



Asia-Pacific Economic Cooperation APEC – Tsukuba and UNESCO (MGIEP) International Conference XII February 7-12, 2018



Innovation of Mathematics Education through Lesson Study Textbook Development for SDGs, STEM, and Energy by Cross-border Education The case of Indonesia

Wahyudi SEAMEO Regional Center for QITEP in Mathematics

background

As a continuation of APEC-Tsukuba and UNESCO (MGIEP) International Conference XI, which was held in Tokyo, February 9-12, 2017,

Indonesia and Thailand have embarked on Cross-Border Lesson Study together. The cross-border lesson study was conducted on August 8, 2017.

Tasks using APEC Energy Database. The preparation start in the beginning of June

Cross border communication using statistical task

CONSIDERATION PRIOR TO DESIGNING THE LESSON



The theme of the lesson

"Imagine hidden variables and relations through the questioning the graphs, and appreciate the significance of being able to analyze the situation and predict the future by using them."

Timeline

DATE	ACTIVITIES	
22 May – 21 July, 2017	Desining lesson plan	
2 June – 23 July 2017	Discussing and editing lesson plan together between Thailand and Indonesia via email and video call	
24-31 July, 2017	Prepare for Cross Border Lesson study	
1 and 8 August, 2017	Cross-border Lesson study between Thailand and Indonesian students	
	Writing of the Report	

Indonesian Team

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The task that we develop

GRADE: 8

TOPIC: Data handling and analysis

LESSON OBJECTIVES

represent and describe energy-related data in the form of tables, graph, and charts

interpret data in the context of energy explain the correlation between different energy consumption and CO₂ emission

SGDs to be adressed



Overview of the task

Meeting 1 (Worksheet 1)

The students compare electricity consumption of Indonesia and Thailand using APEC Energy Database. This meeting is conducted separately in each country.

Meeting 2 (Worksheet 2)

The students investigate the primary source of energy used to generate electricity and how it is related to CO_2 emission. This meeting is connected via WebEx.

Worksheet 1 THE COST OF OUR BRIGHT WORLD How much electricity do Indonesia and Thailand use?





"Which country, between Thailand and Indonesia, consume more electricity?" "What could be the reason behind this phenomenon?"

Worksheet 1

THE COST OF OUR BRIGHT WORLD

How much electricity do Indonesia and Thailand use?

Year	Electricity consumption (in ktoe)			
	Indonesia	Thailand		
1990	2.624	3.297		
1991	2.945	3.698		
1992	3.363	4.240		
1993	3.701	4.840		
1994	4.207	5.376		
1995	7.065	6.125		
1996	7.637	6.652		
1997	8.390	7.089		
1998	8.212	6.917		
1999	10.301	7.005		
2000	9.365	7.562		
2001	9.795	7.937		
2002	10.093	8.615		
2003	10.481	9.198		
2004	9.117	9.854		
2005	9.205	10.387		
2006	9.684	10.951		
2007	10.435	11.413		
2008	11.103	11.608		
2009	11.584	11.587		
2010	12.675	12.813		
2011	13.749	12.759		
2012	14.963	13.871		
2013	16.129	14.185		
2014	17.080	14.461		



DESCRIBING DATA



By looking at the graph, describe the differences and similarities between electricity consumption of Thailand and Indonesia.



INTERPRETING DATA

- 2
- The graph beside depicts the population count of Indonesia and Thailand from 1990 to 2015.
- Do you agree that the consumption of electricity is related to the number of people living in the country? Explain your reason.



3 What do you think is the factor that influence the amount of electricity consumption of a country? Explain.

Worksheet 2

THE COST OF OUR BRIGHT WORLD

Does electricity consumption cause air pollution?





"Can you observe any relation between electricity consumption and production of CO₂?"

The students are going to investigate data from the following countries.







Graph 1 Total Electricity consumption 1990 - 2014 (in ktoe)



source: http://www.egeda.ewg.apec.org/egeda/database/database-top.html

Graph 2 SOURCE OF ENERGY TO CREATE ELECTRICITY

The following are pie charts depicting source of energy for electricity in 2014. What can you conclude?



source: http://www.egeda.ewg.apec.org/egeda/database/database-top.html

Graph 3 Coal Consumption for Power Generation (in ktoe)



source: http://www.egeda.ewg.apec.org/egeda/database/database-top.html

Graph 4 Total CO₂ Emission in kt



source: <u>http://www.egeda.ewg.apec.org/egeda/</u>database/database-top.html

INTERPRETING DATA

- 1 Observe Graph 1. For China and USA, their electricity consumption is going up.
 - However, in Graph 4, CO_2 production of China is going up while USA's CO_2 production is going down.
 - What do you think is the cause behind these phenomenon? Explain your answer. Use the graph to support your reasoning.

2 Does higher electricity consumption influence higher CO₂ production? Explain your assumptions.

What happened in the classroom? Electricity consumption does not depend on population count. The electricity use (in Thailand) is almost the same as in Indonesia even though the population is much smaller.

Setting to activate Window

MEETING

(B)

I think it depends on individual use of electricity, not the number of population. Country with fewer people but more technology use per people will have higher electricity. MEETING

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Example of the students' answer: Meeting 1

 By looking at the graph, describe the difference and similarities between electricity consumption of Thailand and Indonesia. 			
T	hailand is more stable than Indonesian.		Do you agree that the consumption of electricity is related to the number of people living in the country? Explain your reason.
			Yes, because people are depending on electricity nowadays, so the more reople the more electricity concurs peins
Do y	ou agree that the consumption of electricity is related to the number of people		
t de	the because No, 1 dass don't agree. It is the the technology of the country. 3.	Wha	at do you think is the factor that influence electricity consumption of a country? ain.
3.	What do you think is the factor that influence electricity consumption of a country? Explain. technology and population are the factor that influence electricity consumption of a country.	The • T • F • P	e sactors as electritity consuportion are the disserent temperatures tabits appliance oscillated and electronics to pulation

Example of the students' answer: Meeting 2

	1. Observe Graph 1. For China and USA, their electricity consumption is going up.
2. Look at Graph 2. Among all the primary sources of energy (coal, hydro, geothermal, nuclear, and others) which one is used the most by all the four countries? Coal 19 Used the most all Countries	However, in Graph 4, CO ₂ production of China is going up while USA's CO ₂ production is going down. What do you think is the cause behind these phenomenon? Explain your answer. Use the graph to support your reasoning. Because China use more coal than USA, and USA have another alternative energy, For example they use nucleor, hydro, and others.
 4. Look at Graph 4. a. Describe the similarity and difference in CO₂ emission of China and USA. b. What can you say about CO₂ emission of Thailand and Indonesia? 	Does higher electricity consumption cause higher CO ₂ production? Explain your answer.
difference: Chino, It is increasing while in USCH, It mosely Starting the some b. Co. emission OF thailand pend Indonesia are very to	No. depend to source everoy that use to create the electricity. it doesn't

LESSON LEARNED FROM THE IMPLEMENTATION

The task support the students to 'read the world' through data and statistics The new use of ICT in mathematics classroom: connectivity and communication Technical matter: internet connection, language, method of sounds recording

SUGGESTION FOR THE NEXT LESSON STUDY:

- For internet, it is recommended to use LAN/cable connection.
- The broadcast should be provided with subtitles.
- It is recommended that instead of recording the sound of the room, the microphone should record individual voice and be connected through the internet instead.

Thank you.