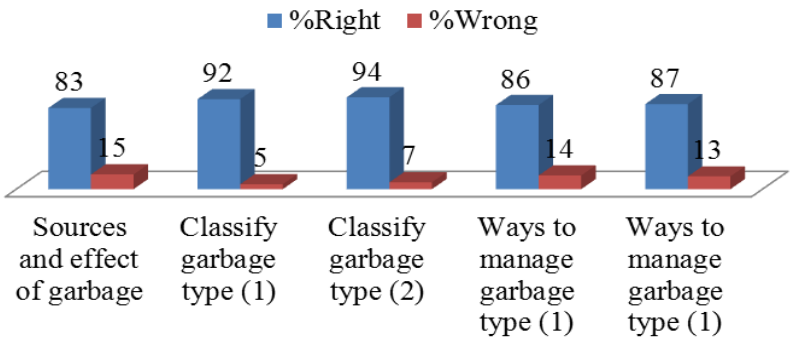


Figure 8 A post test to students learning garbage disposal

Development of Lower Secondary School Students' Learning Science through Lesson Study in the Concept of ESD

Subject: Plant classification (Monocotyledon and dicotyledon)

- Problem: Low learning outcome of students including demonstration of lessons, repetition after teacher, and in classifying plants, they misunderstanding of the criteria, and the connection of plants into daily life.
- Causes: Low scientific skills in students, don't know how to use the connection between daily life to

lesson or lesson to daily life, some of them don't play attention to activities provided, insufficient activities to encourage students.

- Finding (by integrating ESD): 3 main activities had provided as well 1) compare characteristics of seeds (between mono and dicotyledon germinating seeds), students observed how cotyledons growing (have them observe how could seeds germinated); 2) compare leaves and classify into groups (encourage them to the use and important of each leave); and 3) Compare flowers of each group and identify others to the appropriate groups (have them understand how flowers become the fruits and the distribution of seeds such as the grass, etc.).

To implement this lesson plan, a model teacher introduced herself about teaching materials, ways of teaching (including activities), and methods for evaluation before started a lesson. Then, she conducted a lesson belonging to lesson planed while other observed teaching, learning outcomes, and effects of materials using. And, we finally processed a feedback to the lesson after each teaching.

The students' performance was analyzed by a comparison between two classes in day 1 and day 2 as specified in Figure 9 and 10. The figures show the high percentage of students' learning outcomes.

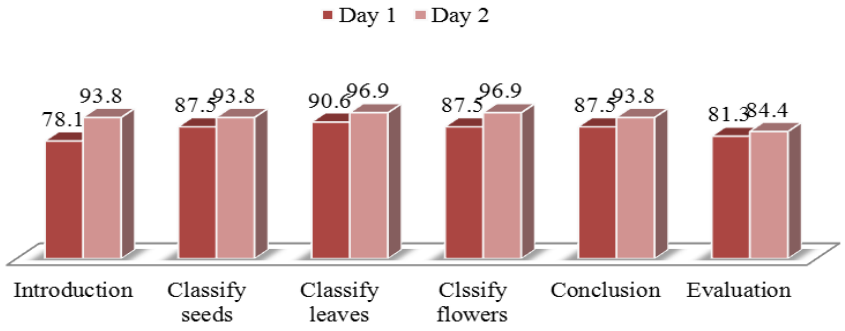


Fig.9 An evaluation of learning outcomes (in percentages)

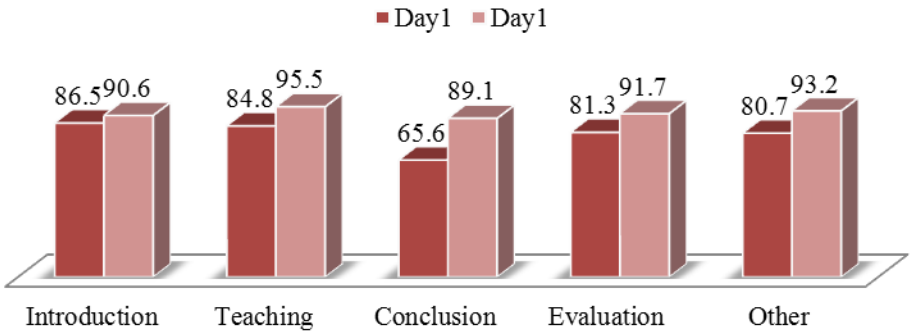


Fig.10 An evaluation of teacher's implement a lesson (in percentages)

The beneficially of using ESD integration through a lesson:

#Advantages of developing a lesson plan during two classes are summarized as in the following list:

- met all learning objectives
- good interaction between teacher-students and students-students
- in activities, students learned from real situation, materials that related with their daily life which lead them to understand the contents
- students demonstrated and exchanged ideas to each other on both classification (parts of plants) and importance of plants (including usage and conservation)
- students demonstrated and exchanged ideas to each other on both classification (parts of plants) and

importance of plants (including usage and conservation) (more than the first day)
- activity1: students identified clearly types of plants using cotyledon structures, and also determined that seeds could be germinated by water or humidity whereas some of them can be food for them
- activity2: they identified groups of plants using leaves' structures, and classified of those could be food, herbs, grass etc. based on their eating habit or usages, and
- activity3: they solved a misunderstanding of flower's structure, and explored knowledge from flowers to seeding by winds, insects, birds etc.

 # Improvement:
- time management and controlling classroom
- should have a teacher demonstration first better than students' demonstration after explanation (esp. leaves' structures)
- deep explanation the structure of flowers and how the criteria to classify
- in assessments, were focused only groups' assessments, and
- in assessments, better to apply various ways of assessment such as playing game with vocabulary cards, interview etc.

From the use of Lesson Study cycle for developing this research lesson, the processes in our study was accordingly to Baba (2007) that stating problems in a classroom or during teaching-learning, and then developing, conducting and evaluating lesson (respectively). For the issues to be discussed, were including teacher competence, classroom interaction, school infrastructure, ability to demonstrate lessons, and ability to identify living thing as well as the plants using criteria. According to Vegas, (2005), teaching conditions are affected to students' learning outcomes, our study was explained the effects of those conditions. It's also corresponding to Isoda (2010) that a study was consisted of study cycle, model of implementing (teacher model and observers), some differences between title and objectives, not fix types of lesson plans, teacher's commitment, and study results.

The activity 1 (87.5-93.8%, from day1&2, respectively), students applied knowledge on monocotyledon and dicotyledon using seeds to their germination, selection for food (beans and nuts), and preservation through discussion. In activity 2 (90.6-96.9%, from day1&2, respectively), they identified parts of different leaves and then grouped to types by demonstration; herewith, they explored knowledge on leaves to the grass, garden or farm plants. And, activity 3 (87.5-96.9%, from day1&2, respectively), they could well identify structures of flowers, and explored to the seeding from it flower. However, activities should apply more games, interview or study outside campus etc.

Integrating Curriculum to Address Sustainability at BTTC (November, 2017)

Curriculum mapping (Subject-based)

A curriculum for the secondary teacher education program which majored in Biology at BTTC was mapped in order to college's calendar. The model used for mapping was included 1) Essential questions, 2) Content, 3) Skill, and 4) Assessment as Table 6.

Table 6: Curriculum mapping for the secondary teacher education program which majored in Biology at BTTC

	Week 5
Essential Questions	- What are the structures and their functions characteristic of Phylum Plathyhelminthes - What are representative examples and their classification level? - What is the significance of the Plathelminthes to the environment and/or humans?
Content	Phylum Plathyhelminthes
Skills	- Reading fact sheet about Plathyhelminthes (body form, feeding, reproduction) - Classify flatworms - Analyzing and evaluating diagram of life cycles, ecology, infection, and prevention - Determining the most important ones
Assessment	Worksheet questions and demonstration about selected worms' ecology and life cycles

Integrating to address sustainability

In this example, we use the potential of the STSE model for embedding ESD in our curriculum including with 3 steps as well: 1) issue identification and association with curriculum requirements, 2) connecting issues with learning outcomes, and 3) identifying curriculum opportunities for embedding ESD. STSE: Science, Technology, Society, and Environment approach or model of teaching.

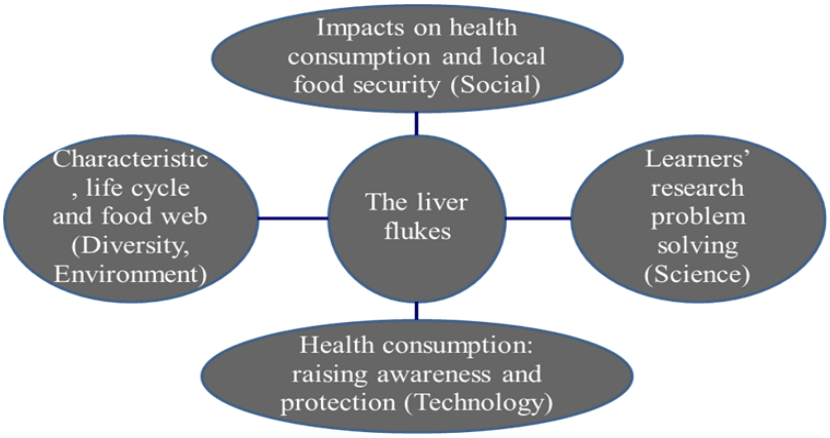
Step 1: Issue identification and association with curriculum requirements:

Issue: *Liver flukes (flat worm, Phylum Plathyhelminthes) are common parasites found in central and southern Laos and constitute a major public health problem in the country.*

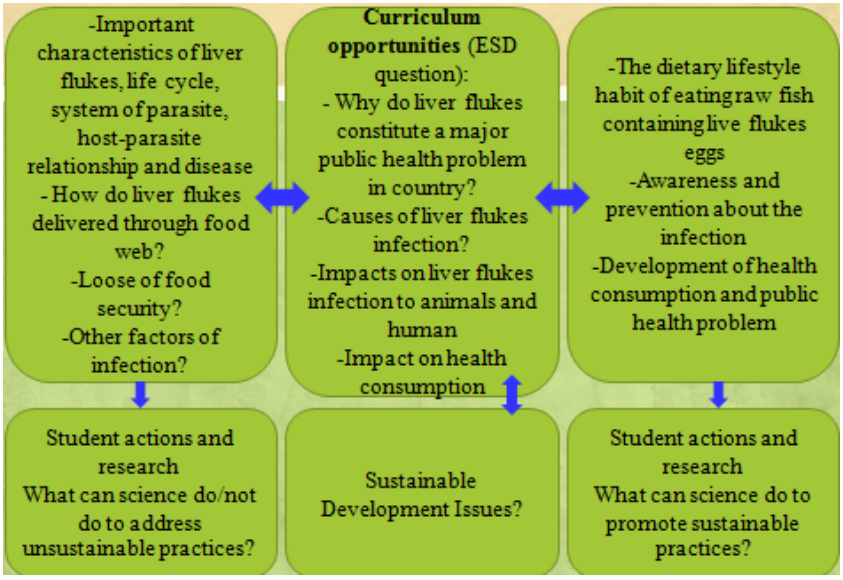
Table 7 Issue identification and association with curriculum requirements

Learning outcomes (original):	Suggested ESD learning outcomes:
Learners should be able to: - use the principles established in the classification of animals	Learner should be able to: - use the classification system to group animals and identifying relationship among them (role in ecology, importance or impact to the environment as well as to response with issue in health consumption)

Step 2: Connecting issues with learning outcomes



Step 3: Identifying curriculum opportunities for embedding ESD



An implementation a lesson plan

Topic: Animal Classification, Phylum Plathyhelminthes (Flat worms)

Deepen: Students were asked to discuss and explain the body parts, habitats, movements, and feeding after filling the worksheet (and focus on how a free living flatworm). Then, teacher demonstrate a brief lecture about flatworm characteristics and also it classification. After that, students were asked to classify figures of other flatworm species and group them into parasites or non-parasites (free-living) (11).

Elaborate: Students were asked to investigate the affect of parasitic flat worms on human especially liver flukes that constitutes a major public health problem in country. Students worked as the same group to conduct and evaluate the explanation about life cycle, important role or affect to human or cause human disease. They created their works on the big sheet papers and designed them to answer the ESD questions from teacher that included:

- importance characteristics (life cycle) and relationship between host-parasites, and delivery;
- causes and effects (to animal/human, social, economy and environment); and
- ways to resolve, awareness, and also conservation for good health consumption. Classroom resources include science books, videos, science website were allowed for them.

From this study, a curriculum for the secondary teacher education program of BTTC was mapped in order to college's calendar that providing into: 1) essential questions, 2) content, 3) skill, and 4) assessment. The most important skill to integrate idea on ESD is about analyzing and evaluating diagram of life cycles, ecology, infection, and prevention and Determining the most important ones (for animal classification, subject based). For integrating, there was included with 3 steps as well: 1) issue identification and association with curriculum requirements, 2) connecting issues with learning outcomes, and 3) identifying curriculum opportunities for embedding ESD. To connect issues and develop lesson plan, a model of STSE model was used. Teaching-learning method: a problem-based learning was implemented. From the implement, we found that students engage understanding of and attitudes towards good health consumption (Figure 11). They demonstrated a classification of animals' groups and evaluated about their role, importance and be aware for their long lives and ready to explore experiences when they have to teach their future students.

Integrating curriculum to address sustainability at BTTC (2018)

Step 1: Curriculum mapping (Subject-based)

A curriculum for the secondary teacher education program which majored in Biology at BTTC was mapped in order to college's calendar. The model used for mapping was included 1) Essential questions, 2) Content, 3) Skill, and 4) Assessment as Table 8.

Figure 11 Teaching-learning animal classification: flatworms

Table 8 A curriculum for the secondary teacher education program which majored in Biology at BTTC

	Week 13
Essential questions	- What are the general characteristics of Arthropods? - How many groups of Arthropods? examples - Explain about exoskeleton, muscle, circulatory and respiratory systems of some Arthropods? - Tell and explain about ecosystem of some Arthropods and their roles? - Analyze their importance, usages, and affects from some Arthropods in their own locals? - Find the ways to conserve some important insects or arthropods, and how to prevent or avoid the negative effects from some insects.
Contents	Unit 9: Arthropods (Exoskeleton, muscle, circulatory and respiratory systems)
Skills	Learners should be able to: - Tell the general characteristics of some Arthropods - Explain about exoskeleton, muscle, circulatory and respiratory systems of some arthropods. - Identify and explain characteristic of their ecosystems and the roles in the system. - Analyze their importance, usages, and affects from some Arthropods in their own locals. - Find the ways to conserve some important insects or arthropods, and how to prevent or avoid the negative effects from some insects.
Assessment	- Understanding of general characteristics and processes of body systems from worksheet and test. - Understanding of and attitude towards animals' ecosystems and their roles from worksheet and test. - The analyzing or classifying about their importance, usages, and affects from some insects and other arthropods to environment in their locals. - Understanding of and be aware on the conservation and protection.

Step 2: Analyze/identify issues and connect to the curriculum requirement

Topic: Arthropods: Characteristics, Ecology, Importance and Conservation

Issue: Arthropods is a large Phylum of animals that have caused some students couldn't identify its specific characteristics, habitats and importance.

Table 9 Analyze/identify issues and connect to the curriculum requirement

Learning outcomes (existed in the curriculum):	Learning outcomes (after mapping curriculum):
Learners should be able to: - Tell characteristics of some arthropods - Tell the exoskeleton, muscle, circulatory and respiratory systems of some arthropods	To response problems and the needs in education, environment, socials and economic; we have designed learning outcomes as the following list: Learners should be able to: - Tell the characteristics of arthropods (included main organs of each body's systems) - Identify and determine about their ecosystems and the roles - Tell and explain the importance, usages, and affects of some arthropods in their local - Tell and explain the conservation and protection of some arthropods

Step 3: Develop new lesson plan after connect or integrate issues to the curriculum requirements

Topic: Arthropods: Characteristics, Ecology, Importance and Conservation

Activity 1: Study physical characteristics, exoskeleton, muscle, circulatory and respiratory systems of Arthropods

Students were asked to set into groups as appropriated to study animals' structures, body parts, exoskeleton, muscle, circulatory and respiratory systems from slideshow, video and live animals. Then, filling statements to the worksheets and introducing to the class and exchange ideas with other groups. Each group received different species of arthropods such as honey bee, freshwater prawn, grasshopper, butterfly and spider. From here, we found that students cold tell and explain about animals' body systems to the class and also exchange and give comments to each other.

Activity 2: Arthropods, Ecology and Importance

Students in individual group were asked to read and get understanding of a short story and diagram about animals such as habitats, status of increment, reducing or extinction, importance, usage and roles in the food webs. Then, they were encouraged to analyze those stories and diagrams by filling their own

statements into the appropriate blanks below the diagrams. After that, they presented their findings to the class to share and exchange ideas with other groups.

Activity 3: Arthropods' posters

Students in group were encouraged to build their own posters from the worksheets and diagrams by arranging them to a future board. In the board, name if animal, body systems or structures, habitats, life cycle, ecology, usage, conservation or protection were included. After rearranging, students were encouraged to practice and finally presented their posters. Posters would be stored in their own classroom.

From an assessment, we found that this poster's building is the primarily way to get them attitude towards and be aware on the living thing as well as these arthropods affecting and relating to their current daily lives.

From an assessment after lesson, students gained an understanding of what makes insects a unique part of the animal kingdom and how they compose into bodies' systems. They received an introduction to the types of arthropods groups by studying main organs in systems to classify insects or other arthropods. They gained an understanding of how insects' adaptations help them survive and thrive in a variety of habitats. They could introduce to the many roles insect play in natural communities. Furthermore, students could be able to define endangered or extinct, identify relationship between insects and their habitats, identify human activities that harm insects and suggest ways to protect them by working in group to promote by creating posters.

However, this lesson is still basic. So, the next investigation should be more specifically and actively such as have them to discuss what they could do in their own homes to help protect the insects that live around them. Guide them to evaluate each other's works and display completed posters in an appropriated area of the school.

Acknowledgement

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C-4 Mongolia

Activities for Sustainable Future

Dulguun Jalgalsaikhan[2], Burmaa Banzragch[2], Oyuntungalag Orsoo[1],
Munkhjargal Ochirbat[3], and Uuriintuya Dembereldorj[1]
[1] Institute of Teachers' Professonal Development, Mongolia
[2] National University of Mongolia, Mongolia
[3]Orkhonschool of Mongolia, Monogolia
uuree9@gmail.com

Context

1. Brief introduction about Mongolia and Mongolian educational system (BatchuluunYembuu, 2010)
2. Master Plan to develop education of Mongolia in 2006-2015 (MongoliaGoverment, 2006)
3. Mongolia Sustainable Development Vision 2030 (Mongoliagreat khural of State, 2016)
   3.1. Knowledge-based society and a skillful Mongolia
4. Institute of teacher's professional development
   4.1. Background ITPD
   4.2. ESD Project implemented in ITPD
      4.2.1. Strengthening the teacher's professional development system through applying ESD Contents in teachers and school administrator's professional development curriculum (ITPD, 2017)
      4.2.2. Integrating ESD into lessons and activities in primary and secondary school
5. Implementation form of "Global Action Program" in school project

Brief Introduction about Mongolia and Mongolian Educational System

Background

Located between Russia and China, Mongolia is the world's second-largest landlocked and least densely populated country in the world. It spans a territory of 1565000 km^2. The country is divided administratively into 21 provinces, including the capital city, Ulaanbaatar. Mongolia's relatively good education system during the socialist period included free and widespread access, good quality, impressive levels of attainment, a policy on nondiscrimination, and measures to deliver education services to the nomadic population through boarding schools. Mongolia claims one of the highest literacy rates (97.8%) in the world (the percentage of male literacy was 98.7% and female literacy was 99.2%). By the mid twentieth century, literacy rates throughout Mongolia increased drastically with the shift from traditional Mongolian script to Cyrillic. The national education system consists of a complex set of successive education programs, including formal schooling and a non formal education (NFE) sector.

Goals of the Education System

The Mongolian Constitution (1992) guarantees its people general education free of charge. The fundamental assumptions stated in the Education Law reflect the principle of equality in education: every citizen has equal rights to his or her education regardless of race, ethnicity, nationality, sex, religion, disability, social status, and economic condition. Furthermore, "education shall be humanistic and democratic, universally available and continuing." These provisions state that Mongolia must gear toward a public education system grounded upon equality in educational opportunities. The Education Law and sub-sector-specific laws, including the Pre-school Education Law, the Primary and Secondary Education Law, Vocational Education Law, and Higher Education Law, have been enacted. The recent

amendments (2006) to the Education Law of Mongolia provide a legal framework for school structural reform (from 10- to 12-year system); upgrading teachers' social status through the rationalized pay and incentive system and better protection of the rights of children.

Structure and Operation of the Education System

The Mongolian education system consists of preschool education, primary education, secondary education, technical and vocational education and training, and higher education and a broad range of NFE activities devoted to the various target groups of the population. The new structural reform of the education system moved from a 4-4-2 system to a 5-4-2 and then to a 6-3-3 in line with international practices. Beginning with the 2004–05 school year, schools began to serve 7-year olds, and from the 2008–09 school years, the school entry age is being reduced to 6.

Master Plan to Develop Education of Mongolia in 2006-2015

Before ESD 17 goals Government of Mongolia ratified the Master Plan to Develop Education of Mongolia in 2006-2015 and issued a resolution to implement it. The main thrust of Mongolia's Education Master Plan is on quality education. The main aim is to create an enabling environment for quality education at all levels.

Objectives of the plan (2006-2015)

	Access	Quality	Management
Early childhood Education	Objective 1. Increase the preschool gross enrollment up to 99%	Objective 2. Create quality educational services to ensure needs of development for children of early childhood	Objective 3. Improve policy, legislature and management of early childhood education
Primary and secondary education	Objective 1. Reduce disparities in unequal opportunities to obtain quality education among students and support to enjoying right to study	Objective 2. Create environment and conditions to provide quality services of primary and secondary education	Objective 3. Improve and develop policy and management to support school development
Non-formal and adult education	Objective 1. Reduce disparities in unequal opportunities to obtain quality education among students and support to enjoying right to study	Objective 2. Create environment and conditions to provide quality services of primary and secondary education	Objective 3. Improve and develop policy and management to support school development
Non-formal and adult education	Objective 1. Provide continuous educational services in conformity with needs to study and live of people, and improve accessibility of non-formal and adult educational services	Objective 2. Upgrade quality and environment and non-formal education at all levels and improve capacity of resources	Objective 3. Improve policy and strategies of non-formal educational sector and create information and financial systems
Technical education and vocational training	Objective 1. Increase enrollment in technical education and vocational training by 56.1%	Objective 2. Improve quality of training in technical education and, vocational training create supplies of human resources to work in labor market, which will meet demands of market	Objective 3. Renew management of technical education and vocational training

Higher education	Objective 1. Improve coordination of enrollment in higher education	Objective 2. Create favorable conditions to ensure quality guarantee of higher educational training	Objective 3. Improve management and financial system of higher education

Support will be provided to analyze whether existing education policies and strategies are ensuring quality education for all. Measures to enhance quality education will include advocacy for early childhood education and care especially for ethnic/linguistic minorities, nomadic populations and vulnerable groups; provision of bi-lingual education for linguistic minorities; integration of inclusive education, human n rights education, education for 52 sustainable development, peace education, value education, life skills education, HIV and AIDS prevention education, etc. into education policy and school and teacher training curricula; increased access to and application of best practices and innovative approaches in teacher training and school classrooms; support to improve curricula; and develop measures that improve teacher supply, teacher motivation, professionalism and accountability.

Mongolia Sustainable Development Vision 2030

The Mongolian government has recognized the urgency of creating an environmentally, socially and economically sustainable future.

State Great Khural of Mongolia has passed Mongolia Sustainable development vision 2030 by Annex to State Great Khural Resolution No 19, 2016. Mongolia Sustainable development vision state that:

By 2030, Mongolia aspires to be amongst leading middle-income countries based on per capita income. It hopes to be a multi-sector stable economy, and a society dominated by middle and upper-middle income classes, which would preserve ecological balance, and have stable and democratic governance. Also for Education, Mongolia would achieve the Increase the enrollment rate in primary and vocational education to 100 percent, and establish lifelong learning system in education system through implementation of the Mongolia Sustainable Development Vision 2030. Education area are shown 2.2.3 part of Mongolia Sustaibanle Development Vision 2030.

2.2.3 Knowledge-Based Society and a Skillful Mongolia

Objective 1. Ensure that every child is enrolled at pre-school education facilities, meeting the standard requirements and providing the basis for learning the Mongolian language and culture.

Phase I – (2016-2020): Expand the types and forms of the pre-school education system, improve their quality, and build an environment in which 70 percent of all pre-school age children are enrolled at pre-school education facilities.

Phase II – (2021-2025): Further advance the pre-school education system, improve the quality of the system, decrease the number of children per pre-school teacher to 25, and build an environment in which 80 percent of all pre-school age children are enrolled at pre-school education facilities.

Phase III – (2026-2030): Decrease the number of children per pre-school teacher eto 20 and build an environment in which 90 percent of all pre-school age children are enrolled at pre-school education facilities.

Objective 2. Improve the general education system to the international benchmark levels to educate Mongolian citizens and ensure impartation of quality education.

Phase I – (2016-2020): Arrange for the preparations to be evaluated by the Program for International Student Assessment (PISA), build an environment to ensure that all general education schools have two shifts, develop and implement an education program that (also) fits the traditional nomadic lifestyle, and

assure that every child with high school education has a professional orientation.
Phase II – (2021-2025): Have the evaluation carried out by the PISA, decrease the number of general education schools having two shifts by up to 30 percent, and decrease the national average of students in a class to no more than 25 per class.
Phase III – (2026-2030): Improve the rank in the PISA score by five places, supply all schools with laboratories, equipment and technical facilities, decrease the number of general education schools having two shifts by up to 50 percent, and decrease the national average of students in a class to no more than 20 per class.

Objective 3. Improve vocational education and training system conjunct with development priorities, and equip the graduates with strong professional skills.
Phase I – (2016-2020): Strengthen the teaching capacity of the vocational education and training system on the basis of social partnership, expand its technical capacity, and increase the number of students to 60 thousand.
Phase II – (2021-2025): Improve the vocational education and training system based on demand and increase the number of students in this line of training.
Phase III – (2026-2030): Meet the national workforce demand fully from the national pool of skilled and professionally trained persons.

Objective 4. Advance the tertiary education system to meet the sustainable development goals, and improve the lifelong education system.
Phase I – (2016-2020): Establish a tertiary education system matching international standards built on a 'training-research-industry' cooperation model, which would provide equal, inclusive and quality tertiary educational services.
Phase II – (2021-2025): Build a science and technology cluster and park in accordance with priority development areas, and ensure that no less than four Mongolian universities are ranked among Asian top universities.
Phase III – (2026-2030): Establish a tertiary education system capable of turning out educated and skilled graduates, capable of competing in the international labor markets.

Objective 5. Ensure the coordination and coherence of science and industry, and develop a knowledge-based society.
Phase I – (2016-2020): Expand the cooperation for science organizations and industry to promote and adopt innovation, and increase the expenditures for financing of science, technology and research to 2 percent of the Gross Domestic Product.
Phase II – (2021-2025): Further increase the expenditures for financing of science, technology and research to 2.5 percent of the Gross Domestic Product.
Phase III – (2026-2030): Continue increasing the expenditures for financing of science, technology and research to 3 percent of the Gross Domestic Product.

Institute of Teacher's Professional Development

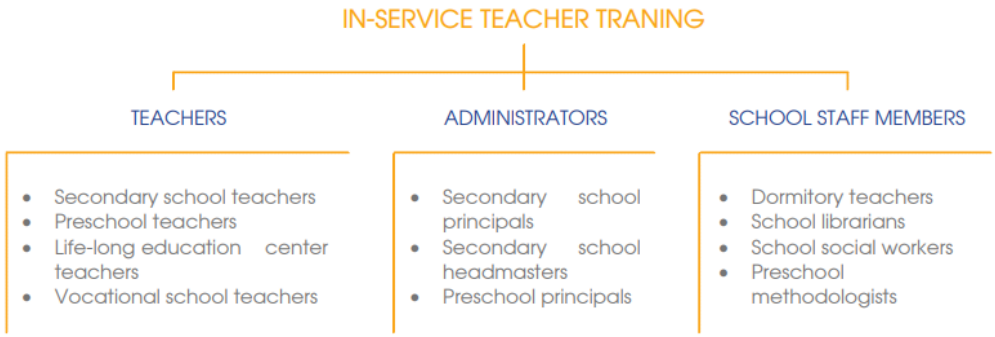
Background ITPD

ITPD is focusing on the MECS policies to provide and to support for teachers and staff professional development and sustainable, effective working condition with the reason of the main role of reforming the education sector of Mongolia.

Main Scope of Activities

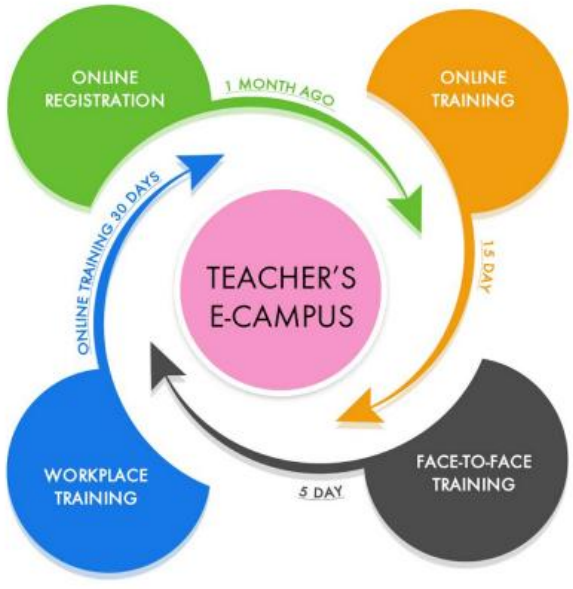
- Support continuous and sustainable development of preschool, primary and secondary school teachers, administrators and staff members
- Support implementation of education policies and strategies
- Set up online environment for the support of teachers' development
- Organize teacher development activities as providing teaching certification and qualification
- Extend cooperation with international and national organizations

ITPD Support Continuous and Sustainable Development of Preschool , Primary and Secondary school teachers, Administrators and Staff Members



IN-SERVICE TEACHER TRAINING

Regardless of the property type, provide preschool and secondary school teachers' professional development every five years within the state budget. (Article 40.8, Law on primary and secondary education) Duration of the basic training for teachers will be 50 days, and 35 days for administrators and other staff members.



Face-to-face training

Professional development training for teachers and school staff members is conducted at nationwide level. It is aimed to provide professional theoretical and methodological support based on target groups' needs.

Online training

Online training is organized 14 days before face-to-face training, and during 30 days of online training through an e-campus. Target groups are involved in online workplace training.

In order to achieve the Sustainable Development Goals on 2030 Agenda for Sustainable Development from UN, ITPD has been working with "Education for Sustainable Development" project in Mongolia since 2014, and conducted training for teachers and staff members to introduce the ESD concept, develop a training module and guidelines, and strengthen capacity building of ITPD employees. ITPD is cooperating with "Education for Sustainable Development" project of GIZ in ESD field and focuses on mainstreaming education for sustainable development principles, approach into in-service teachers' professional development of general secondary school and preschool organizations as well as its implementation and outcomes assessment. There are 2 projects which were implemented by ITPD last year.

A. Strengthening the teacher's professional development system through applying ESD contents in teachers and school administrators professional development curriculum
B. Integrating ESD into lessons and activities in primary and secondary school

ESD Project Implemented in ITPD

Strengthening the Teacher's Professional Development System through Applying ESD Contents in Teachers and School Administrator's Professional Development Curriculum (ITPD, 2017)

OBJECTIVE:

To support learning how to implement ESD methods for teachers and school administrators through trainings of "Strengthening the teacher's professional development system".

TARGET GROUP:

Methodologists and officers of Institute of Teacher's Professional Development

DURATION: from 15 June to December 15, 2017

EXPECTED OUTCOME:

OUTCOME 1: To identify the suggestions to improve for legal documents through comparative researches.

Course of action:

1.1 To identify the suggestions to improve for legal documents through the comparative researches.

1.2 To cultivate the sample procedure for legal documents regarding.

OUTCOME 2:

Education and culture departments' officers be able to cohere ESD in professional development curriculum.

Course of action:

2.1 To cultivate the curriculum based on needs.

2.2 To conduct training titled as "Methods to implement ESD in local professional development trainings".

2.3 ESD methods including the provinces features will be cultivated by Education and culture departments

2.4 To train the secondary education teachers in order to implement core curriculum in a range of education quality reform /To develop the capacity of trainers and teams of provinces/

OUTCOME 3:

To be able to develop online contents for professional development activities.

Course of action:

3.1 To cultivate training of methods of conduct online trainings for ITPD methodologists with the partnership of professional organizations.

3.2 To develop instructional design and e-content to improve conducting trainings and to specialize by the majors.

3.3 To experiment with the cultivated sample in the trainings for 1 year experienced teachers.

3.4 To provide devices to protect software of online trainings.

Organization and responsibility

Course of action	Department in charge	Outcome	Work group or partner groups
Research, summary and translation of legal documents whether ESD contents included or not which are related to teacher's professional development	Linguistics and humanities sciences training department	Draft of suggestions to improve for research report and procedure	Team includes the representatives of ITPD and internal consultants

To improve capacity of Education department officers in Ulaanbaatar and provinces	Natural Sciences training department	Training report	Other departments will be company for contribution
Methods for integrating ESD includes features of provinces will be cultivated by Education and culture departments		Report for experimenting of cultivated methods	
Training for secondary education teachers	Planning and monitoring department	Training report	Work group which sat up according to the resolution number 424 from the Minister of Education, Culture and Science will company with other departments
To apply online training in professional development activities	E-Learning department	Training and experimenting report (in English and Mongolian), online tasks fund	Workgroup which will be set up under the resolution from the director of ITPD
Main leader	Mrs. Oyuntungalag.O, Deputy director, Mrs.Solongo.I	Final report /project implementing activities and financial/	Departments and work group in charge

Activities Plan

Expecting result	**Activities**	**Outcome**	**Duration**						
			2017						
			V	**VI**	**VII**	**VIII**	**IX**	**X**	**XI**
Expecting result 1: Development of a guidance on improving legal environment by inspecting/researching policies of teacher's professional development	1.1 Development of a guidance on improving legal environment by inspecting/researching policies	Report of inspection/research, Guidance							
	1.2 Development of a suggestion to improving certain policies according to guidance	Suggestion Журмын төслийн загвар							
Expecting result 2: Local educational department officers and administrations will get a capacity to integrate ESD to local professional development trainings/programs, its curriculums and activities.	2.1 Development of curriculum which is based on needs.	Approved curriculum Батлагдсан сургалтын хөтөлбөр							
	2.2 Implementation of training "Methodology of integrating ESD concepts on local professional development trainings"	3 days classroom training							
	2.3 Local educational department will develop the ESD methodology which is focused on certain local specialty	Integrated methodology of 21 /provinces and 9 districts							
	2.4 To train the secondary education teachers in order to implement core curriculum in a range of education quality	Report and suggestions to improve for the trainings							

	reform /To develop the capacity of trainers and teams of provinces/								
	2.5 Wage of trainers of training as secondary education curriculum methods								
	2.6 Assignment and travel cost of trainers of training as secondary education curriculum methods								
Expecting result 3: To get a capacity to develop online training contents for activities of teachers' professional development	3.1 ITPD methodologists will develop the design of the online training guidance and will organize trainings with the help of professional organizations on how to guide online training	4 times of trainings							
	3.2 To develop integrated instructional design, e-content guidance on improving online training and develop on each subjects.	Developed designs							
	3.3 Development of guidance/handbook for teachers								
	3.4 To implement/test newly developed design on first year in-service teachers' training.	Report of implementation							
	3.5 To get certain devices and software for online trainings	Purchased devices and software							
	Report	Summary report							

Integrating ESD into Lessons and Activities in Primary and Secondary School

INTRODUCTION:

Result of the joint project of the Standing Conference of the German Ministers of Education and Culture (KMK) and the German Federal Ministry of Economic Cooperation and Development "Curriculum Framework Education for Sustainable Development" 2nd updated and extended edition is published on 2016.

By correlating special features of Mongolian curriculums, the general outcomes of the project are reflected on the teacher's guidance that developed by Institute of teacher's professional development. Under the context of integration of ESD in education, learning objectives, the content of the study topic, training approaches and evaluations will be transformed into education for the ESD and will contribute to the development of the Comprehensive Competence of the SD.

In framework of integrating ESD into lessons and activities in primary and secondary school, we have done followings:

- Integrate ESD into curriculum goal and objective (Detect links)
- Integrate ESD into curriculum content (Detect links)
- Integrate ESD into methodology (To develop skills)

The guidance provides a structural basis for Education for Sustainable Development (ESD) in schools. It offers support for developing curricula, for designing lessons/learning units and for defining and assessing standards in this learning area. Even though the guidance does not systematically define learning objectives or educational content, or propose a chronology or specific learning methods, leaving

these tasks to the state or school curricula, it does make suggestions for the elaboration of

- **competencies** that students should develop,
- **thematic areas** and contents that are important and suitable for developing these competencies,
- **Performance standards** to be achieved.

OBJECTIVE:

To develope and distribute a guidance "Integrating ESD into lessons and activities in primary and secondary school" for various activity of supporting continuous development of preschool, primary and secondary school teachers, adminstrators and staff members.

TARGET GROUP:

Institute of Teacher's Professional Development's methodologists and teachers.

DURATION: from 15 June to October 15, 2017

EXPECTED OUTCOME: Will be developed general and every subject's guidance for integration ESD into lessons and activities in primary and secondary school

OUTCOME 1:

Methodologist's be able to identify ESD and core competences in study curriculum.

Course of action:

a. To enhance knowledge about SD and ESD and to learn how to apply content of ESD to professional development trainings and other activities, and methodology of how to integrate teacher's competencies of ESD
b. Methodologists learned how teacher's compentency and content of ESD connected to their subjects indirectly and directly and increased their understandings the knowledge of ESD.
c. To determine correlation of comptences and topics between subjects.

OUTCOME 2:

Will be developed general and every subject's guidance

a. Will be developed general guidance with general understanding about Competencies, themes, standards, design of lessons and curricula
b. Will be developed every Subject-related competencies (Secondary School Certificate/10 school years) linked to the core competencies of Global Development Education/ESD

General understanding

COMPETENCY AREAS

The division of Global Development Education/ESD competencies into the areas of

- **Recognizing.** Within the competency area **recognizing**, the ability to gain knowledge in a target-oriented manner is of particular interest, since the exponential growth of knowledge in many disciplines makes it more and more difficult to define fundamental knowledge and to continually stay up to date. Which interdisciplinary knowledge is necessary depends upon the topics covered in the learning area
- **Assessing.** The boundary to the competency area **assessing** is fluid when it comes to the ability to use media critically and the key ability to recognize the suitability and worth of information and its sources.
- **Acting.** There is a connection to the competency area **acting** by communicating feedbacks but also in successful actions and failures as well as in the interactive process of information acquisition. The acquisition and processing of information as well as the acquisition of knowledge are the necessary basis for the formation of opinions and decisions and for responsible action.

EDUCATION FOR SUSTAINABLE DEVELOPMENT GOALS LEARNING OBJECTIVES

Recommendations for SDG learning topics and approaches

- ✓ Cognitive domain: comprises knowledge and thinking skills necessary to better understand the

specific SDG and the challenges in achieving it

- ✓ Socio-emotional domain: includes social skills that enable learners to collaborate, negotiate and communicate to promote the SDGs as well as self-reflection skills, values, attitudes and motivations that enable learners to develop themselves
- ✓ Behavioral domain: describes action competencies

PROMOTION OF KEY COMPETENCIES FOR SUSTAINABILITY

- ✓ Systems thinking competency
- ✓ Anticipatory competency
- ✓ Normative competency
- ✓ Strategic competency
- ✓ Collaboration competency
- ✓ Critical thinking
- ✓ Self-awareness competency
- ✓ Integrated problem-solving competency

ESD enables all individuals to contribute to achieving the SDGs by equipping them with the knowledge and competencies which are needed to not only understand what the SDGs are about, but to become engaged in promoting the transformation needed.

Implementation Form of "Global Action Program" in School

The global future of social development is defined as "sustainable development". As for Mongolia, everyone including a president is discussing about Sustainable development. There are multiple activities and several documents are conducted/developed by UNESCO in 2013-2015 regarding ESD. Implementing activities of the concepts of those documents a

As of Mongolia is a member of UN and UNESCO, we are responsible to participate those activities and to contribute world's sustainable development. As for schools and teachers, they are front facing on the implementation of goal which is focused to cultivate each child to have proper knowledge and skill which can make a contribution to SD. To create the suitable environment for students' development, teachers face to demands to have proper knowledge on ESD as well as implementing skill of it. Most importantly, teachers needs to change their teaching methods regarding the ESD concepts. In order to provide teachers with research studies based proper information of how to integrate ESD concepts into lesson, we have implemented a project at school #65 of Ulaanbaatar where locates rural area of city, which supports teachers' teaching activities and provide teachers with technical and theoretical advices. Following activities are done, such as;

1. Training
    a. 17 SDGs
    b. Global action program
    c. Road map
    d. Teachers action and global action program
2. Joint programs / activities
    a. Research on teachers' previous assumptions
    b. Research on students' previous assumptions
    c. Projects
        - Incorporating/integrating school curriculums into sustainable development
        - Incorporating/integrating syllabus into sustainable development

- Focusing to develop students to have have skills of sustainable development competencies through school training

Results of projects could be divided into following levels, such as;

Teachers:

- ✓ Understanding of ESD in teachers has expanded, introduced to global policies and papers of ESD, learned ideology of intergrading ESD into their teaching.
- ✓ Every teacher has conducted a unit plan including ESD's issues of their teaching field.
- ✓ Five Grade8 students and five Grade11 students have participated in the first ESD Olympiad organized by City Education Department.
- ✓ Majority of teachers live in rural area so they have planted potatoes, onions and turnips in their backyards and were tutored the care for vegetation and a planting of onions was done by both teachers and students.
- ✓ Each classroom got three types of garbage can made out of cupboards by teachers and students learned to sort their trash.

These activities have stimulated Strategic competency, Collaboration competency, Critical thinking competency and Self-awareness competency.

Primary students:

- ✓ Taking public transportation instead of being driven to school in warmer seasons.
- ✓ Finish their food without leaving leftovers.
- ✓ Putting up saving electricity and water indications by light switches, plugs and water taps.

These activities have practiced Anticipatory competency, normative competency, Strategic competency, Critical thinking competency and Self-awareness competency.

Middle and high schoolers: They were asked to think about what they can do for a safe and healthy environment. Activities for restoring nature and environment included:

- ✓ Planted trees in National park and school area with a watering schedule.
- ✓ Learned to sort their trash and collected plastic bags and bottles to sell them to recycle. Money earned is used for buying cleaning materials.
- ✓ Every students started to own a notebook for exam where they take all of their tests in order to decrease paper for copying of tests and exam papers.
- ✓ Grade 12 students were actively involved in the project "Making box for dangerous waste". At the school "Box for dead batteries" was placed by Ministry of Environment and Tourism. Students have brought unused batteries from their home and put them into the box. When it was full, specialists came to replace it. Students were aware of advantages of using recharged batteries.
- ✓ Students of Eco club are going use and fill in the "Green Passport" of Ministry of Environment and Tourism.

These activities practice Systems thinking competency, Anticipatory competency, normative competency, Strategic competency, Critical thinking competency and Self-awareness competency.

C-5 Myanmar

ESD Practices in Myanmar Education

Yin Mar Win and San San Maw
Sagaing University of Education, Myanmar
yinmar.sioe@gmail.com

Country Context

Myanmar has a long coastline, abundant fertile lands, a rich endowment of natural resources and one of the lowest population of 53.9 million (2014 Census) and annual population growth of 0.89 percent. Myanmar's recent economic growth has been impressive. The Asian Development Bank estimated GDP growth had increased from 5.5 percent in 2012 to 6.8 percent in 2014. However, Myanmar's economy is heavily reliant on the agriculture sector and extractive industries (Ministry of Education, 2016). Natural resources play a key role in Myanmar's development, with forests covering an estimated 45% of the land area. However, Myanmar has one of the poorest records globally in environmental management, and in recent decades environmental degradation has emerged as a critical issue. This is demonstrated by Myanmar's rate of deforestation, which is among the highest in the Mekong sub-region and estimated as the third highest globally (Ministry for Foreign Affair, Finland, 2017). Therefore, in order to achieve sustainable economic development, Myanmar needs to reduce its reliance on natural resources and expand the services and manufacturing sectors. In addition, there are also other key challenges that the country needs to address to achieve sustainable development and equitable economic growth such as the growing disparity between wealthy in access to essential services, especially between citizens living in urban and rural areas, internal and external migration, human trafficking and drug abuse. The provision of quality and equitable education plays an important role to help the government to address these challenges (Ministry of Education, 2016).

General Background

Myanmar's Education System

1. Early Children Care and Development (ECCD)

The Ministry of Education (MOE) and Ministry of Social Welfare, Relief and Resettlement (MSWRR) are the lead ministries involved in the provision of ECCD services. In addition, there are a number of non-governmental and private sector organizations actively supporting communities with the provision of ECCD services.

2. Basic Education

The current basic education system comprises of five years of primary education (KG to Grade 4), four years of lower secondary and two years of upper secondary education. There are currently 47,363 basic education schools in Myanmar reaching approximately 9.26 million students. The majority of these schools is managed by the Department of Basic Education under the MOE. In addition, a significant percentage of students accesses basic education through monastic, private, community and other types of schools.

3. Alternative Education

The MOE provides access to alternative education through a Non-formal Primary Education Equivalency Programme (NEPE EP) for out-of-school children and a Summer Basic Literacy Programme (SBLP) for adults. The NEPE EP is currently being implemented in 89 townships where it is reaching 11,234 learners. The SBLP was restarted in 2013 and it reached 22,444 learners. This figure doubled in 2014 to 46478.

4. Technical and Vocational Education and Training (TVET)

Access to technical and vocational education and training in Myanmar is provided by relevant ministries and the private sector through 372 technical and vocational and training centre.

5. Higher Education

Myanmar has 171 higher education institutions (HEIs) which are overseen by eight ministries. In the 2015 academic year, there were 225,178 students studying full-time in HEIs under the responsibility of the MOE, while an additional 411,164 students were accessing higher education through Distance Education Universities (Ministry of Education, 2016).

Key Challenges of the Current Education System

The MOE established National Education Strategic Plan 2016-2021 which addresses the following challenges that the Myanmar education system is currently facing, . The key areas facing challenges are;

Area 1. Preschool and kindergarten education
Area 2. Basic education – access, quality and inclusion
Area 3. Basic education curriculum
Area 4. Student assessment and examination
Area 5. Teacher education and management
Area 6. Alternative education
Area 7. TVET
Area 8. Higher education
Area 9. Management, capacity development and quality assurance

In addressing the challenges of basic education sector, in order to improve the student learning achievement, it is necessary to conduct some reforms in basic education – access, quality and inclusion, basic education curriculum, student assessment and examination, teacher education and management.

Basic Education- Access, Quality and Inclusion

In recent years the MOE has undertaken a wide range of basic education reforms in order to improve access to quality basic education including launching free and compulsory primary education, establishing a national school grants and stipends programme stating a commitment to restructuring the system to include a kindergarten (KG) year and 12 years of subsequent schooling and raising teacher and civil servant wages. Within the monastic education sub-sector, the government has started to provide teacher salary subsidies. Importantly, there is emerging evidence that many of these reforms are beginning to have a positive effect; according to reports, the increase in the number of children enrolled in primary and secondary schools in the 2014-2015 school year was due to the reduced cost of education for parents among other factors.

In 2015-2016 academic year the government basic education system consisted of 35,650 primary, 6,224 middle and 3,513 high schools serving 8,853,480 students. In addition, almost 300,000 children attended 1,538 monastic education schools, which teach the basic education curriculum and are administered under the Ministry of Religious Affairs and Culture (MoRAC). Other types of schools providing basic education include 438 private schools and schools managed by ethnic education department, however, there is no comprehensive data on the coverage of these schools. The basic education system is administered by the Department of Basic Education, which oversees state/region education offices, and district and township education offices.

Despite the impressive reform achievements of the last few years, the basic education system continues to face major challenges relating to school access, retention and inclusion: and school quality and quality improvement monitoring. Most children in Myanmar have the chance to go to school, and the number of boys and girls who enroll in school is almost equal, although many children enroll late, particularly boys. However, very few children receive more than four years of schooling. There are multiple and complex,

and often context –specific, reasons for children dropping out of school at primary and secondary levels, of which poverty, language difficulties, disability and lack of interest are the most common.

The poor quality learning environment in many schools, combined with an overloaded and outdated curriculum and teacher-centered pedagogy that emphasize rote memorization for examinations, have contributed to a "lack of interest" among children in basic education which leads to their dropping out from school.

The school environment needs to be improved so that it is conducive to quality teaching and learning. Monastic education schools face particularly entrenched challenges relating to school quality due to lack of resources. Many children learn very little in school, with children in Grade 3 still struggling with reading comprehension and basic mathematical skills. Of the minority of students who make it to Grade 11, only about one-third pass the matriculation exam each year.

In many schools parents have to additional private tuition fees, which are the largest component of household expenditure on education in Myanmar. In addition, parents often focus on test results – which are not reliable indicators of education quality – which may create a bias towards rote learning in schools.

Myanmar also does not have a school quality assurance framework that sets out minimum quality standards for teaching and learning, school management and school facilities.

Gender dynamics may mean that access, inclusion and quality issues are different for boys and girls; however, the lack of Myanmar – specific studies of gender and education means that very little is known about whether this is indeed the case.

Increasing access to basic education in Myanmar is vital for the country's growth and equity. However, efforts to increase access to education must be supported by efforts to improve education quality. The strategies that can address the challenges of access, quality and inclusion area are (1) Enable universal access to free basic education, (2). Support compulsory and inclusive education, and (3). Improve school quality through a national school-based quality assurance system.

Basic Education Curriculum

A quality basic education curriculum is a critical building block for Myanmar's socio-economic development and it is an essential prerequisite of quality education and improvement of student learning achievement. The curriculum is the key reference point for teachers.

The MOE is committed to improving the basic education curriculum to make it more relevant to the lives of students by focusing on 21st century skills, soft skills (including personal development and employability skills) and higher order thinking skills.

In recognition of the importance of a sound and updated curriculum, the MOE launched a comprehensive review of the basic education curriculum – Grades 1 to 11 under the landmark CESR research and Education Working Group policy review initiatives. The CESR and Education Working Group reviews recommended upgrading and improving the basic education curriculum to: (a) ensure horizontal and vertical content and competency linkages; (b) reduce overload and address gaps in content coverage; (c) ensure alignment between the new curriculum, pedagogy and learning assessment reforms; (d) align with the planned restructuring of school grades KG+12 (5-4-3); (e) meet the needs of a technology-based society facing rapid socio-economic development; and (f) improve quality and align with ASEAN regional and international standards.

Related basic education reforms aimed at strengthening pedagogy, providing quality teaching and learning materials, and strengthening student assessment and national examination systems will complement and support the new basic education curriculum. Together, these integrated reforms will improve learning outcomes and promote equitable and inclusive learning among all children.

International evidence clearly highlights the added value of an emphasis on 21st century skills, soft skills and higher order thinking skills in the new basic education curriculum. Many governments worldwide explicitly state that the national curriculum should have relevance for all students by

equipping them with the knowledge and practical skills they need for life, the workplace and for continuing education.

The strategies that can address the challenges of basic education curriculum area are (1) Redesign the basic education curriculum emphasizing 21st century skills, (2). Build the professional capacity of curriculum development teams, and (3). Implement the new curriculum through strengthened curriculum management, dissemination and monitoring, and evaluation system.

Student Assessment and Examination

Assessment is used across all levels of a country's national education system for the purposes of accountability, school and system improvement and to support student learning. However, the ultimate purpose of assessment is to improve education quality, which leads to improvements in student learning outcomes. Effective student assessment enables teachers and students to track learning progress and identify areas for improvement it also enables students to demonstrate their achievements through qualifications they gain as the result of assessments. Assessments enable Ministry of Education (MOE) official to hold schools and teachers to account for their performance and to develop and refine policies. Assessment can help countries to improve the equity of their education system, with a focus on areas where students need greater support in summary assessment is the cornerstone of a high-performing system.

The Government is committed to improving the quality of education as an integral part of major ongoing social sector reforms and expanded national economic development. A key focus of these reforms is a move away from an assessment and examination system focused on the accurate repetition of acquired content knowledge to a more balanced education system tht assesses student learning progress against national learning standards related to child educational development and the skills they will need for lifelong learning.

The shift is in line with international research that demonstrates the importance of monitoring a student's ability to engage in and complete complex thinking and problem-solving tasks and develop self-learning skills. These are skills that students need for personal and professional development and that a nation needs for a successful workforce.

The MOE will undertake assessment reforms as part to the basic education reforms to improve classroom teaching and student learning achievement. Assessment reforms will be closely aligned with the introduction of the new basic education curriculum. International research shows the importance of curriculum evaluation and student assessment being integrated across all levels of the national education system.

The Department of Myanmar Examinations (DME) has the overall responsibility for assessment of basic education in Myanmar. Currently, the DME oversees three major types of student assessment: the Continuous Assessment and Progression System (CAPS), year-end examinations in Grades 5 and 9, and the Grade 11 matriculation exam. These assessments all reinforce patterns of rote memorization and repetitive teaching.

While the CAPS system, practiced in previous years was intended to promote classroom-based assessment focused on measuring student learning, the lack of an integrated implementation approach has meant that it has had limited impact in changing the focus on rote learning in fact, there is some evidence that the Chapter End Test component of CAPS may have even reinforced this focus. The CAPS system has most likely contributed to poof learning outcomes in the basic education schools. In addition, parents have felt compelled to tuition fees to help their children do better at tests and exams, adding significantly to the cost burden of education.

Many countries in the Asia Pacific region have recognized the national and global opportunities to be gained from changing from content to skills-based assessment systems. Skills-based systems prioritise the acquisition of skills that students will be able to use throughout their lives. In order to put in place

such a system the MOE will set out the minimum assessment standards against which to measure learning achievement. These standards will define what the MOE expects students to know and be able to do as a result of their time spent in school.

The MOE will adopt an assessment system that links to a continuous cycle, whereby teachers and students participate in assessments, and teachers, students, parents and education managers learn from and respond to assessment results. Reliable assessment tools will be developed for teachers to measure student performance against expectations and national standards. Data collected from these tests will inform new policies and target assistance to schools with consistently low-performing students. The MOE will strengthen the professional capacity of officers responsible for managing the assessment system and commit to maintaining a modern assessment infrastructure.

The strategies that can address the challenges of Student assessment and examinations area are (1) Improve assessment and examinations and (2). Strengthen co-ordination, management and monitoring.

Teacher Education and Management

Improving the quality of classroom teaching is essential to improve student learning achievement in schools and educational institutions in Myanmar. This includes having a sufficient number of qualified teachers in every school, in order to achieve the minimum teacher student ratios and qualification standards set by the MOE. Currently the MOE is facing a number of challenges in deploying qualified teachers to all schools, especially schools in remote rural areas. Therefore, the MOE has prioritised an integrated and comprehensive approach to teacher education and management reform under the NESP.

The National Education Law (NEL) (2014) and NEL Amendment (2015) provide a clear legal framework for progressive, integrated and comprehensive teacher education and management reforms. The NEL, CESR Phase 2 Teacher Education Reports and Education Working Group Reports, all recognize that a motivated and well-trained teaching force is a prerequisite for quality education, and that this can only be realized through improving the status, quality, management and professional development of teacher. It is also widely recognized that complementary improvements in the education system are also needed such as greater investment in infrastructure and instructional materials and an effective student assessment system that supports teachers and engages parents.

In high-performing education systems worldwide teachers have a central role to play in improving educational outcomes. International research shows that the way that teachers teach has a greater effect on student learning outcomes than any other factor. When teachers have strong subject and pedagogic knowledge they are more effectively able to diagnose and solve children's learning problems and introduce a dialogic, mixed-method teaching style. Myanmar has a long history of interactive pedagogy, dating back to at least the Innwa era (the 14th century), but, for various reasons, this is not widely practiced.

In order to support teachers in their professional development and to improve all aspects of teaching practice a sound and supportive teacher management policy is essential. Such a policy needs to be well researched widely consulted upon and reflect the cultures and communities in which teaching takes place. The teacher management policy also needs to clearly explain professional development pathways for teachers.

To date, the MOE has launched a number of projects with international partners to improve the quality of teacher education in Myanmar. These include strengthening teacher education management, teacher education curriculum reform, pilots to improve in-service teacher education, and upgrading the English language and methodology skills of teacher educators. These projects will support the successful implementation of the strategies and programmes.

The strategies that can address the challenges of teacher education and management area are (1). Strengthen teacher quality assurance and management, (2). Improve the quality of pre-service teacher education, and (3). Improve the quality of in-service teacher professional development.

ESD Teacher Training in Myanmar

In Myanmar, an in-service teaching program was initiated as Disaster Preparation and Response Education (DPRE) in cooperation with UNESCO after Cyclone "Nagis" hit severely in May 2008. Education for Sustainable Development was introduced as adjectival education such as DPRE.

In 2016, the Ministry of Education and UNESCO in partnership with Panasonic launched "Strengthening Schools for Education for Sustainable Development" (SSESD) project in Nyaung U Township, Myanmar. The project aims to empower Myanmar's learners to lead and promote sustainable lifestyles as socially responsible global citizenships and leaders of the future. 400 in-service teachers joined trainings on teaching materials to integrate education for sustainable development (ESD) into the basic education curriculum. Seven school regions Nyaung U township, Mandalay Region, Myanmar hosted three day trainings for teachers from all grade levels.

HlaHla Win (2007) analysed the extent to which ESD concept is integrated in basic education curriculum in Myanmar. In science curriculum of the elementary level, ESD themes include personal hygiene and family health, respect for the natural environment, curiosity in the natural environment and the importance of natural resources for daily life. The curriculum aims to educate the children to understand and apply the importance of natural resources, to love and cherish the natural environment and conserve and utilize it in sustainable manner, and also safeguard self-body and health.

At the lower secondary school level, in the science curriculum of Grade 5, the students have to learn about Environmental Conservation of the Earth in the chapter 5 of Earth and Space. This chapter consists of two components, namely environment and Space and Weather/Climate In the component of Environment, they have to study Atmosphere, Hydrosphere (Resources of Fresh Water), Lithosphere (Types of Land, Soil) and Biosphere (Wild Animals, Forest, Sea Animals). And in the section of Space and Weather/ Climate, Solar System and Space and Usefulness of Space are taught.

Likely, students have to study about EE and ESD in the same chapter of Grade 6. The title of the chapter is Earth & Space (Environmental Conservation of the Earth). The students must learn about Man & Environment, Human Beings (Part of Ecosystem), Environmental Degradation (Impact of Human Factor), the Reasons of Environmental Damages, Population Explosion, Poverty, Industrialization, Increase of Vehicles, Modern Life Styles, Environmental Conservation for Mankind, Environmental Education, Environmental Movements, Space, Weather & Climate, the influence of Water Vapour, The Importance of Atmosphere, Agriculture and weather.

In Grade 7, occurrence of Earth Day, World Environmental Day, United Nations' Environment Programme; history of environmental conservation; problems like air pollution, global warming, extinction of rare species, ozone depletion, acid rain, the causes of those problem, theirs consequences presented and instructed comprehensively.

In Grade 8, deforestation, the reasons to cause of deforestation, the related environmental degradations are taught logically. Moreover, afforestation and forest conservation, eco- tourism etc are also described in detailed. Soil erosion, the related environmental problems and methods of are also presented in the environmental conservation of the Earth and Space. Hence, it can be said that the sustainable behaviours like afforestation, systematic forest production, substitute energy producing, recycling of used paper, preventing illegal firing forests, establishing natural sanctuaries & natural parks, promoting eco-tourism, controlling shifting farms, controlling chemical fertilizer & pesticide, using bio-fertilizer, systematic ways throwing away of industrial wastage etc are informed logically. Also, preventing illegal trade of rare species of flora & fauna, preserving flooding areas etc are efficiently educated. Thus, it can be concluded that the matter of ESD for the Junior High School students becomes up-to- date and valuable.

At the Upper Secondary School Level, in Biology, Environmental Biology is introduced. The contents are: A biotic or Physical Factors of an Eco-system, the Biologic Environment & Interrelations of

Organisms, Symbiosis, Parasitism, Commensalisms, Mutualism, Cycles in an Eco-system, The Water Cycle, Nitrogen-Cycle, Other Factors, Pollutions, Air Pollution, Land & Water Pollution, The Use and Abuse of Drugs (Drugs, Use of Drugs, Heroin), Alcohol, Smoking and Health. So, it could be concluded that Biology is one of the most effective subject for informing EE and ESD in High School Level.

Another subject that can train EE and ESD in the High School Level is Chemistry. In the present curriculum is Chemistry. In the curriculum, Chemistry in Society is the only one section, which inform EE and ESD for the learners. The contents of this section are: Chemistry in Modern Agriculture, Elements required by plants, Soil, Fertilizers, Natural Fertilizers, Chemical Fertilizers, Nitrogen, Phosphorous and Potassium, Effects of Nitrogen, Phosphorous and Potassium, Classification of Chemical Fertilizers, Nitrogen Fertilizers, Urea, Production of Urea, Reaction of the Soil, Ammonium Sulphate, Ammonium Nitrate, Calcium Nitrate, Super phosphate, Bone meal, Potassium fertilizers, Soil Reaction, Test for Soil Reaction, Neutralization of soil acid, Neutralization of soil alkali, Insecticides, Growth Substances, Cement Production, Cement, Raw Materials for Cement Production, Manufacturing Process, Plaster of Paris POP, Salt Production, Traditional Method of Salt Production, Disadvantages of Traditional Methods of Salt Production, Salt Production by Solar Evaporation and Bittern.

In baseline survey, lower secondary school teachers show interest in implementing ESD and exhibit a positive attitude towards ESD. However, it was noted that the participants' level of awareness of the various ESD concepts is rather low and they do not understand ESD concept clearly. According to the survey, although some topics related to sustainable development already exist in lower secondary science curriculum, most of Myanmar teacher do not recognize the sustainability-related content and they do not have the teaching skills to relate topics to the sustainability paradigm. So, it becomes necessary to provide effective professional development practices for Myanmar teachers in order to implement ESD in teaching and learning.

Presently, we have been running an in-service teachers' training project entitled "Integration of Education for Sustainable Development (ESD) in Lower Secondary Science Teaching through Lesson Study". It is intended to help lower secondary science teachers to develop lesson plan integrated with ESD through lesson study as school-based professional development. 20 lower secondary school science teachers who were participants in baseline survey volunteered to participate in the training project. Stufflebeam's (2003) Context, Input, Process, and Product (CIPP) evaluation model is used as a framework to systematically guide the conception, design, implementation, and assessment of training project.

Based on the baseline survey results, firstly, a 3 day-workshop was held to introduce the themes of ESD in teaching and learning situation and how to integrate ESD concept in science lessons. At the start of the workshop, the participants were interviewed, using semi-structured interview questions and had pretest consisting of basic scientific concepts and ESD themes. And then, a science topic at the lower secondary school level was given to the participants and they were asked to develop a lesson plan as the way they develop. Teachers' capacity assessment based on lesson observation and interviews was conducted and their training needs were identified.

From semi-structured interview and pretest, it is found that most lower secondary school science teachers misunderstand the themes of ESD, and they mostly use teacher-centered approach in teaching and learning. Moreover, in teaching science lessons, they emphasize on factual knowledge and rote learning for examination. However, they believe that students should be led to live a sustainable life through school subjects. As document analysis, on-site lesson plans were reviewed. It is noted that teachers identify learning outcomes at the knowledge level and describe teacher-centered approaches as their teaching techniques. After that, introduction of the themes of ESD and of how to integrate ESD concept in science lessons was delivered to the participants. And then, with the help of the facilitators, the participants developed ESD integrated lesson plan. At the end of the workshop, semi-structured interview was administered to the participants. It is found that the participants improve in the

understanding of ESD themes in teaching and learning and of how to integrate ESD concept in science lessons.

Based on the workshop experiences, we decided to practice the lesson study as the school-based professional development practice in implementing the training project. According to the school location, the participants are divided into two groups. In each group, they will develop lesson plan focused on ESD, implement the lesson in the classroom, observe and analyse the lesson together. The outcomes of the project will be evaluated, based on observation on the participants' lesson presentation and student's learning outcomes.

Recommendations for Promoting Teacher Education on Education for Sustainable Development (ESD)

- Establishing school-based professional development practices focused on ESD for in-service teachers instead of cost-training courses.
- Developing and Distributing teacher guides of ESD lessons
- Integrating ESD into pre-service teacher education program
- Promoting administrative support

S-1

An analysis of characteristics of collaboration among the participants of the Dreaming Eco School Project

Hyungson Ju[1], Jaeyoung Lee[2], Suejung Jung[3], Jungnan Kwak[3],
Yeona Son[4], and Kangseok Kim[5]
[1]Korea National Open University, Korea
[2]Kongju National University, Korea
[3]Korean Environmental Education Program, Evaluation and Research Center, Korea
[4]Dankook University, Korea
[5]Sungshin Girls' High school, Korea
Ecopia21_@hanmail.net

In the process of making a sustainable society, education is perceived as the most critical factor. In particular, the knowledge level and passion of educators is regarded as one of the key factors for students to understand the issues of SD (UNESCO, 2005). Then, how can we develop teachers' professionalism in EE and ESD?

The paradigm for developing teachers' professionalism is shifting from an academic approach to a reflective approach and to a community approach. The community approach places an emphasis on developing professionalism collaboratively as teachers teach and learn from one another, criticizing individualistic limitations of the reflective approach. The key to the community approach is collaboration (Seo, 2008).

This study began with the question of what type of collaboration would be possible in a professional development of teachers of environmental studies, which was a selective subject introduced in 1992. The teachers find it hard to form a curriculum consultative body or engage in regular collaboration since there is usually just one environmental studies teacher assigned to each school.

This study was conducted to find out whether there was any collaboration among the participants of Dreaming Eco School project in the secondary schools where there were environmental studies teachers who majored in EE, with a goal to vitalize school EE under the auspices of the ministry of Environment in 2017. The key participants of the project were the teachers of environmental studies and researchers, and as their interaction mainly took place in workshops, the workshops were the main subject of analysis. The characteristics of collaboration among them were analyzed by investigating the workshop information leaflets and minutes.

The findings of the study were as follows. The participants shared progress on school space creation and the joint project on fine dust at the workshops. Moreover, they learned about the integrity of environmental studies class, community mapping and class criticism. With regard to the schedule, topics and methods of workshops, they made decisions in consultation with one another. Such collaboration showed the characteristics of contrived collegiality (Hargreaves, 1994), as it was the type of collaboration compelled and imposed by the project participation. Nevertheless, there were voluntary activities such as the joint project which had been proposed by one teacher and participated by 9 schools. Therefore, although the collaboration among the participants started as contrived collegiality, voluntary collaboration was shown with the progress of the project. There were obstacles in creating the community culture, such as communication issues and tension to have their professionalism among the participants. Despite these limitations, the collaborative interactions of the participants were meaningful as it brought issues of what would be a highly integrated environmental studies aspired by the 2015 revised national curriculum and how to implement it in school to the attention of the teachers and the researchers.

S-2

A trial of music composition on a theme of the marching season from spring to summer around the Japan Islands (An interdisciplinary class for the university students toward the cultural understanding in ESD)

Haruko Kato[1] and Kuranoshin Kato[2]
[1]Shotoku Gakuen University, Japan
[2]Okayama University, Japan
kuranos@okayama-u.ac.jp

All music works have their own background and it is necessary to understand the various backgrounds for generation of the music works, in order to deepen the music appreciation and expression. The climate is one of the important backgrounds, and to understand the climate there would be useful for appreciate the context of music. Inversely, what we feel from the music expression could be also helpful to understand the associated climate or weather situation there.

As such, the joint activity between the climate and music would be useful for promoting the education of both climate variability and cultural understanding as the targets of the ESD. Besides, it could contribute greatly also to promoting the students' and teachers' fundamental "ESD Literacy" itself, such as thinking of various complex relations, diversity, etc., among the ESD targets (as will be discussed in the other presentation by our group).

By the way, the seasonality is a common important feature characterizing the climate in the mid-latitude regions. However, many different factors relating to the seasonal cycles result in the great variety of the seasonal features from region to region even within the mid-latitudes. For example, there are many stages with rapid seasonal transitions in East Asia, greatly influenced by the global-scale Asian monsoon system. Such seasonal transition features also bring the remarkable change in the "seasonal feeling" from month to month around the Japan Islands.

We will report an interdisciplinary lesson practice between music and climate education at such viewpoint, for the students of Teaching Course of Music, Faculty of Education, Gifu Shotoku Gakuen University made from April to July 2016 (with adding further consideration presented at the EGU2017). As for the natural science, they have studied it only a little in the university to get license of primary school teacher, but they are specialized in music and music education to become a teacher. In this class, the students tried to compose on the theme of the marching season from spring to summer in the Japan, including the pre-, mature- and post-Baiu (Meiyu/Chang-ma) seasons.

At the first lesson, they went around outside of the university to feel and enjoy the cherry-blossom season of April. Then, they created music works to express their own seasonal feelings with musical instruments or voices. At the final stage of this activity, their works were performed with various instruments and they had a chance to re-recognize the influence of seasonal climatic phenomena on our feelings.

The students could have really experienced the detailed seasonal advance just during their activity and their works were classified roughly into the following two different types, 1) Scene depiction (ex.1: "Forerunner of the Baiu season", ex.3: "The sun shine and the shade", ex.4 : "The spring wind", ex.6: "The wind"), and 2) Feelings depiction (ex.2: "A feeling of the rain", ex.5: "The sky full of hope-with my feeling the wind-"). In the future, it is also necessary to develop study method through music to lead to promote also the interests in climate, even for the students who do not specialize in science.

S-3

Toward the development of study programs on the seasonal cycles of weather and climate systems around Japan on ESD

Kuranoshin Kato[1], Yusuke Kuwana[1], Hideki Morishita[1], Haruko Kato[2], and Kazuo Otani[1]
[1]Okayama University, Japan
[2]Gifu Shotoku Gakuen University, Japan
kuranos@okayama-u.ac.jp

To know the detailed seasonal cycles in various regions (including the tendency of the day-to-day and interannual variations) is the common basis for deeper understanding of (1) seasonality of the dominant daily weather systems and their variability, including the "extreme meteorological or climatological events" and (2) an important background of the cultural generation affected greatly by the "variety of seasonal feeling" in each region. Then, in the education of climate variation in the ESD including the regional climate response to the global-scale one, as well as in the cultural understanding education, it is also necessary to lead the students' deeper understanding of the detailed seasonal cycles in that region as an important base.

Besides, the education on climate system sciences including the climate variability is important not only for providing the scientific backgrounds for the individual ESD activities (studies on environment, disaster prevention and climate variability), but also for promoting the students' and teachers' fundamental "ESD Literacy" itself, such as thinking of various complex relations, diversity, etc., among the ESD targets. Thus, in the climate education, topics on the seasonal cycles there which can lead also to thinking of various complex or un expected relations, and so on, as well as the topics on the climate variations, would be an effective way to promote the students' "ESD literacy".

In Japan, the topics on the dominant daily meteorological situations in each season are one of the important contents in the earth science education at the junior high school and high school. Thus we could construct these study plans by including not only the necessary information for a direct climate and climate variation education in the ESD, but also the research-like activities with some brief analyses of the observation data or weather charts, and so on, which could contribute to promoting the students' ESD literacy together with the information literacy.

For example, although the formation of the Siberian high, which affects the winter climate around Japan greatly, is closely related to the seasonal development of the very cols Siberian air mass, locations of these centers are rather different from each other. The very this situation is an essential cause for the especially colder air intrudes into East Asia in winter than in the same latitudes. For another example, daily Siberian high begins to develop seasonally already in October when the alternative passages of the extratropical cyclones and anticyclones still dominate around Japan. From such studies, students would be able to recognize the variety of the seasonal cycles around Japan. The study materials for such viewpoint could be provided from the precipitation features during warm season around Japan.

Although we are now considering these development of the study plans, we will briefly introduce these ideas which we would use for constructing our study plans, together with some of our previous activities at the schools.

S-4

Comparison with the Current State of the Alien Species Problem and Description of Textbooks in Japan

Toru Doi
University of Toyama, Japan
torudoi@edu.u-toyama.ac.jp

Loss of biodiversity can't stop all over the world. One of the causes is fixing of the alien species introduced by humans. In response to these circumstances, measures such as enforcement of the "Invasive Alien Species Law" (2005), formulation of "Biodiversity National Strategy 2012-2020" (2012) and "Action plan to prevent the damage caused by alien species" (2015) have been developed one after another in Japan. As a result, people's awareness of alien species has improved, and the activities of local governments and NPOs are also increasing (Kishimoto, 2018). Action plan to prevent the damage caused by alien species has shown that promotion of education improves awareness of civilian alien species problem and prevent introduction and escape of alien species. In other words, education is required to understand the facts of the alien species problem and comply with "Three Principles for Preventing Damage to Alien Species". However, it's the current state that it can't be said at all that three general principles are obeyed. For example, about 200,000 Red-eared sliders keep being imported every year. Garpike which is carnivorous and will grow up over 1-meter was sold until recently and escaped individuals found in the field. Some people release crayfish which were breeding to the field.

Does the current school education in Japan encourage proper understanding of alien species problem and compliance with the Three Principles? What kind of description is there about alien species? This report shows the result. Survey subjects are follows;

- Current elementary school Science textbooks 3rd～6th grade, total 25.
- Current Junior high school Science textbooks 1st～3rd grade, total 15.
- Current high school Basic Biology textbooks, total 5.
- Current high school Science and Our Daily Life textbooks, total 5.
- Current elementary school Living Environment Studies textbooks, total 16.

As a result, the following was identified. Descriptions of the background of the transfer and the history of escape are extremely poor, compared with the description about alien species problem and the post-escape, in every investigated textbooks. It will be extremely difficult to encourage compliance with the Three Principles if students don't understand the background of the transfer and the history of escape appropriately.

Y-1

Education for Sustainable Development (ESD) Learning Material Development for Science Secondary School Curriculum

Wijaya A. F. C. and Muslim
Indonesia University of Education, Indonesia
agus.fany@gmail.com

The world is currently experiencing a crisis, not just an environmental crisis but also economic and social. On the other hand, UNESCO over the past decade has socialized that the sustainability of the world depends very much on the three pillars, namely the balance between environmental, economic and social dimensions. The fact that happens shows how the tendency of thinking patterns to solve a problem sometimes prioritize one dimension without considering the other dimensions in a balanced manner. The condition also affects the educational situation in Indonesia, when students study the concept of science in the school, environment dimension has a very big role, while the economic and social dimensions are under consideration. As a result, the teacher's perspective in considering the preparation of the learning material as the meaningfulness of learning has not led to the real sustainability of thinking. Education for Sustainable Development (ESD) was introduced by UNESCO as part of the development of the Millennium Development Goals (MDGs) which later became Sustainable Development Goals (SDGs) aimed at designing and preparing education as a medium for sustainable development. Through the Research and Development (R & D) design with the implementation of ADDIE (Analysis, Design, Develop, Implement and Evaluate) model, this research has to aims, the first one is to develop and validate the ESD Awareness instrument on Physics science materials at the secondary school level by identifying and preparing ESD Awareness instruments related to Physics science materials, as well as testing the validity and reliability of such instruments in the measure sustainability awareness of secondary school students. While the second one is to develop the teaching and learning materials of Science-Physics in high school through the process of identification and preparation of teaching materials in accordance with ESD approach, as well as mapping the profile of sustainability awareness and increasing knowledge of secondary school students. Using the sustainability awareness questionnaire instrument and the students' cognitive achievement test, it is hoped that a suitable Science-Physics ESD-based teaching and learning materials can be obtained for secondary school level in the form of a structured learning material.

Y-2

Integrating a Curriculum for the Secondary Teacher Education Program which Majored in Biology at Bankeun Teacher Training College to Address Sustainability

Sompong Siboualipha and Chanhthamala Southammavong
Bankeun Teacher Training College, Lao PDR.
Somepong55@gmail.com

A curriculum for the secondary teacher education program which majored in Biology at Bankeun Teacher Training College was mapped in order to college's calendar. The model used for mapping was included 1) Essential questions, 2) Content, 3) Skill, and 4) Assessment. Then, issues were identified and connected to the curriculum requirements. After that, a new lesson plan was developed and demonstrated to the first year students at BTTC entitled "Arthropods: Characteristics, Ecology, Importance and Conservation". In a lesson plan, three activities were implemented as well as 1) study physical characteristics, exoskeleton, muscle, circulatory and respiratory systems of Arthropods; 2) Arthropods, Ecology and Importance; and 3) Arthropods' posters.

From an assessment after lesson, students gained an understanding of what makes insects a unique part of the animal kingdom and how they compose into bodies' systems. They received an introduction to the types of arthropods groups by studying main organs in systems to classify insects or other arthropods. They gained an understanding of how insects' adaptations help them survive and thrive in a variety of habitats. They could introduce to the many roles insect play in natural communities. Furthermore, students could be able to define endangered or extinct, identify relationship between insects and their habitats, identify human activities that harm insects and suggest ways to protect them by working in group to promote by creating posters.

However, this lesson is still basic. So, the next investigation should be more specifically and actively such as have them to discuss what they could do in their own homes to help protect the insects that live around them. Guide them to evaluate each other's works and display completed posters in an appropriated area of the school.

Keywords: Bankeun Teacher Training College, ESD, Mapping Curriculum, Arthropods

2nd day, June 10th (Sunday)

- Keynote
- Research Presentation

Keynote 1

A Pedagogy for Hope: Science and Sustainability

Ralph Levinson
Institute of Education, University College London, UK

Today the living world faces unprecedented global disturbances which are likely to cause devastating harm to species survival, including that of *Homo Sapiens*. There are numerous research articles which propose ways of promoting knowledge, attitudes and civic behaviour designed to ameliorate this harm. But I will argue that such gradualistic changes are inadequate. Deeper philosophical, structural and political changes are necessary for the livelihood of a sustainable planet and a citizenship committed to ecojustice.

I will discuss the content of these changes for a sustainable society and what type of education is presupposed by such changes. A sustainable future is predicated on a philosophy that questions the role of modern science underpinned by a human-centred universe and the separation of Mind from Nature, in other words, a transformation towards ecologism or 'green' politics. Such a deep-rooted change needs to stress interconnectivity between all aspects of Nature but also between diverse ways of understanding the world: historical, cultural and techno-scientific. Finally it demands a citizenry which recognises this interdependence and is prepared to find creative solutions which benefit the planet as a whole.

Having set the scene for the preconditions of a sustainable society I will discuss a pedagogy of hope: securing diversity, compassionate justice and renewal of life (Simon, 1992). In arguing for a particular approach to teaching I am inspired both by Hannah Arendt's notion of action (praxis) and Emanuel Levinas's Ethics of the Other. I illustrate a pedagogy of hope through an example of a young teacher introducing 14 year olds to the idea of Interdependence.

Keynote 2

Japanese Experience on ESD and Teacher Education for ESD

Katsunori Suzuki
ESD Resource Center of Japan, Japan
suzuki@esdcenter.jp

Japan has been actively promoting ESD since the launch of the United Nations Decade of Education for Sustainable Development (DESD) in 2005. Japan strongly promoted ESD in formal education. The Ministry of Education, Culture, Sports, Science and Technology (MEXT) integrated ESD concept into school education programmes by revising the "Course of Study" for elementary and junior high schools in 2008 and for senior high schools in 2009. The UNESCO National Committee of Japan proposed in 2008 to use the UNESCO Associated School Project Network (ASPnet) as a tool to promote ESD at schools. A network of higher education institutions to support ASPnet school (ASP UnivNet) was established in 2008 initially with seven universities.

UNESCO associated schools in Japan are considered to be an ESD leader schools influencing surrounding schools to promote ESD. The numbers of UNESCO associated schools rapidly increased in Japan from 15 in 2005 to 1,034 in 2017. UNESCO associated schools and their network (ASPnet), thus, played a leading role to promote ESD in formal education sector. One of the important characteristics of Japanese ASPnet is composition of school types. About half of the UNESCO associated schools are elementary schools and one fourth are junior high schools, while high schools are dominant in schools systems in most other countries. ASP UnivNet played an important role to support ASPnet schools by assisting schools for developing ASP membership applications, providing schools with intellectual resources of universities, encouraging cooperation with relevant stakeholders such as social education institutions and NGOs, and linking Japanese UNESCO associated schools with those in other countries. ASP UnivNet also increased from 7 in 2008 to 20 in 2017.

To create a platform for dialogue among different ESD stakeholders both in formal and non-formal/informal sectors at regional/local levels, the United Nations University located in Tokyo proposed a regional centres of expertise (RCEs). Following the concept of RCEs, MEXT started an initiative on ESD consortium in 2014 to created multi-stakeholder network at regional/local levels.

Following the second stage of ESD with the Global Action Programme (GAP), the Japanese Government, with the initiative of MEXT and the Ministry of the Environment, established a national ESD promotion network with a national and 8 regional ESD resource centers. They are supposed to support local ESD centers (ESD partners), which support local level ESD actors.

In FY 2016 Nara University of Education conducted a research on teacher training programme in Japan and identified the following six abilities required for ESD teachers:

To have broad and deep basic knowledge on various ESD related topics such as environmental education, international understanding, disaster reduction, peace, human right, etc.;

To pay much attention to unique recognition of students, linkages among topics and processes for transformation rather than results;

To develop leaning materials/processes with much attention to local resources and conditions;

To facilitate communication among students, teachers, experts, local resource persons etc.;

To respect diversity – both biodiversity and cultural diversity; and

To keep willingness to further develop better learning materials.

S-5

Lesson Trial of the Content Plant Body at Elementary School Science: Focusing on Promoting Pupils' Scientific Thinking

Hironori Kanae
Elementary School attached to University of Toyama, Japan
kanae@fes.u-toyama.ac.jp

The important thing is to update our thoughts on the subject. For that, we will take the following methods.

① Children are confident in what they have already learned.
② Children clarify the difference between what they have learned and the event.
③ Children make their own hypothesis.

Specifically, I will explain the state of the lesson. It is a science class at the elementary school of 3rd grade. Children raised their own plants. So, Children know that plants have leaves, stems and roots. The purpose of the lesson is to think about the role of stem.

First, I show pictures to my Children. In the photograph, one plant in the schoolyard is shown. Children mark the roots, stems and leaves of plants. Teachers make sure that Children understand the structure of plants. Children have confidence in their knowledge. (①)

Next, the teacher shows the pictures of the cabbage selling to the store to the Children. The teacher again instructs the Children to mark the roots, leaves and stems. Children are confused. There are leaves in the photo of cabbage, but there is no stem or root. Children clarify the difference between what they have learned and the event. (②)

However, Children think that plants must have leaves, stems and roots. Children have a hypothesis that the stems of cabbage are hidden in its leaves. (③)

Students want to take leaves of cabbage and want to see inside. They will do experiments when their feelings to confirm their hypotheses become stronger. They are very pleased when they find stems. Children think why it is a stem, and think about the role of the stem. Children get new ideas about the role of stem.

We value these above three things in science education. Children will think on their own initiative. Children can deepen scientific thinking.

S-6

Development and Practice of ESD Program to Understand Local Environmental Issue by High School Students

Kiyoyuki Ohshika
Aichi University of Education, Japan
ohshika@auecc.aichi-edu.ac.jp

A global Action Program (GAP) was adopted at the UNESCO world Conference on ESD, at Aichi-Nagoya in 2014. Empowering and mobilizing youth, is one of five priority action areas indicated by the global Action program. After the conference, it has developed several ESD projects targeting of youths in Aichi Prefecture. As a program targeting university students, 'Kagayake Aichi Sastina Research Institutes' was started four years ago, and university students living in Aichi are working on activities to solve environmental problem or tasks with collaborate companies. A new environmental learning promotion project for high school students "Aichi's future creation club" has begun in 2017. The objective of this project is to develop an educational program to solve regional problems based on the results of biological survey by high school students as the main body. In 2017, five high schools in Aichi prefecture were adopted for this project. The five high schools set a theme for each school, conducted research activities for a few months, and developed educational programs to solve the results and problems such as board game, quiz, Karuta and so on. For each school, the project was promoted by organizing a cooperative team consisting of facilitators that summarize the whole activities and specialized advisors to support the survey activities. In November when the project was over, all schools have participated at the environmental festival in Aichi Prefecture and introduced mutual educational programs to citizens at that time. Furthermore, in some schools, high school students conducted practical lessons using their educational programs at elementary and junior high schools in the area. As a result of class practice, elementary and junior high school students experienced the program with positive interest and high motivation. Moreover, through its experiences, they noticed local issues and became aware of environmental problems. Thus, the educational programs developed in this project was proved to be excellent for understanding the local environmental problems. After completing all projects, it holds forums that participate in 5 high school students, introduce each other's educational programs. At the forum, all members are discussed about local environmental problems and future activities by their own playing with their developmental program by each other.

Y-3

In-service Teachers' Perception towards Education for Sustainable Development (ESD) in Myanmar

Yin Mar Win, San San Maw, and San Aye
Sagaing University of Education, Myanmar
yinmar.sioe@gmail.com

In 2005, the United Nations (UN) Decade of ESD was launched to enhance the role of education in promoting sustainable development. At the UN Conference on Sustainable Development in 2012, the international community agreed to "promote education for sustainable development, and to integrate sustainable development more actively into education beyond the UN Decade of Education for Sustainable Development (UNESCO, 2014). Education for Sustainable development (ESD) is a type of education that encourages students to be active citizens who have a role in transformation how our societies operate. Through ESD, children will be encouraged to see themselves as people who have an active role in shaping a better future. This goal of ESD is reflected in the subject matter, and in the way that ESD is taught (NZAID, 2009). In order to practice such type of education in Myanmar, it is imperative to explore the current situation of teachers concerning with the theme of ESD in teaching and learning.

The aim of the study was to explore Myanmar in-service teachers' perceptions towards Education for Sustainable Development (ESD). The research was intended to focus on lower secondary school teachers' level of ESD awareness and knowledge, their attitudes towards ESD, and their willingness to adopt ESD within the classroom setting, and their ESD teaching skills. The instrument was developed, based on the study of Cordina & Misfud (2016). Exploratory factor analysis was used to assess evidence for validity of the instrument. The questionnaire of 60 items includes 17 items ESD awareness and knowledge, 23 items of attitudes toward ESD, and 20 items of ESD teaching skills. The quantitative research involved the collection and analysis of the questionnaires. The data came from 248 lower secondary school teachers from 30 schools. Data collection was conducted in December 2017, before conducting the in-service science teacher training focused on ESD. The data was analysed by descriptive statistic, using Statistic Package for Social Science (SPSS) statistical tests. The findings showed that in general, lower secondary school teachers show interest in implementing ESD and exhibit a positive attitude towards ESD. However, it was noted that the participants' level of awareness is rather low and they do not understand ESD concept clearly. Moreover, it was found that most of teachers lack of adequate teaching skills. This study provided information needed for implementing the in-service science teachers' training program focused on ESD.

Keywords: Education for Sustainable Education (ESD), Lower Secondary School Teachers, Perceptions

Y-4

Implementation Form of "Global Action Program" in school

Dulguun Jalgalsaikhan[2], Burmaa Banzragch[2], Oyuntungalag Orsoo[1],
Munkhjargal Ochirbat[3], and Uuriintuya Dembereldorj[1]
[1] Institute of Teachers' Professonal Development of Mongolia, Mongolia
[2] National University of Mongolia, Mongolia
[3] Orkhonschool of Mongolia, Mongolia
uuree9@gmail.com

Nobody mustn't be left behind development! This is the slogan of sustainable development. Leaving nobody out of it, "Global Action Program on ESD - 2030" project initiated in the UN's conference where delegated Chief Executives in Rio De Janeiro in the year of 2012.

In September 2015, during the United Nations General Assembly, a new global development agenda was adopted by all the Member states in order to define development priorities to 2030 in line with the Millennium Development Goals and the Education for All (EFA) goals, expired in 2015: the 2030 Agenda for Sustainable Development. Education represents a strategic resource for building resilient and sustainable societies. Every development starts with the change of minds of people leading them to right type of actions, attitudes and behavior, creating conditions for active and aware citizenship. The youth is the key to sustainable and inclusive growth, therefore to guarantee sustainable development, the quality of education system, especially of teachers, must be refined.

ESD requires to include key sustainable development issues into teaching and learning and encourages innovative, participatory teaching and learning methods that empower and motivate learners to take action for sustainable development. There is therefore an urgent need to build the capacity of educators, as well as trainers and more important thing is that to change every teacher's methodology regarding sustainable development. In addition to this, to implement ideas of sustainable development, teachers need more precise information about sustainable development based on scientific researches. To support teachers 'activities and give them some orientations, there was chosen school #65, which is located far away from Ulaanbaatar as a project implementing place.

1. Training
    a. 17 goals of ESD
    b. Global Action Program
    c. Teachers' action and Global Action Program
2. Cooperation
    a. Intergrading the curriculum with Education Sustainable Development
    b. Intergrading syllabus regarding Education Sustainable Development issues
    c. Through the training, providing ESD's complex pantology to students

Outcomes of the training:

Teachers:

- ✓ Understanding of ESD in teachers has expanded, introduced to global policies and papers of ESD, learned ideology of intergrading ESD into their teaching.
- ✓ Every teacher has conducted a unit plan including ESD's issues of their teaching field.
- ✓ Five Grade8 students and five Grade11 students have participated in the first ESD Olympiad organized by City Education Department.
- ✓ Majority of teachers live in rural area so they have planted potatoes, onions and turnips in their backyards and were tutored the care for vegetation and a planting of onions was done by both teachers and students.

- ✓ Each classroom got three types of garbage can made out of cupboards by teachers and students learned to sort their trash.

These activities have stimulated Strategic competency, Collaboration competency, Critical thinking competency and Self-awareness competency.

Primary students:

- ✓ Taking public transportation instead of being driven to school in warmer seasons.
- ✓ Finish their food without leaving leftovers.
- ✓ Putting up saving electricity and water indications by light switches, plugs and water taps.

These activities have practiced Anticipatory competency, normative competency, Strategic competency, Critical thinking competency and Self-awareness competency.

Middle and high schoolers: They were asked to think about what they can do for a safe and healthy environment. Activities for restoring nature and environment included:

- ✓ Planted trees in National park and school area with a watering schedule.
- ✓ Learned to sort their trash and collected plastic bags and bottles to sell them to recycle. Money earned is used for buying cleaning materials.
- ✓ Every students started to own a notebook for exam where they take all of their tests in order to decrease paper for copying of tests and exam papers.
- ✓ Grade 12 students were actively involved in the project "Making box for dangerous waste". At the school "Box for dead batteries" was placed by Ministry of Environment and Tourism. Students have brought unused batteries from their home and put them into the box. When it was full, specialists came to replace it. Students were aware of advantages of using recharged batteries.
- ✓ Students of Eco club are going use and fill in the "Green Passport" of Ministry of Environment and Tourism.

These activities practice Systems thinking competency, Anticipatory competency, normative competency, Strategic competency, Critical thinking competency and Self-awareness competency.

S-7

Possibility of Using Omoshiro Jikken (the Fascinating Experiment) to Teach Science

Shinichi Furihata[1] and Sachi Kawamura[2]
[1]Tokyo University of Agriculture and Technology, Japan
[2]United Graduate School of Tokyo University of Agriculture and Technology, Japan
sfurihat@gmail.com

The Japanese Course of Study (MEXT, 2017) recommends "Curriculum to be created with the society (Shakai ni Hirakareta Kyoikukaei)," which is where schools and society create curriculum for the betterment of society. We are undertaking efforts to make some qualities and competences available to trainee teachers in the subjects of science (Rika). In this presentation, presenters report an ideas and efforts for trainee teachers in science (Rika) in Japan.

First, presenters show a traditional content of a lesson we use to teach trainee teachers how to teach science (Rika Kyoiku Ho). To develop an educational curriculum "Curriculum to be created with the society", both teachers and supporters are required of the qualities and competences as an active learning facilitator in the learning process of learning (Shutoku), utilization (Katuyo) and exploration (Tankyu).

Second, presenters report a development process of active learning in science at junior high school through Omoshiro Jikken (the fascinating experiment). OJ is an experiment that makes students feel "science is interesting", it is possible to do without using special equipment and chemicals.

In this presentation, in addition to reporting the efforts of trial and error of the OJ, presenters give discussion points of the possibility of utilization of OJ to teach science in the middle school in the perspective of ESD.

S-8

Proposal of a Procedure to Make Student Teachers Recognize Their Gained Skills and Competencies of ESD

Hironori Sasaki
Chugokugakuen University, Japan
hironori_sasaki@sky.megaegg.ne.jp

The Sustainable Development Solutions Network (SDSN) released a guide in 2017 entitled "Getting started with the SDGs in universities". The guide helps universities, higher education institutions, and the academic sector to accelerate their contributions to the Sustainable Development Goals (SDGs). It points out that one thing universities can do is to provide students with the knowledge, skills, and motivation to understand and address the challenges of the SDGs. In particular, they are Cross-cutting skills and 'key competencies' that are relevant to addressing all of the SDGs. Then, what kind of skills and competencies does the pre-service teacher professional development course which I teach have to educate pre-service student teachers? The guide refers to "Education for Sustainable Development (ESD) Goals: Learning objectives" which UNESCO released in 2017 and describes the elements of skills and competencies. Some of the elements are as follows: "Reflect on the concept of sustainable development, the challenges in achieving the SGDs, the importance of their own field of expertise for achieving the SDGs and their own role in this process" and "Reflect on the relationship of formal, non-formal and informal learning for sustainable development, and apply this knowledge in their own professional work". Reflection on their ESD experiences as well as student teaching practice is so difficult for the student teachers. I believe that reflection is not sufficient as a competency of ESD but recognition of their gained skills and competencies is more important. In a previous study, I developed a procedure to make the student teachers recognize that they had gained practical knowledge during teaching practice. Therefore, in this presentation, I adapt my approach to ESD teacher professional development and propose a procedure to make the student teachers recognize their gained skills and competencies of ESD.

Dimova (2015) et al reorganized Dewey's phase of inquiry into three situations and six steps. I used the phase of inquiry and teach the student teachers that teachers can finally gain the practical knowledge necessary through these steps. I assume that the procedure is useful for ESD professional development and the student teachers can reflect on their experiences and realize they have gained the skills and competencies of ESD. Firstly, the student teachers write notes during the ESD practice in their field. Secondly, they attend class and I allow them to reflect on experiences from adapting the procedure using the newly developed worksheet. Finally, they recognize their gained skills and competencies of ESD.

S-9

Introduction of the Effectiveness and Barriers of School-Enhancing Education for Sustainable Development in Japan

Tomonori Ichinose
Miyagi University of Education, Japan
ichinose@staff.miyakyo-u.ac.jp

Under this Global action program, recently, ESD teacher training have launched in the different place by the different institutions such as; Swedish International Centre of Education for Sustainable Development at Uppsala (SWEDESD), Learning teacher Network (LTN) in Europe, Asia Pacific Institution of Education for Sustainable development (API) supported by the International Network of Teacher Education Institutions Address Sustainability (INTEIs). Last year Japanese Ministry of Education (MEXT) also organized national level ESD teacher training in four different places in Japan.

Two essential features of ESD is important for the ESD teacher training: the first deals with content, the second with pedagogy can be introduced. For the content, it should be involved three essential aspects of holism: connect environmental, social, and economic dimensions of SD issues, integrate their past, present, and future implications, and focus on their local, regional, and global issues. The second essential feature of ESD deals with the process of teaching and learning. ESD focusses on the development of skills and action competence for sustainability. This pedagogy has been labelled pluralism. Although local issues and policies for ESD can be different depends on the participant countries. Holistic and Pluralistic approach are common for embedding ESD in each country.

Despite a global commitment to ESD as a teaching approach, there is very little empirical evidence for international comparison; one thing that would be useful to compare is the extent to which ESD is implemented in the school and classrooms, and the effects ESD has on the school and students.

The main research questions are therefore the effects of a holistic ESD approach to content and a pluralistic ESD approach to teaching in the context of Japanese formal education: What is the effect of ESD for the students and in the school from the viewpoint of school teachers? In my presentation, I will show the research effect of Questionnaires survey which were distributed in ESD, UNESCO-Associated Schools of the Northeast part of Japan from 2014 to 2017.

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Contact
Hiroki Fujii
Okayama University ESD Promotion Center
3-1-1 Tsushimanaka, Kita-ku, Okayama, 700-8530 Japan
Tel: -81-86-251-7637
E-mail: fujii-hi@okayama-u.ac.jp