The Impact upon Students' Behaviours and Attitudes of Integrating ICT into Learning under the TPACK Model

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Abstract

Despite the fact that ICT integration into education has been broadly introduced and used for years in Thailand, and numerous initiatives have been launched by the government and local education authorities, its use is still limited and studies conducted on ICT usage and its impact on education have been inadequate. (UNESCO-UIS, 2014).

This research aims to respond to the need for assessing the impact upon students' learning behaviours and attitudes of integrating ICT into learning under the TPACK model. The research sample comprised 385 students from five local schools who studied at the primary level during the 2014 academic year. These students were taught by ten pre-service teachers who were equipped with theories, guidelines, and hands-on activities to enable them to effectively design ICT-integrated lesson plans under the TPACK model.

The results showed that the teachers were able to effectively design ICT-integrated lesson plans under the TPACK model. The pre-service teachers mostly used the "learning from approach" and "learning with approach" ICT adoption models (Laohajaratsang, 2003). The findings showed that the average scores of the students' learning behaviours and attitudes after completing ICT-integrated activities were at a very good/highest level. Moreover, all teachers reported positive attitudes toward this innovative learning approach and realised the importance of using ICT in their teaching.

Introduction

Studies conducted on ICT usage and its impact on education have been inadequate, particularly in Thailand. The TPACK conceptual framework of Mishra & Koehler (2006) is not a brand new idea, but it is gaining popularity amongst Thai researchers and scholars as an approach to be cultivated in teachers in order to integrate content, pedagogy and technology into lesson plans effectively, systematically and creatively. Thus, this research project is designed to investigate the impact upon students' learning behaviours and attitudes of integrating ICT into learning under the TPACK model. The focus of this study was on how well ten pre-service teachers majored in primary education from Chiang Mai University, Thailand implemented their ICT-integrated lesson plans at local schools where they were assigned as teachers.

a) At what level will the pedagogical integration of ICT under the TPACK model of Chiang Mai University by pre-service teachers majoring in primary education have an impact on their students' learning behaviours?

b) At what level will the pedagogical integration of ICT under the TPACK model of Chiang Mai University by pre-service teachers majoring in primary education have an impact on their students' learning attitudes?

The sample comprised 385 students from five local schools who studied at the primary level during the 2014 academic year. The students comprising the sample group were taught by ten fifth-year pre-service teachers majoring in primary education who participated in the two-day workshop "Facilitating ICT-Pedagogy Integration Supporting Competency-Based Teacher Training Reforms in ICT-Based Learning" at the Information Technology Service Centre, Chiang Mai, University held on 21-22 August, 2014 and self-selected as the sample teachers for this study. The instruments were the ICT-integrated lesson plans, the student behaviour observation forms, the student attitude questionnaires, and the teacher interview forms. The approaches that the teachers adopted for ICT were also investigated.

The problem being addressed

In this research study, the TPACK model was incorporated as the framework for an ICT-integrated learning approach. The TPACK model was selected to provide the basis for successful ICT integration because of its proven instructional value. The ten pre-service teachers were introduced to the TPACK model and they were trained during the workshop to design lesson plans integrating the ICT into their teaching using the TPACK model. The TPACK model identifies three domains of knowledge that pre-service teachers need to be competent in before designing effective ICT-integrated lesson plans, including: Content Knowledge (CK), Pedagogical Knowledge (PK) and Technological Knowledge (TK).

After the workshop, the ten pre-service teachers who volunteered as the research teachers were asked to submit their ICT-integrated lesson plans under the TPACK framework. After receiving some feedback from the researcher, the pre-service teachers implemented their ICT-integrated lesson plans at local schools where they were assigned as teachers.

In addition to the TPACK model, this research also investigated approaches that the teachers used in adopting ICT in their teaching and learning. According to Thanomporn Laohajaratsang (2003), there are four major approaches to integrating ICT in a classroom setting. The two major approaches are the Learning From and Learning With approaches.

In the first approach, *Learning From ICT*, ICT is used as interactive instructional materials and activities to enrich the learning process. Learners learn from computer-assisted instruction or via online education resources/homepages/websites.

Secondly, *Learning With ICT*, ICT is integrated to support meaningful learning. Learners are empowered to learn more effectively. The pre-service teachers' ICT-integrated lesson plans were analysed to examine the relationship between ICT-adoption approaches and their impact on students' learning behaviours and learning attitudes.

By investigating the impacts of integrating ICT into learning under the TPACK model and ICT adoption approaches, the researcher expected to obtain some good-practice guidelines for effectively integrating ICT into learning and see exemplary ICT-integrated lesson plans demonstrating various approaches for integrating ICT into teaching and learning.

Study Design/Approach

The research question of this research study was: at what level will the pedagogical integration of ICT under the TPACK model of Chiang Mai University by pre-service teachers majoring in primary education have an impact on their students' learning behaviours and students' learning attitudes?

Data were collected by research instruments including the ICT-integrated lesson plans, the student behaviour observation forms, the student attitude questionnaires, and the teacher interview forms. In-depth analysis of the collected data was conducted. Then, the researcher interpreted the data according to the standard criteria with the conceptual and theoretical framework related to the TPACK framework.

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Table 1: Some examples of ICT-integrated lesson plans demonstrating various approaches for integrating ICT into teaching and learning

No.	lesson plans	Content	Pedagogy		Technology	Sample Picture of ICT Use
			Activity Type	Instructional Strategy		
1.	Life Cycle of Insects (science, grade 5)	Developmental life of insects	Explore Content, Draw Concept Map, Discussion	Inquiry-Based Learning, Mind Mapping, Brainstorming	-Learning Object titled "Life Cycle of Insects." (non-UNESCO resources), -Dia to create diagrams on life Cycle of insects (UNESCO multimedia resources)	 Learning Object titled "Life Cycle of Insects." (non-UNESCO resources),  Dia to create diagrams on life Cycle of insects (UNESCO multimedia resources)
2.	External parts of my body (science, grade 1)	External parts of my body involves eyes, ears, mouth, hands, fingers, legs and feet	View Presentation, Draw, Sing & Dance, Discussion	Blended Learning, Collaborative Learning, Brainstorming	-PowerPoint (teacher-made) to introduce the concept to the students -Prezi (teacher-made) titled "External parts of my body" - YouTube song called "My Body" (non-UNESCO resources)	 PowerPoint (teacher-made) to introduce the concept to the students  Prezi (teacher-made) titled
9.	Types of Soil (science, grade 2)	Types of soil consists of Clay Soil, Sandy Soil and Combination Soil	View Cartoon Animation, Play a Game, Do Drills and Practice, Discussion	Blended Learning, Collaborative Learning, Practice by Doing, Brainstorming	-Powtoon titled "Type of Soils" (teacher made)	 Powtoon titled "Type of Soils" (teacher made)
10.	Summary writing from Listening to and Watching Stories (Thai, grade 4)	Capturing and summarizing important points from listening to and watching stories	Answer Questions, View Presentation, Do Drills and Practice, Draw, Discussion	Blended Learning, Collaborative Learning, Practice by Doing, Brainstorming	-Prezi titled "Summary writing from Listening and Watching Stories" (teacher-made) -Multimedia Interactive e-Book titled "Pla Boo Thong" (non-UNESCO resources)	 Prezi titled "Summary writing from Listening and Watching Stories" (teacher-made)  Multimedia Interactive e-Book titled "Pla Boo Thong" (non-UNESCO resources)

Table 2: Some examples of selected technologies and ICT adoption approaches

No.	lesson plans	Technology	Roles of Technology	
			Learning From	Learning With
1.	Life Cycle of Insects (science, grade 5)	Learning Object (non-UNESCO resources)		✓
		Dia (UNESCO multimedia resources)		✓
2.	External parts of my body (science, grade 1)	PowerPoint (teacher-made)	✓	
		Prezi (teacher-made)	✓	
		YouTube (non-UNESCO resources)		✓
9.	Types of Soil (Science, grade 2)	Powtoon (teacher-made)	✓	
10.	Summary writing from Listening to and Watching Stories (Thai, grade 4)	Prezi (teacher-made)	✓	
		Multimedia Interactive e-Book (non-UNESCO resources)	✓	

Results

Based on analysis of the ten ICT-integrated plans, observation of classes where teachers implemented ICT-integrated plans and investigation of ICT adoption approaches selected by teachers in the sample, it was found that all of the lessons plans used both Learning With and Learning From ICT adoption approach models, except for Lesson 9 and 10 which both used only the Learning From ICT adoption approach model. The researcher observed the learning behaviors of three hundred and eighty five primary students while ten ICT-integrated lesson plans designed under the TPACK model were being implemented. The students were from 5 local schools in Chiang Mai -- namely Ban Mae Hea Samakkee school, Chiang Mai Christian school, Wat Khachao school, Regina Coeli College and Puttisopon school – and they were observed during the first semester of the 2014 academic year. After observation, the students' learning behaviors were converted to scores and categorized as follows:

1.00-1.49 Students' learning behaviors need improvement

1.50-2.49 Students' learning behaviors were at a mediocre level

2.50-3.49 Students' learning behaviors were at a good level

3.50-4.00 Students' learning behaviors were at a very good level

The results of students' learning behaviors for ICT-integrated lesson plans which adopted Learning With and Learning From ICT adoption approach models (Number 1 to Number 8), the students' learning behaviors were at a very good level with average scores ranging from 3.50 to 3.92. Meanwhile, the results of students' learning behaviors for ICT-integrated lessons which adopted Learning From ICT adoption approach model were at a good level with average scores of 2.81 and 2.51.

In addition, it was found that the results of the students' attitudes toward ICT-learning activities from lesson plans (Number 1 to Number 8) which *Learning With* and *Learning From* ICT adoption approaches showed that the students' attitudes towards ICT-integrated learning activities were at the highest level ranging from 3.50 to 3.87 and students' attitudes towards knowledge and experience gained after learning with average scores ranging from 3.51 to 3.79. Meanwhile, the results of students' attitudes toward ICT-learning activities from lesson plans which adopted Learning From ICT adoption approach model (Lesson Plans 9 and 10) were at the high level with average scores for both students' attitude towards ICT-integrated learning activities (3.49 and 3.39); and students' attitudes towards towards knowledge and experience gained after learning (3.48 and 3.27).

Teachers' Impact upon Managing Instruction Using ICT

Based on interviews with the 10 pre-service teachers who were the subjects in this research study, the instructors reported that they integrated ICT to aid their instruction and to manage ICT-activities in the classrooms such as English quiz contests, games, sing-along activities etc. In addition, they allowed the students to use ICT to produce work such as charts, flowcharts, mind maps and pictures. All of these ICT-related activities enabled teachers to lecture less and engage students more. Also, these activities created more interaction in the classroom. In addition, students changed their learning behaviors in that they were more active and attentive to the class assignments, especially students who were previously passive or who disliked learning. The ICT-integrated activities created an environment in which they were more attentive to the class activities and motivated to learn.

In addition, ICT-integrated instruction made learning more effective. This is mainly because ICT was utilized to present information in multimedia formats (i.e. text, still pictures, moving pictures, graphics, video and sound) which helped make the content more concrete. Therefore, students were more engaged with their learning and were able to achieve the learning objectives accordingly. Managing instruction using ICT also helped the teachers to create a wide variety of learning activities, increase interaction, and create a learning environment conducive to learning. Students had fun learning, and enjoyed their classes.

Challenges

The challenges uncovered while managing ICT-integrated activities were mostly ICT infrastructure problems such as insufficient number of computers in the schools, and slow speed of internet connection. Furthermore, another problem was connected to that the online presentation program, *Prezi*, which the teachers liked to use for presentations; that is, when many students logged-on at the same time, the program became sluggish in processing. However, the teachers helped solve this problem by asking students to download the program onto the Personal Computer (PC) and used it off-line. Lastly, it was found that while students worked on their ICT-integrated activities, there were always some students who connected to the internet and played games or used Facebook. The instructor solved this problem by making sure that all the students understood the class rules and conditions of ICT usage in the classrooms.

Summary of the Findings

- The results showed that the ten volunteer pre-service teachers were able to effectively design ICT-integrated lesson plans under the TPACK model. Based on the data analysis of UNESCO's feedback form, it was found that all the ten pre-service teachers expressed that the UNESCO multimedia resources were powerful and useful tools for learning.
- It was found that the pre-service teachers mostly used the "learning from approach" and "learning with approach" models. For ICT-integrated lesson plans which used the "learning from approach" and "learning with approach" models, it was found that the average scores of the students' learning behaviours after completing ICT-integrated activities were at a very good level. Meanwhile, the average scores of the students' attitude after completing ICT-integrated activities were at the highest level.

- However, for ICT-integrated lesson plans which used only the "learning from approach" model, it was reported that the average scores of the students' learning behaviours during ICT-integrated activities were only at a good level. In addition, the average scores of the students' attitude after completing ICT-integrated activities were only at the high level.
- Moreover, all teachers reported that they had positive attitudes toward this innovative learning approach and realised the importance of using ICT in their teaching. The main reason was that this new learning approach attracted their students' attention, elicited the students' interaction, engaged the students more in their learning and, in sum, made their students more active.

Discussion and conclusion

This research study proved that the TPACK, used by UNESCO for developing multimedia integration, is the right model for developing ICT-integrated lesson plans/learning activities. Equipping educators with the TPACK model when designing ICT-integrated lesson plans will result in successful ICT integration.

Integrating ICT into teaching and learning under the TPACK model had positive impacts upon students' learning behaviours and attitudes. Schools should systematically adopt the ICT-integrated learning approach developed using the TPACK framework. This means that teachers must be equipped with three different knowledge domains including technological knowledge, pedagogical knowledge and content knowledge when integrating ICT in their teaching. Most importantly, they must understand how ICT can support and enhance learning in a way that combines technology with pedagogy and content in an effective manner.

Teachers should not limit their ICT adoption by using only a *Learning From* approach model. Instead, they should design ICT-integrated activities in a way that most supports meaningful learning and requires students' engagement and interaction. This is best accomplished by including the *Learning With* ICT adoption approach into the ICT-integrated activities and lesson plans.

ICT-integrated learning requires a certain amount of preparation work be done with students. In other words, students must be equipped with basic knowledge related to ICT-integrated activities such as basic computer literacy and knowledge/skills on how to use certain programs or other learning tools prior to the introduction of ICT-integrated learning.

With regard to integrating ICT into teaching and learning effectively, teachers must also equip themselves with the skills needed, ranging from basic knowledge/skills on computer literacy to selected multimedia resources, such as the UNESCO multimedia resources/non-UNESCO resources used in this research study.

Lastly, ICT infrastructure is very important to successful integration of ICT with teaching and learning. Schools must be able to provide a certain level of ICT infrastructure. This includes the provision of a high speed internet connection as well as suitable hardware, software, multimedia learning resources and/or related devices and accessories, such as high performance PCs, sound cards, headphones, microphones and so on.

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Bio-data

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