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Using a Blended Mobile Learning Model for Learning on Tablets through Local Science Learning Stations in SaKaeo Province, Thailand

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Abstract. With the cooperation between the Science Education Center, Srinakharinwirot University (SWU), Thailand, and the Graduate Institute of Digital Learning and Education, National Taiwan University of Science and Technology (NTUST), Taiwan, this academic service project about using a Blended Mobile Learning model for learning on tablets was provided to science and technology teachers in Sa Kaeo, a border province in the east of Thailand. This project was developed through the integration of scientific concepts and local wisdom using science learning stations at the College of Bodhi Vijjalaya, SWU, Sa Kaeo campus, composed of five learning stations; 1) Adobe clay house, 2) Charcoal, 3) Bio-extraction, 4) Alternative energy and 5) Community forest. This project was conducted as a research. The one-group pretest-posttest design was applied. The project was divided into two phases; 1) the development of online science learning resource integrated with the local wisdom and research tools and 2) the project implementation. The participants were 38 science and technology teachers (male = 20, female = 18) in primary and secondary school levels. Data were analyzed statistically using frequency, mean, standard deviation, and nonparametric Wilcoxon matched-pairs signed rank test. The results revealed that teachers' conceptual understanding of three aspects; 1) how to use tablets as a tool of learning, 2) scientific concepts of learning stations and 3) the mobile learning model and approaches, were all significantly increased ($p<.05$). Moreover, the teachers were satisfied with the project and some of them were applied the knowledge from the project to their teaching.

Keywords: blended mobile learning, local science learning stations, learning on tablets

Introduction

The development of science and technology is one index presenting the progress of a country. A wide variety of the electronic devices, equipment and information technology which, nowadays, are continually created through the process of creativity also have greatly influenced people's lives. In the modern era, if we look around, we will be familiar with people whose lifestyle use electronic devices such as tablets and smart mobile phone all over every place we visit. These devices can be used efficiently in various dimensions including the educational dimension. Applying electronic devices to the learning process and educational activities can contribute to the quality of education and also reduce inequality in education as well. Learning activities that rely on digital systems not only promote learning in the form of mobile learning but also make learning close to the real life of learners (Shih et al., 2010; Sung et al., 2016; Basak et al., 2018). It seems that technology can make differences in the classroom in dynamic and positive ways. Additionally, technology can also unravel the problem about teaching with lecturing strategy (Benlloch-Dualde et al., 2010; Arifin & Sukmawidjaya, 2020; Sprenger & Schwaninger, 2021). The key to success in integrating technology into the teaching and learning processes or classroom is related to the method of integration. The integration between teaching and technology should be homogeneous and meet the needs of learners (Adams & Hayes, 2009; Hartman et al., 2019)

In Thailand, between 2012 and 2014, the government recognized the importance of using technology in education. The Thai government, during that time, identified an urgent policy item 1.15 in education involved with providing "Tablet PCs" to the schools across the country under the One Tablet Per Child project (OTPC project) (One Tablet Per Child project, 2012).This was consistent with the second strategy of the Eleventh National Economic and Social Development Plan (2012-2016) which focuses on "human development toward a sustainable lifelong learning society" and also the first stratefy of the Twelfth National Economic and Social Development Plan (2017-2021) which focuses on "strengthening and realizing the potential of human capital". Preparing electronic learning media that can be used via electronic devices for all groups of people to be able to easily and conveniently access anywhere and anytime is one of the development guidelines (Office of the National Economic and Social Development Board, 2011 & 2016). In addition, in the process of developing the country, Thailand needs to emphasize improving the quality of education in order to be recognized at the international level, meet the needs of the country and also create the opportunity for entering to the good quality of education system rightfully. Online learning resources are a way to create opportunities for not only educational personnel, teachers or students but also available for people in general to access information easily, quickly and universally which can promote learning anywhere and anytime.

Srinakharinwirot University (SWU), Thailand, has an area-based academic service in Sa Kaeo province. On behalf of the Science Education Center, SWU, in cooperation with the College of Bodhi Vijjalaya, SWU, Sa Kaeo campus, we have developed five science learning stations. These integrated scientific concepts and local wisdom, and consisted of; 1) adobe clay house, 2) charcoal, 3) bio-extraction, 4) alternative energy and 5) community forest. These science learning stations are served as an important learning resource in Sa Kaeo. The project has received positive feedback from teachers, students, local scholars, people in the community and others involved as well.

However, expanding this knowledge from on-site learning to pervasive learning through an online learning resource needs to be considered. This way of learning is useful to disseminate information, to promote both in-class and out of the classroom learning to encourage ubiquitous learning and to engage students and others who are

interested in this way of learning. Moreover, it also motivates learners to learn and keep up with technology. Learning this way helps to reduce the inequality in education and to preserve local wisdom and knowledge of the community. In the process of learning, students will have opportunities to gain in-depth knowledge, and to observe things that their teacher mentioned in the classroom. Students will be able to apply the knowledge they have gained to real life and become aware of the value of local knowledge. Moreover, this way of learning is not only useful for them individually but will also help students to discuss and exchange their ideas with peers as well (Shih et al., 2010; Iyamuremye et al., 2022). Considering science learning stations integrated to local wisdom in Sa Kaeo province, it clearly seems to be a good and important starting point for encouraging teachers, students and community members to understand science in a familiar context. Besides, these science learning stations will encourage people in the community to appreciate and take pride in their own wisdom, which leads to sustainable learning.

With cooperation between the Science Education Center, SWU, and the Graduate Institute of Digital Learning and Education, National Taiwan University of Science and Technology (NTUST), Taiwan, which both specialize in science education, ubiquitous learning and blended mobile learning, this project was interested in providing academic service in order to develop online science learning resource integrated with the local wisdom of Sa Kaeo province. This project aims to promote teachers' understandings of concepts of using tablets as tools of learning, scientific concepts of learning stations and the mobile learning model and approaches. This academic service was implemented in the form of a two-day workshop. The main staff of the workshop was composed of first year doctoral students and faculty staffs from the Science Education Center, SWU, along with doctoral students and expert from NTUST. Additionally, regarding the project, SWU doctoral students applied their knowledge from the course related to developing innovative science learning.

Blended mobile learning

As a result of the advancement of technology and the internet system, digital learning has changed from the classic model of learning such as computer-assisted learning to web-based learning, mobile learning and ubiquitous learning (Hwang & Tsai, 2011; Basak et al., 2018; Iyamuremye et al., 2022). "Mobile Learning" or "M-learning" was created in order to provide opportunities for people in general for easy access to educational resources. Mobile learning can be used in both formal and informal learning (Shuler et al., 2013; Basak et al., 2018; Matzavela & Alepis, 2021). However, it is necessary to link formal and informal learning, such as learning in museums, to focus specifically on content and skills that correspond to school curricula as well (Cahill et al., 2011).Tatar, Roschelle, Vahey,& Penuel (2003) pointed out the benefits of learning in the form of mobile learning through electronic devices. Mobile learning is able to help students to construct their own knowledge while doing activities. Mobile learning is also able to encourage students to share information with classmates. Moreover, mobile devices are portable and help give students access to data and information instantly. This way of learning can enhance students' interpersonal communication and motivation to learn as well (Huang et al., 2008; Hwang et al., 2009; Galligan et al., 2010; Goodwin, 2012; Matzavela & Alepis, 2021). In other words, the use of mobile and wireless communication technologies can help unite the world of learning, especially the natural sciences, to the digital learning resources, effectively (Chu et al., 2010; Crompton et al., 2016).

The United Nations Educational, Scientific and Cultural Organization (UNESCO) has proposed three focus points of M-learning, which are; 1) *distance education,* such as learning in museums or other resources,2) *authentic learning,* which encourages students to investigate and explore the complex problems through working with peers under the guidance of the experts and teachers and 3) *assessment method*, which has to emphasized self- assessment, evaluation and reflection (Shuler et al., 2013).

Much related research has been involved with different mobile learning models. A blended mobile learning model is one learning model which is outstanding in the way it links in-class and outdoor learning. The blended mobile learning model is mainly composed of three components, which are traditional instruction, indoor mobile learning, and outdoor mobile learning. Learning via this model, each student is required to use a smart mobile phone or tablet and learn in the environment using wireless communication. Students should be able to access the internet anywhere and anytime. Using the blended mobile learning model in both in-class and outdoor learning will help students to connect what they have learned from the classroom to online learning resources and learning through actual situations outside the classroom. This way of learning allows students to learn in a meaningful way (Hwang, 2014). Corresponding to the study of Shih et al. (2010), the research found that teaching with this model not only helps students to realize the relationship of learning with real contexts but also helps students to construct concepts links between real situations and textbooks. Besides, it is a tool that helps students to reflect and record their own learning processes with meaningful learning experiences (Vavoula & Sharples, 2002; Wong & Looi, 2011). Students become active learners and more interactive in learning (Huang et al., 2008) which not only enhances learning but also improves students' learning potential as well (Chanet al., 2006; Crompton et al., 2016).

Research objectives

1. To develop online science learning resource integrated with the local wisdom of Sa Kaeo province.
2. To investigate the results from using online science learning resource integrated with the local wisdom of Sa Kaeo province as follows;

2.1 Participants' understandings toward concepts of using tablet as a tool of learning, scientific concept of learning stations and mobile learning model and approaches.

2.2 Participants' satisfactions toward online science learning resource and the project

Participants

The participants in this study were 38 science and technology teachers who taught in primary and lower secondary levels from 4 schools in Watthana Nakhondistrict, Sa Kaeo province, Thailand.

Methodology

This project was conducted and concurrently merged to the research. The one-group pretest-posttest design was applied. The project was divided into two phases; 1) the development of online science learning resource integrated with the local wisdom and research tools and 2) the project implementation.

Phase 1: The development of online science learning resource integrated with the local wisdom and research tools

1. Researchers set a meeting with working staff, SWU doctoral students, faculty staffs from of Science Education Center, SWU, along with doctoral students and expert from NTUST, and planned to develop online science learning resource

integrated with the local wisdom based on five science learning stations including 1) adobe clay house, 2) charcoal, 3) bio-extraction, 4) alternative energy and 5) community forest at College of Bodhi Vijjalaya, SWU, in Sa Kaeo campus.

2. The working staff and expert went to Sa Kaeo province to explore the area of learning stations and talked collaboratively with teachers in the area about the academic service project.
3. SWU doctoral students designed website, learning materials, worksheets and knowledge documents preparing for the development of online science learning resource through the advisement of SWU instructors and the expert from NTUST.
4. According to the documents from 3, working staffs developed online science learning resource integrated with the local wisdom in the form of website.
5. The research tools were developed including workshop concept test, satisfaction toward project questionnaire and follow-up questionnaire.
   5.1 The workshop concept test composed of 15 multiple-choice items in these three following concepts.
      - Concept of using tablets as a tool of learning (5 items)
      - Scientific concept of 5 learning stations (5 items)
      - Concept of blended mobile learning model and approaches (5 items)
   5.2 The satisfaction toward project questionnaire composed of 14 Likert scale items asking about the participants' level of satisfaction toward the project location, duration, services, speakers and activities.
   5.3 The follow-up questionnaire composed of 3 questions as follows.
      - Question 1: Have you applied the knowledge about "using tablets as a tool of learning in iOS and Android systems" in your teaching? And why? Please explain your results or reasons.
      - Question 2: Have you applied the knowledge about "scientific concept of learning stations" in your teaching? And why? Please explain your results or reasons
      - Question 3: Have you applied the knowledge about "blended mobile learning model and approaches" in your teaching? And why? Please explain your results or reasons.
6. The expert checked the quality of the website and research tools. Then, working staffs improved the website and research tools based on expert's suggestions and recommendations.
7. The working staff tried out the website and online learning materials with a small group of students.
8. The working staffs improved the website again after trying out.

Phase 2: The project implementation

1. This academic service was implemented in the form of a two-day workshop with 38 science and technology teachers who taught in primary and lower secondary levels from 4 schools in Watthana Nakhondistrict, Sa Kaeo province.
2. The content used in the workshop composed of;
   2.1 Introducing the concept of using tablets as a tool of learning
   2.2 Introducing the 5 learning stations applying the concept of blended mobile learning model and approaches
   2.3 Creating lesson plans to promote science learning on tablet.
3. The follow-up process was provided after two months of the workshop. The project methodology can be seen in Figure 1.

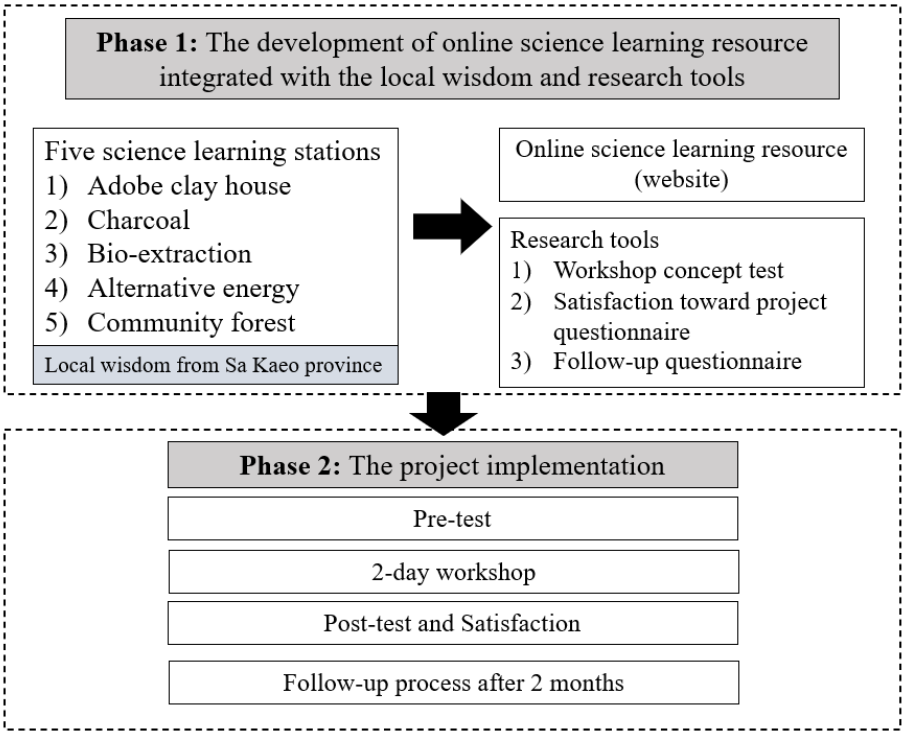

Figure 1: The summary of the project methodology

Data collection and analysis

1. The quantitative were collected from workshop concept test and satisfaction toward project questionnaire.
2. The data from the workshop concept test were analyzed using Wilcoxon matched-pairs signed rank test.
3. The data from the satisfaction toward project questionnaire were analyzed using the criterion presenting the level of satisfaction as follows.
   4.50 - 5.00 strongly satisfied with this statement or highest level of understanding
   3.50 - 4.49 satisfied with this statement or high level of understanding
   2.50 - 3.49 neither satisfied nor dissatisfied or moderate level of understanding
   1.50 - 2.49 dissatisfied with this statement or low level of understanding
   1.00 - 1.49 strongly dissatisfied with this statement or lowest level of understanding
4. The follow-up process was provided after two months of the workshop to participants using a follow-up questionnaire. The data from the follow-up questionnaire were qualitatively analyzed using content analysis (Krippendorff, 2013).

Results

Science Education Center, SWU, has developed online science learning resource integrated with the local wisdom based on five science learning stations at College of Bodhi Vijjalaya, SWU, in Sa Kaeo campus. The results are divided into three parts including the feature of the development of online science learning resource integrated with the local wisdom, understandings toward concepts of using tablet, and evaluation on the project.

Feature of the development of online science learning resource integrated with the local wisdom

Science learning stations are composed of 1) adobe clay house, 2) charcoal, 3) bio-extraction, 4) alternative energy and 5) community forest. In order to develop the website, we have integrated this project with the subject related to innovative science learning course for first year doctoral students of Science Education Center. The students are involved in designing the website, creating learning activities, worksheets and important information under the suggestions of the course instructors and expert. The website can be seen in Figure 2.

Figure2: Online science learning resource integrated with the local wisdom

Understandings toward concepts of using tablet

The data from workshop concept test were analyzed using Wilcoxon matched-pairs signed rank test. The results found that participants' understandings scores toward all concepts after attending the workshop were significantly increased at .05 level of statistical significance level ($z = -5.364$, $p = .000$). Considering separately to each concept of the workshop, the results revealed that teachers' understanding were significantly increased at .05 level of statistical significance of three concepts; 1) concept of using tablets as a tool of learning ($z = -5.356$, $p = .000$), 2) scientific concept of 5 learning stations ($z = -3.341$, $p = .001$), and 3) concept of blended mobile learning model and approaches ($z = -4.344$, $p = .000$) as shown in Table 1.

Table 1: Participants' understanding scores

Concepts		n	Total cores	M	S.D.	z	p
Concept of using tablets as a tool of learning	Before	38	5	1.11	0.92	-5.356*	.000
	After	38	5	4.00	0.84		
Scientific concept of 5 learning stations	Before	38	5	1.50	1.06	-3.341*	.001
	After	38	5	2.37	0.82		
Concept of blended mobile learning model and approaches	Before	38	5	2.66	1.19	-4.344*	.000
	After	38	5	4.00	1.04		
Understanding scores toward all concepts	Before	38	15	5.26	2.00	-5.364*	.000
	After	38	15	10.37	1.60		

*p< .05

Evaluation of the project

The results of the project come from a two-day workshop for training 38 science and technology teachers who teach in primary and secondary level in Sa Kaeo province.

Participants' satisfactions toward project were collected using project satisfaction questionnaire. The data were analyzed from the responses of 35 science and technology teachers who teach in primary and lower secondary levels out of 38 teachers (92.10%) from four schools in Watthana Nakhondistrict, Sa Kaeo province, Thailand. The participants' general information was presented in Table 2.

Table 2: Participants' general information

Gender	Number of participants	Percentage
Male	16	45.7
Female	19	54.3
Total	35	100

The participants' satisfactions toward project frequency and mean scores presented that the project achieved the desired objectives asshown in Table 3.

Table 3: Participants' satisfactions toward the project

No	Statement items	Level of satisfaction					M	S.D.	Data interpretation
		5	4	3	2	1			
1	Workshop/ project location	18	16	1	-	-	4.49	0.56	Satisfied
2	Project duration	10	19	6	-	-	4.11	0.68	Satisfied
3	Services from working staffs	20	11	4	-	-	4.46	0.70	Satisfied
4	Transferring of knowledge from speakers and expert	18	15	2	-	-	4.46	0.61	Satisfied
5	Speakers' responding to the participants' questions	21	12	2	-	-	4.54	0.61	Strongly satisfied
6	Understanding in using tablet in iOS and Android systems before attending the workshop	4	7	9	11	4	2.89	1.21	Moderate

Table 3 (Cont')

No	Statement items	Level of satisfaction					M	S.D.	Data interpretation
		5	4	3	2	1			
7	Understanding in using tablet in iOS and Android systems after attending the workshop	5	20	9	1	-	3.83	0.71	High
8	Understanding in science learning station integrated to local wisdom before attending the workshop	1	10	14	7	3	2.97	0.98	Moderate
9	Understanding in science learning station integrated to local wisdom after attending the workshop	6	23	6	-	-	4.00	0.59	High
10	Understanding in blended mobile learning model and approaches before attending to the workshop	4	8	9	11	3	2.97	1.18	Moderate
11	Understanding in blended mobile learning model and approaches after attending to the workshop	10	18	6	1	-	4.06	0.76	High
12	Writing lesson plan using tablet and blended mobile learning model	6	22	5	2		3.91	0.74	High
13	Benefits gained from the project	14	15	3	3		4.14	0.91	High
14	Satisfactions toward overall project	13	16	3	2	1	4.09	0.98	Satisfied

Besides, the participants have responded to an open-ended question in the project satisfaction questionnaire. The content analysis was used to analyze their responses. The participants' responses are as follows;

Question: How will you apply the knowledge from the project to your teaching? The results are grouped into five groups of response in the following.

1) Writing lesson plans.
2) Providing new technology into the process of teaching and learning.
3) Applying this knowledge to learning activities.
4) Using this knowledge to develop their teaching capabilities.
5) Using this knowledge as teaching media and materials.

All participants thought that this project was useful for teachers and students, as one of teachers stated that "*this is a good project and is useful for teachers and students. The expert and speakers are good and have tuneful voices. The staffs are friendly and have a good service mind. This project makes me realize the important of using technology in teaching."*

The follow-up results about teachers' applying the knowledge from the project in science classroom two months after completing the workshop.

The working staff carried out the follow-up process using questionnaire sending to 38 teachers and received the questionnaires back from 23 teachers (60.53%). Teachers' opinions and reasons are presented orderly depending on the questions as follows;

Question 1: Have you applied the knowledge about "using tablets as a tool of learning in iOS and Android systems" in your teaching? And why? Please explain your results or reasons. Teachers' responses can be seen in Table 4.

Table 4: Teachers' responses toward question 1

Items	Frequency (%)	Results or reasons
Have applied	7 (30.43)	• Using this way of teaching is good for students but the school internet system needs to be ready. • Tablets help students a lot during searching for their science project information. • Using tablets in the classroom can promote students' interests in science learning. • Students have learned by doing and gained more knowledge. • Tablet is a good teaching material.
Have not applied	13 (56.52)	• Schools have not enough tablets and teaching materials compare to the number of students. • The school internet system is not ready. • Primary students are too young to learn this way. • Students and teachers have not enough knowledge about using tablets. • Teachers have not enough time to teach based on their school workloads.
Will apply in the future	3 (13.04)	• Schools will completely have tablets for all students in the future. • Teachers will apply the knowledge in ICT subject.

Question 2: Have you applied the knowledge about "scientific concept of learning stations" in your teaching? And why? Please explain your results or reasons. Teachers' responses can be seen in Table 5.

Table 5 Teachers 'responses toward question 2

Items	Frequency (%)	Results or reasons
Have applied	10 (43.47)	• Students can search the scientific concepts from science learning stations website. • Students can answer the question from activities in the website. • The concept "bio-extraction" can be used corresponding to students' real-life situation in school.

Table 5 (Cont')

Items	Frequency (%)	Results or reasons
		• These scientific concepts can be integrated into other learning areas such as "occupation and technology" corresponding to the Basic Education Core Curriculum B.E. 2551 (A.D. 2008). • Students have learned from learning resources. • Students have improved their achievement and have more interests in learning. • Students have gained more knowledge about science and their local wisdom from five science learning stations.
Have not applied	11 (47.82)	• The school internet system is not ready. • Teachers teach in technology subject not science subject. • Teachers have not enough time to teach based on their school workloads.
Will apply in the future	1 (4.35)	• Teachers will integrate these concepts to social science subject for primary students in the future.

Question 3: Have you applied the knowledge about "blended mobile learning model and approaches" in your teaching? And why? Please explain your results or reasons. Teachers' responses can be seen in Table 6.

Table 6: Teachers 'responses toward question 3

Items	Frequency (%)	Results or reasons
Have applied	8 (37.78)	• Students can learn better. • This way of teaching can promote students' thinking, interests and curiosity in their learning. • Students can send their assignments back to the teachers via social networks using tablets and smart phones. However, some students secretly play games and Facebook. • Students have gained more knowledge.
Have not applied	11 (47.82)	• The school internet system is not ready. • Schools have not enough tablets and teaching materials compare to the number of students. • Students and teachers have not enough knowledge about using tablets. • Teachers have not enough time to teach based on their school workloads.

Table 6 (Cont')

Items	Frequency (%)	Results or reasons
Will apply in the future	4 (17.39)	• Schools will completely have tablets for all students in the future. • Teachers will integrate these concepts to social science subject for primary students in the future. • Teachers will set a special class teaching by using tablets.

Discussion and implications

From the development of online science learning resources integrated with the local wisdom of Sa Kaeo province, the working staff conducted academics services in the form of a workshop about using a Blended mobile learning model for learning on tablets. Additionally, the working staff has studied the results of the project through three aspects of knowledge, which are the concept of using a tablet as a tool of learning (in iOS and Android systems), scientific concepts of five learning stations and Blended mobile learning model and approaches. In addition, we also studied the participants' satisfaction toward the project. The results found that, although, teachers' understanding of the three aspects of knowledge were significantly increased, they still had problem understanding scientific concepts, due to the fact that they teach in primary and lower secondary school levels and did not have degrees in science. These may obviously affect their understanding in science. Therefore, during the workshop, speakers provided the participants with opportunities to ask questions about content used in the workshop and also discuss together in groups. Moreover, working staff created an online social network for teachers in order to discuss problems while they were teaching using tablets at school. Additionally, from the follow-up process asking about teachers' applying the knowledge from the project in science classes, the results revealed that using a tablet as a tool of learning in the classroom is good for students but the school internet system needs to be ready. Moreover, tablets also help students in searching for science project information and can promote students' interests in science learning, which corresponds to Shih et al. (2010). Shih et al. (2010) stated that, even though students have no prior knowledge at all when they come to the class, learning by using a mobile device can promote students' interest in learning at a high level. However, Adams, & Hayes (2009) have studied using tablet PCs in mathematics learning. Their results revealed that most students would like to learn in this way but there are also many students who do not think that a tablet would help them to promote the development of their learning experiences.

According to teachers' opinions who have applied M-learning and tablets in the science classroom, the responses showed that tablets are a good teaching resource. Similarly, the research of Hulls (2005) discovered that tablet PCs can help teachers to use marks with various colors to draw the students' attention to the class and make lectures more interesting. We can claim that wireless and M-learning serve as useful tools for learning in a student-centered system. Besides, teachers' opinions also indicated that students can answer the questions from activities in the website which is consistent with Shih et al. (2010) and Goodwin (2012). The results of these two studies found that students can answer the questions in worksheets with plenty of information.

More importantly, regarding learning through science learning stations integrated to local wisdom using M-learning, students have gained more knowledge about science and their local wisdom from the five science learning stations. Shih et al. (2010) has reinforced that learning this way can be used for students with different levels of

achievement. Furthermore, this way of learning can promote students' thinking, interests and curiosity corresponding to Galligan et al. (2010) and Sivakumar (2016) which mentioned that the tablet PCs in teaching and learning are able to create learning environments and also to enhance learning opportunities for both students and teachers.

The additional responses from the follow-up found that students can send their assignments back to the teachers via social networks using tablets and smart phones. However, some students secretly play games and Facebook in class. This accords with the study of Shuler et al. (2013) and Kopecký et al (2021) which revealed that mobile devices frequently were not allowed to be used in schools. This may cause obstructive factors that affect students' learning. For teachers who have not applied tablets in the classroom, their reasons are similar. Teachers have not enough time to teach based on their school workloads. Besides, teachers and students' knowledge about using tablets and mobile smart phones are inadequate. The teachers need a handbook of guideline on how to use both iOS and Android tablets. If teachers and students can use the tablets and M-leaning efficiently, they will find that these devices and learning model can be used in several useful ways such as recording video and audio in order to assess student's learning behaviors, sending useful information to students, connecting to email and taking notes. Moreover, tablets are portable for learning in other places (Jisc Regional Support Center, 2012; Sivakumar, 2016).

Teaching and learning this way normally have to occur in an internet-enabled environment. The most important problem for using this way of teaching and learning is that schools are unable to provide the internet system. As a result of the internet problem of the school, this leads us to suggest considering how to conduct teaching and learning science using tablets in the offline environment for further study.

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