EIU Best Practices Series **No. 36**

Enhancing Student Environmental Sustainability Awareness with Innovative Art Media: A Multi-disciplinary Activity of Art and Science

Chulalongkorn University

EIU Best Practices 2014



United Nations Educational, Scientific and Cultural Organization
국제연합 교육과학문화기구

APCEIU
Asia-Pacific Centre of Education for International Understanding under the auspices of UNESCO
유네스코 아시아태평양 국제이해교육원

Foreword

The Asia-Pacific Centre of Education for International Understanding (APCEIU) under the auspices of UNESCO was established in 2000, the International Year for the Culture of Peace, under the agreement between the Government of the Republic of Korea and UNESCO. As a Category 2 organization, APCEIU is "exercising its core function of fulfilling UNESCO's mandate through various programmes of Education for International Understanding and Global Citizenship Education," as Mme Irina Bokova, Director-General of UNESCO, kindly remarked during her visit to APCEIU on 3 February 2014.

As a leading centre for Education for International Understanding (EIU) and Global Citizenship Education (GCED), APCEIU has devoted itself to strengthening EIU and GCED capacities in the region by training teachers and teacher trainers, developing educational materials and programmes on EIU and GCED and strengthening the network of educators, experts, civil society leaders, and other stakeholders in the region.

The EIU Best Practices aims to promote local initiatives in the 47 UNESCO Member States in the Asia-Pacific region and encourage innovative practices in different local contexts. Thanks to the continued support of National Commissions for UNESCO in the Asia-Pacific region as well as numerous local education practitioners, APCEIU has published and disseminated a variety of monographs over the past eight years. This year, two monographs and a collection of three cases are introduced with the series numbers 36, 37, and 38.

The following case, Enhancing Student Environmental Sustainability Awareness with Innovative Art Media: A Multi-disciplinary Activity of Art and Science

authored by Mr. Poonarat PICHAYAPAIBOON from the Faculty of Education of Chulalongkorn University, aims to raise students' awareness of environmental sustainability by using the case of waste green mussel shell management which connects to the global warming issue. By learning how waste green mussel shells can be transformed into pigment or clay and then using them to create their own artwork, students are able to develop their understanding of environmental sustainability. The programme has presented a very successful case from the aspect of educating children about living in harmony with the earth.

I believe that through this programme, numerous good practices can be widely shared among the educators, scholars, policy makers, and activists who are committed to promote a Culture of Peace in the Asia-Pacific region. In doing so, I sincerely hope that EIU Best Practices will continue to inspire innovative initiatives in the Asia-Pacific region and beyond.

I would like to extend my deepest gratitude to the Thai National Commission for UNESCO and Chulalongkorn University for their kind cooperation in sharing their experiences.

December 2014

CHUNG Utak
Director

EIU Best Practices is...

APCEIU has been committed to the promotion of a Culture of Peace since its inception, in line with one of the pillars of education "Learning to Live Together." A Culture of Peace has been a key principle at the core of UNESCO's ethical mission. It involves a set of values, attitudes and behaviors that can be taught, developed and improved upon to enhance mutual understanding and conflict resolution. Attaining a Culture of Peace requires transformation of institutional practices, as well as individual values and behaviors in which education plays a crucial role in the process. As a major educational tool aimed at promoting a Culture of Peace, EIU addresses issues related to cultural diversity, globalization, social justice, human rights, peace and sustainable development. It focuses on increasing the capacity of learners to deal with issues of everyday life, to resolve community conflict, and to enjoy human, political, and civil rights to a greater extent.

APCEIU launched EIU Best Case Studies in 2006 in cooperation with the UNESCO Member States in the region to encourage educators, scholars and activists to implement and share local initiatives on EIU. It is an outreach programme that invites them to share their efforts in promoting education for a culture of peace in different social and cultural contexts. Now renamed as EIU Best Practices in order to further encourage the participation of practitioners in the field, the programme seeks to promote and collect innovative practices based on optimal classroom conditions and activities, school climate, community, and social atmosphere and disseminate them throughout the region.

The programme is conducted through the following steps: 1) Call for Applications: APCEIU sends announcement letters along with application forms

and guidelines to the 47 National Commissions for UNESCO, UNESCO field offices, major National Institutes of Education in the region, and APCEIU's MOU partners in the region; 2) Screening and Selection: Submitted applications are reviewed by the Screening Committee, composed of experts, who then select the best practices; 3) Field Visit: APCEIU staff undertake field visits to the programme sites of the selected cases to confer the EIU Best Practices awards, conduct field observation and interviews, and provide the selected applicants with the guidelines for the final report; 4) Submission of the Final Reports: Selected applicants submit the final reports to APCEIU based on the guidelines; and 5) Publication and Dissemination: Final reports are published as a monograph series and disseminated throughout Asia and the Pacific region.

Given the favorable and enthusiastic responses from the region and support from the National Commissions for UNESCO, APCEIU wishes to expand the positive momentum built thus far and to further its efforts for the coming years. APCEIU encourages educators, scholars and activists from the Asia-Pacific region to apply and share their experiences and perspectives. The Centre expects that through the EIU Best Practices, diverse practices of EIU will be widely shared throughout the entire region and beyond, thus contributing towards achieving a Culture of Peace.

Author

Dr. Poonarat Pichayapaiboon is an Associate Professor in the Division of Art Education, Department of Art Music and Dance Education, and at the Faculty of Education at Chulalongkorn University in Bangkok, Thailand.

He received his Bachelor's Degree in Education from Chulalongkorn University in 1982, Master's Degree in Ceramics from Illinois State University in 1984, and Doctor of Education from Illinois State University as well in 1987. Dr. Pichayapaiboon has more than 25 years of teaching experiences inart and research. He was the Head Department of Art Music and Dance Education. His latest granted research by the National Research Council of Thailand was "the Innovative of Process to Develop Pearl Plates Gouache Color from Wasted Green- Mussel Shell."

The innovation won the Gold Medal Award from the 42nd Geneva Invention of Switzerland. He also won the Special Prize from the Korea Invention Promotion Association of the Republic of Korea. His innovation was used in art classroom to create multidisciplinary Art and Science activities which aims to raise students' environmental sustainability awareness.

Acknowledgement

I would like to sincerely express my gratitude to the Asia-Pacific Centre of Education for International Understanding (APCEIU) for encouraging me to finish the publication entitled "The Enhancing Student Environmental Sustainability Awareness with Innovative Art Materials: a multidisciplinary of Art and Science Activities."

My appreciation goes to Associate Professor Dr. Chanita Rukspollmuang, the Former Dean of Faculty of Education, Chulalongkorn University for her supporting and recommended this programme to the APCEIU.

I am also grateful to the faculties of the division of Art Education at Chulalongkorn University who devoted themselves for the wonderful work in creating the innovative art media and art activities. They are Dr. Apichart Pholprasert, Dr.Khanobbhorn Wattanasukchai, Dr. Intira Phrompan, and Dr. Soamshine Boonyananta. The gratitude also goes to Associate Professor Dr. Sanong Ekasit, the Director of Sensor Research Unitat the Chemistry Department of Chulalongkorn University, for his consulting in innovative pearl plate research. My appreciation also extend to both Ms. Somjai Jongrakwit (M.Ed) the director of the art project at the Chulalongkorn University Demonstration School and the Samutsakorn Provincial Administration Organization, who provided students to participate in the Best practice programme. Lastly I offer my thanks to Mr. Puchong Rojsangrat, my PhD candidate, who was helpful as an assistant throughout the programme.

Table of Contents

Enhancing Student Environmental Sustainability Awareness with Innovative Art Media: A Multi-discipline of Art and Science Activities

1. Introduction

1.1 Background of the Programme

A group of researchers from the Division of Art Education, Department of Art, Music and Dance Education, Faculty of Education, and the Sensor Research Unit, Department of Chemistry, Faculty of Science, Chulalongkorn University had successfully developed the innovative Pearl Plate Colours and Pearl Plate Clay from green mussel shell. The research was funded by the National Research Council of Thailand (NRCT). It aims to combat global warming by reducing a large amount of waste green mussel shell from seafood market and industries in Thailand.

The innovative products are also expected to replace mica–a mineral from rock-with organic pearlescent substance such as pearl plate from green mussel. The green innovations are not only safe for people, but also provides an alternative way of new art mediums, add values to waste green mussel shell, creates sustainable environment, and keeps the earth away from global warming.

1.2 Rational Information

As we know, the world is facing global warming. Based on research, greenhouse gas is not only the main cause of heat effect on earth atmosphere, but human activities such as combustion and production of carbon dioxide also contribute to earth warming.

People need to know that climate change and the rising of sea water level are

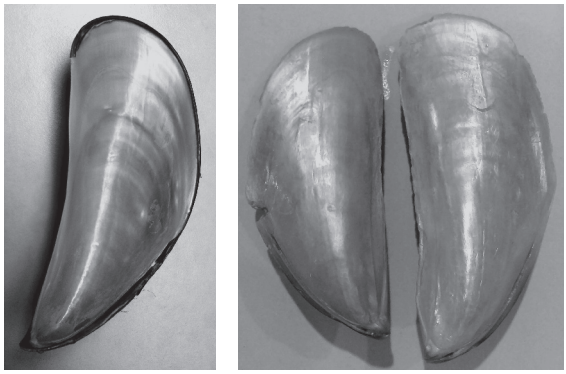
caused by global warming. It is also the reason for the extreme weather conditions that causes disasters such as droughts, changes in rainfall, and floods. Global warming also causes increase in climate-sensitive infectious diseases such as dengue fever, cholera, and malaria. Education plays a significant role in making people understand and realize environmental issues. Such awareness can be made by showing the relation and impact between modern development and natural environment. It is the role of education to promote sustainable development. Schools and universities may have to put environmental issues into classroom activities.

Few people know about the concept of shellfish sequestration and that it can remove substantial quantities of carbon dioxide in the atmosphere. Since the earth's atmosphere and ocean are closely related, they exchange water and gases, which cause climate change. The amount of carbon in ocean which affects global warming can be reduced by shellfish cultivation because the shellfish uses carbon to build its shells. Research from the University of South Australia on carbon sequestration potential of shellfish reported that a two year old Pacific oyster shell weighs around 70 grams can sequester 8.4 grams of carbon, or 12 percent of its shell weight. Therefore, like planting trees, green mussel cultivation can help reduce carbon. However, to maintain carbon in the shell, the waste shell should be placed back into the sea, much like how dried leaves and dead trees can be made into compost.

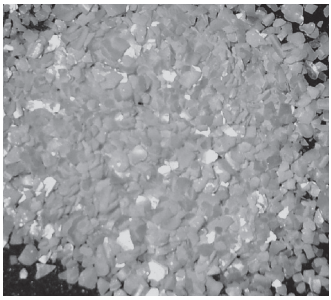
The programme targeted the waste green mussel shell from the seafood market. In Thailand, green mussel or Asian mussel (Perna viridis) is cultivated along the coast. Each year, 44% from the total product of aquaculture is green mussel. One hundred thousand tons of green mussel clams are currently in the seafood market which produces around 50,000 ton of waste. They are normally disposed of through landfill.
The waste decompose slowly and remain in the soil for more than a decade. This method is bio toxic to soil and underground water, reduces soil fertility, and decreases soil water absorption. In addition, if these waste shells are corroded by acid, they will emit CO_2 back to the atmosphere. This will eventually contribute to the greenhouse effect.

Therefore, the waste shells need to be managed properly. The new way to manage the waste is to transform the shell into pearlescent plates.

▲ *The improper elimination of green mussel shell in a landfill at SrangSok Temple, Samutprakarn Provice of Thailand caused the surrounding community to suffer from the rotten smell of the mussels.*

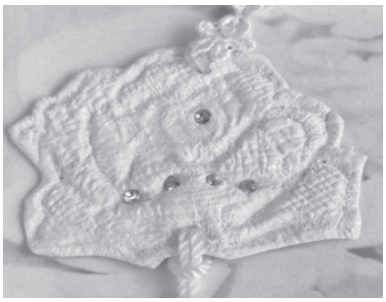


▲ *Before (left) and after (middle) chemical treatment on mussel shell.*
The lustrous of nacre layer from mussel shell was transformed into tiny pieces of pearl plate (right).



1.3 Initiation

The programme initially proposed to promote sustainable development by using the innovative art media as a tool for global warming awareness. A research entitled "Value Creation of Waste Green-Mussel-Shells from Seafood Industries by Transforming to Pearlescent Materials and Related Product"[1] was the main research which lead to two crucial innovation researches. They were the innovation of Pearl Plate Colour[2], and the innovation of Pearl Plate Clay (or Chula Clay)[3].



▲ *Pearl plate colours and Clay*

▲ *The innovations were awarded 3 Gold Medals by Salon International des Inventions de Genève Switzerland, and got Special Prize from Korea Invention Promotion Association (KIPA) in 2014*

Both Pearl Plate Colours and the Clay create exciting classroom activities. The astonishing sparkle of incidental light on the surface of pearl plates attracts students' attention. It can encourage students to explore the new technique of artworks.

It makes the activities in art classroom fun and develops students' creativity. At the same time, it can educate students about environmental sustainability through a case of waste green mussel shell management.

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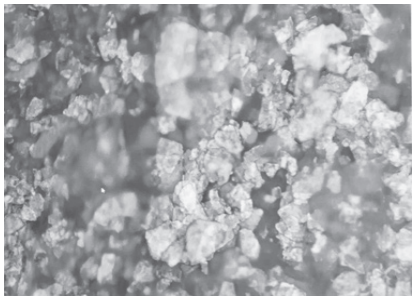
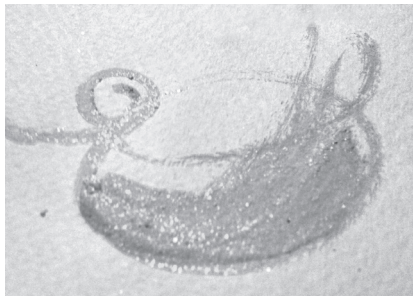
1 Sanong Ekgasit PhD, Faculty of Science, Chulalongkorn University

2 Invented by Poonarat Pichayapaiboon Ed.D, Faculty of Education, Chulalongkorn University and Puchong Rojsangrat, Art Education PhD candidate

3 Invented by Soamshine Boonyananta PhD and Intira Phrompan PhD , Faculty of Education, Chulalongkorn University

▲ *Enlargement of the pearl plate particles (left).*
The sparkling glitter can be observed when the painting dried.

The programme provides knowledge of global warming, environmental sustainability, and nature of green mussel shell which enables students to reflect and to present their ideas of environmental sustainability solution on their artwork.

Aside from the aesthetic experience, the programme encourages students' curiosity and creativity as well as promoting the dimension of living in harmony with the earth through art education. It enables the individual to acquire critical understanding of problems at the national and international levels, through multidisciplinary activities of art and science.

2. Description of the Programme

2.1 Goals and Objectives

Goal:
to develop awareness of environmental sustainability by using art activities to promote living in harmony with the earth

Objectives:
- to introduce art media to art classroom
- to develop awareness of environmental sustainability, especially to children and students in art classroom
- to engage multidisciplinary activities of art and science in art classroom through the green innovation

2.2 Conceptual Framework

The programme's main concept is sustainable development, focusing on transforming waste to artwork. Then, it raises awareness of environmental sustainability. Once waste (a non-value object) is transformed into art object (a personal feeling and wisdom), it can create both aesthetic value and awareness of environmental sustainability simultaneously.

2.3 Programme Detail

The class setting

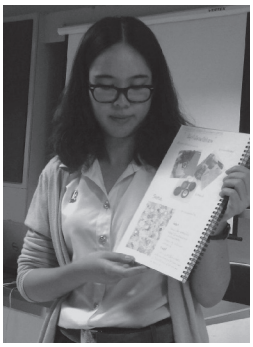
The contents and activities consist of four sessions. They are flexible and can be adjusted slightly depending on the level of participants and settings.
Four different classes are involved in the programme. These are the following:

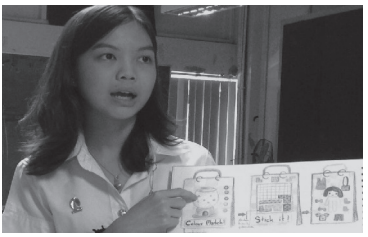
1) Environmental Art[4]

This class requires thinking and creativity to create beautiful art pieces. Twenty three pre-service art teachers enrolled in this class. The field trip is included for the teachers to observe the pearlescent plate transformation at the Sensor Research Unit laboratory, Department of Chemistry.

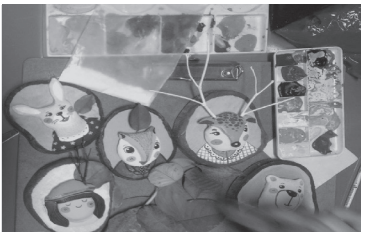
Environmental Art Class for Pre-Service Art Teacher

▲ *In class activities of Environmental Art class for Pre-service art Teacher*

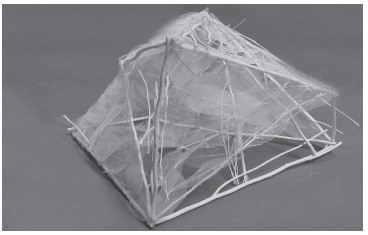




▲ *Presenting the idea and sketching of waste to art object*



▲ *Classroom artworks critique*



▲ *PLamps made from leaf and wood rod (right) and made of plastic straws (left).*

2) Aesthetic Appreciation[5]

This class is a general education course with 151 pre-service teachers enrolled. Global warming crisis, environmental sustainability, and the new art mediums are introduced in two hours of lecture. The class is aimed at creating awareness of the global warming crisis and environmental sustainability solution.

4 Conducted by Apichart Pholprasert PhD, Faculty of Education, Chulalongkorn University

5 Conducted by Poonrat Pichayapaiboon Ed.D, Faculty of Education, Chulalongkorn University

Aesthetic Appreciation Class for Pre-Service Teachers

▲ *Class lecture to pre-service teacher in Aesthetic Appreciation class discussing the topic on Aesthetic in Environment Sustainability*

▲ *The sparkling glitter of pearl plate inside the glass tube caught the attention of the pre-service teachers.*

▲ *A student sharing his idea of environmental sustainability!*

3) The Enhancing Art Potential Project [6, 7]

The project is designed for elementary students who artistically gifted. Twenty five students from fifth grade joined the programme. The project consists of various art techniques and activities for the students to discover in one whole semester. There are four sessions included in the project.

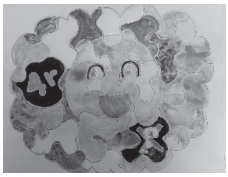
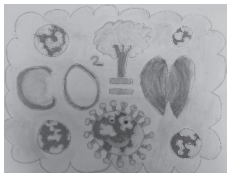
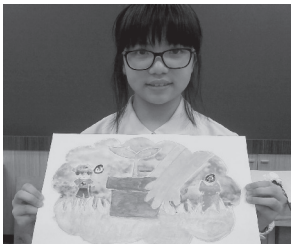
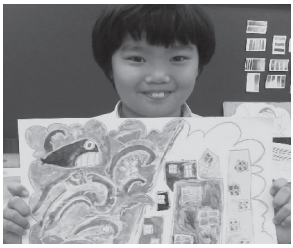
6, 7 Project supervision by Somjai Jongrakwit M.Ed, Chulalongkorn University Demonstration School.

8 Conducted by Khanobbhorn Wattanasukchai-Sangvanich PhD, Faculty of Education, Chulalongkorn University, and the graduate students from Art Education Curriculum Development course.

The Enhancing Art Potential Project at Chulalongkorn University Demonstration School


▲ *Elementary school art class*




▲ *Children showing their global*


▲ *Art Education Graduate Students do class preparation*

▲ *Art Education Graduate Students do class preparation*

4) Art Go Green Workshop [8]

This is a one day workshop with 34 children coming from SK Park, Samutsakorn province, the place where the green mussel cultivation area is situated.

The Art Go Green Workshop at Samutsakorn Province

▲ *Children from green mussel cultivation area at Samutsakorn province.*

▲ *Explaining the 4R's principle; the waste prevention.*

▲ *Children starting their artworks.*

▲ *Beautiful artworks*

▲ *Looking for their artwork display*

▲ *Mind mapping*

▲ *Class of Art Go Green workshop*

▲ *Art Go Green workshop team*

The main contents and activities are as follows:

The contents and activities consist of four sessions. They are flexible and can be adjusted slightly depending on the level of participants and settings.

Four different classes are involved in the programme. These are the following:

1. The Global Warming and the Changing of Life

The objective of the activity is to show how the earth becomes warmer and its effect on life. Teachers ask the students the following questions: (1)What are their understanding on the greenhouse effect? (2)What causes the effect? (3) How is it related to life on earth? Teachers provide time for students to formulate

their thoughts, write their ideas, and discuss them in the classroom. The teacher then asks students to think about how the greenhouse effect relates to waste management and asks them to draw pictures.

2. The Environmental Sustainability

The issue narrows down to environmental sustainability and waste management. Teacher asks students about their understanding of environmental issues together with their experiences on the issues. After that, each student shares his/her experience. Teacher summarizes the overview of the environmental issues and highlighted the following issues: climate change, resources conservation, overpopulation, loss of mountain glaciers and ice caps, pollution, landslides and soil contamination.

Then, students were asked how these environmental issues can affect the lives of the people and how the human waste can damage and destroy the natural resources and environment. The 4R's for sustainability- reducing, reusing, recycling, and repairing-are introduced to class. Each student selects his/her own environmental issue and designs his/her mind map on environmental sustainability.

3. Multidisciplinary : Art and Science Activities

The case of waste green mussel shell from sea food markets and industries was selected as classroom topic. The information on waste green mussel shell management using the conventional way (landfill) and the innovative way (transforming shell to pearl plate) were discussed. Sample of improper green mussel waste management is included in the case study for discussion.

The importance of mussel shell was shared in the class. The carbon sequestration of plants and animals was also mentioned. Teachers started the class discussion by asking students to define the greenhouse effect. A comparison between the conventional and innovative waste utilization of green mussel shell was presented to the class.

Demonstration and explanation on how the green mussel shell is transformed into pearl plate is included in the activities. The main procedure is to deconstruct calcium carbonate crystal called "aragonite" on shell nacre layer (known as mother pearl) into pearlescent particle plates. Protein decomposition treatment is employed to the mussel shell degradation. This organic material can be used to make pigment for watercolor paints or white clay to create environmentally friendly art media using fun activities.

Explanation on the characteristics and structure of the mussel shell especially the iridescent nacre found inside the shell were also provided. A field trip to the chemistry lab at the Department of Chemistry, Faculty of Science is included only for pre-service art teacher to enhance their art and science experiences. Then, the new art mediums were introduced to the art classroom under the topic "Turning Waste into Art to Live a Sustainable Life".

4. Art Presentation and Exhibition

For the pre-service art teacher, PowerPoint and artwork presentation of his/her artwork is done individually. Upon feedback and critique of the teacher on the artwork, they are displayed to the general audience.

For the Art Learning Project and the Art Go Green Workshop, some artwork are selected to be evaluated in class. Questions of environmental sustainability are asked to assess the students. Student artworks are exhibited to express their ideas and to share their knowledge of the global warming solution.

Relevance to EIU

Nowadays, global warming is not only an issue for scientists. It concerns everybody since we are all affected by the ecological impact of climate change. The sustainability of human life is dependent on the well-being and sustainability of the earth.

Education for caring for the environment to achieve environmental sustainability is a key dimension of EIU. Moreover, the theme of the programme is in line with one of the key themes of EIU, living in harmony with the earth.

By using the waste green mussel shell as a case to raise awareness of environmental issues, the participants understood the mechanism of global warming and at the same time learned the importance of preserving and caring for the natural resources In addition, the programme allowed the elementary level students and pre-service teachers to appreciate the 4Rs of waste prevention.

It is also expected that the pre-service teachers will pass on their knowledge of environmental sustainability to their students in the future. In line with pedagogical principle of critical empowerment that is essential to EIU, the programme enabled the participants to translate their understanding and concern for environmental sustainability through artworks.

3. Conclusion

3.1 Evaluation and critical reflection

The programme provided environmental sustainability activities to different types of classrooms. The programme activities helped students (this includes the graduate students who assisted in class) to have a better understanding of the global warming impact, waste management, and the 4Rs principle. Students became more aware of environmental preservation and protection and global responsibility. The programme helps promote the EIU visions.

The programme discussed the biosequestration to children coming from the families living in the cultivation area of green mussels. The activity paved the way for them to appreciate the work of their family. They learned that mussel and oyster cultivation can be used to reduce greenhouse gas.

Surprisingly, instructors, graduate students, pre-service teachers, and students were skeptical on the melting of Himalayan glacier. They are not aware of the possible impact on the environment. The rising atmosphere temperature causes Himalayan glacier to retreat. The glacier is the world's largest reserve of fresh water in ice form. This glacier supplies fresh water for billions of people in South Asia and South East Asian countries. According to the World Wildlife Fund (WWF), the impact of global climate change is melting the mighty Himalayan glacier at the fastest rates ever recorded in human history, jeopardizing a vital source of freshwater in Asia. This effect will be visible by year 2050. The retreat will have an impact on the level of water in seven major rivers including Mekong River, which will put people in South China, Laos, Cambodia, Vietnam, and Thailand at risk from droughts and lack of drinking water. The programme pointed out that the retreat will also have an impact on the people in North Eastern region of Thailand if the melting accelerates.

Most students were confused between global warming and ozone depletion. It is possible that they were given misleading information. Both concepts are totally different phenomena. The programme enabled the students to know the right information. In global warming, greenhouse gases are trapping heat in the atmosphere which makes the earth warmer, while human activities such as deforestation and burning fossil fuels cause global warming. On the other hand, the ozone is a layer of gas above the earth's surface. The ozone layer prevents

harmful ultraviolet (UV) rays from reaching the earth. As the ozone gets thinner, excessive UV radiation can enter the earth, harming it. The ozone depletion is caused by the release of CFC (chlorofluorocarbons) and other ozone depleting substances.

3.2 Conclusion

As defined by the United Nations World Commission on Environment and Development in its 1987 report, "Our Common Future", "sustainable development is the development that meets the needs of the present without compromising the ability of future generations to meet their own needs." It is important for citizens to understand the sustainable development, since we are learning to live together. We are all sharing resources of environment, economy, and society. We are facing reduction of resources such as fresh water, fuel, and rare species. People are over consuming renewable resources such as fishes and forests. We create pollution to air, water, soil. It is necessary to include the concepts of sustainable development (environment, economy, and society) into the classroom. The sustainability should be part of a person's lifestyle to create a sustainable society. People who have a sustainable lifestyle do the following: use green product or environmentally friendly products, reduce CO_2 emissions, apply the 4R's to reduce waste, harvest rainwater, support green community projects, build backyard garden, buy locally grown products, and among others.
For this programme, transforming wastegreen mussel shells to pearl plate art mediums is a good example of sustainable development. The programme encouraged children to appreciate the green art products by integrating art and science activities. It also raised their awareness of environmental crises, such as global warming.

The success of the programme was made possible with the strong support of people and institutes. These include instructors and graduate students from the Division of Art Education of Department of Art Music and Dance Education, Enhancing Art Potential Project of Chulalongkorn University Demonstration School, Sensor Research Unit of the Department of Chemistry, Faculty of Science, Samutsakorn Provincial Administration Organization, and Faculty of Education, Chulalongkorn University.

field visit

▲ *The successful moment: Conferring of the EIU Best Practices Award*

Mr. Utak Chung, Director of APCEIU, and Mr. Kwang-Hyun Kim, Chief of Publication and Public Relations Team, undertook a field visit to Chulalongkorn University in Bangkok, Thailand on 17 September 2014 to carry out the following missions: 1) to confer the EIU Best Practices Award to the awardee, 2) to undertake classroom visits and field observation, and 3) to hold a consultative meeting with the awardee and Dean of Faculty of Education of Chulalongkorn University.