Report on Lesson study on Cross border education in relation to STEM and energy

Thailand & Indonesia
Introduction

After APEC-Tsukuba International Conference X: Innovation of Mathematics Education through Lesson Study Challenges to Energy Efficiency on STEM and Cross-border Education, 12-15 February, 2016 at University of Tsukuba Japan. Thailand and Indonesia has set a cross-border lesson study together as the timeline as follow.
## Timeline for Cross-Border between Thailand & Indonesia

<table>
<thead>
<tr>
<th>Date</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-21 September 2016</td>
<td>Design lesson plan (first draft), via e-mail</td>
</tr>
<tr>
<td>22 September 2016</td>
<td>Edit lesson plan together between Thailand &amp; Indonesia via WebEx online</td>
</tr>
<tr>
<td>23 September – 2 October 2016</td>
<td>Prepare for Cross-Border Learning between Thailand and Indonesia</td>
</tr>
<tr>
<td>3 October 2016</td>
<td>Cross-Border Learning between Thai students and Indonesia student</td>
</tr>
<tr>
<td>4 October – 8 November 2016</td>
<td>Edit video, report</td>
</tr>
</tbody>
</table>
Introduction

The lesson was implemented in 9th grade class with 15 students from Thailand (10 girls 5 boys) from the Demonstration School Khon Kaen University (Moodindang) and 30 students from Indonesia (SMP N 4 Pakem Yogyakarta)
participants

Thailand
15 students from the Demonstration School Khon Kaen University (Moodindaeng)
2 Mathematics Teachers
4 Researchers from Khon Kaen University and Suratthani Rajabhat University

Indonesia
30 students from SMP N 4 Pakem, Yogyakarta.
1 Mathematics Teachers of SMP N 4 Pakem Yogyakarta
2 Researchers from SEAMEO QITEP in Mathematics, Yogyakarta Indonesia
Thai Staff
Consultant
• Assist Prof. Dr. Maitree Inprasitha
• Mr. Preecha Kruwan

Coordinator
• Dr. Narumon Changsri
• Dr. Wipaporn Suttiamporn
• Miss. Sirikwan Srivilai

Name of Demonstration Teacher in Thailand
Dr. Thanya Kadroon
Dr. Suttarat Boonlerts

Staffs
Mr. Watcharapon Seesan
Miss Chompoo Lunsak
Miss Supinda Petchara
Mr. Sunti Bunleng
Mr. Chanintorn Boontem
Miss Jitlada Jaikla
Miss Sirirat Chaona
Mr. Saastra Laah-on
Miss Pimpaka Intaros
The lesson Plan

- Title “Energy use and Electricity”
- 9th grade class
- Date 3 October, 09:30-12:00
- Room no.1368, faculty of education, KKU and SMP N 4 Pakem Yogyakarta
- Web EX Program
Lesson Plan for Cross Border Between Thailand and Indonesia
Task for Grade 9<sup>th</sup>

- Students gather information on electrify appliance used at their home
- Discuss about energy use in daily life
- Find how much was spend for the electricity bill
- Find the relationship between electrify appliance used at their home and the electricity bill
- Ask students in a group to create proposal on ways to reduce the spending on electricity
Lesson Objectives

• gather information on electrical appliance used at home
• to find the relationship between electrical appliance used at their home and their electricity bill
• to find the ways or how to reduce the spending on electricity
Teaching-Learning Materials Needed

- Work sheet
- Electricity bill
Activity

Task 1 (Home work)
• ask our students to gather information on electrical appliance used at their home.

<table>
<thead>
<tr>
<th>Electrical Appliance</th>
<th>Brand</th>
<th>Total Number</th>
<th>Energy Rating</th>
<th>Wattage</th>
<th>Usage (hours/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Conditioner</td>
<td>Saijo denki</td>
<td>1</td>
<td>5</td>
<td>1,300</td>
<td>8</td>
</tr>
<tr>
<td>microwave</td>
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<tr>
<td>TV</td>
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<tr>
<td>Refrigerator</td>
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<td>Electrical Appliance</td>
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<td>Energy Rating</td>
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<td>Usage (hours/day)</td>
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<tr>
<td>Air Conditioner</td>
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</tr>
</tbody>
</table>
Task 2
• Ask students to find out how much their home electricity bill for the last three months.

Task 3
• Ask our students to find the relationship between electrical appliance used at their home and their electricity bill.

Task 4
• Ask our students (in group of 3 or 5) to design poster or create proposal on ways to reduce the spending on electricity.
• and Present to whole class
STEM

Science: energy, electricity, scientific process
Mathematics: calculation, statistics
Engineering: energy saving
Technology: use of instruments, ICT to write and share explanations
Social studies: economic
Result

Introduction (30 minute)

• Introduction about cross border between Thailand and Indonesia
• Rate and Currency between Thailand and Indonesia
• Check the data on gather information on electrical appliance used at their home and electricity bill in last 3 month
  (5 groups of student already prepare)

• to find the relationship between electrical appliance used at their home and their electricity bill
  (students found the electricity bill has relevance with electrical appliance used at their home)
### Electrical Appliances at my Home

<table>
<thead>
<tr>
<th>Electrical Appliance</th>
<th>Brand</th>
<th>Total Number</th>
<th>Energy Rating</th>
<th>Wattage</th>
<th>Usage (hours/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TV</td>
<td>Sony/Kanayo</td>
<td>2</td>
<td>85-90%</td>
<td>350-400</td>
<td>3</td>
</tr>
<tr>
<td>Stereo</td>
<td>Tharim</td>
<td>1</td>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Air Conditioner</td>
<td>Sharp, Toshiba</td>
<td>4</td>
<td>600 watt</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>Fan</td>
<td>Mitsubishi, Kodari</td>
<td>4</td>
<td>52 watt</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Iron</td>
<td>Philips</td>
<td>1</td>
<td>1400 watt</td>
<td>400</td>
<td></td>
</tr>
<tr>
<td>Light Bulb</td>
<td>Panasonic</td>
<td>2</td>
<td>50 watt</td>
<td>50</td>
<td>10</td>
</tr>
<tr>
<td>Washing Machine</td>
<td>Toshiba</td>
<td>1</td>
<td>1500 watt</td>
<td>1000</td>
<td>1</td>
</tr>
<tr>
<td>Hair dryer</td>
<td>Panasonic</td>
<td>1</td>
<td>1600 watt</td>
<td>1000</td>
<td>5</td>
</tr>
<tr>
<td>Computer</td>
<td>Samsung</td>
<td>2</td>
<td>1000 watt</td>
<td>800</td>
<td>10</td>
</tr>
<tr>
<td>Laptop</td>
<td>Vac, hp, Acer</td>
<td>5</td>
<td>800 watt</td>
<td>500</td>
<td>2</td>
</tr>
<tr>
<td>Microwave</td>
<td>Whirlpool</td>
<td>1</td>
<td>1200 watt</td>
<td>500</td>
<td>5 min</td>
</tr>
<tr>
<td>Electrical Appliance</td>
<td>Brand</td>
<td>Total Number</td>
<td>Energy Rating</td>
<td>Wattage</td>
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<tr>
<td>Stereo</td>
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</tr>
<tr>
<td>Air Conditioner</td>
<td>Samsung</td>
<td>5</td>
<td>220</td>
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<tr>
<td>Fan</td>
<td>Hoolms</td>
<td>5</td>
<td>150</td>
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<td>10</td>
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<tr>
<td>Iron</td>
<td>Sharp</td>
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<td>11.0</td>
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<td>3</td>
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<tr>
<td>Light Bulb</td>
<td>Panasonic</td>
<td>5</td>
<td>16.0</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>Washing Machine</td>
<td>Haier</td>
<td>5</td>
<td>600</td>
<td></td>
<td>2</td>
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<tr>
<td>Hair dryer</td>
<td>Lesmedha</td>
<td>5</td>
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<tr>
<td>Computer</td>
<td>Aman</td>
<td>5</td>
<td>500</td>
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<td>1</td>
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<tr>
<td>Laptop</td>
<td>Azul</td>
<td>5</td>
<td>220</td>
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<tr>
<td>Microwave</td>
<td>Haier</td>
<td>4</td>
<td>300</td>
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<td>1-2</td>
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</tbody>
</table>
### Electrical Appliance at my Home

<table>
<thead>
<tr>
<th>Electrical Appliance</th>
<th>Brand</th>
<th>Total Number</th>
<th>Energy Rating</th>
<th>Wattage</th>
<th>Usage (hours/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TV</td>
<td>Samsung</td>
<td>2</td>
<td>5</td>
<td>96 watt</td>
<td>2</td>
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<tr>
<td>Stereo</td>
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<tr>
<td>Air Conditioner</td>
<td>Toshine</td>
<td>4</td>
<td></td>
<td>500 watt</td>
<td>8</td>
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<tr>
<td>Fan</td>
<td>Sharp</td>
<td>5</td>
<td></td>
<td>52 watt</td>
<td>3</td>
</tr>
<tr>
<td>Iron</td>
<td></td>
<td>1</td>
<td></td>
<td>1100 watt</td>
<td>2</td>
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<tr>
<td>Light Bulb</td>
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<tr>
<td>Washing Machine</td>
<td></td>
<td>2</td>
<td></td>
<td>1560 watt</td>
<td>1</td>
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<tr>
<td>Hair Dryer</td>
<td></td>
<td>1</td>
<td></td>
<td>1600 watt</td>
<td>1</td>
</tr>
<tr>
<td>Computer</td>
<td></td>
<td>1</td>
<td></td>
<td>1200 watt</td>
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<td>Laptop</td>
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<td>4</td>
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<td>860 watt</td>
<td>5</td>
</tr>
<tr>
<td>Microwave</td>
<td></td>
<td>1</td>
<td></td>
<td>1200 watt</td>
<td>0.5</td>
</tr>
</tbody>
</table>
Result

Introduction (30 minute)
• Discussion about the important of energy, electricity use in daily life, need of electricity, resource for electricity (Students concern that energy and electricity is very important for daily life and the need of electricity use in their home, industry, agriculture and economy. Now Thailand lack of the electricity resource especially natural gas so we have to buy some electricity from Laos Myanmar also China)
Introduction
Discussion point between Thai Students and Indonesia Students

1. Mean of electricity bill between Thai and Indonesia (Thailand is 57 USD/month and Indonesia is 20 USD/Month)
2. The energy resource for electricity of Indonesia (water, natural gas, solar cell etc)
3. How to or the ways to reduce the spending on electricity or saving energy (Change to LED, Open the windows beside air condition, turn off the electricity, using bicycle, using electricity on label no.5 )
What do we learn from the Lesson?

- Interesting
- Challenging
- Mathematics concept also STEM
- 4Cs of 21st Century Skill
Cross Border on Lesson Study Between Thailand and Indonesia
Students sharing experience
The question for Indonesian friends.

1. What do you think about the environment in your country?
2. How do you solve the environment in your country?
3. How long can you use the electronic energy from the environment?
4. Did you ever have a problem about the environment in your country?
5. What is the most important electric energy in your country?
6. How do you save energy in your home?
7. What do you think the world in the 20 next years will be like?
8. Do you think about the world in the 20 next years will be like?
9. What do you think about nuclear power? and do you think it will be possible in the future?
10. What is the most sustainable energy in your country?
The question for Indonesian friends.

1. How do you feel when you learning about electric?
   Answer: I feel so so and sometimes I feel it's cool because we will know about how much we use electric.

2. Do your country serious about use electric?
   Answer: My country isn't serious about it.

3. Do you have a plan to save electric in your country and what about it?
   Answer: In my country, there is renewable power source.

4. How much electric tax that you have to pay?
   (1 month) Answer: 716 in my country.

5. Have your country has campaign about electric?
   Answer: In my country have ex in 8 pm we will close electric appliances.

6. How much about average of electricity bill in one month?
   1000 bath or $35.409 (US)

7. Where is the most electric source in your country?
   Answer: Srinakarin dam.

8. What do you think about quality of electric in your country?
   Answer: In my country is average.
The question for Indonesian friends.

1. How much of electric bill at your house in September?
2. How many percent of VAT in your country?
3. How do you reduce using electrical appliance in your house?
4. Do you have any policy to save electrical energy in your country?
5. What kind of brand that you think it is the safest of electrical appliance?
6. What should you do to reduce using energy from coal and geothermal energy?
7. What kind of electrical appliance that you think it is the most wasteful of electrical appliance?
8. What kind of natural resources that you use to manufacture electrical energy?
9. Do you have any idea about electrical energy from nuclear energy?
The question for Indonesian friends.

1. If you not spend your electricity bill what will happen?
2. How much VAT in your country?
3. Can you example wattage of electrical appliance in your country?
4. Do you have “save energy label” in your country?
5. What is the most electrical appliance which your use?
6. Can you show your electricity bill?
7. How do your country manufacture electrical energy?
8. การผลิตไฟฟ้าในประเทศไทยมีวิธีต่าง ๆ อย่างไร?
9. [Handwritten note]
The question for Indonesian friends.
How much do we have to pay for the electricity bill?
Students sharing experience
Poster design for Saving Energy

Project
- Make air condition by myself
  - Put fan
  - PVC
  - Ice + salt

This project is about science. We will put coldness in 1 hole and open in 1 hole so the wind will come out. If it's hot you can use natural gas and in the box we will put ice and salt because salt will keep cooling.

SAVE

Reduce, Reuse, Reject, Repair, Repurpose.
Cross Border on Lesson Study Between Thailand and Indonesia
What students learn from cross border?
What I learn
In Thailand, the demand for more electric power but it is not enough, so Thailand import electric from Laos PDR. and other country.
Indonesia can produce electric energy in many way such as solar cell, wind energy, Hydroelectric power. And Indonesia have campaign for everyone to save energy
What I impress/interested in

I impress the way of save energy of Indonesian friends because it is simple way and everybody can do such as open the windows instead of open air conditioner moreover we will get cool wind from the nature.
What I will do next
I will share the ideas to another for save energy.
Make A project to save energy with friends.
Acknowledgement

- CRME, Faculty of Education, KHON KAEN UNIVERSITY
- Faculty of Education, SURATTHANI RAJABHAT UNIVERSITY
- The demonstration school of Khon Kaen University (Modindaeng)
- SEAMEO QITEP in Mathematics, Yogyakarta Indonesia
- SMP N 4 Pakem Yogyakarta, INDONESIA
Thank you