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The development of I2CARE Training Model for Pre-service Science Teachers to Enhance their TPACK Understanding

SIRAPRAPAH SRISUPAN ,
THEERAPONG SANGPRADIT ,
SIRINOOT TEANRUNGROJ ,
& MANAT BOONPRAKOB

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Siraprapah Srisupan, Ed.D Candidate in Science Education, Science Education Center , Faculty of Science, Srinakharinwirot University, Thailand , *E-mail : sirapra1029@gmail.com*

Asst. Prof. Dr. Theerapong Sangpradit , Science Education Center , Faculty of Science, Srinakharinwirot University, Thailand , *Email : theerapong@swu.ac.th*

Asst. Prof. Dr. Sirinoot Teanrungroj , Faculty of Science, Srinakharinwirot University, Thailand

E-mail : sirinoot@swu.ac.th

Instructor. Acting Sub Dr. Manat Boonprakob ,

Behavioral Science Research Institude of Srinakharinwirot University, Thailand

E-mail : manatboo@swu.ac.th

Purpose

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The purpose of this study was to develop a training model for pre-service science teachers for enhancing their Technological Pedagogical and Content Knowledge or TPACK

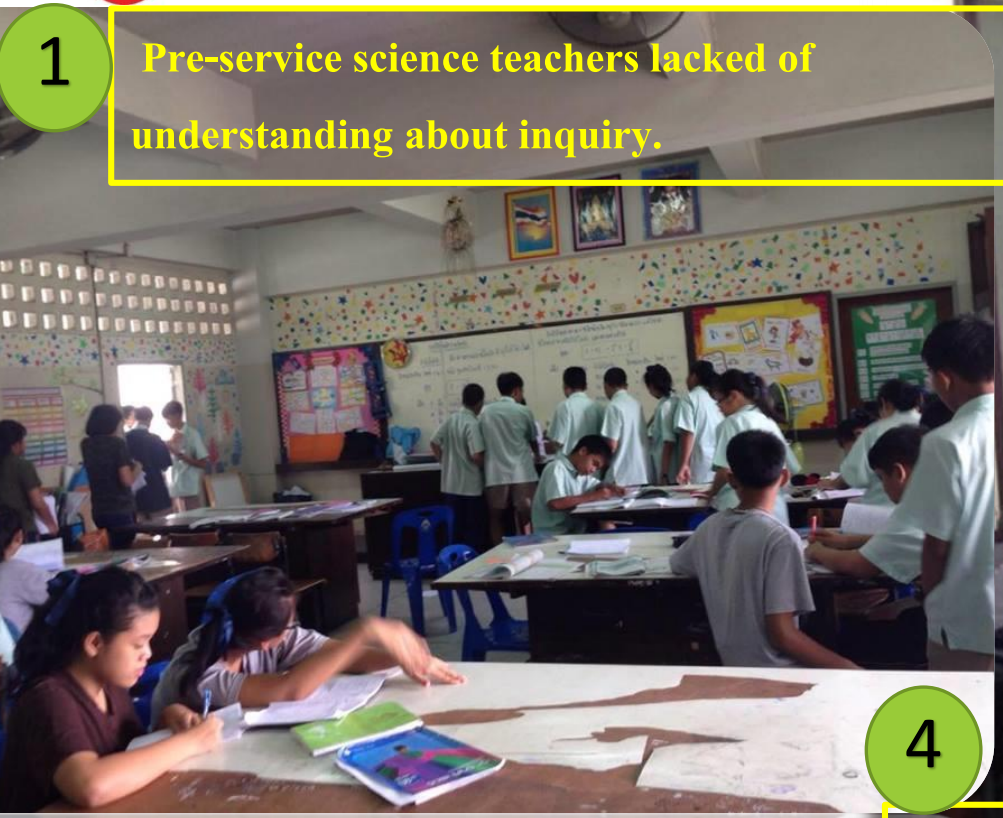
Background

In Thailand ,

Technology tools in science classroom …

Problems

1 Pre-service science teachers lacked of understanding about inquiry.



2 Pre-service science teachers are usually lecturer not a facilitator.

3 There were a few ICT tools in their classroom

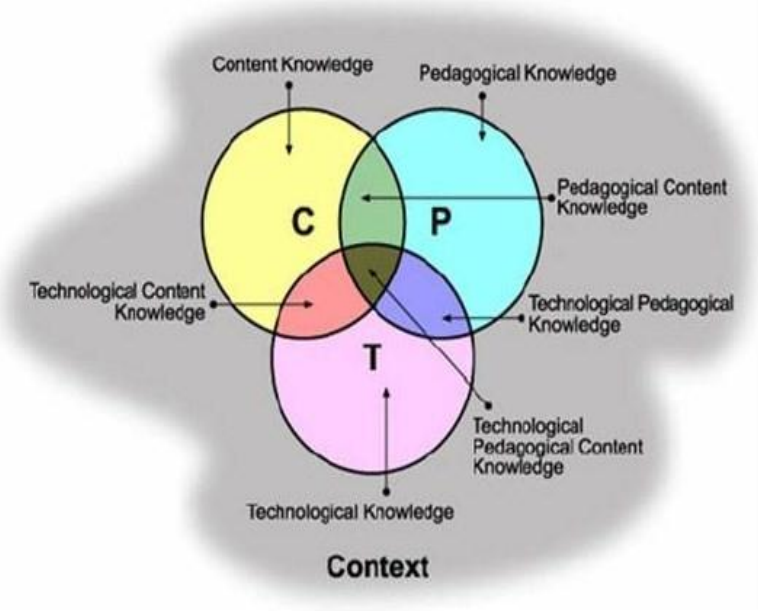
4 Pre-service science teachers viewed ICT as a tool for transmitting and displaying information to student.

5 Pre-service science teachers lacked of understanding about how to integrate ICT in their teaching and they had difficulties to access to ICT.

Therefore, pre-service science teachers should know how to integrate ICT in their classrooms.

In addition ,

They should understand the Technological, Pedagogical, and Content Knowledge or TPACK. This TPACK framework helps teachers to integrate ICT effectively for their instructional design (Koehler, & Mishra.2008 ; Kim ,& Freemyer. 2011).



Technological Pedagogical Content Knowledge (Koehler & Mishra 2008)

Developing a training model to enhance pre-service science teachers 'understanding of TPACK is important to them to have the experienc knowledge and skills in order to design their instructional teaching integrating with ICT in science classroom.

TPACK framework developed from Pedagogical Content knowledge(PCK) that was introduced by Shulman (1986) , described PCK as the most useful from of content represented thought difference analogies that makes it comprehensible for other.

In this paper PCK defined as the knowledge of pre-service science teachers.

This knowledge consists of knowledge about students , knowledge to identify learning objectives , knowledge about instructional strategies (Inquiry) , and knowledge about assessment.

TPACK defined as the knowledge of integration ICT with science teaching and learning through inquiry-learning activity focusing on difficult science-content topic for students.

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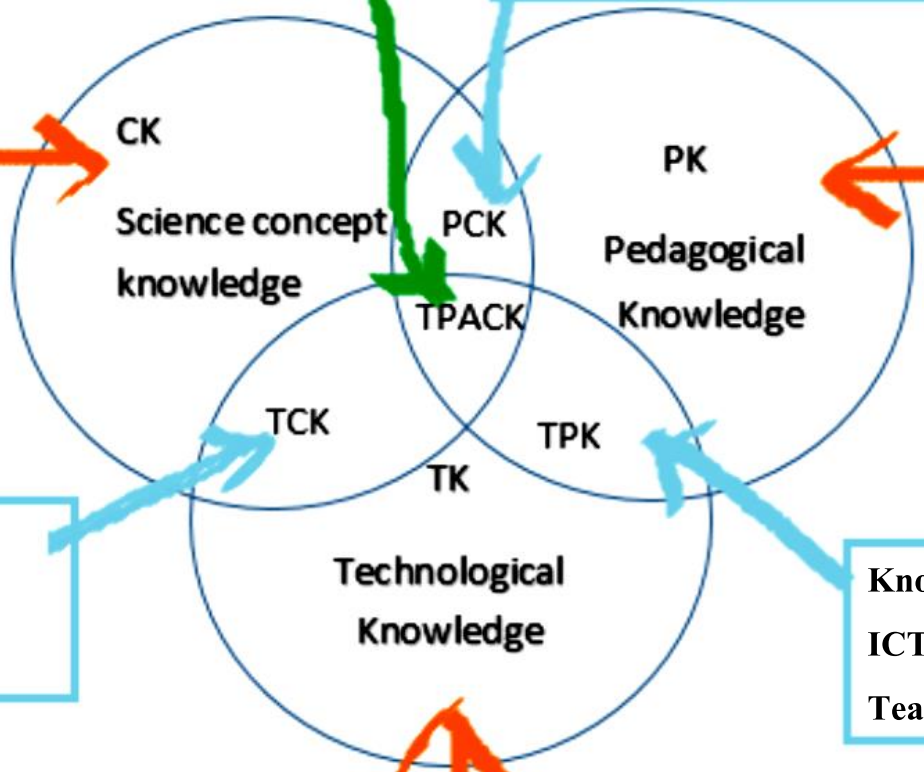
Knowledge in scientific concepts. By using criteria based on the nature of content-topics : Naturalistic concept , Law , and Theory



Knowledge about teaching : students learning , to determine learning objectives , instructional strategies focused inquiry, and assessment.

Knowledge of using the appropriate ICT-technology with science contents

Knowledge of using the appropriate ICT-technology with Teaching in classroom.

Simulation

Database

ICT tools to facilitate learning

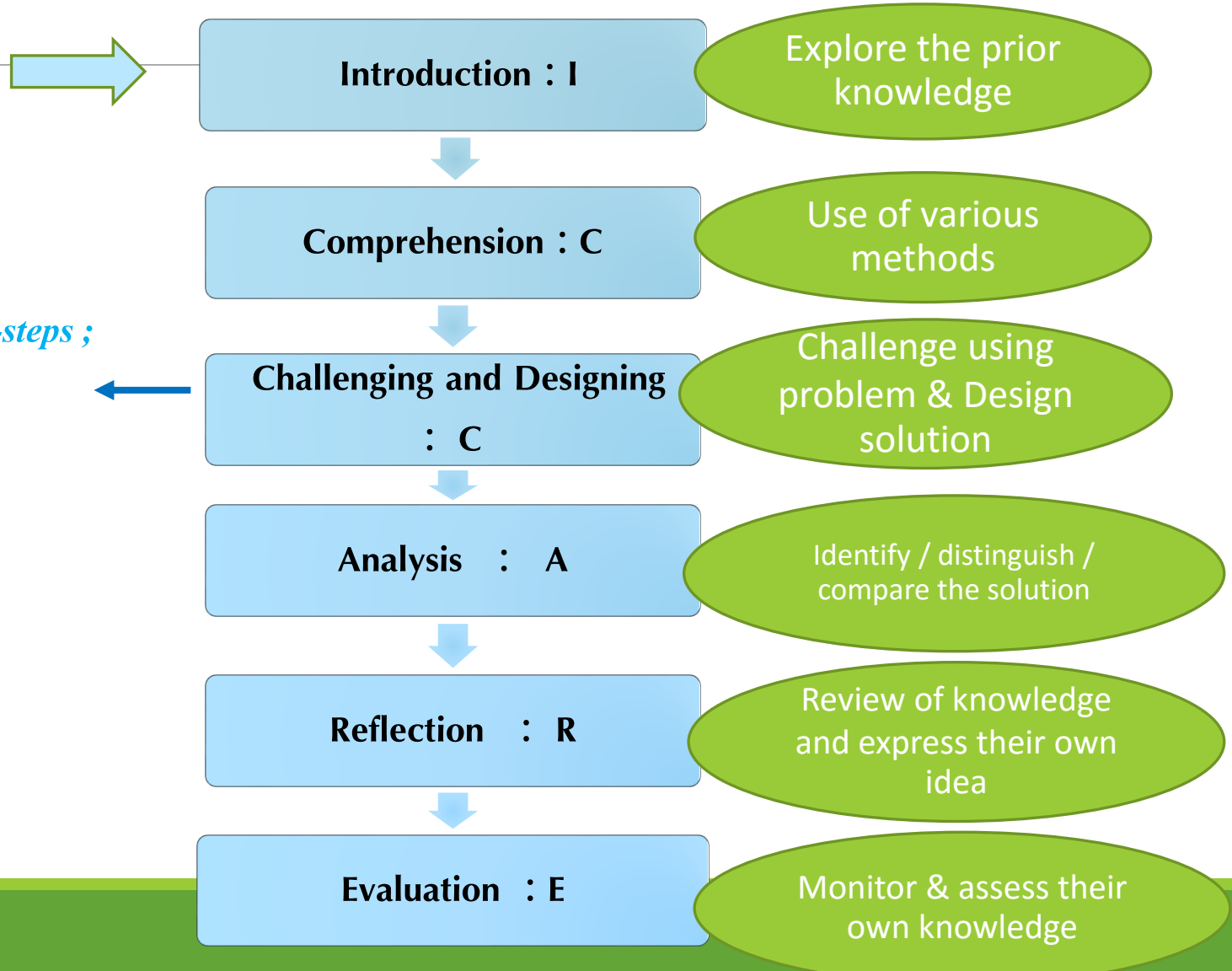
*ICT tools to support understand science concept

ICT tools to Search and Resource

I2CARE model for pre-service teachers to enhance TPACK

The development of I2CARE training model developed base on TPACK – Principles, Integration ICT for science classroom principles, constructivist, social-constructive, collaborative learning and design thinking.

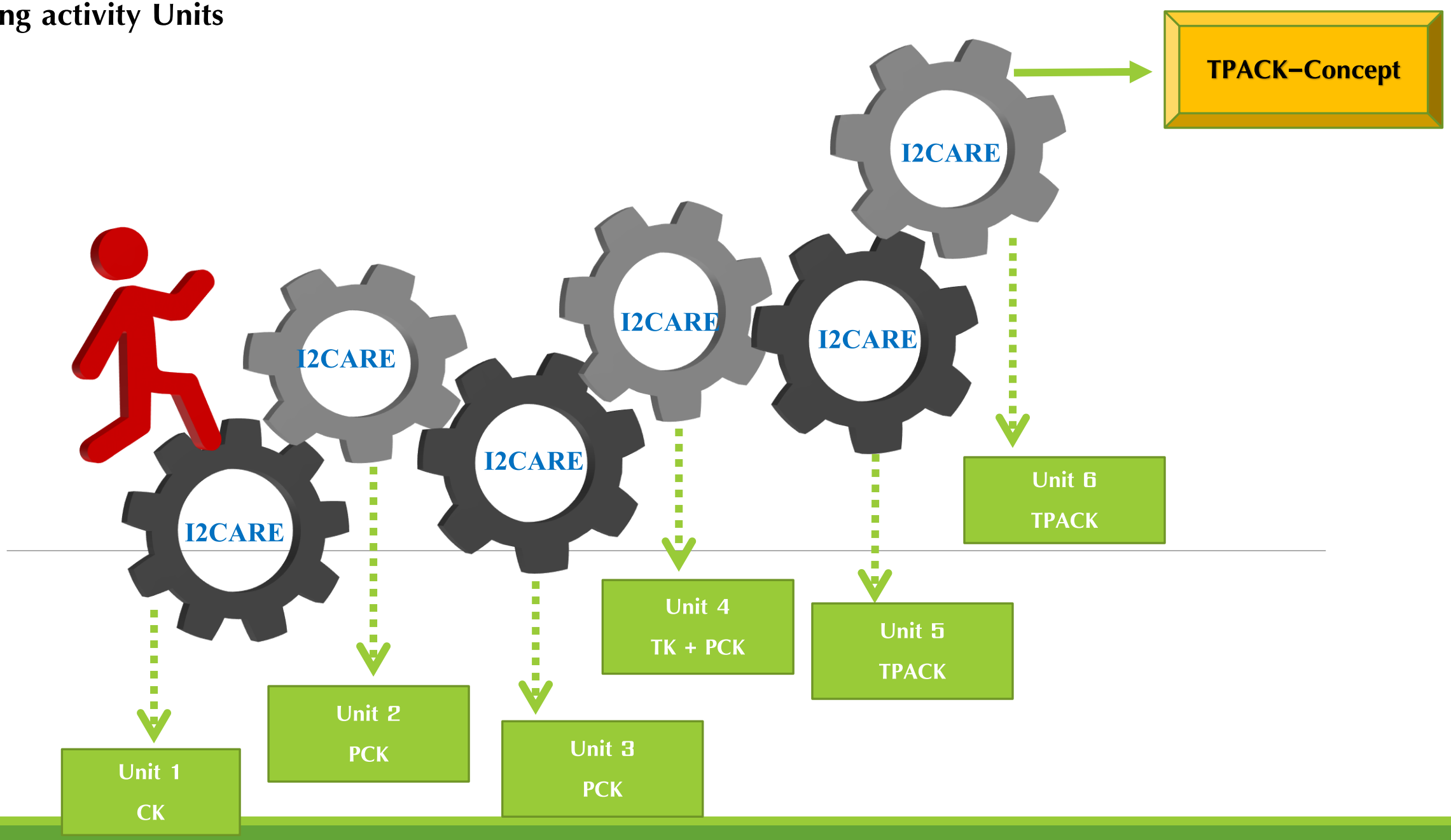
I2CARE model consisted of 6 steps :



Challenging and Designing (CD) consisted of 2 sub-steps ;

- *challenged by problem*
- *Designing refer to the design or solution*

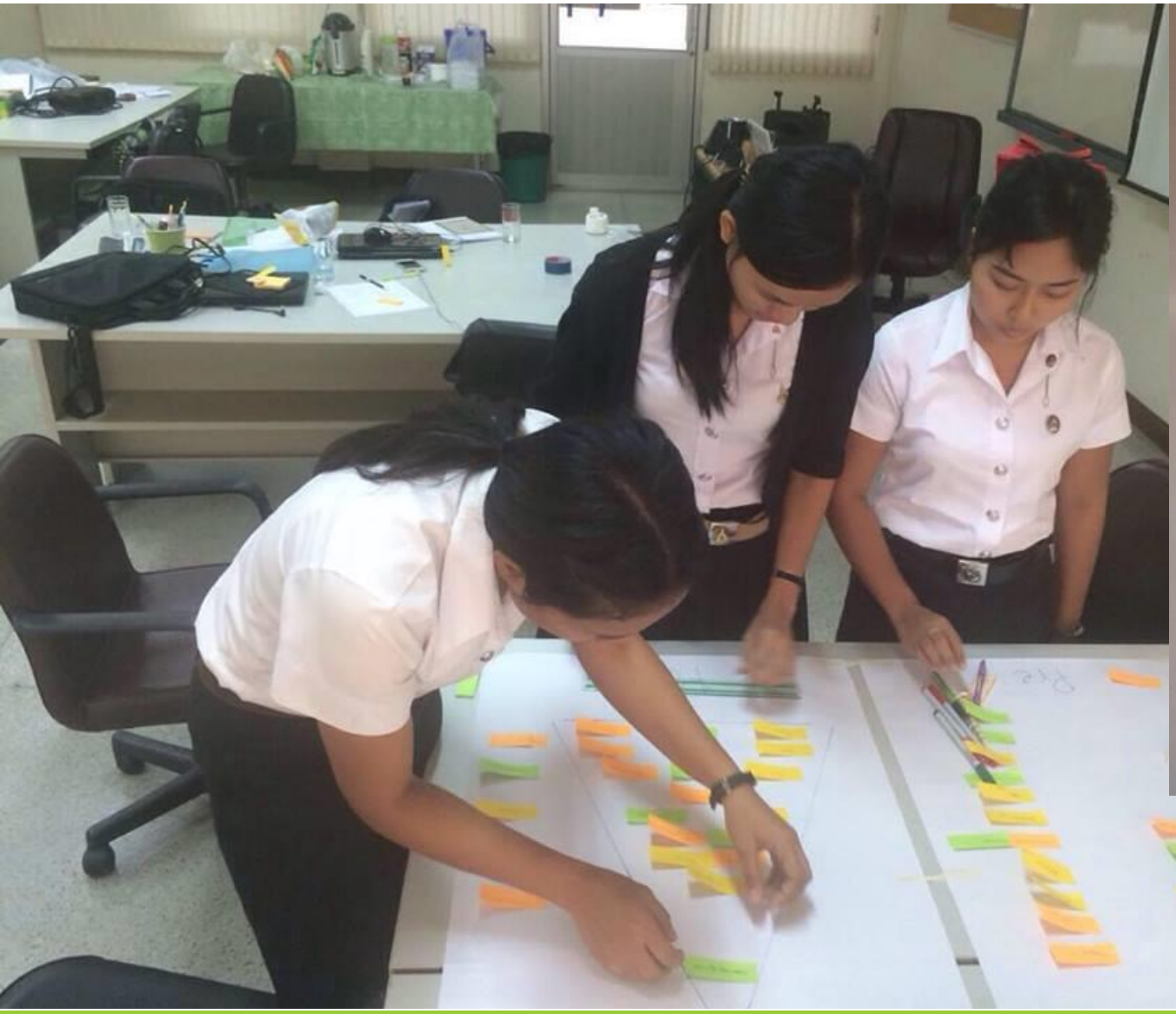
Training activity Units

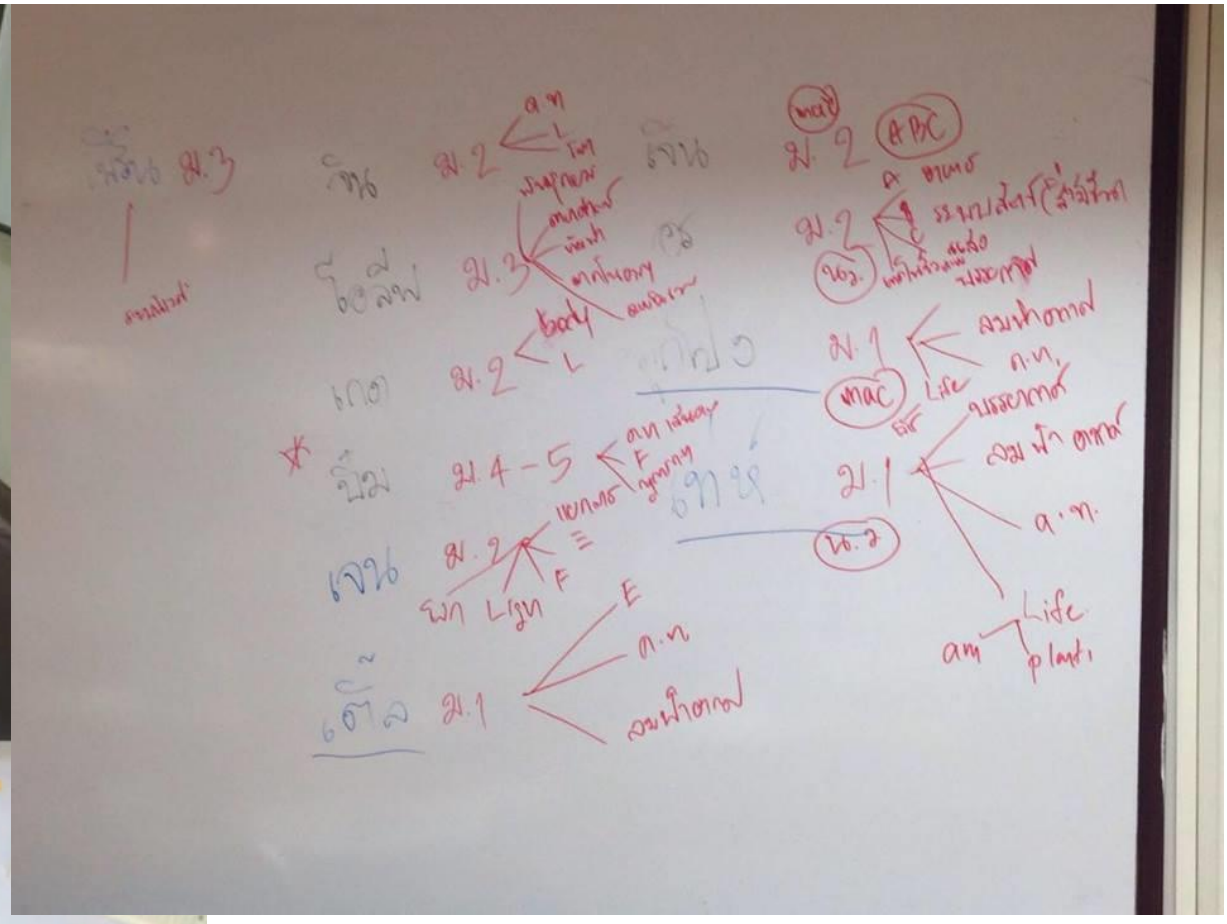


The training workshop program was a 32-hours program and driven by I2CARE model which consisted of 6 steps

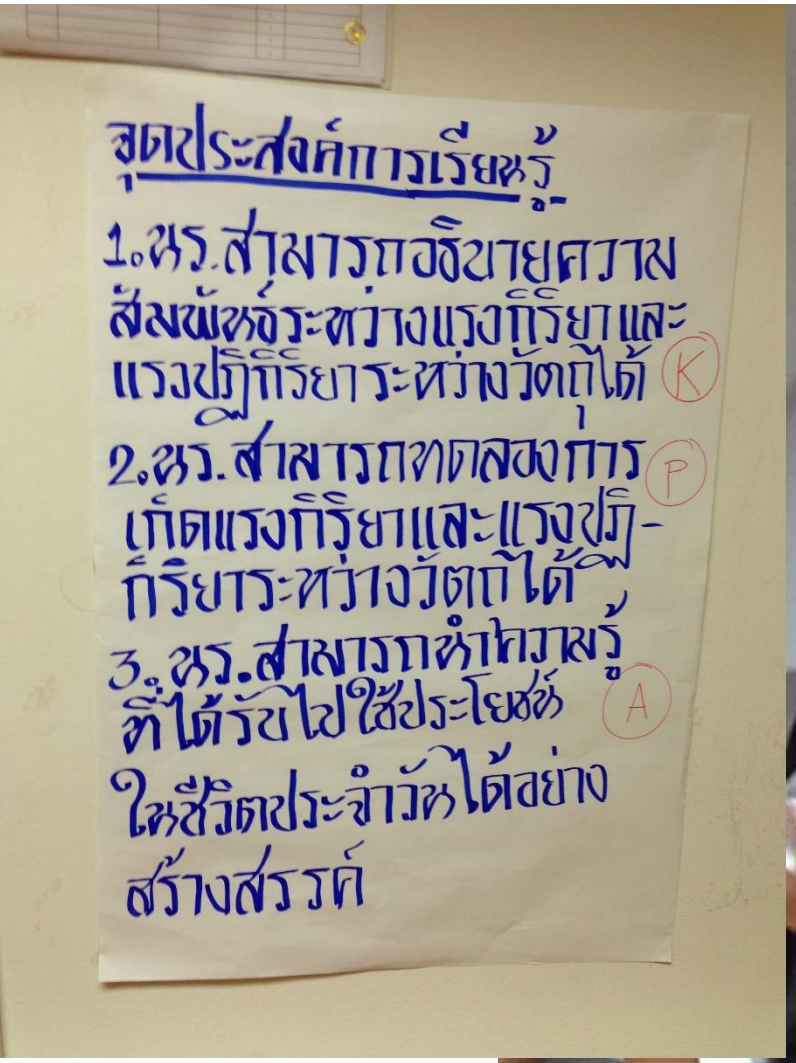
The overview of the training activities

The example of Training Activity



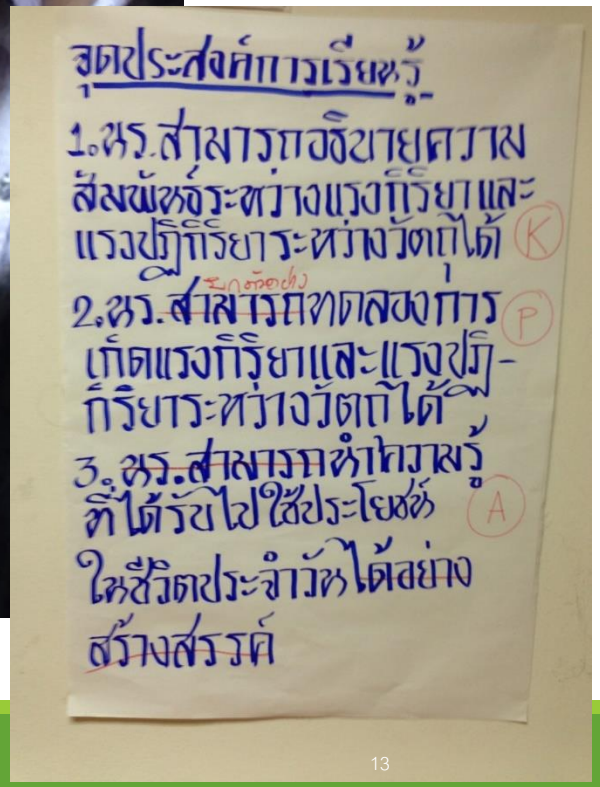


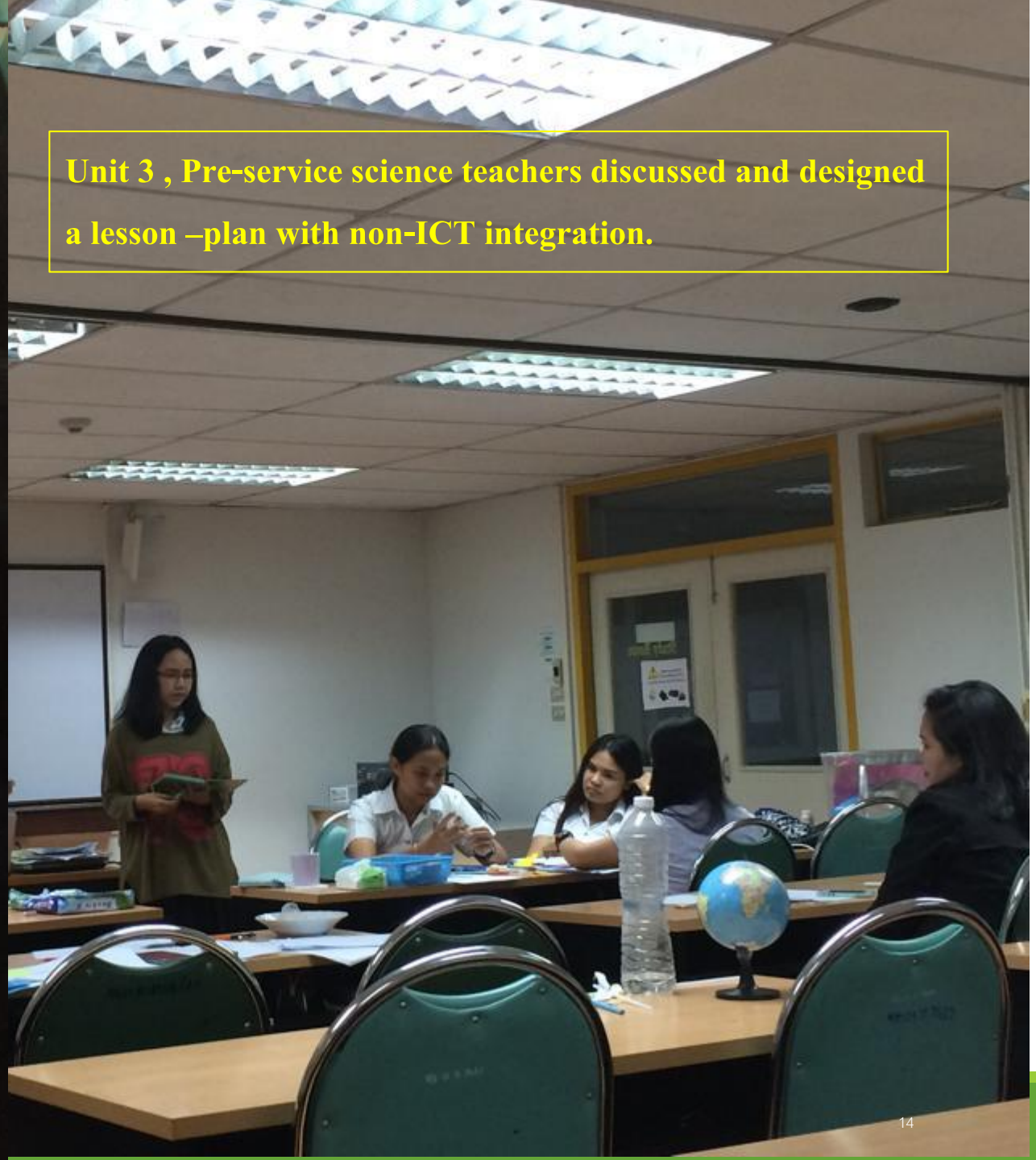
Pre-service science teachers analyzed science content knowledge characteristics in Unit 1.



Unit 2 :

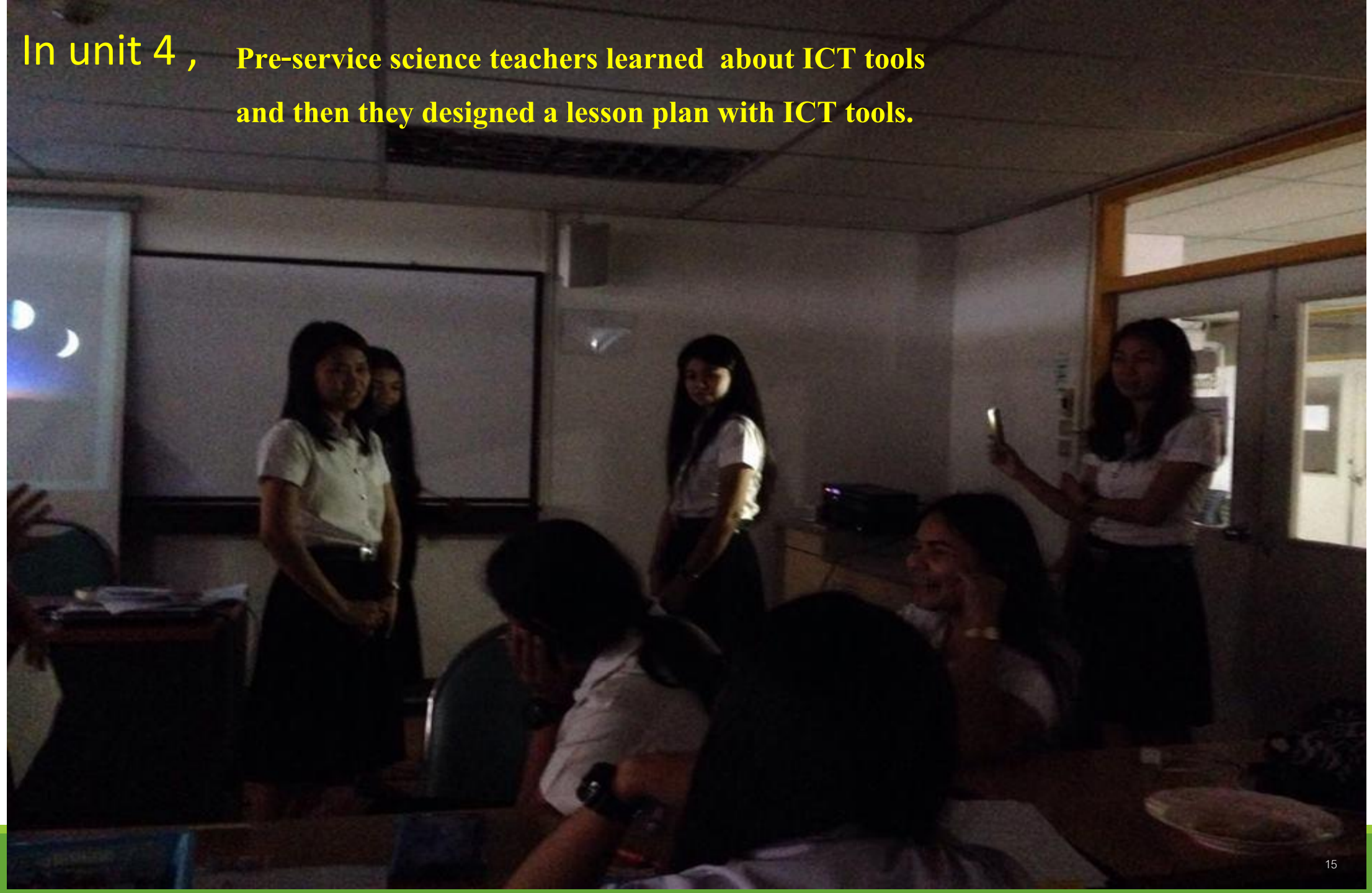
Pre-service science teachers discussed about wrote learning objective to design their teaching activities.





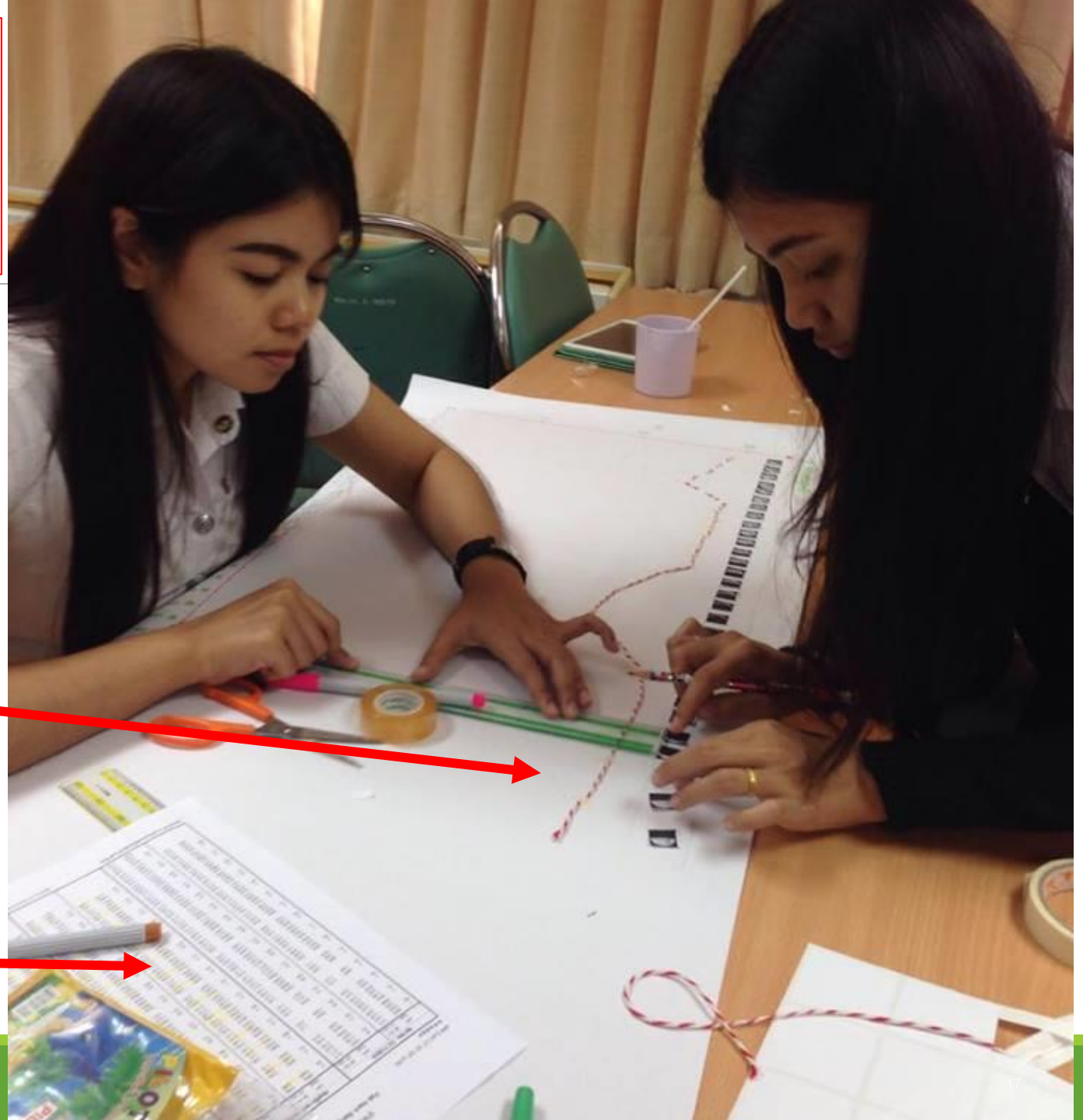
Unit 3 , Pre-service science teachers discussed and designed a lesson –plan with non-ICT integration.

In unit 4 , **Pre-service science teachers learned about ICT tools and then they designed a lesson plan with ICT tools.**



In Unit 5 , the pre-service science teachers were taught by instructor as an example of using TPACK concept to their teaching.

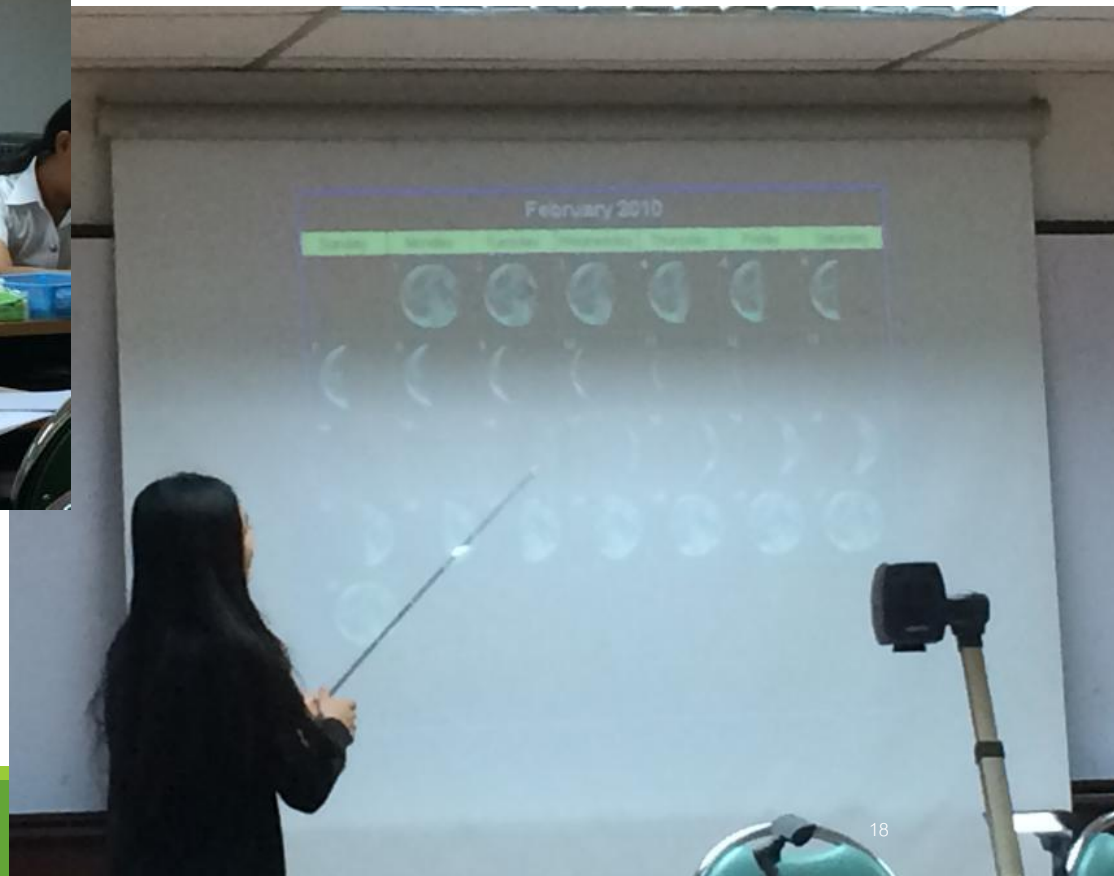
Integration ICT with science teaching and learning through inquiry-learning activity focusing on a difficult science-content topic for student.



Pre-service science teachers were using the moon image and rope lines to determine maximum and minimum water tide. Combining with the information from the website.

The database (TK) is used tide data from the Hydrographic Department.

Unit 6 , Pre-service science teachers designed learning activities and presented the activity.



Pre-service science teachers used the designed activity in their own classroom.

Pre-service science teacher set up situation for their students. This learning activity was proceed by students toward active learning. Teacher as facilitator who prepared air map and information about the movement of air in Thailand.

Participant

Participants were 10 pre-service science teachers in Year 5 of their study and they were on their teaching practice in field experience in secondary school level. They applied to participate in this research by themselves.

Results

The results showed that the percentages of all pre-serviceteachers' TPACK Understanding (post-test) increased in all components (PCK , TPK , TCK , and TPACK). (see Table 1)

Table 1: All components TPACK mean scores of pre-service teachers

N=10	PCK (36 full scores)		TCK (7 full scores)		TPK (7 full scores)		TPACK (20 full scores)	
	pretest	posttest	pretest	posttest	pretest	posttest	pretest	posttest
$\bar{x}$	16.93	22.47	2.86	4.53	4.23	5.03	10.93	13.96
S.D.	1.85	2.79	0.74	0.39	0.087	0.125	0.71	1.06
t	12.284*		8.987*		8.985*		10.019*	
p	.000		.000		.000		.000	

*p< .01

As the interview data tha show about TPACK understanding from pre-service teachers said that;

"I taught about weather forecasts. As I analysed the contents which were about air pressure and storm movements, they were quite difficult for students to understand. Consequently, I designed the lesson by making a situation that students were going to the beach. Then they heard the weather forecast that the storm was coming so they should make a plan whether to go to the beach or cancel the plan. I provided weather maps by using the information from the Meteorological Department of Thailand website. My student had to analyse and find answers by themselves. They could learn on their owns from the provided ICT media." (PS1) --- refer to TPACK

Table 2 :Differences of percentile all components TPACK

N=10	TPACK							
	PCK (36 full scores)		TCK (7 full scores)		TPK (7 full scores)		TPACK (20 fullscores)	
	pretest	posttest	pretest	posttest	pretest	posttest	pretest	posttest
$\bar{x}$	16.93	22.47	2.87	4.53	4.23	5.03	10.94	13.96
S.D.	1.85	2.79	0.74	0.39	0.087	0.125	0.71	1.06
%	47.03	62.42	41.00	64.71	60.43	71.86	54.70	69.8
D	15.39		23.71		11.43		14.80	

D = The difference of percentile scores between pretest-posttest

From the table 2 showed TCK (23.71) had the most of the difference of percentile mean scores between pretest-posttest , followed PCK (15.39) , TPACK (14.80) , and TPK. Moreover, the average scores of all pre-service teachers' TPACK understanding reached more than 60% in all components.

Conclusion

The pre-service science teachers' TPACK understanding increased. It may be caused by the I2CARE trainning model with 4 reasons in the following ;

1. All activities in training program were designed emphasizing on the familiar context of pre-service science teachers, so they can apply knowledge easily in their real classroom.

2. The training model let them to identify the similarities and differences situations and issue in classroom.

3. The training model gave the pre-service science teachers opportunity to design the lesson plan collaborately with their peers.

4. Teaching demonstration was useful to help the pre-service science teachers see how to TPACK integration look like in science classroom.

The I2CARE training model can be used to provide the initial experience and opportunity for pre-service teachers to understand how to integrate ICT into science teaching.

Acknowledge

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Thank you ^_^